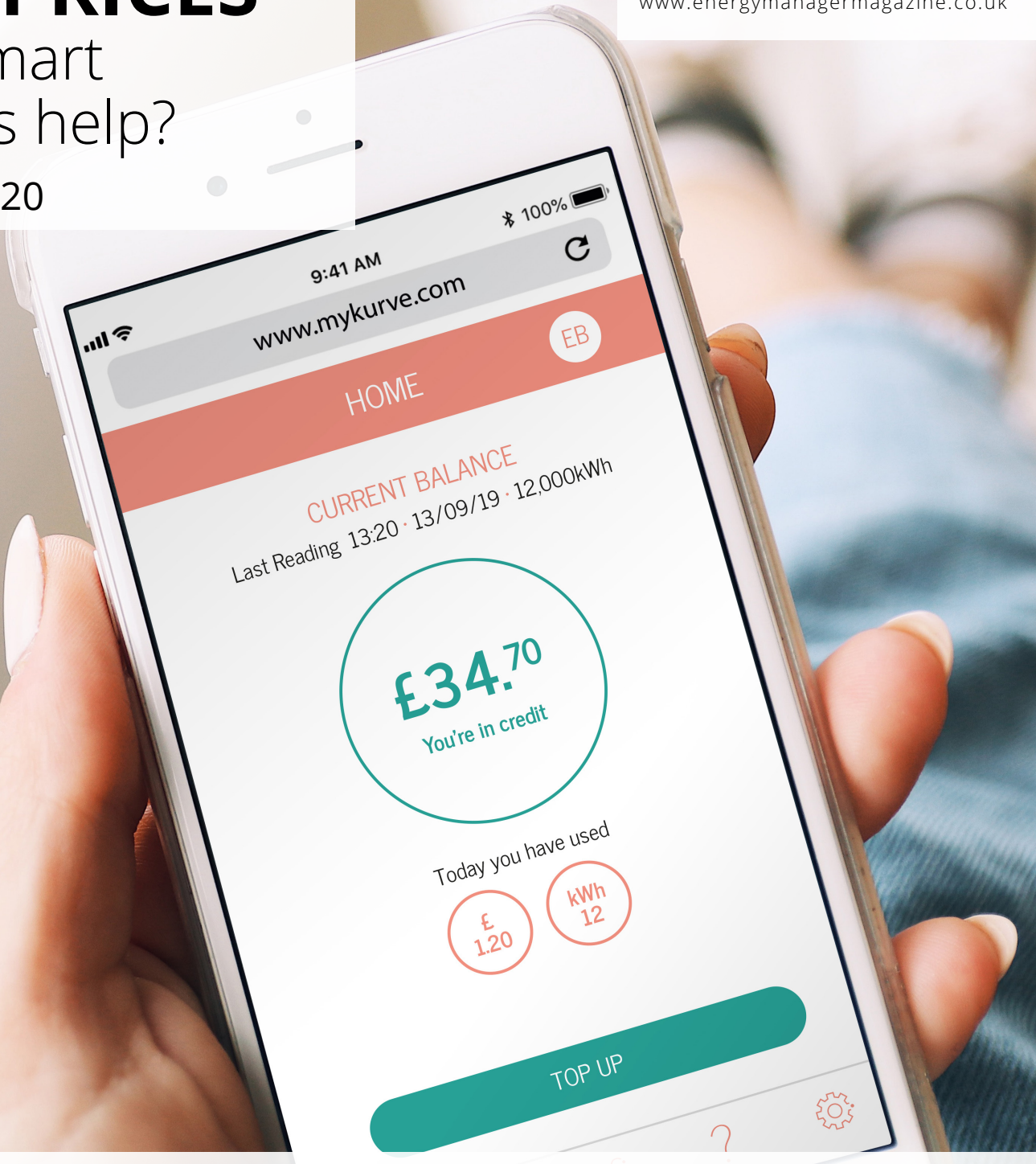


# SOARING GAS PRICES –

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Heat pump technology supported by Heat Networks Investment Project



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Stepwise progress to more sustainable heating





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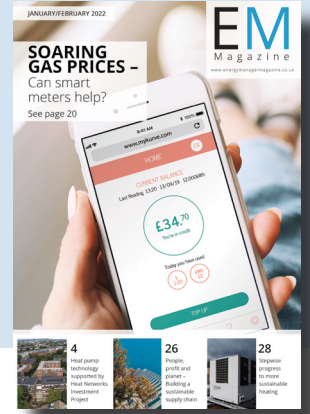
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# HEAT PUMP TECHNOLOGY SUPPORTED BY HEAT NETWORKS INVESTMENT PROJECT

Following the publication of the Heat and Buildings Strategy, Triple Point Heat Networks Management are delighted to announce funding awards to a suite of low carbon heat network projects. Heat networks have been identified by the Government as a key technology and the Strategy placed particular emphasis on the use of heat pumps in the delivery of low carbon heat.

The announcement combines these two technologies across four projects. The variety of projects that have secured funding really demonstrate the adaptability and flexibility of heat pump technology when deployed in heat networks.

The successful heat network schemes utilise heat pump technology and bring the total amount awarded via the Heat Networks Investment Project to over £250 million.

Ken Hunnisett, Triple Point Heat Networks Investment Management said: "The Heat and Buildings Strategy made clear that both heat networks and heat pumps are central to the Government's decarbonisation efforts. So, it is fantastic to see so many schemes already stepping up to combine these solutions in such innovative ways to access heat under our feet, in the air around us, in our waterways and even within our sewerage system. Not only will these inspiring projects deliver carbon savings, but they prove that heat pump technology is

adaptable and can contribute to a smarter, more flexible future energy system."

Lord Callanan, Department for Business Energy and Industrial Strategy said: "Changing the way we heat our homes and workspaces is key to tackling pollution and today's investment into new heat networks across Worthing, London, Bristol and Liverpool will ensure these areas are placed at the heart of the UK's green industrial revolution.

"The new networks of air source heat pumps will deliver affordable, low-carbon heat and energy across the nation's homes, universities residences, and business units, while opening up huge job and investment opportunities, making our thriving cities and seaside towns greener places to live, work, and visit."

## OVERVIEW OF PROJECTS AWARDED FUNDING

### ROYAL BOROUGH OF KENSINGTON AND CHELSEA

Kensington and Chelsea Council has been awarded over £1.1 million to develop a new zero carbon heat network which will be able to provide heat to 826 existing homes in North Kensington, and several public buildings and business units. Around 80% of these homes are heated currently by two heat networks which are over 40 years old, and the remainder use individual combi-boilers

and gas CHP. By using Air Source Heat Pump technology, the Notting Dale Heat Network will be zero-carbon from 2030 supporting the council's plans for the borough to become net zero carbon by 2040. The scheme is expected to deliver carbon savings over the first 15 years of operation of around 790 tonnes per year.

Cllr Kim-Taylor Smith, lead member for Grenfell, Housing and Social Investment, said: "It's important as a Council we continue to put residents first and provide a better quality of life now and for future generations. We're making great strides in our progress to decarbonise all of our services and the borough as a whole, but we know homes can be one of the biggest carbon emitters.

"It's fantastic to be able to further our plans for a zero-carbon heat network, which we have co-designed with local residents. This will allow us to provide affordable heating and hot water in an environmentally friendly way, whilst tackling fuel poverty."

### WORTHING BOROUGH COUNCIL

The scheme will support Worthing Borough Council's pledge to become carbon neutral by 2030 by replacing gas boilers in 27 buildings with a heat network that will use a centralised heat pump to take heat from the sewer underneath the town. The use of 'sewer heat' to replace gas boilers follows a discovery that sewers below Worthing contain more than enough heat to replace gas boilers in public buildings. The buildings due to be connected to the heat network include the town hall, library, hospital, leisure centres, law courts, police building and possibly even schools. Future expansion potential of the network could see additional premises connect to the network over time. HNIP funding of just over £5 million will cover preparatory work, initial construction and the appointment of a private sector partner to help finance, design, build, own and operate.

When the heat network is operational, the 3MW heat pump will capture heat passing through the mains sewer, which runs below Worthing's high street. It is expected to save 2,454 tonnes of carbon per year by replacing fossil fuel gas boilers with a sustainable energy source.

Cllr Edward Crouch, Worthing Borough Council's Executive Member



for Digital and Environmental Services, said: "The prospect of heating huge swathes of the town using the heat that is literally beneath our feet while phasing out environmentally harmful gas boilers, is a simple but wonderful piece of science that, if adopted around the world, could help save the planet. I'm extremely grateful to HNIP for showing faith in our scheme with this funding."

#### BRISTOL CITY COUNCIL

Bristol City Council has previously been awarded HNIP funding for two heat networks in the city and has secured a further £1.7 million to support the development of a new heat network. Combined, these low carbon networks are expected to deliver heat to over 6,000 residences.

The Temple Heat Network is being developed to generate low carbon heat from water sources accessible from the regeneration of Temple Island and waste heat from the University of Bristol's Temple Quarter Enterprise Campus. A combination of heat pump technologies will be used to provide low carbon heat to local homes and businesses, as well as student housing, university buildings and education facilities. The technology mix includes a Ground Source Heat pump using a local sandstone aquifer, a Water Source Heat Pump using Bristol's floating harbour and extracting waste heat from the university buildings themselves.

Councillor Nicola Beech, Bristol's Cabinet Member for Climate, Ecology, Energy and Waste said: "The Bristol Heat Network is an integral part of our strategy for decarbonising the city and ensuring that Bristol continues to play its part in addressing the climate crisis. The council has invested over £60m in low-carbon and renewable infrastructure in recent years and we're delighted to be working in partnership on this innovative project.

"It's exciting to be replacing old technology with greener solutions and great to be supporting businesses and public sector partners with their own efforts to decarbonise. Developing the heat networks has so many benefits for the city including the reduction in fuel poverty, cutting carbon emissions and creating thousands of jobs to support the local economy."

#### PEEL NRE DEVELOPMENTS LTD, PART OF PEEL L&P

Peel NRE, through its supply company (ESCo) Mersey Heat are delivering a district heat network to the Liverpool Waters development and the surrounding areas. Peel NRE, part of Peel L&P, successfully secured funding in Round 2 to deliver the first phase of the Mersey Heat network. The scheme was initially designed on a Gas CHP generation; however, this new HNIP funding award of £6.2 million will enable the transition to a heat pump solution as the main generation source and connection of a central cluster of existing buildings with significant load (Liverpool's The Three Graces buildings and surrounding properties). The funding will support one of two 3MW low-carbon heat pumps, the first of which will be water source heat pump.

More than 2.5km of pipework for the 4.1km network has already been installed and this new funding also enables Mersey Heat to undertake further feasibility studies. When complete, Mersey Heat will provide low carbon heat and hot water to up to 9,000 homes and 4 million sq. ft of commercial space at Peel L&P's £5bn Liverpool Waters development and nearby buildings.

Jonathan Burley, Commercial Director at Peel NRE, part of Peel L&P, said: "Mersey Heat supports national and local targets to achieve net zero and we're pleased to receive further funding to help roll-out the network on a larger scale.

"The addition of large historical buildings like the Three Graces would make a high-profile impact on reducing Liverpool's carbon footprint and we look forward to working with the buildings' owners and our district heat network specialists Ener-Vate to progress these designs and hopefully connect some of Liverpool's most prestigious properties to our low carbon network." [www.tp-heatnetworks.org](http://www.tp-heatnetworks.org)



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# NEW YEAR – NEW ERA FOR ENERGY REDUCTION AT COLCHESTER INSTITUTE

An ambitious multi-million-pound carbon reduction project took a giant leap forward at Colchester Institute when the new technology was switched on for the first time.

The college in Colchester has installed state-of-the-art air source heat pumps (ASHP) thanks to a £3.7m grant from the Government, as part of the Public Sector Decarbonisation Scheme (PSDS). The ASHP sourced from Arriba Tech, a UK company which builds its own heat pumps using natural refrigerants and easy to repair components.

The grant provided by Salix Finance on behalf of the Department of Business, Energy and Industrial Strategy has seen the replacement of fossil fuel boilers alongside an upgrade of the two principal buildings at the Sheepen Road site. This includes the replacement of all heating infrastructure alongside the installation of double-glazed windows and additional thermal insulation throughout.

Gary Horne, Executive Vice-Principal, at Colchester Institute, said: "Today marks a huge leap forward on our net zero journey, and we are so grateful to our funding and delivery partners for supporting the College in this way. The improvements to our main two buildings will deliver a step change to the learning experience, and with student numbers increasing due to the rising local population, this is perfect timing."

The current decarbonisation work

taking place at the Sheepen Road campus is being undertaken by Cadman Construction, with a workforce which includes staff who were either trained at the college or who are currently attending the college. This includes six apprentices who have already graduated, two current apprentices from the college and one current management trainee who is studying at the college's university centre.

Gary Horne added: "It's something we've championed over the years when we've put bids together. How can we put back into the local economy and how can we better support our students? This work does both with the practical experience being developed while we really benefit in terms of improved facilities."

Works started in the summer of 2021 and B Block was completed before Christmas. The next stage of the project will see the decarbonisation work continue into the adjacent D Block building which currently houses the hair and beauty department. The college will ensure students can still access important learning, whilst the work is taking place.

Kirsty Adamson, programme manager at Salix Finance, said: "It has been an absolute delight working with Colchester Institute on this decarbonisation project

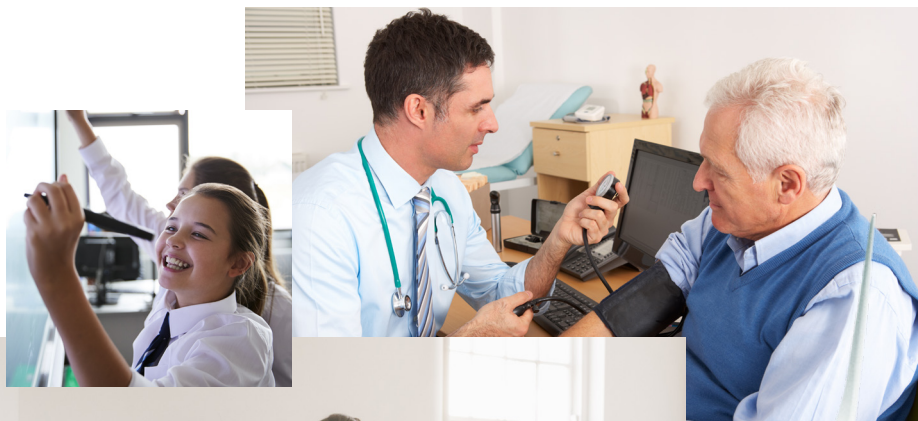
as they have been so enthusiastic about the transformative impact the work is having on the look, feel and greening of their buildings."

"The funding has significantly enhanced the students' learning experiences, provided a better workplace for staff, helped save costs and made huge strides in helping the institution get to net zero. The grant has helped support jobs in the green construction industry and in this case, it also involves the college's former students, which is especially gratifying. We were also pleased to see the money went to local contractors, helping to support the community's economy."

Alison Andreas, Principal and Chief Executive at Colchester Institute said "In October, the College declared a climate emergency. This landmark project is a really important statement that we are serious about carbon reduction and our role as a business, and as an educator, in the net zero challenge."

Salix Finance delivers government funding to the public sector to improve energy efficiency, reduce carbon emissions and lower energy bills and is funded by the Department for Business, Energy and Industrial Strategy. Email: [ben.miller@salixfinance.co.uk](mailto:ben.miller@salixfinance.co.uk)

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# ELECTRIC CAR CHARGERS FAST-TRACKED IN SOUTH EAST

Almost 1,000 electric car chargers have been fast-tracked to connect to the electricity network in London, the South East and East of England - thanks to an online portal for chargepoint installers.

Since launching Smart Connect in February 2021, UK Power Networks has instantly approved more than 2000 new applications for electric car chargers, heat pumps, batteries and solar panels in record time. The portal means people don't have to complete multiple paper forms and streamlines the process so installers can work more efficiently and install more devices for more customers. So far, 983 (more than half) of the 1,720 new electric car charging applications have been instantly approved by the portal, meaning devices could be connected straight away.

Smart Connect is also making other low carbon technologies possible. Applications to connect 234 electric heat pumps have been auto approved since February, along with 765 household solar installs and 66 domestic batteries.

The service works by using artificial Intelligence to process data about each household installation. When an installer applies to connect a new car charger, Smart Connect refers customers to a UK Power

Networks expert if the electricity supply needs to be upgraded to gain additional power. If no upgrades are required, the tool provides an automatic assessment and then auto approval.

Installers with multiple jobs planned, can also use Smart Connect to check the status of all their applications at the click of a button.

Ian Cameron, head of customer service and innovation at UK Power Networks said: "Millions of electric cars and heat pumps will connect to our networks over the next decade. Through tools like Smart Connect we'll make sure - whether we're working with installers or directly with consumers - they can all connect at pace."

Gary Church, electrical contracts manager at Blueflame (Colchester) Limited, which installs and maintains heat pumps



Thousands of electric car chargers are being fast-tracked to connect to the electricity network in the South East

and solar PV systems across Essex and Suffolk, said: "We've been using Smart Connect throughout this year and it's been a brilliant tool for us. It's streamlined our process of notifying installations of heat pumps and PV completely. It also ensures we are always complying with all regulations and give our customers the best service possible." [www.ukpowernetworks.co.uk](http://www.ukpowernetworks.co.uk)

## MITSUBISHI ELECTRIC RELEASES NEW CPD GUIDE ON MULTI-RESIDENTIAL BUILDINGS, WITH SUPPORTING WEBINAR

Mitsubishi Electric has released its latest CPD guide, 'Multi-Residential Buildings: Heating, Hot Water and Ventilation', to provide clear information on some of the UK's most pressing building challenges.

Multi-residential buildings are usually medium and high-rise apartments, leased to private tenants, and they are a growing part of the UK property sector. As with all dwellings, these buildings must comply with Building Regulations, and be designed to meet targets such as low-carbon construction and operation, while ensuring occupants have adequate ventilation and protection from overheating.

This guide considers these problems, their impact on the property market and looks at the technology that can support the design and operation of multi-residential buildings.

It discusses the importance of heat networks and heat pump technology as

crucial technologies for decarbonising the UK, and explores the need for developers to consider these heating and hot water options for multi-residential buildings.

The guide also covers the growing focus on building occupant health, and how to combat the issue of overheating and maintain good indoor air quality when building new homes - including the role of Mechanical Ventilation with Heat Recovery (MVHR) technology, which extracts stale air continuously from the dwelling while recovering heat from the outgoing air.

"We're seeing a large rise in the number of multi-residential properties being built," says Graham Temple, Marketing Manager. "With these new developments happening

under tight regulation and carbon restrictions, it's time developers looked towards new technologies that can help them overcome building challenges in a sustainable manner."

The CPD Guide can be downloaded here: [https://library.mitsubishielectric.co.uk/pdf/book/Issue\\_76\\_Multi\\_Residential\\_Buildings\\_Heating\\_Hot\\_Water\\_and\\_Ventilation\\_Technologies#page-1](https://library.mitsubishielectric.co.uk/pdf/book/Issue_76_Multi_Residential_Buildings_Heating_Hot_Water_and_Ventilation_Technologies#page-1)

To support the guide, Mitsubishi Electric is hosting a webinar on the 3rd of February at 2pm. The webinar expands on the topics covered in the guide, and provide opportunity to discuss the issues and solutions.

Register to attend the webinar here: <https://bit.ly/3AhlHCr>







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# IN THE AGE OF NET ZERO, HOW DOES A COMPANY GO ABOUT WORKING OUT ITS CARBON FOOTPRINT?

**A**s we begin a new year, the push for companies to reach Net Zero is stronger than ever. With pressure mounting from protests, governments and competitors to make serious steps towards Net Zero, working out what that roadmap looks like needs to be a top priority for business leaders..

Unfortunately, like many initiatives implemented by politicians for good soundbites, in practice the road to Net Zero is not straightforward at all. When it comes to calculating your carbon footprint (and therefore working out how to get to Net Zero) while there are tools out there, there is a lack of common methodology and standards, which of course causes confusion.

Even with tools in place to help a business needs – shock – a calculator, and – sorry about this – an accountant and an auditor.

As the FT noted, the key people missing from COP26 were the auditors. Admittedly heads of state aren't massive fans of hanging out with auditors (not sure anyone is) but they should have been there.

A huge shift is needed to encourage and enable businesses to work out their current position and steer where they are going, and there is no avoiding that accountants & auditors are at the heart of that process.

In terms of auditing, BCorps are all the rage. They look at your business holistically, help you be transparent and send your customers a clear message about your intentions which is great but, for most smaller and medium sized businesses, it all boils down to the same questions.

What is my carbon footprint and what can I do that's meaningful to mitigate it.

## HOW DOES A COMPANY OFFSET AND REDUCE ITS CARBON FOOTPRINT?

Well, answering that means a lot of the same difficulties as the first question. To know how much to offset you need to know how much you're making in the first

## Andrew Oury

place. When it comes to offsetting, the truth is there are a lot of uncertainties, we still can't be certain how much CO<sub>2</sub> a tree absorbs for example. And whether carbon offsetting is good or bad largely depends on the offset in question.

There are loads more questions that businesses are going to have to get answers to meaning a large investment in terms of time, resources and almost certainly accountants (sorry and yes, other professional advisers are available).

Now of course you are thinking how does a company pay for this?

Well the good news is that the government already has some tax structures in place to support getting you to NetZero such as:

1. Climate Change Levy – a tax collected by energy suppliers and paid by businesses and the public sector to encourage them to become more energy-efficient.
2. Carbon Price Support – to incentivise electricity generators to invest in low-carbon electricity by increasing the cost of fossil fuels.
3. Landfill Tax – to divert waste from landfill to less harmful methods of waste management
4. Aggregates Levy – to encourage the use of recycled materials over the extraction of rock, sand and gravel which can damage the environment
5. You can claim 'enhanced capital allowances' (a type of first year allowances, which is in addition to the Annual Investment Allowance) for:
  - New zero-emission goods vehicles
  - Some cars with low or Zero CO<sub>2</sub> emissions
  - Energy saving equipment on the energy technology product list
  - Water saving equipment on the water efficient technologies product list
  - Plant and machinery for gas refueling stations
  - Gas, biogas and hydrogen refueling equipment



There are also some grants available from Innovate UK – offers grants targeted at companies developing technology for sustainable purposes – and The Sustainable Innovation Fund – to help stimulate clean growth recovery in light of COVID-19 across all the sectors of the UK economy. Even one to create woodland and plant trees

Scottish businesses can access interest-free green loans up to £100k to help pay for energy and carbon-saving upgrades and potentially a cashback grant of up to £20k.

For Scottish businesses, there is also the Low Carbon Transport Business Loan which offers up to £120,000 interest-free to help reduce the carbon impact and fuel costs of their transport arrangements through the purchase of new, more efficient vehicles.

These initiatives are a start but the fact remains that businesses do need help answering the basic questions first:

- What do I need to do right now?
- What should I be doing for tomorrow?
- And how the hell do I work it out?

While messages of getting to NetZero are everywhere, expecting businesses to make changes without a clear understanding of how they get there is a recipe for disaster.

Right now the best way to get the clarity and guidance business so desperately needs is from – sorry again – accountants.

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# QUIXOTE -V- THUNDER 90 – PART 1: DOUBTS & DILEMMAS

Backtracking from the 17th century, when the chivalrous knight and ‘ingenious gentleman’ Don Quixote jousted with ‘hulking giant’ Windmills, to the 9th century’s mythological Norse God of Thunder, the debate continues regarding the long term credibility of renewables versus a nuclear alternative. Thorium, one of only two remaining radioactive elements that still occur naturally in significantly large quantities on Earth, has the atomic number 90 and derives its name from the ancient northern Germanic tribes where Thor originated. Today, within the UK electricity generation sector the use of renewables has increased low-carbon generation to its highest ever peak but the energy output from nuclear sources is at a record low. In the first of two articles **Chartered Engineer Graham Olsen** and **Professor Robert Jackson** reflect upon these significant facts and examine a potential ‘energy-mix car crash’ that may fail to quench Britain’s future energy demands.

**E**nergy may be defined as the force needed to perform work measured in Joules, named after James Joule the 19th Century English physicist and mathematician, whilst the rate at which this work is performed defines power measured in the unit of Watts, named after James Watt the 18th Century Scottish mechanical engineer and chemist. The latter’s steam engine sparked the global ‘Industrial Revolution’ and developments in science and engineering made by Joule and Watt changed the world in which we live. But today, that world is threatened by unsustainable demands on the environment which are now at the core of efforts to de-carbonise the economy. Perhaps now is the time for nuclear energy to play a crucial role within a new ‘Sustainability Revolution’? However, before future solutions can be examined it is prudent to identify the principal challenges currently facing the UK energy market.

Providing power to consumers on demand, even when it is not sunny or windy, clearly demonstrates that intermittent generation is a principal challenge for the renewables industry, and this problem is further compounded by the absence of a cost-effective and

reliable means to capture and store electrical energy. This question of energy storage also gives rise to the ongoing debate regarding the pros and cons of battery-based storage solutions versus molten-salt alternatives, each of which require detailed examination. Given current limitations in the storage of electrical energy, it is extremely problematic to optimise renewable plant design-capacity and cost-effectiveness; if too large, the energy produced will not be utilised, if undersized, then customer requirements will not be met. Moreover, getting electricity from where it is generated to where it is consumed requires a power transmission and distribution system that comprises a reliable power grid.

The principal obstacles relating to balanced energy demand comprise: climatic conditions; economic pressures; customer behaviour; and customer dependency/reliance on utility sector provision versus personal provision. Whereas, the principal stumbling blocks relating to steady energy supply comprise: infrastructure capacity and reliability; transmission and distribution; energy storage; and technical resource capability. These combined challenges are often compounded by a mismatch between fluctuations in both supply

and demand coupled with the intrinsic limitations of renewable technologies.

Whilst wind turbines are subjected to highly variable inflow conditions that depend on location, both onshore and offshore, and on geographically different atmospheric flows, wind power is one of the fastest-growing energy sectors in the world with its contribution to global electricity generation set to increase from 5 to 30% by 2050. During the same timeframe it is estimated that the carbon footprint of those materials required to create and install wind turbines globally will be at least 9 times lower than that resulting from carbon dioxide gas emissions currently attributed to coal-fired power stations within the United States alone. Notwithstanding the vagaries of climate change, as exemplified by recent storm-based disruption to energy supplies throughout the UK, wind-generated power is also clearly preferable to fossil fuel generated alternatives, with associated greenhouse gas emissions only accounting for between 2.5 and 125 grams of carbon dioxide per kilowatt hour. However, with the increasing deployment of large-scale wind farms, there is an impending need to ensure that sufficient raw materials are available to meet the expected global capacity growth without creating new



Image by ILIER NAVARRO from Pixabay

environmental impacts from resource depletion and material scarcity, and/or from extraction process wastes, all of which could increase the carbon footprint of future electricity production.


Modern wind turbines also display **'less-than-green'** credentials. Their UK-based manufacture and construction require raw materials ranging from coking coal and iron ore to rock-aggregates and lithium additives. These are collectively used in the production of steel, aluminium, cement and concrete and rely on very high operating temperatures. Purchasing steel from alternative production sites, including China, depends on a high proportion of 'dirty coal' as an energy source and the Chinese connection also rears its ugly head when it comes to the use of rare earth magnets in turbine manufacture. Rare-earth magnets are permanent magnetic alloys manufactured from rare earth elements that comprise a set of 17 heavy metals whose atomic numbers range between 57 and 71. Despite their name, these elements are relatively plentiful within the Earth's crust, with one of their number being even more abundant than copper. However, by some geological quirk most rare earth elements are to be found in China and, to make matters worse, other renewable technologies

including solar are increasingly reliant on silver and copper plus rare earth elements. To satisfy the growing need for batteries the future mining of lithium is even being contemplated in Cornwall to counter the unsafe and uncontrolled mining operations that currently occur in central Africa.

Although local individual solutions, such as roof-top solar combined with battery storage, have the potential to permit residential and commercial users to effectively disconnect from the grid, for power to remain available to all, for all of the time, the grid is an essential asset. Indeed, grid-dependency is becoming ever-more critical owing to more electricity being derived from intermittent renewable sources. However, reliance on this essential asset is compromised by the grid's age and its physical potential to meet today's demands. Volatility in energy generation and energy needs, compounded by the unpredictability of renewable energy sources, serve to create price volatility and spikes throughout the renewables market. This means that renewable energy further complicates the economics of an already notoriously complicated sector making it extremely difficult for utilities to manage their infrastructure plans. Energy production is but one

of the many inputs into low-carbon economics, with products and services increasingly vulnerable to changes in government policy on climate change. However, when the Bank of England is imploring companies to go carbon-neutral on the grounds that this is better for finance and business, the merits of this approach must be questioned.

The expansion in the use of electric vehicles coupled with the reduction in the production of petrol and diesel cars together with the introduction of heat pumps to replace home gas boiler systems all serve to foster a changing consumer landscape. In addition to concerns relating to the energy cost of production and life cycle of batteries outlined above, the growth in electric vehicle use requires an examination of the amount of energy consumed in an internal combustion engine compared with the volume of gas or fuel needed to be burned at a power station to produce the electricity. Unsurprisingly, the energy in both cases is similar. So the only apparent benefit of moving to electric vehicles would appear to be the removal of toxic exhaust fumes from our roads and cities. But this solution requires more remote power stations creating increased emissions albeit in less densely populated areas.

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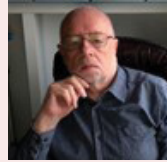
Examining the UK's current energy use, and comparing this with global statistics, it is evident that the UK has greater than average potential wind and tidal opportunities but less solar. At the same time the country has reduced its reliance on indigenous coal but has, in effect, exported its coal burning activities to the far-east where the raw material is mined and employed to power industry in making products once produced in the UK. In the short term a lack of reliable and stable renewables means that UK residents remain largely dependent on natural gas for home heating, whether this be by boilers within households or by local heat pumps driven by electricity derived principally from gas-fired power stations.

Recent developments have also included new solar-powered installations that are intended to produce hydrogen through the process of electrolysis. However, the energy value of hydrogen so produced is, at worst, only likely to equate to 30% of the solar energy input, and at best to no more than 60% of energy input. Furthermore, if hydrogen were to be produced through electrolysis powered by energy generated from a gas-fired power station, then this percentage would plummet to 15%. A phrase originating from a medieval asylum for the insane in part of a London Abbey comes to mind: **'Barking Mad'**.

A heat pump permits the extraction of up to 4 times its input electrical energy. The same ratio applies to domestic gas and electricity tariffs where the cost per kWh of electricity is approximately 4 times the kWh cost of gas. This therefore, directly reflects the efficiency of a power station in converting the burning of gas fuel to electricity. Consequently, moving from conventional gas heating to heat pumps will, in practice, mean that the same amount of gas will be burned at a power station to produce the equivalent heat pump electrical input as would be burned in an existing domestic gas boiler. The end result is that the same amount of carbon producing gas is going to be burned at power stations as was previously burned in home boilers resulting in no advantage being gained by switching to heat pump technology. Hence, until such time as carbon emissions from communal gas-fired power stations can be reduced there is little point in adopting so-called renewables.

## About The Authors:

**Graham Olsen** is a Chartered Engineer and former senior manager within the UK utility industry now acting as an independent consultant and expert witness.



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Claims from within the energy sector purport that hydrogen fuel is able to be produced through electrolysis with an efficiency in the order of 70% and a number of commercial sources suggest even greater efficiencies are achievable. It is further claimed that hydrogen could account for between 30-60% of the UK's energy mix by 2050. However, an analysis of this scenario suggests that electricity power stations would have to burn 50% more gas or other fuels than at present to take account of the alleged 70% efficiency rate in order to match current consumption. Much is made of producing green hydrogen from renewable sources such as solar, but again this would require energy providers to increase solar by the same proportions from an already enormous solar deficit if renewables are to displace fossil fuels to any great extent.

To alleviate the ever-present problems associated with renewables, emanating from a myriad of variables that may include geography; climate; technology; and consumers, there may, perhaps, be an elegant solution to these many annoying intermittences, in the form of nuclear energy. Today, solar energy may be stored in the form of heat, at a temperature of approximately 1,000 degrees Fahrenheit, using molten salt comprising a mixture of sodium and potassium nitrates. Its storage may last for up to six or seven hours before the stored energy can be used to create steam to drive an electricity-producing turbine. But, interestingly, molten fluoride salt is also the preferred method to cool a thorium-powered reactor core. Hence, using high-temperature nuclear fuels

and molten salt coolants may offer an attractive and simple means of efficient, stable and reliable energy generation that is not subject to the vagaries of climate.

Returning to the arid but fertile plateau of La Mancha, our adventurous heroes caught sight of thirty or forty windmills standing on the plain, and as soon as Don Quixote saw them he said to his squire Sancho Panza: *"Fortune is directing our affairs even better than we could have wished: for you can see over there ....a place where stand thirty or more monstrous giants with whom I intend to fight a battle and whose lives I intend to take."*

His squire retorted: *"Look you here, those over there aren't giants, they're windmills, and what look to you like arms are sails."*

Don Quixote replied: *"It is perfectly clear, that you are but a raw novice in this matter of adventures. They are giants, and if you are frightened, you can take yourself away and say your prayers while I engage them in fierce and arduous combat."*

So to conclude Part 1 of this paper, perhaps the delusions suffered by Don Quixote are more widespread and troublesome than first imagined? Perhaps the UK government's short-sighted over-reliance on renewables is also pure folly? Only time will tell, but Part 2 of this paper may well shed light on reliable alternatives.

**Editor's Note:** Part 2 of this article is to be published in the coming months and will detail the responses and remedies to the shortcomings raised in Part 1.

# ENERGY CRISIS: AN UNINTENTIONAL, YET PERFECT STORM FOR THE UK'S GREEN ENERGY TRANSITION

Chris Bowden,  
Managing Director,  
Squeaky.

After a period of historically low energy prices, during the Covid induced lock downs, gas and power prices have started their inexorable rise and hit historic highs. In the UK problems have mounted left and right with several energy suppliers going bust and millions of UK households experiencing significant increases in their energy bills. The industrial and commercial (I&C) and public sector has also been directly impacted by the massive rises in wholesale power prices.

Of course, the world has faced volatile energy markets and supply squeezes for decades. But the big difference this time is that this is the first major energy crisis of the clean-power transition. And whilst there has, and will continue to be, fallout from the recent wholesale market volatility, the net effect could be beneficial in the movement towards a greener world. Ultimately, this could well be the tipping point that we needed in the nation's transition to clean energy.

In short, paying more for gas and power, could spur on the deployment of a lot more renewable energy.

There's no doubt, some FTSE100 companies will be feeling the strain of the rapid increase in energy cost, particularly those whose budgets are based on the price of the previous year. Some will be seeing energy bills almost double, and when these costs are already in the millions, there may be some who will find themselves in a difficult situation where margins will be squeezed or prices to end customers will have to rise.

And it's not just the private sector that will be feeling the impact, the public sector will be under huge pressure too as it's much harder to pass on these higher energy costs to customers as some companies can.

Buying renewables from projects that need a Corporate Power Purchase Agreement (CPPA) to get funding can



disconnect a corporate from unstable and volatile power prices and provide greater certainty. This is because the power price needed by the developer of the project isn't linked to fossil fuel prices, instead it is linked to the cost of solar panels or wind turbines and the cost of capital. And whilst the cost of solar panels has risen steeply over the last twelve months the levelized cost of energy for a solar project is still below £50/MWh which compares very favourably to 2022 power prices of over £100/MWh.

Organisations who, prior to the energy crisis entered a CPPA, will have successfully insulated themselves against this chaos and will be reaping the rewards of stability.

Whilst the cost of renewable energy under a CPPA is below the cost of fossil fuel energy, it's important for a buyer to also consider the additional costs that often come with a long-term renewable energy transaction, namely the capture risk or the integration of this CPPA into both an organisation's energy supply and the wider energy system.

The integration of renewable sources in the energy system is one of the key components of any energy system decarbonisation strategy. However, this integration raises many challenges in terms of planning, operation, and reliability practice.

Renewable technologies are not comparable with fossil-based generation in terms of dispatchability. This translates into high system costs of renewable

generation, as it requires holding significant back-up capacity to ensure a balanced energy supply throughout the day. In fact, these challenges will only further increase as the share of renewable energy generation increases to levels never witnessed before. To date, these aspects have been only marginally considered in economic analyses of renewable energy deployment.

In addition, the politicisation of gas and power could also prove to be a challenge in the transition away from fossil fuels. Renewables imply a more flexible and decentralised approach to energy generation and one way to achieve this is interconnection with other markets. Electricity transmission operates under several significant constraints, among which are the interconnections between different regional electricity grids and the capacity constraints of transmission lines that limit movement of energy.

No matter how painful and expensive the transition from fossil fuel to clean energy will be, there is no escaping the fact that it is entirely necessary. Overcoming one of the greatest challenges of our time will require a rethink of the entire system; an overhaul of decade-upon-decade of supply chains diseased with fossil fuels; management of competing thoughts and ideas; rapid innovation, a sharp focus on deploying and scaling up existing technologies, and a high degree of global collaboration.

<https://www.squeaky.energy/>



# A SMARTER GRID FOR A GREENER BRITAIN

How Ecotricity's Smart Grid can help you get to Net Zero

**A**s Britain's greenest energy company, we're on a mission to create a greener Britain. We use our customers' bill money to build new sources of renewable energy, including windmills, sun mills, and in 2022 a green gas mill, all providing much needed clean, renewable energy to the grid.

But what happens when there's too much wind and solar generation? Where does all that energy go? And what happens when the wind isn't blowing or the sun isn't shining? That's where the Ecotricity Smart Grid is helping to make a more stable, greener grid. It's the future of energy in Britain.

If your organisation uses significant amounts of energy and you have the flexibility to adjust your energy demands throughout a 24-hour period, the Ecotricity Smart Grid could both save you money and ensure you're using renewable energy round the clock, helping with the move to Net Zero.

Mark Meyrick, Head of Smart Grids at Ecotricity, explains more about the benefits of this exciting new technology:

## WHAT IS THE ECOTRICITY SMART GRID?

It's a digital control system that links together thousands of businesses, energy generators and energy storage systems. These are all connected wirelessly to a single digital platform, enabling them to work together to create a more sustainable and secure energy grid with balanced supply and demand. This kind of system is sometimes called a Virtual Power Plant.

## HOW DOES THE SMART GRID WORK?

It uses algorithms to monitor the



**As renewable energy generation increases, Britain's energy grid needs to become more flexible. Energy storage is just one part of the answer – the bigger solution is the Ecotricity Smart Grid."**

Mark Meyrick, Head of Smart Grids - Ecotricity

energy grid, showing us where we could improve stability. With this information we can identify opportunities to make small adjustments that have a big impact. It may be something that seems insignificant, like dimming the lights for just sixty seconds when there's a high demand on the grid. But when you've got thousands of businesses plugged in, it can make a huge difference.

## WHAT ARE THE BENEFITS FOR ORGANISATIONS?

There are lots of benefits. There's the financial one, of course - making changes to the amount of energy you use and the times at which you use it, can make significant **savings on your energy bills**. Your organisation may also have a battery or electricity generation system – if we can call on that at various points, we'll pay you for using it.

Then there's the wider impact of a smarter energy grid that's connected to energy storage systems. This gives us the ability to provide **round the clock renewable energy – it's sustainable business that's better for the planet.**

## WHY HAVE ECOTRICITY DEVELOPED THE SMART GRID?

As renewable energy generation increases, Britain's energy grid needs to become more flexible. The problem is having the right amount of energy available at the right time, as you can't

expect the weather to be completely consistent. Energy storage is just one part of the answer – the bigger solution is the Ecotricity Smart Grid.

Innovation like the Ecotricity Smart Grid is another big step towards creating a sustainable world – one where renewable energy delivers our power needs come rain or shine.

As a not-for-dividend company, we invest our customers' bill money into building new sources of green energy in Britain, so with us you don't just get energy with a green source, you get a green outcome too. It's what makes us different from other green energy suppliers.

## DISCOVER MORE ABOUT OUR SMART GRID

To sign up or find out more about the Ecotricity Smart Grid, visit our website or email [smartgrids@ecotricity.co.uk](mailto:smartgrids@ecotricity.co.uk)

**FIND OUT MORE**





# THE TRIADS ARE HERE: WHAT TO EXPECT 2021/22

**H**alf an hour might not sound like a long time, but if you're using electricity at a peak time, it can be hugely costly. This is no truer than during the Triads – the three half-hour periods of the year when electricity demand is at its highest.

But it's not just the price of electricity that makes the Triads costly for businesses. The Triads also determine your business' annual contribution to the electricity transmission system, that delivers power around the country.

"The National Grid's cost of transmitting electricity from power generators to smaller distribution networks runs into the hundreds of millions of pounds every year," says Jake Miller, Electric Assets Lead at Drax.

"Those costs are recovered via the Triad scheme. It works as a stratified cost recovery where the customers who use the most pay the most in transmission costs."

This means there is a real incentive for organisations to avoid using electricity during the Triads periods.

## WHEN ARE THE TRIADS?

The Triads are the three half-hour periods of highest electricity demand by consumers on half-hourly metered electricity supplies.

By their very nature, they move each year, but they follow set rules:

- The Triads fall between the beginning of November and the end of February.
- Each one is separated by at least ten clear days.
- They are retrospectively calculated in March each year.

From these three half hours, National Grid can understand from each electricity consumer's meter how much power they used at that point in time and calculate a proportional Transmission Network Use of System (TNUoS) charge.

## TRIADS 2020/21

The Triads typically fall on periods when high business demand combines with high demand from domestic users, causing a spike in the overall energy demand.

| 2020/21 Triad dates     | Time period   | Peak demand |
|-------------------------|---------------|-------------|
| Monday, 07 Dec, 2020    | 17:00 – 17:30 | 44.449 GW   |
| Thursday, 7 Jan, 2021   | 17:30 – 18:00 | 45.450 GW   |
| Wednesday, 10 Feb, 2021 | 18:00 – 18:30 | 44.997 GW   |

(Source: National Grid ESO)

## HOW CAN BUSINESSES AVOID PAYING MORE FOR TRIADS?

The proportional costs of the TNUoS charges to the Triads makes it hugely valuable for organisations to avoid using power during peak times.

For some companies, it can be worth millions of pounds to avoid using large amounts of power during the Triads. This incentivises them to predict when the Triads might occur and to use their electric assets flexibly.



For some businesses, this can mean turning down power consumption when demand is high, for others it may mean utilising their own generation sources or batteries to avoid peak power prices.

## HOW ARE THE TRIADS CHANGING?

Historically, it was relatively easy to predict when these three 'super peaks' in demand would occur.

However, factors such as the impact of COVID-19 on electricity demand, the changing nature of the grid and an element of game theory, make it harder to spot the Triads ahead of time.

"Over time, it's become harder and harder to predict when the Triads will occur because people are trying to avoid them."

"The natural peak is no longer a natural peak because everybody's trying to use less then," explains Miller. "Instead, the peaks actually occur on the shoulders next to periods when people expect Triads to fall."

## MOVING TO A NEW SYSTEM

The changing nature of the UK's energy mix means the cost of maintaining and operating the transmissions system is increasing.

More distributed power sources around the country mean greater distances to transmit power to metropolitan areas. There's also the need to update the network for a more data-driven smart grid future.

Owing to these changes, the Triads are on their way out with a new system pegged to come into effect in the winter of 2023/24.

They're expected to be replaced by a system detailed in the NG Targeted Charging Review (TCR), which will charge users based on the size of their capacity agreement with National Grid.

Ofgem and National Grid have yet to determine how the new methodology will work, so for now, avoiding peak demand is still crucial to avoiding prime-time charges.

## HOW DRAX CAN HELP YOU WITH TRIADS

Flexibility is at the core of Drax's electric assets service. We aim to work with you and seek permission to turn off items of machinery or other assets, or to change the timing of certain tasks. By forecasting when the Triad periods will likely fall, we can manage your electric assets and energy usage and reduce your exposure to premium prices. All of which leads to valuable savings.

By applying our expertise in data analysis, demand side response management and energy market trading we can help you recognise flexibility, and reap the financial rewards from your processes, with minimal, or no, impact on your business.

Find out how Drax can help maximise your savings and avoid costs: <https://energy.drax.com/electric-assets/>

# INDUSTRY-TARGETED ENERGY AUDIT SERVICES HELP OPTIMISE THERMAL UTILITIES AND PRODUCTION

For companies seeking to make their steam systems as efficient and sustainable as possible, there is no shortage of expert advice. Spirax Sarco's divisional energy services manager EMEA Martin Corkery and global portfolio manager for services Sakis Palavratis provide the details.

Companies face many environmental sustainability challenges for their steam systems. These include:

- Optimisation of steam, energy and water demand
- Reduction of the steam, energy and water intensity of their products
- Reduction of carbon footprint
- Increased efficiency
- Legislative compliance
- Achieving consistent end-product quality and productivity.

## FINDING THE RIGHT KNOWLEDGE PARTNER IS CRITICAL TO HELP ACHIEVE SUSTAINABILITY GOALS

Many companies have established Energy Management Systems that integrate their energy management into existing business systems. This enables them to manage their energy and achieve sustained savings more effectively by establishing policies and procedures to systematically analyse, improve and monitor energy efficiency.

Whether a company is certified to energy management standards such as ISO 50001 or simply deploying the associated principles, Spirax Sarco provides holistic support for every phase of their steam system sustainability challenges in accordance with their specific requirements – whether it is planning, engineering or operational management including service, maintenance and monitoring.

ISO 50001 is a voluntary standard premised on establishing a holistic energy management approach that considers organisation, technology and behaviour. It is underpinned by the four key principles of plan, do, check and act. Spirax Sarco support is aligned with these principles.

This includes providing tailored audits, which can range from a specific check-up of a single

process to an entire steam system, including steam generation, water treatment, steam distribution, process applications and condensate return.

In consultation with the customer, engineered solutions for steam systems from end to end can be provided. These can range from high efficiency heat exchange and recovery systems to thermocompressors for steam recompression and recovery, energy storage and controlled deployment, and bespoke condensate recovery solutions, among others.

## MONITORING

Accurate monitoring is a fundamental premise of any successful optimisation of steam systems. ISO 50006, for example, provides guidance to organisations on how to define, measure, monitor, and review energy baselines and energy performance. When the appropriate baselines and energy performance indicators are established they can be used to monitor energy performance and forecast future energy consumption, and referenced to determine corrective and preventive actions.

In line with these principles, expert advice can be provided on the sizing and selection of flow meters together with the design and engineering of installations for water, fuels, steam and condensate, as well as technical expertise and support and services to customers to design, implement and manage Energy Management Information Systems (EMIS).

Enhancing technical knowledge of steam systems assists companies to achieve and maintain more sustainable outcomes. Spirax Sarco offers



courses suited to all levels of steam expertise and can tailor and deliver the training in one of its dedicated training centres, as well as online.

## IN CONCLUSION

As businesses endeavour to meet their environmental challenges, the need for environmentally sustainable solutions is greater than ever. Customers can be assured that Spirax Sarco will support them whatever stage they are on in their sustainability journey.

For more information on steam system audits, go to <https://www.spiraxsarco.com/global/en-GB/services/steam-system-audits>

## ABOUT SPIRAX SARCO

For engineers around the world Spirax Sarco is synonymous with excellence in steam system engineering. Spirax Sarco offer the industry's most extensive range of products and services, coupled with expertise to deliver system audits and assessments, based on over a century of practical application across a variety of industries. In short, Spirax Sarco create solutions that set the benchmark for steam-using organisations worldwide, working alongside them to improve productivity, save energy and reduce waste.

Our commitment to customers is supported by over 1,200 dedicated engineers and a direct sales force in 66 countries across the globe, through which we serve customers in around 130 countries. Our aim is to help our customers build sustainable and profitable businesses, using our country and industry insight to tailor solutions precisely to their needs.

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We see...

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GESTRA

# SOARING GAS PRICES – CAN SMART METERS HELP?

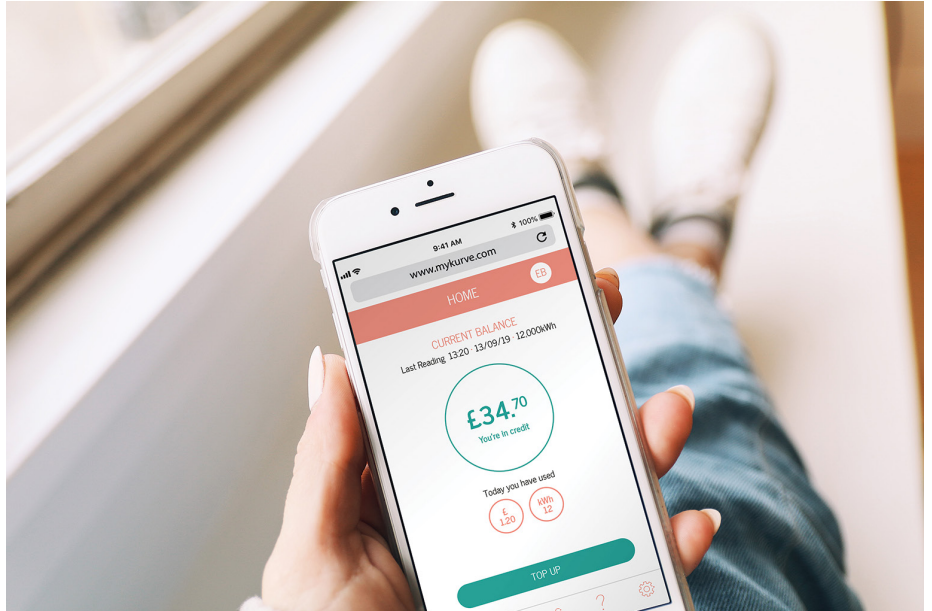
Steep gas prices are front of mind for many energy managers at the moment. Some housing associations, developers and managing agents operating heat networks have mentioned incoming kWh rate increases of up to 292% in recent months.

This level of increase presents a dilemma for energy managers when it comes to setting end-user heat tariffs: is it better to follow the exact pattern of the market, accepting a short period of steep pricing in the hope that things will improve in 2022, or should they spread the upsurge over a longer period, with a risk that customers will be paying over the market rate come 2023-24?

There is no easy answer to this. Analysts are currently predicting that, while prices should drop back down in 2022, it may be mid-2023 before they return to 2021 levels. Whatever energy managers decide, many residents in heat network properties are still going to see an annual increase of about £240 in their heat bills. While comparable to the price rises consumers running traditional gas boilers will experience, this is nonetheless likely to cause real hardship for some.

It might seem counterintuitive, then, to think about investing in smart metering technology as we head into what some are calling an energy crisis. Who wants to load yet more costs onto a scheme right now? However, given that the information smart meters provide is known to stimulate positive behaviour changes that significantly reduce personal energy consumption – and therefore costs and emissions – it's well worth considering. At a time when housing providers need to be seen to be doing something practical to help, this is a very constructive, measurable, and accountable way of demonstrating care for their residents, while also fulfilling corporate sustainability goals.

Moreover, the positive benefits of energy-consumption data can be further multiplied if it's provided in an accessible and convenient way. The latest data from our own web-based metering and billing solution for heat networks demonstrates this clearly. Such smart metering technology provides residents with a completely paperless experience, enabling them to view, monitor and manage their energy account from any internet-connected device, at any time, and from any location. Its usage figures tell



an interesting story about the difference easy access to energy consumption data makes to people's heating habits.

Firstly, over a third (35%) of page views on the app are from residents reviewing their energy usage. This is substantially more than any other type of activity such as viewing their balance (24%) or paying a bill (6%), indicating the great interest that people have in monitoring how much energy they're using when they're given the opportunity to see it. It appears to have the same appeal as counting steps on a smart watch!

In comparison, residents in credit-billed properties have no real-time view of their consumption data; once a bill arrives a month-and-a-half after the fact, it's very hard to know what behavioural changes could have made a difference, and by how much. This inevitably results in inertia.

Secondly, we can see that access to real-time usage information often has a clear and dramatic impact on levels of consumption. At a development of 50 residential units in North London, monthly energy usage over four months from July to October 2021 was between 21% and 43% lower than that of a comparable 46-unit South-London site that is credit billed. At another 89-unit property in South London, the difference was even more pronounced; usage was 29% to 55% lower each month compared to a similar 84-unit credit-billed property in Wembley. It's not hard to see how such sizeable differences in consumption levels can make a real impact on people's bills when gas prices are as high as they are today.

Another benefit of smart metering technology is that it gives energy managers real-time data about occupancy levels and peak-usage times, as well as alerting them to any potential issues within the network. This can help them to quickly identify and rectify any costly inefficiencies – particularly crucial at a time of spiralling energy costs.

Despite all the savings that smart metering can generate, it can still be hard to justify the cost at a time when everyone is feeling the pinch. However, the good news is that using a web-app can slash the upfront CapEx investment by up to 60% compared to installing In-Home Display devices. Furthermore, with less hardware to maintain, operational and replacement costs (OpEx and RepEx) can be cut by around half as well.

It's interesting to note that virtually all (99.2%) customers using the web-app choose to pay for their energy online, with the vast majority (77.1%) accessing the web-app via their smartphone. This indicates how much people nowadays tend to prefer online methods of engagement, meaning that providing a digital payment option is essential. However, it's also important to ensure that alternatives are available for people that don't have internet access. The COVID pandemic has highlighted the fact that not everyone has use of a smart device and/or WiFi. For those that don't, many of whom may be vulnerable for various reasons, there can be serious knock-on effects for school, work and homelife.

[www.insite-energy.co.uk](http://www.insite-energy.co.uk)

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**Increase** energy efficiency and **reduce** your costs.

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footprint** & improved  
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# REPORT TO THE HEAD TEACHER'S STUDY!

It's all very well to write about what portable energy loggers (PELs) can do and the sort of benefits they might provide but how do things work out in a real application? To answer that question, an 11-day energy monitoring exercise was carried out at a secondary school in Kent. Julian Grant of Chauvin Arnoux discusses the results.

**T**ight budgets that always seem to be getting tighter are a way of life for almost every organisation and business, but arguably schools have some of the tightest budgets of all. It's vital, therefore, that they squeeze the maximum possible value out of every pound they spend and, as energy bills make up a significant proportion of that expenditure, it's clear that energy efficiency is a major concern.

With this in mind, a secondary school with 700 pupils was offered a period of energy monitoring with the objective of identifying areas where efficiency could be improved, and savings could be made. The school governors responded enthusiastically, and arrangements were made to install a Chauvin Arnoux PEL103 portable energy logger at the school's main incomer.

This innovative instrument uses flexible current transformers and clamp-on connections, and has a magnetic base for rapid mounting, which meant that it could be installed quickly and

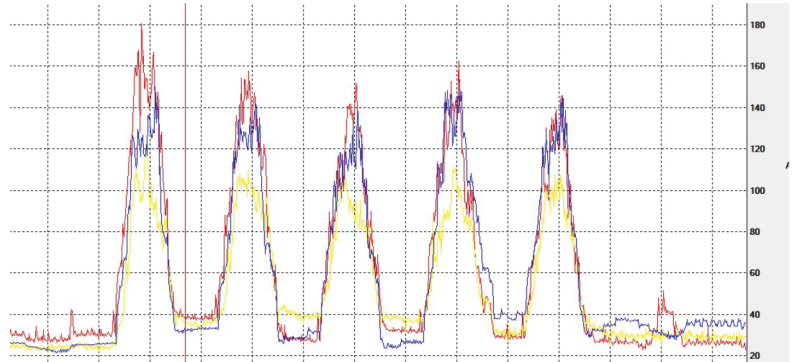


Figure 1: Phase currents over the monitoring period

easily with a minimum of disruption. It was left in place for eleven days, thereby capturing comprehensive data for school days and for weekends.

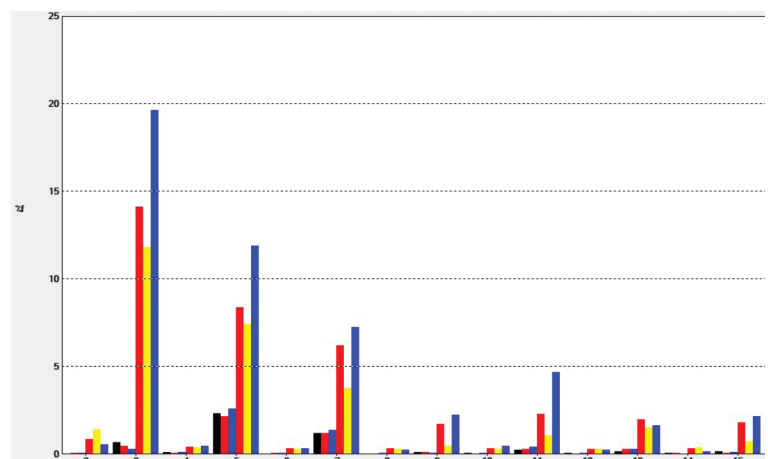
The results were both interesting and useful. One of the first things noted was that there was a substantial imbalance of phase currents, as can be seen in Figure 1. The peak current on one phase was 219.2 A, compared with 172.8 A on the second phase and 150.3 A on the third. This clearly shows that the loads in the school, most of which are single-phase, are badly distributed across the phases. This is undesirable as imbalance increases the current in the neutral conductor and can result in excessive heating. Current imbalance can also lead to local voltage imbalance at various points in the installation, which may affect the efficient operation of three-phase loads like motors.

Also notable was the high level of harmonics in the supply system. As Figure 2 shows, the third and fifth

harmonics were particularly high. Given the growing numbers of 'electronic' loads in today's schools this is not surprising: personal computers, office equipment and LED lighting tend to introduce third harmonics, while uninterruptible power supplies (UPSs) and servers are a common source of fifth harmonics. Nevertheless, the harmonics are potentially problematic as, once again, they can lead to unexpected heating in neutral conductors, and can also cause electronic equipment to malfunction.

By far the most startling revelation from the monitoring results, however, can be seen by referring again to Figure 1. As would be expected, this shows that the peak current is drawn from the supply during the day on weekdays when the school is occupied. However, the results also show that in the evenings and at the weekends, when the school is closed, a current of around 30 A per phase is still being drawn. While some of this probably relates to things like emergency

Figure 2 - Harmonic levels



lighting and is therefore unavoidable, the overall figure was unexpectedly high.

In fact, the school investigated this out-of-hours consumption and found that the portable electric space heaters, which were being used to supplement the poorly performing HVAC system in part of the school, were often being left on during the night and at the weekend. This is a perfect example of a quick energy saving fix at zero cost since all that was necessary was to ask the teachers to be more diligent in switching the heaters off at the end of the day!

One final parameter that was carefully evaluated during the monitoring period was power factor, but this was found to be good at all times, with little opportunity for further improvement. This was probably because the school had few inductive loads, and those few were balanced out by capacitive loads such as LED lighting. In other applications and even in other schools this may not be the case, so careful attention should always be given to the power factor results when a monitoring exercise is carried out.

The power system monitoring exercise at the Kent school clearly identified some issues of concern but unfortunately, shortly after it was completed, the advent of the COVID pandemic meant that the governors and staff were beset by more pressing challenges which prevented immediate action on its results. Nevertheless, the exercise has produced some clear recommendations for the future, which should provide large benefits.

The first – turning off portable heaters out of hours – has already been implemented but this is only an interim solution. Longer term, larger energy savings will be achieved by upgrading the HVAC system so that heaters are not needed at all. There may also be other unnecessary out-of-hours loads, such as lighting and computers left on when not needed, and it would be worthwhile for the school to check on these and, for example, fit automatic lighting controls that respond to room occupancy, and time switches to turn off supplies to computers at the end of the day.

The high level of harmonics should certainly be addressed. It would be beneficial to identify the individual sources and, where necessary, fit filters. The result will be cleaner supplies, reduced



cable heating and longer equipment life. Finally, it would definitely be worthwhile to look at redistributing the single-phase loads on the power system to provide better balance between phases. Again, this would reduce heating in neutral conductors, and help to ensure that any three-phase loads on the system operate efficiently.

Monitoring power quality and usage at the Kent school was an exercise which was easy and inexpensive to

carry out, and which did not affect the normal operation of the school in any way. It did, however, provide results and insights that will allow the school to use electrical energy more efficiently and to reduce its energy bills. It can be confidently stated, therefore, that the answer to the question posed in the introduction about how useful portable energy loggers are in real applications is that they are very useful indeed!  
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# A HELPING HAND FOR LOCAL AUTHORITIES RESPONDING TO THE CLIMATE EMERGENCY

Industry  
comment by  
Craig Mellor,  
Director, Deer  
Technology Ltd

Local authorities and combined authorities have a key role to play in addressing the global climate emergency. Indeed, it is estimated that 82% of UK emissions are within the scope of influence of LAs. Now the UK Government has published the national Net Zero Strategy and Heat and Buildings Strategy, there is a better understanding of what is expected of local government – though Westminster has not imposed local Net Zero strategy targets. In many cases, however, LAs have already set their own goals and local Net Zero Strategies.

Alongside the challenges facing LAs, there are also opportunities, most notably in the form of grant funding. For example:

- **Public Sector Decarbonisation Scheme Phase 3** – £1.425 billion over the period 2022/2023 to 2024/2025 to support heat decarbonisation and energy efficiency measures in public sector buildings.
- **Social Housing Decarbonisation Fund** – £800m for energy-efficiency improvements to social housing.

Considerable investments are expected to be made in replacing gas-fired boilers with air-source heat pumps (ASHPs) powered by (hopefully) sustainably generated electricity. These retrofits to the existing housing stock will improve energy efficiency, contribute to decarbonisation and, of course, help steer the UK towards its target of achieving Net Zero by 2050.

An additional benefit of energy-efficient ASHPs for social housing is that



they help to alleviate the problem of fuel poverty. Although household electricity bills will increase due to consumption by the ASHP, these households will no longer be using gas-fired heating and should pay less overall for their energy.

In a similar vein, millions of pounds of funding will help to accelerate the adoption of electric vehicles. If EV charging points are installed for social housing properties, electricity bills will increase again, even though the



household's expenditure on petrol or diesel will either fall or be eliminated.

Despite the net savings, householders with newly-installed ASHPs and EV charging points are likely to be concerned at the rise in electricity bills. One way to help quell concern is with better meter reading and improved visibility of consumption data. More on this later.

From a local authority's point of view, there are many possible approaches to decarbonisation and improving energy efficiency, a few examples of which are: switch to sustainable sources of energy; use energy more efficiently; cut waste; and do things differently so as to use less energy. Whatever changes are made, it is important to have accurate measurements of consumption before and after, otherwise the true scale of the benefits will never be known.

Let us consider, for example, electricity consumption in a small block of flats. Each household will have its own electricity meter, plus there will be a meter for electricity consumption in communal areas – such as lighting for the exterior, hall and corridors, and lifts if the building has them. When a housing association can see patterns of consumption, households that use more energy can be identified so they can be helped to reduce consumption. If one household's consumption is particularly high or low, it could be an indication of energy theft. Were the housing association to upgrade all communal lighting from incandescent and fluorescent lamps to LED lamps, the 'before and after' data could help inform decisions about how quickly other properties should be retrofitted with LED lighting.

Looking beyond the social housing example above, local authorities need to improve energy efficiency and decarbonise their entire estates. These might include town halls, offices, sports and leisure facilities, entertainment centres, schools, libraries, commercial premises, and museums and galleries. The size of the challenge is formidable but the potential benefits are substantial.

Earlier we hinted at the importance of metering and the visibility of consumption data, for which remote meter reading has much to offer. But

there is another benefit of up-grading meters for remote reading: reduced carbon emission associated with meter readings. With conventional meters, somebody needs to travel in a van to the meter's location and back again. Despite multiple meters being read during the course of each trip, the carbon dioxide emissions per meter add up over time. We have calculated that if 100 meters are read per week, the greenhouse gas emission associated with the van over a period of five years could amount to 31.2 tonnes of CO<sub>2</sub>e (carbon dioxide equivalent).

## COST-EFFECTIVE DECARBONISATION

It has to be said that smart metering has not lived up to expectations. The roll-out has been slow, compatibility issues have persisted, and poor signal coverage means some smart meters only operate as dumb meters.

Fortunately, Deer Technology's LimpetReader offers a cost-effective and environmentally-friendly alternative. This clever, battery-powered opto-electronic device is attached to an existing analogue meter's faceplate with optical tape or adhesive. Installation only takes around 10 minutes because there is no need to dismantle the meter or interrupt the supply. The meter's register remains visible should a visual read be necessary, and dual-register meters have one LimpetReader for each register.

If a LimpetReader is removed or tampered with, this can be identified via the data out-put, which helps to detect and deter energy theft.

Carbon dioxide emissions associated with meter readings are eliminated because vans never need to be used for meter readings. The patented LimpetReader is unique among automated reading systems in that readings are classified as 'visual' for regulatory purposes.

Each ultra-compact LimpetReader device incorporates multiple micro-cameras for imaging the register. The images are date- and time-stamped before being transmitted to Deer Technology's secure server.

Images are sent to the server via the mobile phone network using proven GSM technology. Up to 16

LimpetReader devices can be linked to a single AutoReader transmitter, which is ideal for housing associations with multiple tenants in a single building.

Once the individual images have been uploaded to the server, they are stitched together to create a high-quality, distortion-free image of the meter's register. Software then converts the register image to a numerical value, which is stored with the image. Data and images can be accessed by the customer in a variety of ways, depending on the requirements. Deer Technology's comprehensive service covers everything from installation through to data management.

We estimate that Local authorities in Great Britain have more than a million analogue electricity meters that could be converted to smart meters using LimpetReader devices, greatly assisting decarbonisation. Already LimpetReaders are being used very effectively in numerous applications in social housing, sports and leisure facilities, offices and commercial premises throughout the UK.

So far we have discussed electricity metering but LimpetReaders are equally applicable to water metering. Water consumption has a carbon footprint – think of the energy required for processing and pumping fresh water and waste water. Monitoring water consumption is a powerful way to identify leaks so they can be repaired quickly and wastage minimised.

Furthermore, leaking hot water taps will result in additional carbon dioxide emissions due to the energy required to heat the wasted water. We have calculated that a hot water tap left running for a year would cost around £10,600 and result in 25.2 tonnes of CO<sub>2</sub>e emissions. Again, it is thought local authority estates have millions of potential applications for retrofitting LimpetReader devices to water meters.

Find out more about Deer Technology's LimpetReader for remote meter reading at <https://deertechnology.com>, telephone 01639 363146 or email [hello@deertechnology.com](mailto:hello@deertechnology.com)



# PEOPLE, PROFIT AND PLANET – BUILDING A SUSTAINABLE SUPPLY CHAIN

**W**hile sustainability has been a major consideration for the energy industry for many years, COP26 accelerated the green agenda and focused attention on the need to make real, meaningful change in the generation and use of energy, and the necessity of setting and committing to ambitious Net Zero targets.

The global goal, according to climate scientists, is the reduction of carbon dioxide emissions by 45% by 2030 if we are to succeed in limiting a rise in temperature to 1.5 degrees.

We are alive to the risk posed by the climate crisis like never-before, and as the consequences of inaction has become more visible - fires, flood, heatwaves and storms are taking place more frequently - everyday activism has grown and we understand that each of us has a role to play, however small that may be.

However, for energy firms, that role is considerably larger - the industry will play a major part in the fight

against climate change and whether, ultimately, we succeed or fail.

## MEETING SUSTAINABILITY OBLIGATIONS

For energy firms and those operating within the industry, the need for action comes hand in hand with a range of other considerations that are vital to safeguard reputation and reassure customers that they are doing their bit to reduce carbon emissions and work towards meeting the UK's net zero emissions target.

Given the level of public scrutiny on the energy industry, it is more important than ever for companies to ensure that their track record on sustainability and their commitment to the green agenda meets accepted standards - both regulatory and morally. Their conduct must be beyond reproach, along with that of the businesses comprising their supply chain, which, in the event of any wrongdoing, poor practice or failure to meet legislator requirements, could well land a company

in hot water simply by association.

## PROTECTING REPUTATION AND SAFEGUARDING AGAINST FINANCIAL HARM

Those companies that fail to observe profit, planet and people as guiding tenets within their sustainability strategy risk not only incurring reputational damage, but will almost certainly feel the bite financially.

As the drive for net zero intensifies, and focus on the utility industry continues to grow - accentuated by the energy crisis which continues to drive up prices in the UK - businesses will need to do more to demonstrate an investment in and a focus on meeting sustainability targets in 2022.

Environmental and social issues are certain to remain at the apex of the corporate agenda, with 71% of companies committed to investing more time, effort and funds into environmental management.

Pressure on businesses to act sustainably and demonstrate strong green commitments will continue to grow exponentially as government, investor and public concern about the climate crisis increases.

## BUILDING A SUSTAINABLE SUPPLY CHAIN

Last year, Achilles commissioned our Global Sustainability Priorities Survey of 2,185 businesses, which highlighted the depth of the issue businesses are facing in building sustainable supply chains. The findings revealed the work that still needs to be done if companies are to succeed in meeting their carbon reduction targets and reducing risk within the supply chain.

While 2022 will see three quarters of businesses making sustainability initiatives a bigger priority, 52% do not have a sustainable procurement strategy in place. Similarly, 52% of businesses still have no carbon reduction strategy - despite awarding carbon reduction a score of 7.4 out of 10 on a scale of priority.

It's vital that we begin working towards the transition to a clean and green energy supply chain but there is a great deal of work that remains to be done.

Over half of the businesses we surveyed do not calculate their carbon output, and, among those that do, 54% use basic tools, such as recording emissions in-house on spreadsheets, while just 19% use third party software. Just one in four has their carbon estimates independently audited.

## FINDING AND SELECTING THE RIGHT PARTNERS

As businesses grapple to ensure that their core operations are sound from a sustainability perspective (there is still much work to be done) and work towards meeting ambitious industry goals, transparency within the supply chain mustn't be neglected.

As an extension of the business, it's vital that suppliers are properly selected to ensure that they are meeting the appropriate standards and share the same values and commitment on sustainability.

Any supply chain must be assessed against a firm's own expectations and, eventually, create a relationship whereby buyer and suppliers are working together collaboratively to achieve a sustainable future.

An effective supply chain assurance scheme can play a key role in building a sustainable supply chain.

## ACHILLES UVDB NETWORK

Achilles is supporting businesses within the energy industry to build and maintain a sustainable supply chain via the UVDB (utilities vendor database) network, ensuring an effective procurement strategy.

We know that sustainable procurement is a major business challenge - our research revealed that the most common issue in sustainability management is the limited number of suppliers with high enough standards. Buyers are concerned about finding new suppliers that meet their criteria, as well as getting enough data on their existing networks. Access to limited sustainability metrics from suppliers was the second most commonly cited challenge - 48% of utilities providers considered it to be a major issue.

The supply chain is the cornerstone of any successful procurement strategy, and the Achilles network currently comprises 60 buyers and 6,500 suppliers. A recognised utilities qualification system under UK legislation, UVDB is supporting businesses within the energy and utilities industries to achieve the highest level of supply chain assurance, saving money and improving operational effectiveness.

Businesses that are part of the UVDB network can rest assured that their supply chain has been thoroughly audited to industry standards and meets all expected benchmarks.

## SOURCING SUPPLIERS WITH SHARED VALUES

Via the UVDB network, Achilles can support businesses in easing the issues they are having with sustainable procurement, helping to take the pain out of the process.

Thousands of companies are struggling to source suppliers and partners that share the same values,

but the UVDB network helps ensure that, as the race to net zero intensifies and investment is ploughed into renewable energy, businesses can find suppliers with the right de-carbonisation and ethical commitments.

Our research showed that the majority of businesses we engaged with are planning to allocate up to 20% of their procurement budget on sustainability projects - the UVDB network will provide them with the tools they need to ensure that their supply chain is sound and shares the same vision and ethos on sustainability.

## SUSTAINABILITY AS A COMPETITIVE ADVANTAGE

Leading from the front on sustainability not only ticks many legislative, operational and moral boxes, but is a huge competitive advantage. A business with sustainability and great environmental management at its heart will undoubtedly reap the financial benefits as a result, while attracting equally-forward thinking partners and setting themselves apart in the battle for talent.

Many of these companies are overhauling their operations, creating a dedicated sustainability role and allocating more procurement spend towards the sourcing of sustainable suppliers. They are focused on not only reducing the carbon emissions of their own company - but that of their supply chain, too.

Achilles plays a crucial part in making this possible, helping companies to fulfil their environmental reporting duties, find suppliers with the right decarbonisation commitments and helping to guarantee excellence throughout the supply chain.

With Achilles, businesses can exceed the sustainability expectations of their stakeholders and reduce costs while helping to protect global ecosystems as we target a net zero carbon world.

Get in touch to find out more about Achilles and the solutions we provide and to arrange a demonstration.

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# STEPWISE PROGRESS TO MORE SUSTAINABLE HEATING



New year, new beginnings, reaffirmed resolutions. Rob Erwood, Sales and Specification Director at Baxi Commercial Solutions, discusses the urgent need to heat UK buildings more sustainably and outlines the options.

**A**s we enter 2022, heightened climate consciousness has refocused the need for greater sustainability across all operations. Where, then, to start? Heating is the biggest reason we consume energy in our society and accounts for the largest proportion of UK greenhouse gas emissions<sup>1</sup>. As such it has been identified as an urgent target for improvement.

The government reiterated the importance of 'changing the way we heat our buildings and improving the performance of the energy-related products' in its Heat and Buildings Strategy.

Ultimately, the transition to low



carbon heating sources will require a shift to low carbon heat pumps, smart electric water heating equipment or hydrogen boilers. But in older, poorly insulated buildings, the move may need to be gradual. These harder to heat buildings present a tough challenge as low carbon heating technologies operate most effectively in conjunction with energy efficiency upgrades.

But while full decarbonisation is unlikely to happen overnight, carrying out efficiency improvements now will help energy managers make significant progress along the path, bringing their

buildings up to code and preparing the way for greater changes.

And what better time than the start of the year to develop a phased refurbishment plan.

## PHASED APPROACH

**Step one** – 'fabric first approach'.

Maximising the performance of the building envelope to reduce heat losses is the best way to build in sustainability.

**Step two** – plant upgrade. If heat pumps are not an option at present, the next step would be to identify any opportunities to use the energy

<sup>1</sup> Source: Department of Business, Energy and Industrial Strategy (BEIS)

source more efficiently. The boiler will likely be the main component of the plant room, so it's important to make sure that it operates efficiently and reliably. Replacing non-condensing boilers with modern energy-efficient condensing boilers, for example, will deliver immediate and significant energy, cost and carbon savings.

## LOW NOX EMISSIONS

Which factors should be considered when selecting boilers?

Most modern condensing boilers now quote near maximum efficiencies. But one area where they do differ is the nitrogen oxide (NOx) emission levels. Air quality is a key environmental issue, particularly in larger cities, due to the established link between poor air quality and asthma, lung and heart-related conditions. Road traffic has been identified as a major source of NOx emissions, but almost all buildings emit air pollution due to combustion in their heating, cooling or electricity generation systems.

BREEAM, the widely adopted building sustainability assessment scheme, offers a maximum of two credits for boilers that achieve NOx emissions below 24 mg/kWh.

Opting for boilers that are eligible for maximum BREEAM credits – like Remeha's Quinta Ace and Gas 320/620 Ace which can deliver NOx emissions below 24 mg/kWh – will optimise the sustainability of the

boiler installation and reduce the building's environmental impact.

## FUTURE PROOFING

A phased approach requires a future-ready installation. So where do hydrogen boilers fit into this? Hydrogen is one of the three pillars of the energy transition, along with electrification (heat pumps) and heat networks. But the rollout is unlikely to happen much before 2030, with the actual date varying from region to region.

In fact, the first stage of the energy transition is expected to be the introduction of a 20% hydrogen blend into the natural gas mix. For assurance of a future proof installation, consider boilers like the Remeha Quinta Ace and Gas 320/620 Ace which have been independently certified to operate on the proposed 20% hydrogen blend.<sup>2</sup>

## MAXIMISING PERFORMANCE

When selecting boilers, consider whole life efficiency and reliability. Ask your chosen supplier to explain the different benefits of aluminium and stainless-steel heat exchangers relative to your project, and to identify the appropriate hydraulic

<sup>2</sup> Our free Guide to Hydrogen for Heat explains the difference between 100% hydrogen boilers, hydrogen-ready boilers and 20% hydrogen blend boilers, and includes a timeline of the anticipated transition to this green gas.

separation system, where relevant, to maximise lifetime performance.

## HYBRID SYSTEMS

**Step three** – hybrid systems.

The next natural step is to integrate low-carbon heat pumps with hybrid-ready condensing boilers.

Hybrid systems offer an effective solution to the complexities currently associated with retrofit projects – at least until heat pump technology evolves. We view Air Source Heat Pumps (ASHP) as the most popular and cost-effective choice of heat pump and are pleased to add them to our portfolio of sustainable heating and hot water solutions.

## ACHIEVING SUSTAINABILITY GOALS

80% of the buildings that will stand in 2050 are already built, so making these buildings more sustainable must be a major priority in 2022. With no silver bullet to decarbonise heat, working with experienced heating suppliers who can develop a heat delivery strategy that meets your project and budget requirements is advisable. At Baxi Commercial Solutions, we look forward to using our knowledge and expertise to tailor a solution that will help organisations set their pathway to more sustainable heating and achieve their environmental goals. [remeha.co.uk](http://remeha.co.uk)



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# UNLOCKING THE SYNERGIES OF COUPLED ENERGY NETWORKS TO ACHIEVE DECARBONISATION



**Dr. Bri-Mathias Hodge, Associate Professor, University of Colorado Boulder and Chief**

**Scientist, National Renewable Energy Laboratory (NREL).**

**T**he traditional concept of an energy network is evolving. Where once, energy networks would operate independently of each other, increasingly there are opportunities to couple networks and leverage synergies between them to help solve some of our biggest decarbonisation challenges. Coupled energy networks can create new sources of flexibility, provide short and long-term energy storage, and incorporate increased amounts of carbon-neutral fuels, all while positively impacting security of supply and reliability.

The most prolific example of coupled energy networks is that of electricity and gas. In 2019, 20% of Europe's electricity was produced by gas-fired power plants. Recognising the co-dependency of the networks, the European Parliament regulated that the European Network of Transmission System Operators for Gas and the European Network of Transmission System Operators for Electricity coordinate their network development plans and scenarios for Europe. The output covers some 90 transmission system operators in 35 countries.

"Integration of the electricity and gas sector can optimise the assessment and usage of both grids, whilst continuing to meet the European energy policy objectives of sustainability, security of supply and competitiveness." - TYNDP 2020 Scenario Report

The interdependencies between gas and electricity networks are just one part of a much bigger picture. As our energy system diversifies to accommodate a low carbon future, we increasingly need to consider how all energy networks and renewable energy sources integrate, including hydrogen, LNG, and other networks, such as heat and liquid. The climate crisis is creating the need to plan new types of networks – particularly for water and for cooling – which will both require substantial amounts of electricity to operate. As a

result, new interdependencies are rapidly being created and networks are becoming more interconnected than ever before.

## WHAT ARE COUPLED ENERGY NETWORKS?

In the simplest sense, a network connects supply with demand. Energy network coupling is where these networks have become interconnected in some way, for example through the introduction of technology. Examples of energy network coupling include:

- Hydrogen produced using an electrolyser and injected into a gas network
- Hydrogen used for power generation
- Electric driven compressor stations used to transport gas
- Electric driven LNG regasification terminals
- Electric heat pumps
- Heat networks supplied by natural gas, electricity or in the future, hydrogen
- Gas to produce combined heat and power
- Hydro networks (rivers, lakes and dams) used to generate electricity
- Hydro networks (rivers, lakes and dams) used for thermal power plant cooling
- Electric driven water pumps
- Electric driven water desalination plants

## WHY DO WE NEED TO CONSIDER THE INTERDEPENDENCIES BETWEEN NETWORKS MORE PROACTIVELY?

Some types of coupled energy networks have been in existence for decades. However, with the exception of the production of electricity using hydrological resources such as rivers and lakes, most networks were rarely planned with energy network interdependencies in mind. To achieve decarbonisation of our energy system, there is an increasing need to better quantify and leverage the synergies between them. The synergies leveraged by coupling energy networks fall broadly into three categories: security and reliability of supply, facilitating renewable integration with flexibility, and introducing carbon-neutral fuels to decarbonise hard-to-electrify industries.

## SECURITY AND RELIABILITY OF SUPPLY

Very few gas power plants store gas, meaning their ability to generate electricity

relies on the gas pipelines to deliver gas at a given pressure. Most pipelines will supply more than one gas plant at a time. However, to date, most electricity networks have only been planned to be able to absorb the loss of its largest contingency, usually a single power plant or transmission line. The risk created by the potential loss of gas supplied by one pipeline to several sites is potentially more severe than the loss of the network's single largest generation asset, but this is often not considered by the electricity network operator.

In September 2021, an attack on a gas pipeline southeast of Damascus in Syria saw the loss of electricity generation from nearly 50% of the country's power plants. While earlier in the year, power was cut to millions of Texans for several days as plummeting temperatures created cascading impacts on the electricity, gas, and water networks. Frozen gas wells and supply lines, coupled with power plant equipment malfunctions caused by weather, and scheduled maintenance, rendered an estimated 45 GW of electricity generation offline.

As gas demand for both heating and electricity generation rose, many power plants experienced supply curtailments due to the nature of their contractual arrangements. While most power plants opt for interruptible gas supply contracts, gas distribution utilities typically have uninterruptible contracts, meaning gas for electricity generation was curtailed ahead of home heating. The outage was further compounded by similar issues for those gas producers with interruptible power contracts meaning that electricity to gas production and processing facilities was "unwittingly" shut-off, further impeding the delivery of gas to power stations.

## FACILITATING RENEWABLE INTEGRATION WITH FLEXIBILITY

Given the variability in renewable output, alongside seasonal changes in demand, different types of flexibility will be required across timescales – from seconds and minutes to days and seasons. Gas-fired powered plants, with their ability to ramp up and down quickly, will be key.

According to a 2021 study conducted by Wärtsilä, G20 countries will require 933 GW of flexible gas power capacity (including hydrogen) and 2,964 GW of energy storage to facilitate a 100% renewable energy future. This approach is just one of many ways that flexibility can be

achieved by coupling networks together.

Others include using large heat stores connected to heat networks which could take advantage of cheap gas or plentiful solar to provide short-term storage. Or battery storage to facilitate the use of renewable generation for the operation of water desalination pumps. Alternatively, green hydrogen could be used as a form of long-term (seasonal) storage. Produced over summer during times of excess renewable generation and then compressed and stored underground (in salt caverns or depleted gas fields, for example), green hydrogen could then be re-electrified over winter, helping to reshape seasonal fluctuations in renewable generation.

The use of dual-fuel energy consumption concepts, where consumers can switch fuel depending on availability, may also rise in popularity; hybrid vehicles are a good example of this in action.

### CARBON-NEUTRAL FUELS

While widespread electrification will be suitable to decarbonise much of the economy, energy-dense industrial processes such as steel and cement manufacturing, and long-haul transport, require a different approach. Hydrogen and ammonia are promising options that can take advantage of excess renewable electricity generation to offer a long-term storage solution. In addition, the existing gas pipeline infrastructure, which can store several days' worth of energy at a time, could be retrofitted for use with hydrogen.

While it is clear that many synergies could be unlocked between energy networks, as an emerging area of research and discussion, there exists little in the way of a roadmap to help energy network planners and operators to do so. Modelling and simulation tools are the next step in allowing planners and operators to explore different outcomes to support the coupling of energy networks, however, given the numerous stakeholders and millions of assets involved, it is a complex challenge.

## THE CHALLENGES OF PLANNING COUPLED ENERGY NETWORKS

### LACK OF COORDINATED PLANNING BETWEEN STAKEHOLDERS:

In many cases, planners and operators of different energy networks have never needed to work together or coordinate their work before, nor needed to share data that is either commercially sensitive or a matter of national security. This is particularly acute at the transmission level, where most operators only have data for one specific energy network.

### MASSIVE AMOUNTS OF DATA:

There is also the challenge of the volume and different types of data that require analysis. The computational ability must keep pace with the millions of new data points that are being made available on each energy network.

### DIFFICULTY OF MATHEMATICAL MODELLING:

Typically, to model different networks in a coupled way requires iterating between two different mathematical models in two different environments. Sharing information between the two models is often challenging, fraught with the complexity of navigating between two different database structures, often without sufficient open APIs. This often results in an infinite loop of manual iterations in which a convergent solution cannot be reached, particularly when the couplings are bi-directional. To overcome this, the models need to be brought together in one environment to allow the networks to be modelled simultaneously.

### HOW CAN SAINT HELP ADDRESS THESE CHALLENGES?

In 2013, as part of his Ph.D. research, Kwabena Pambour set out to create a solution that could model coupled energy networks in one environment with one mathematical model without the need for manual iteration. Today, SAInt, short for Scenario Analysis Interface for Energy Systems, is a comprehensive energy network planning tool that models the integration and coordination of coupled energy networks to optimise and accelerate the path to a fully decarbonised energy system, all in one platform.

With SAInt, modellers no longer need to iterate between modelling tools to consider the interdependencies between different energy networks. In a single platform, SAInt can model electricity and gas networks to quantify their synergies and interdependencies, enabling increased integration of renewable energy sources and hydrogen. It also comes with integrated wind and solar meteorological datasets to support robust modelling of variable renewable energy generation, making it easier to model increased amounts of renewable energy and its effect on different energy networks.

Intuitive and flexible to use, with a modern user interface, SAInt is highly customisable and offers a flexible API to support its users in seamlessly integrating the tool with existing software and databases, streamlining the ability to interrogate the outputs from their models using custom tables, charts, visualisations, and animations. The outcome of this customisable software

is detailed insights that give planners the confidence to make better energy network investment decisions that will benefit the lives of millions of Europeans.

By providing a cost-effective and time-efficient solution, SAInt supports planners and operators to transition from independently planning and operating their electricity and gas networks to a future where energy networks are integrated and coordinated together. In doing so, new synergies including cost and risk reductions are achieved, and improvements to flexibility and reliability unlocked, supporting Europe's path to decarbonisation.

## ADDRESSING REAL-WORLD CHALLENGES WITH SAINT

"As a society we rely tremendously on having reliable energy networks not solely to underpin the economy but to sustain life itself. The devastating impact of events such as the Texas outage in February 2021 show just how imperative reliable energy networks are.

The way that almost all power systems are planned today treats failures as independent events, however, there are often correlations between them. Until we can model how energy networks are coupled together, and put effective mitigation plans in place, we will continue to experience network events with outsized impacts.

Part of the challenge is having the right tools to model the coupling between different networks – attempting to stitch together existing network models doesn't always work out how you'd think. That's what makes SAInt so unique. Coupled energy network modelling needs are met by one software solution where you work in one system time and with a common data structure that facilitates seamless data sharing. The connections and correlations made between the various networks are modelled with no requirement for time-consuming iterations.

One of the most compelling benefits of being able to model coupled energy networks is the ability to take a system-level perspective. This is especially valuable as we model routes for decarbonisation – where some decisions may be locally better but not globally better. There are situations where reducing electricity emissions increases natural gas emissions – or vice versa. Being able to model energy network coupling proficiently will bring us closer to net-zero much more quickly, efficiently, and cost-effectively."

To find out more about how SAInt could enhance your energy network modelling and planning capabilities, contact Carlo Brancucci, Co-Founder and CEO of encoord Inc, at [carlo@encoord.com](mailto:carlo@encoord.com)

# HOW MOF'S WILL TRANSFORM THE ENERGY TRANSITION



The developing climate crisis is alarming countries across the globe, and has forced an urgent response from major industrialised nations. In April 2020, President Biden vowed to cut US emissions by at least 50% before 2030, while the UK recently reaffirmed its ambition to be 'net zero' by 2050.<sup>1</sup> The achievability of these targets, however, will not only depend on limiting greenhouse gases through carbon capture but also a wholesale shift away from the use of fossil fuels.

This is defined as 'energy transition' – moving from current energy production and consumption practices towards a more efficient, low-carbon energy mix. Achieving this objective alongside economic development is certainly challenging, but most experts agree it's feasible providing changes are made today and technological breakthroughs are fully exploited.<sup>2</sup>

The discovery of metal-organic frameworks (MOFs) represents one such breakthrough. These super adsorbent materials can hasten the replacement of oil, coal and gas by solving many of the challenges associated with today's alternative fuels. This includes hydrogen, a clean energy source that many believe will be central to a more sustainable future.

## WHAT ARE MOF'S?

MOFs are a new class of crystalline super-adsorbent. Their highly porous nature means MOFs can be designed to capture, store and release specific gases through a careful selection of metals and linkers during the first stages of synthesis.

It is this bespoke quality, along with a high storage capacity, that gives MOFs so much promise. Other adsorbents, such as activated carbon and silica gel, cannot hold anywhere near as much medium and are unable to be used in such a selective

way. MOFs, on the other hand, offer record-breaking porosities (up to 10,000m<sup>2</sup>/g) and can be developed to target anything from ethylene to carbon dioxide within complex gas mixtures.

## HYDROGEN'S PROMISE

Hydrogen has long been seen as one of the best candidates for easing the world's dependence on fossil fuels, due to its natural abundance and clean burning properties. Various sectors are targeting a transition to hydrogen energy, including private transport. The phase out of diesel and petrol engines is already planned in many countries, with batteries and hydrogen fuel cells expected to take their place in the coming years. Major companies like Toyota have already introduced hydrogen-powered cars to the market<sup>3</sup> but practical challenges, like onboard fuel storage and manufacturing costs, have slowed wider progress.

Domestic heating is another area where hydrogen is expected to play an important role, particularly as it can be piped through existing infrastructure. This will lower the cost of transitioning building stock but more importantly limit the boiler's environmental impact, which is responsible for a high percentage of the home's carbon emissions.<sup>4</sup> Early trials have been promising but, much like the car industry, wider roll-out is dependent on access to pure sources of fuel.

## UNLOCKING THE HYDROGEN ECONOMY

Hydrogen fuel may still face a number of challenges before it can become society's standard green energy source, but MOFs have proven versatile enough to offer solutions across the hydrogen economy.

Take storage, for instance. The low volumetric density of hydrogen sees it take up more space in a container when compared to other gases, meaning cryo-pressurised and liquified storage are necessary to make it practical. However, these methods are not the most secure or efficient ways to handle hydrogen as it's highly flammable. Solid adsorbent materials like MOFs in comparison offer high porosity and a

large surface area, meaning they can store far greater volumes of gas in a confined space without the need to increase pressure. Another significant advantage is the fast fill-up and discharge rates, which would be essential for supporting the transport industry.<sup>5</sup>

Along with their storage potential, MOFs may provide the new levels of purity demanded by end-use applications. Fuel cells, for example, need an exceptionally pure supply of hydrogen to achieve optimum performance yet there are very few naturally occurring sources available. Today, the cheapest way to produce usable hydrogen gas is by purifying hydrocarbons and other compounds, but these processes tend to leave behind unwanted impurities.

To alleviate this issue, MOFs can be tuned to target specific gases and remove undesired molecules from gas mixtures. Their high stability also allows them to be recycled and reused multiple times, even in harsh industrial conditions. Early testing has proved favourable, with hydrogen now able to be purified from a range of sources, including in some of the most common post-production hydrogen gas mixtures. It goes to show MOFs are slowly opening the door to a cheap, effective means of generating pure hydrogen.

The ideas in this piece are just some of the ways MOFs are set to positively disrupt the energy transition. There are other key mentionable applications where these materials are set to transform how society gets its power. Among the most important of these is using MOFs as electrocatalysts to support water splitting – a process central to the large-scale production of green hydrogen.<sup>6</sup> By now though it should be clear that these versatile products continue to deliver on their promise, offering arguably revolutionary progress. MOFs cannot solve the energy transition as a standalone solution – nor can any other technology – but they will play a critical role both today and in the future.

For more information, please contact Dr Conor Hamill, Chief Operating Officer of MOF Technologies or visit: <https://www.moftechnologies.com/>

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# HOW THE INFRASTRUCTURE NEEDED TO SUPPORT THE EV BOOM WILL CREATE A GREENER ENERGY SYSTEM

David Hall, VP Power Systems,  
Schneider Electric

The transportation sector is a significant source of greenhouse gas emissions – a situation that must be addressed in the next eight years if we are to halt climate change. Electric vehicles, with no tailpipe emissions and much less pollution across the entire supply chain than petrol or diesel hold the answer to make this a reality. Mass adoption of electric vehicle usage by consumers and businesses can bring down direct CO<sub>2</sub> emissions from company cars across the UK by 80% by 2025 and zero by 2030.

The UK government has already set a clear direction for the industry by banning the sale of new petrol and diesel cars by 2030 and trucks by 2040 to reduce carbon emissions and stimulate the “green economic recovery”. There has been a noticeable change in the market, with one in ten new vehicles sold now electric, according to the SMMT. Additionally, we’re starting to see more investments within the UK manufacturing base, such as Stellantis’s recent £100m commitment to manufacturing electric vans at Ellesmere Port.

However, alongside scrapping polluting vehicles, we also need to ensure the conditions for the mass adoption of electric vehicles. Closer attention needs to be paid to consumer mindsets and the necessary infrastructure to support the transition. Private individuals and businesses have an essential role in driving the adoption of low carbon, net zero options for everything from trucks, buses, and the rail network to cut their carbon footprints.

## HOME AND AWAY – BUILDING NATIONAL INFRASTRUCTURE

The most significant challenge to overcome before EVs can be adopted on a mass scale is how and where recharging can be done. EV batteries require specific equipment and sometimes hours to be fully recharged.

According to research from Deloitte, approximately 90 per cent of EV purchasers charge their cars at home or work. But many households don’t have driveways or garages and rely on on-street parking, making it challenging to charge overnight. Charging points in lampposts may be part of the solution but are far outnumbered by the number of houses in the average street.

If recharging EV batteries overnight can’t be guaranteed, buyers may be deterred. The pace of the rollout of charging points available for the general public will undoubtedly be a significant deciding factor in many EV sales.

So, as the number of e-vehicles, e-vans, e-trucks, and e-buses increase, the capacity and volume of charging sites will need to increase also. There will also need to be more consideration around on-route charging along the main arterial roads or at service stations. And, what’s more, we’ll need to see much wider availability of ultra-rapid charging facilities instead of the ‘slow’ charging points now typical in public areas.

## FEEDING THE NETWORK

The second and possibly less considered challenge is that by 2050, we’ll likely need another 89 TWh of additional power to satisfy the electricity demands EVs will place on the network. Utilities stakeholders need to invest now to upgrade the electrical network and charging infrastructure available without creating upward pressure on the cost of electricity for consumers and businesses. Although the current higher cost of fuel has been linked to greater interest in electric vehicles, there is a risk that additional costs may stifle enthusiasm.

Work is also needed to upgrade the UK energy grid to accommodate the increased electricity consumption of EVs. This presents a further opportunity to decarbonise the transmission network by safely removing SF<sub>6</sub> (Sulphur

hexafluoride) from medium voltage switchgear and replacing this potent greenhouse gas with alternatives such as SF<sub>6</sub>-free air-insulated switchgear – helping the energy sector embrace a net zero future faster.

## SUPPLY MUST COME BEFORE THE DEMAND

The pressure is on for everyone – countries, businesses, and governments to reach net zero, and time is of the essence. EVs are intrinsic to the decentralised energy resource of the future: a vector of decarbonisation and sustainability. Many solutions and tools are already in place, but the affordability and infrastructure to support future EV owners still need to be addressed to unlock their full decarbonising potential. We need to get this right to transition from petrol and diesel as smoothly as possible for drivers and reap a broader positive impact of EVs on the wider energy network. This work needs to be done in tandem – governments need to invest now in a robust infrastructure to handle the coming surge in EV adoption and avoid the wheels coming off this vital part of the drive to net zero. <https://www.se.com/uk/en/>



# HOT TOPIC: ARE HYDRO PANELS THE SOLUTION TO THE GLOBAL WATER CRISIS?

As we all know by now, of course, the climate crisis is very real and the effects of climate change and rising global temperatures are being felt the whole world over.

Experts say that if we are able to resolve the water crisis, however, it would help to resolve the other issues facing the planet in terms of climate change and its effects... and scientists everywhere are now looking into how best to go about finding a solution to water stress and scarcity, which is certainly heartening news to hear.

Part of the problem where water is concerned, however, is that different regions around the world face different issues, so there's no one-size-fits-all approach that can be adopted, which means it becomes necessary to find a wide range of different solutions that can then be employed where appropriate.

One potential solution is the use of hydropanels, which are able to harvest clean drinking water from the atmosphere using solar power and thermodynamics principles to tap into the supply of water vapour contained therein, capturing water molecules and condensing them into liquid water.

Solutions such as this will become increasingly important as climate change drives more frequent and intense extreme weather events.

The world will see more droughts, which will dry up groundwater and rivers, while floods and hurricanes will contaminate the existing water supply. Glaciers are also now melting at record speeds, depleting the number of freshwater resources available. World Health

Organisation figures show that over two billion people in the world already lack access to safe drinking water and this issue is only going to be exacerbated by climate change and weather-related disasters.

But hydropanels, such as those currently in use by SOURCE (previously known as Zero Mass Water), could prove particularly useful in solving the water crisis.

The pure water collected, which is free from pollution, is filtered and mineralised to provide electrolytes for hydration, as well as improving the quality and taste. It is then stored in a reservoir attached to the hydropanels and sent through to the taps.

The company has already installed its hydropanels in over 50 countries worldwide, Palatinat reports, serving worksites, hospitals, schools, domestic properties and

even entire communities.

Each panel is capable of producing three to five litres of clean water a day entirely offgrid, which could prove particularly beneficial for remote communities suffering acutely from the water crisis.

In Kenya's Rift Valley, for example, the installation of these hydropanels means that young girls no longer have to undertake long perilous journeys to fetch water. And the indigenous community of Bahia Hondita in Columbia is now making use of 149 hydropanels to produce 22,000 litres of water a month.

Other benefits of these hydropanels include the fact that they can provide safe drinking water even in the face of extreme weather events like floods, earthquakes and hurricanes. They're also eco-friendly, making use of renewable energy and also driving down waste from single-use plastic bottles.

However, the technology has drawn criticism from some quarters, with some experts believing it to be more productive to collect rainwater and use water filters instead. And, although they're able to function in low-humidity environments such as the Arizona desert, performance is highly dependent on sunlight and humidity levels.

This means that water production slows in low humidity or when there's severe cloud cover, with the panels producing as little as two litres per panel each day - rather problematic given that a single person requires around 50 litres of water a day to meet basic needs.

## WHAT OTHER INNOVATIVE SOLUTIONS EXIST?

As previously mentioned, there is no single solution to the water crisis - but, luckily, all sorts of innovative technology now exists that can be employed to address the situation worldwide.

Desalination, for example, has long been suggested as one possible solution but it is still an energy-intensive process. Instead, scientists have been looking into various alternatives, such as those at the University of Manchester who have designed a graphite oxide sieve that can retain the salts in seawater, so only water passes through.

This sieve can be scaled to any size and with any pore diameter specifications, so it can allow for the filtration of any contaminants found in the water.



And then, of course, there's wastewater recycling, which is proving to be increasingly popular as an option at the moment. We recently blogged about this and how biogas could be the future for the water sector, helping water and wastewater utilities reduce their energy consumption - which represents around 3.7 per cent of global annual energy.

Converting waste into energy (a process that occurs naturally) is known as anaerobic digestion - and the use of anaerobic digesters has been around since the Victorian times, developed to prevent the buildup of sewage and stop diseases from spreading. Now, water suppliers around the UK are increasingly turning to this technology for green power generation.

## WHAT CAN BUSINESSES DO TO REDUCE THEIR WATER FOOTPRINT?

There's a lot that businesses, irrespective of size or industry, can do to reduce their water footprint and help conserve precious resources for future generations.

Options include rainwater harvesting, so this can be used in place of mains water supplies, prioritising water leak detection and repair, having automated meter readings fitted to track usage and consumption, and even switching water supplier.

This latter option can be a very effective place to begin, since it involves having a water audit of your site carried out so you can identify how you're using water and where, allowing you to come up with strategies to save water, which can be adjusted over time.

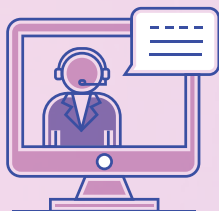
Benefits of switching also include improved customer service, better rates with a different supplier and being able to take advantage of a working relationship with a supplier that has experience of working within your particular business sector.

If you'd like to find out more about business water suppliers in the UK, get in touch with the [SwitchWaterSupplier.com](http://SwitchWaterSupplier.com) team today.

## Switch Water Supplier.com

### Water Bill Validation

Outsourcing the auditing of charges and your water bill validation provides peace of mind and the potential of significant savings.



#### Water bill validation and bureau services.

You probably assume that your business is being accurately billed by your water company, but these organisations are notorious for inadvertently charging customer incorrectly. Commonplace billing errors can lead to discrepancies that run into thousands of pounds, even for SMEs.



#### What is water bill validation?

For larger organisations in particular, there is a need to continually audit charges and validate bills to ensure you are only paying for what your business actually uses. This can become a cumbersome task, especially if your business operates

out of several locations and is served by a variety of water retailers. If this is the case, we recommend outsourcing your water bill validation to a qualified third-party, such as **SwitchWaterSupplier.com**



#### Spend less time processing water bills

Water bill validation can make the process of approving and paying your business expenses more efficient and easier to complete.

Your bills can be validated by a **SwitchWaterSupplier.com** before being approved for payment and passed on to you as the client. You'll never have to spend hours on the telephone resolving issues with water retailers again. Having your bills validated has the added advantage of eliminating the need to dig through old paper copies of your bills and statements, since all documentation is available digitally, via email.



#### What does water bill validation entail?

A preliminary (desktop) water audit<sup>1</sup> is the first step to ensure your water bill will be accurate going forward and to reclaim any refunds from past billing mistakes. Water bill validation

is the next phase of the audit process and this ensures your billing remains consistently accurate in the future.

With the complex nature of your water bill and its many tariffs and fees, it's easy for new charges to become buried deep within the details of your monthly statement, where they will likely go unnoticed. Having a designated expert – and by this we mean a truly experienced consultant – monitoring your water bills can give you peace of mind that you are only paying for the water services that you are actually using and at the correct rates.



#### How SwitchWaterSupplier.com can help

If your business would like to take advantage of water bill validation, **SwitchWaterSupplier.com** can provide the service and with no annual fee.

We provide ongoing checking, monitoring and validation to ensure that any billing errors are dealt with quickly and resolved before payment<sup>2</sup> is issued. There are no lengthy contracts, and your billing history is centralised and completely accessible in a digital format.



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If you'd like to qualify any of **SwitchWaterSupplier.com's** services please get in touch with us and we'll be happy to evidence the services and their value.

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1. <https://www.switchwatersupplier.com/water-audits/>

2. <https://www.switchwatersupplier.com/billing-data-correction/>

# DISTRIBUTED INTELLIGENCE: EMBEDDING THE CONSUMER IN THE ENERGY EQUATION AND POWERING THE FUTURE

Michael Somersmith, Director  
of Product Management, Itron

**M**anaging the rapidly diversifying energy landscape has never been more challenging than today. Look no further than the current energy price crisis to see why – utilities are battling not only against the elements, but also an aging infrastructure that does not yet permit us to fully wean off fossil fuels or take advantage of more consumer-centric approaches.

The simple truth is that renewable energy sources are much less reliable in the face of extremes than gas and coal, as the year 2021 has shown us. In September, UK wholesale energy prices surged to a record-breaking £2,500 per megawatt hour due to a long period of low wind speeds. The same phenomenon was responsible for another spike in November, a spike of £2,000 MWh between peak hours. Both times, the National Grid was forced to call on coal-powered plants to make up for the dip in power generation. And this is just low wind. Strong gales, floods, earthquakes and serious natural disasters all pose a threat to the grid. Indeed, a recent Itron Resourcefulness Report, found utility executives consider the impact of disasters (88%) and integrating renewables (86%) two of the biggest concerns about the energy grid today.

This volatility ultimately translates into power outages, frustrations and higher energy prices for the consumer – a backwards outcome, considering the fact that the role of consumers in energy management is fast-changing.

## CONSUMERS ARE BECOMING ACTIVE PARTICIPANTS IN ENERGY GENERATION

Consumers are now taking their fair share of renewable energy generation, most commonly through installing solar

panels on their roofs. It is then perhaps not surprising that solar PV is expected to be responsible for over half of all new renewable energy generation in 2022. Where new trends emerge is how these consumers are encouraged to share what they generate.

Today, one in six utilities use customer-generated power, and the use cases are growing. Adding to this, there are now various government schemes that incentivise consumers to help stabilise the grid. For example, the UK government's Smart Export Guarantee pays households to feed excess solar energy back in to the National Grid at a time of need. And it's not just solar PV – UK households are filing a record number of applications for batteries, potentially tripling the UK's battery storage capacity (1.3GW to 4.5GW) by the end of 2022 and giving the grid a chance to return to the equilibrium 50GHZ during peaks and troughs.

Besides solar panels and batteries, one of the most significant ways consumers can help stabilise the grid is through their electric vehicles (EVs). Modern electricity monitoring and metering technology will turn EVs from a thing you drive, to a thing you can derive energy from. But before we get there, we must first overcome the challenge of integrating EVs into the grid at scale – a concern for 85 percent of utilities.

## THE EV CONUNDRUM

We know even boiling kettles during the World Cup final can wreak havoc on the grid. At the end of the famous 1990 World Cup Final, millions of Brits reached for their kettles, generating a whopping 2,800MW surge in electricity demand. Even today, the National Grid



must prepare for half-time kettle-boiling and light switching. Now imagine what happens when five commuters in a cul de sac all plug in their EVs at the same time after a day of work – day after day, including on match days!

Luckily, new EV trials are providing a window into future energy cooperation. In the recent government-backed Smart Metering Innovation for Load flexibility (SMILY) field trial, the latest generation of SMETS2 meters were put to the test to help utilities take control of EV charging schedules, harmonising them to the most optimal times from the grid's point of view.

As one of the participating organisations, we were able to see first-hand how modern smart metering technology was able to incentivise and produce collaboration between users and utilities to keep the grid balanced. By the end of the trial, 76 percent of participants became comfortable with their energy supplier remotely controlling the charging of their EVs (at the start this was 60 percent) and the same rate expressed interest in learning about the impact of their EVs.

## WHERE DO WE GO FROM HERE?

There is a clear shift in consumer attitudes that utilities need to pay attention to and take advantage of. With the growth of consumer appetite for insight – be that on how energy



There are infinite possibilities created by edge computing and distributed intelligence that can support the future direction of the utility business model.

is spent or how they can monetise their energy generation – comes the demand of action and innovation.

The proliferation of technologies has already resulted in a complex low voltage network that provides charging for EVs and hybrids, solar and smarter meters dotted alongside the edge of the energy network. As we see the demand for smarter energy management solutions rise, power generation will increasingly move from a centralised to a distributed model. This, combined with the complexity of the network means that, in order to keep the grid stabilised, command and control of the electric grid will also have to become more decentralised, and more capable at the service point and at the distributed generation plants.

There is no escaping the fact that utilities will now have to re-imagine their business models and move energy management solutions closer to where problems occur. As the industry moves towards a reformed business model of data-driven and performance-based initiatives, a new technological framework comprised of distributed intelligence and edge computing will emerge.

## THE PROMISE OF DISTRIBUTED INTELLIGENCE

Distributed intelligence applies analysis, decision making and action where it is best utilised for the most valuable outcome. It enables utilities to manage rapidly changing conditions locally, providing significant improvements to outage detection and analysis, distribution

connectivity modelling, fault detection, theft detection, transformer load management, renewables integration, EV integration and multiple innovative consumer services.

At the heart of this reformed model is two-way communication. In the current infrastructure, a transformer can communicate supply to an EV charging point, but the charger cannot feed supply back via the same route, nor can its energy be used to power the local environment such as the home or other buildings. Under distributed intelligence, sensors, meters and IoT equipment can all communicate with each other to compare information and status. Devices can then create a bee-hive effect where one device can tell another device that something is occurring, and the other device can validate and pass that information on to a third device. This real-time peer-to-peer communication enables the network to self-correct faster, for example by controlling high loads locally or keeping the lights on during natural disasters.

Beyond improving grid efficiency, reliability and safety, distributed intelligence is also a business imperative, since customers will reward utilities that can provide fast or preventive action with their loyalty. With the complexity of the information provided, and the broad nature of the solution, having an open and vibrant ecosystem of solution providers will create more opportunity for the consumer to capture the value from this technology shift, while simultaneously enabling utilities to begin the development of advanced solutions that meet the needs of future smart cities.

## CHANGE IS NOW UNDERWAY

Since the beginning of recorded time, armies and societies that have distributed decision making and action closest to the problem, closest to the battle have prospered over their centrally bound rivals. It is only now that these same concepts can be applied across our networks and edge devices. This is a broad, complex set of challenges that requires a long-range vision and technology that can enable management of distributed assets across multiple domains.

The good news is that the proof points are already here and the technology already exists to start making this vision a reality. Forerunners include Florida Power and Light, which currently runs advanced metering, distribution automation and over half a million of smart streetlights that adjust light levels based on motion or presence levels, all on the same multi-application network. And the utility industry as a whole is making strides in aftermarket services – for example, by retrofitting non-communicating devices with IoT edge routers – and in consumer services, providing open platforms through the latest generation of smart meters. The future of energy management is distributed and intelligent. To reach this point of technological maturity before it becomes a question of playing catch-up, providers and governments must re-evaluate their strategies today, devise new systems and spur innovation that leverages advanced analytics in the context of local environments, local communities and most importantly, consumers. [www.itron.com/emea](http://www.itron.com/emea)

# MOVING BEYOND ENERGY EFFICIENCY



## Laura Clare Davies, Inspired Energy

to adapt or change their behaviour, it's more likely they'll engage with wider energy and sustainability initiatives. Implementing a full behavioural change programme also helps businesses to not only reduce their consumption, but their carbon emissions as well.

### THE IMPORTANCE OF DATA

Looking ahead, organisations that are ready to move beyond initial energy efficiency measures have many options, all of which are achievable and will reap benefits for the business as well as the environment. One thing that is central to making effective change is data. Put simply, you can't manage what you don't measure, so businesses should start measuring their energy consumption before they begin their optimisation journey. This will enable them to know where, when and how they're using energy. We're already seeing that when planning a net zero strategy, it's those organisations that don't have the data they need to find their baseline, that fall at the first hurdle.

Sound data management is key for organisations required to comply with regulatory schemes such as Streamlined Energy and Carbon Reporting (SECR) and the Energy Savings Opportunity Scheme (ESOS). Those who have already submitted reports for SECR will tell you that data collation can be challenging, which means that starting data collection early is crucial.

Smart metering can also help businesses to keep on top of their costs by implementing an automatic meter reading (AMR) device for non-half hourly supplies or a data collection contract for half-hourly supplies. This can provide them with greater control with a managed rollout. Measuring half-hourly (HH) data, particularly for those with multiple sites can be challenging.

There are then a number of ways organisations can better use energy consumption data to help inform business decisions, keep energy costs in line with budgets and help with future planning. Firstly, they should review data regularly to understand how it can be used to support their energy strategy. Businesses should work from a baseline of their energy performance and then

identify how factors such as production levels, behaviour and seasonality influence their consumption. Then they can prioritise areas for improvement and track their results to see if they are meeting or exceeding their goals and if the strategy needs further optimisation.

### TAKING CONTROL WITH ON-SITE GENERATION

In recent years, we have seen a real increase in the number of businesses installing on-site generation as they move beyond energy efficiency and further towards net zero emissions targets. As well as the clear environmental benefits, price is also a key motivator for many businesses. On-site generation prices are becoming more attractive, particularly in light of the record high wholesale prices we are seeing. Many organisations are also conscious that green energy contracts come with a premium – which means that investing in a renewable on-site generation asset can reduce their energy costs as well as their carbon emissions.

One question that businesses often raise is whether they should invest in battery storage as well. It is worth considering, but it will really depend on how the business pays for its energy. If their costs are fully passed through, then they're likely to benefit from battery storage more than those that are on a fixed contract, because they could avoid higher TNUoS costs by utilising stored energy during peak demand periods. Those that are on fixed term contracts will see less benefit, because they will be paying a premium to fix their price.

### THE ROAD AHEAD

There's no doubt all businesses should be aiming for net zero now, no matter how far away that target may seem. While there are many organisations that are well on the road to net zero, there are some that are starting out on this journey and it's important they have the confidence and support to move beyond energy efficiency. Through harnessing the power of their data and taking a holistic approach to energy optimisation change is possible and it's not just our climate that will benefit. [www.inspiredenergy.co.uk](http://www.inspiredenergy.co.uk)

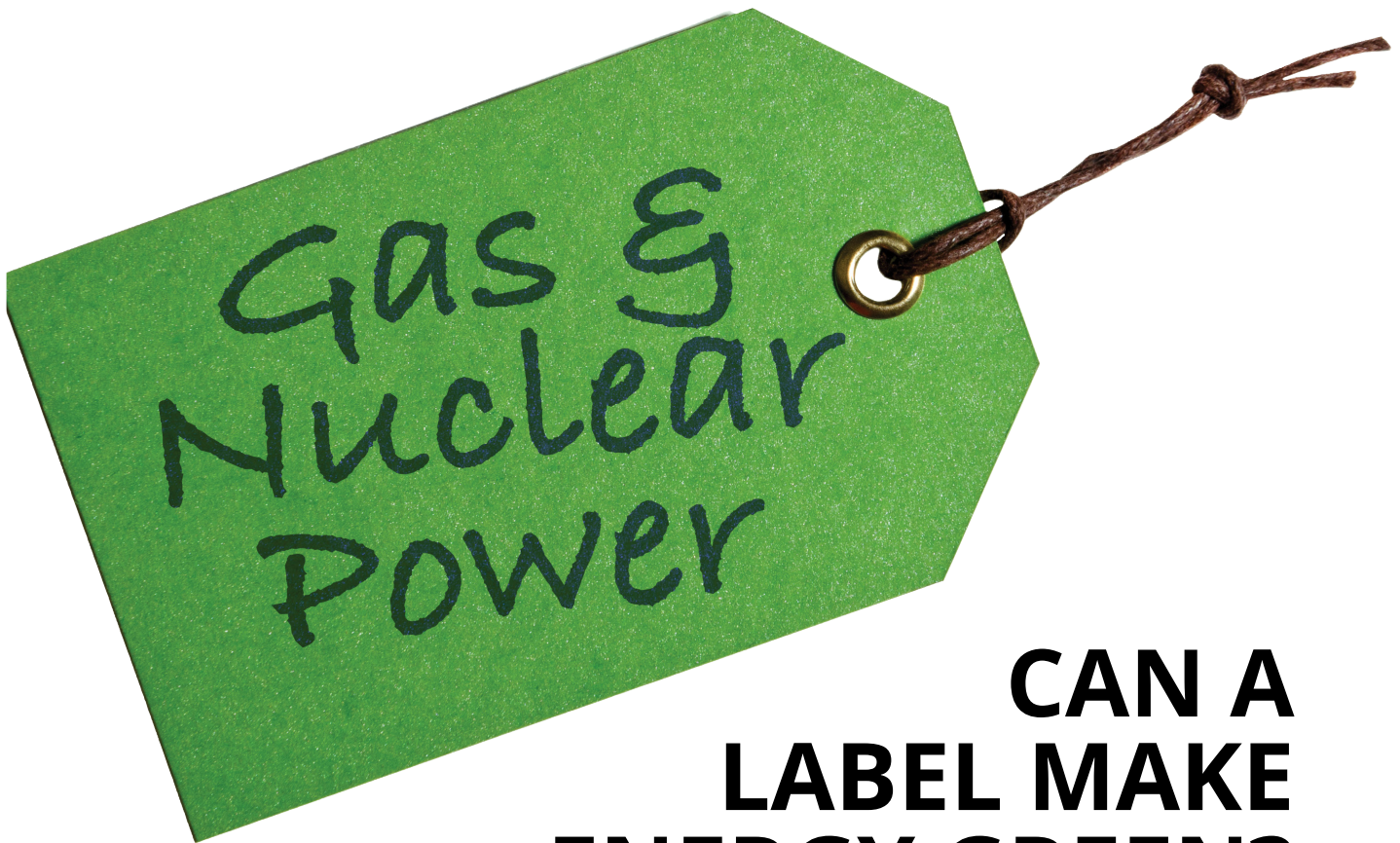
**W**ith sustainability front and centre on the world stage, a climate in need of rescuing and volatile energy prices to navigate, the pressure is on all of us to transition to a low-carbon future. For the majority of businesses that already consider themselves energy efficient, what's next on the road to net zero?

Today, many businesses have already begun to improve their energy efficiency as they recognise the need to play their part in tackling climate change and the vital benefits it has on their bottom line. During a time of volatile energy prices, these economic benefits are more important than ever before.

Many organisations start their energy reduction journey by addressing 'low-hanging fruit' measures like switching to LED lighting or installing sub-metering. After implementing initial energy efficiency measures, we then typically see businesses take one of two routes. Some focus on their electricity consumption by implementing measures like renewable on-site generation and voltage optimisation, which ensures that the voltage for their site is set at the optimum level for their machinery and assets.

Others take a more integrated approach by focusing on behavioural change as well. It is through taking a truly holistic approach that looks at energy optimisation, not just reducing usage, that organisations will drive real change and move beyond energy efficiency alone. The key here is not just focusing on how much energy a business is using but also when and how they are using that energy.

A holistic approach that gets staff involved in energy efficiency is very effective. By helping employees understand why they're being asked



## CAN A LABEL MAKE ENERGY GREEN?

**T**he start of the new year heralds a brewing argument across Europe with the European Commission proposing to label some gas and nuclear power as 'green'. With a majority vote in favour, this could become law by 2023.

This comes just months after the COP26 Climate Summit pledged to keep temperature rises within 1.5°C. Scientists say this is required to prevent a "climate catastrophe". Current pledges, if met, will only limit global warming to about 2.4°C.

The logic in labelling gas and nuclear as green is that they are helping to transition the continent to cleaner power with the fossil gas and nuclear energy sectors contributing to the decarbonisation of the European Unions economy.

Some of the criteria states that gas plants will have to limit the amount of carbon dioxide released per kilowatt-hour of energy produced. While nuclear plants will need evidence of strict waste disposal plans. This is in the hope that only producers with the highest standards will be included within the 'green scheme'.

Individual nations have responded, and not surprisingly with their vested interests front and centre. France, with 70% nuclear reliance, but an historic pledge to cut this by half and close 12 of its reactors by 2035, is reportedly pushing for nuclear production to be included.

While senior politicians in Germany, which is in the process of phasing out nuclear completely, have described the proposal as 'wrong', that environmental disasters and large amounts of nuclear waste could be the outcome, and the proposal simply waters down the good label for sustainability.

Obviously, there is a need for global collaboration to produce energy that comes from sustainable sources. Having entered the 2nd year of the decade that will end with global CO<sub>2</sub> emissions supposedly being halved and fewer than 30 years until our net-zero target, the deadlines suddenly feel very real!

Consider, for a moment, that the quest for green energy production is being looked at through the wrong end of the telescope. A far-away, broad picture, a mass of inter-related parts, almost too much to take in and little clarity. But if we were to turn the telescope around, we can pin-point very specific issues and take determinate action. To relieve pressure on the transition to greener energy production, part of the answer could be to use less rather than make more. The greenest energy is, surely, the energy we don't use!

By cutting the unnecessary consumption of energy at as many points of use as possible, every individual action is contributing to future sustainability.

The key factor is making actions easier.

Irus, the energy management system from Prefect Controls has been helping universities and student accommodation providers to play their part in cutting energy use since 1997. The system is constantly looking for ways to reduce heat input and control is at the fingertips of energy managers who can monitor, measure, and manage energy use remotely. The internet-based portal provides data from every room with temperature and activity time periods being set individually to give maximum comfort with maximum efficiency.

Room occupants have control over their personal comfort, but should they set the temperature to maximum and forget about it, leave the room, or open a window, Irus takes over, recognises that heating the space would be wasteful and reduces energy input.

The system has evolved over time and monitors the environmental conditions of the space it inhabits, with alerts being sent to management if it detects unusual humidity, light, decibel, or CO<sub>2</sub> levels.

While nations argue over the big picture, individual actions taken locally by reducing consumption can help to mitigate the immediate problems, while waiting for sustainable energy production issues to be resolved.

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Because we believe in a future where reducing carbon emissions and managing costs isn't an 'either or', but a 'both'.

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