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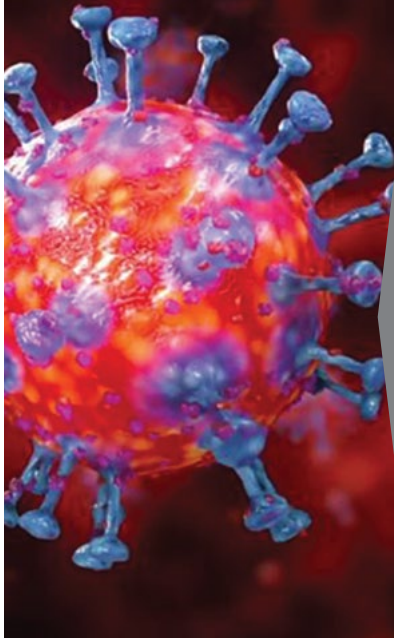
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Too good an opportunity to miss

As restrictions imposed by the COVID-19 lockdown ease, there appears to be a broad consensus that the recovery should be a green one and the argument is compelling: the UK's ambitious climate change programme of achieving net zero emissions as an economy within the next 30 years. A pivotal point in this transition, perversely, may well prove to be the pandemic and its impact across society.

“The money that will be necessary to kick-start the economy following the COVID-19 pandemic can, if tied to certain conditions, be used dually as stimulus for decarbonisation

It is difficult to enact lasting wholesale changes to business as usual when everything seems to be OK and many have an interest in maintaining the status quo. The unique circumstances that have led to a fair proportion of the economy essentially being put on pause or operating at a reduced level has eliminated business as usual.

This allows us the opportunity to rebuild in a different way. The COVID-19 lockdown has perhaps removed the fear of not having business as usual. Many more people have now used video chat regularly, reduced travel to a minimum, shopped online for almost everything. To achieve net zero new jobs and skills are required across clean energy supply, energy efficient technology and infrastructure.

The energy transition was always going to require further cash stimuli from the government to stimulate it. The money that will be necessary to kick-start the

economy following the COVID-19 pandemic can, if tied to certain conditions, be used dually as stimulus for decarbonisation. Finance for specific firms, industries or infrastructure projects can be contingent on reducing emissions or ameliorating the effects of climate change.

The Committee on Climate Change has previously identified a detailed set of appropriate investments and it says that “many are labour-intensive, spread across the UK and ready to roll out as part of a targeted and timely stimulus package”.

Given the short-term pressure of keeping a business solvent in the current crisis, it is compelling that many large firms – the paying consumer, feel it is too good an opportunity to miss. In an open letter, more than 200 UK businesses, investors and business networks, have called on the government to deliver a COVID-19 recovery plan that aligns with the UK's wider social, environmental and climate goals.

Any economic stimulus required to recover from COVID-19 may as well fulfil the additional aim of meeting net zero legislation which will so in any case be required over the next decade.

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Green light for 350MW mega solar farm in Kent, with 700MWh storage to follow

Britain's biggest solar PV farm to date, the 350MWp Cleve Hill project near Faversham in Kent, has been given the go ahead.

The £450m development is the first UK PV farm to qualify as a Nationally Significant Infrastructure Project (NSIP), as a result requiring sign-off by energy secretary of state Alok Sharma.

The Cleve Hill farm will be sited across 388ha – the equivalent of 600 football pitches – on the north Kent coast. More than 870,000 panels, some mounted on racks as high as a double-decker bus, will face east and west to maximise output.

Co-developers Wirsol Energy and Hive Energy intend to add massive amounts of battery storage, up to 700MWh. The site already has an existing



400kV substation, located at one of the transmission grid's tightest pinch points in southern England.

Cleve Hill has been in planning since 2017. Construction is scheduled to begin next spring, with first power due by 2022. Backers are yet to be confirmed.

The massive development has been criticised by Greenpeace, as well as local MP Helen Whately, who fear "industrialisation" of the north Kent's coastal strip.

But its developers say it enhances biodiversity. Three

kilometres of hedgerow will be planted. A freshwater grazing marsh will be maintained, as will habitats sheltering overwintering birds. Rights of way including the Saxon Shore coastal path will be respected, and conservation groups will sit on the site's management body.

A BEIS spokesperson commented: "The decision to grant consent for the Cleve Hill solar park was taken after careful consideration. Solar power has the capacity to play an important role in the UK, ending its

contribution to climate change by 2050. This project will help power nearly 100,000 homes, making it a world-leading solar and storage project."

The scheme dwarfs anything co-developers Wirsol Energy and Hive Energy have delivered to date.

Celebrating the decision, Hive CEO Giles Redpath said renewable energy "is the most important thing that is going to happen to our planet over the next 50 years. Solar energy is unique. It will transform the world."

An even bigger solar farm may soon await the minister's decision under NSIP rules. Sunnica Solar is working a 500MWp installation on the Cambridge/Suffolk border near Newmarket.

Ofgem delays Triad cull

Ofgem has delayed killing off Triad avoidance until 2022.

The regulator had intended a new charging methodology to come into force in 2021, but National Grid ESO asked for an additional year.

The system operator and energy suppliers were concerned that clarity regarding the new banded charges would come too late in the year, leading to contracting issues. IT system changes would also be rushed which could compound problems, they argued.

The changes – which will move the residual element of transmission network charges (TNUoS) from demand to a fixed charge based on a site's available capacity, or recent annual demand – will now take effect from April 2022.

BEIS plots new baseline and higher buyout for extended CCA scheme

The government intends to reset the baseline and impose higher buyout costs for an extended Climate Change Agreement (CCA) scheme that reopened to new entrants in April.

It also plans to stop participants 'banking' historic carbon savings in order to qualify for fresh incentives.

CCAs provide carbon tax breaks worth £300m a year to firms that cut energy use and carbon emissions.

In the last Budget, the government said it would extend the scheme for two years to 2025 and reopen it to businesses, having closed

to new entrants in 2018.

BEIS now seeks view on how that should work and on potential reforms should it decide to carry the scheme beyond 2025.

The consultation indicates eligible firms wishing to join the CCA programme will have until 30 September to do so.

It proposes resetting the current target baseline from 2008 to 2018, tasking businesses with cutting energy consumption 20% by 2030, in line with the 2017 clean growth plan.

Companies' actual performance against those targets will then be published every

two years from 2023.

The CCA scheme operates in two-year target periods. BEIS indicated it will not allow over performance in early periods to be carried over into the new periods. That means companies will have to continue making improvements to gain their tax discount.

Equally, companies will not be able to use early over performance to avoid the buyout aspect of the scheme – which obliges participants to pay £14/tCO₂e for failing to meet their targets.

BEIS said about half of participants have been using banked over performance and/or buyouts to meet their targets. To discourage that, it plans to hike the buyout rate to £18/tCO₂e.



Sizewell C: EDF to test UK government as it prepares to push nuclear option

EDF is seeking planning approval for its 3.2GW plant at Sizewell C on the Suffolk coast.

The state-owned utility plans to test UK government appetite for long-term, guaranteed payments for more centralised, but inflexible, zero carbon baseload.

Uncosted in the documents, Sizewell C will replicate EDF's proprietary EPR technology now being pioneered at Hinkley Point C in Somerset. Both plants are equal in capacity.

Last September EDF confirmed Hinkley C's construction bill had risen by a further £2bn, to between £21.5 and £22.5bn, blaming ground conditions.

In March 2018, EDF's UK CEO Simone Rossi suggested the Suffolk plant may come in 20% cheaper. EDF now cites last year's government consultation on the nuclear industry's Regulated Asset Base model as implicitly underpinning that hope.

Approved in September 2016, the government handed Hinkley C an index-linked



strike price of £92.50/MWh, guaranteed for 35 years. It has been described as "risky and expensive" by the government's own auditors.

Nuclear option

The UK has committed to decarbonise the economy within three decades. If that is to be achieved by electrifying heat and transport, the UK will need vast increases in zero carbon generation, as well as massive network investment.

EDF states that electrifying heat and transport cannot be done without new nuclear.

However, there are reservations within Whitehall about committing for decades to large chunks of inflexible baseload that is unlikely to arrive before 2030.

Those concerns may have been amplified in recent weeks. In May, EDF stuck a deal with National Grid ESO to halve output from its Sizewell B pressurised water reactor to help keep the transmission system stable while demand is suppressed by the COVID-19 pandemic.

More nuclear power may require similar deals

or procurement of new balancing services to cater for periods of high renewable generation and low demand, which add cost to bills.

On the flip side, the system operator would certainly benefit over winter from reliable, dispatchable baseload in a system dominated by fluctuating renewables.

Meanwhile interconnectors, which National Grid is building, alongside producing hydrogen via electrolysis, could help ease excess power issues while helping to decarbonise heat, transport and industry.

Should EDF get the contract it requires, East Anglia will benefit from Sizewell C's 25,000 construction jobs and 1,000 apprenticeships, claimed EDF. Some 70% of supply chain value will be retained in the UK, it stated.

Operating economics are not disclosed in the Sizewell C application, for which public consultation began in 2012, gathering responses from 10,000 Suffolk residents and organisations.

Government sets out stall for UK carbon market

The government has set out plans to implement a UK carbon trading scheme by January next year.

The UK Emissions Trading Scheme (UK ETS) will replicate many aspects of the reformed EU Emissions Trading Scheme (EU ETS), under which about 1,000 UK companies have to either reduce their carbon emissions to meet set limits, or buy carbon credits via carbon markets.

The government has previously stated that it may

link up the UK market with the EU's scheme and has not shut the door on that option, "if it suits both sides' interests".

But it may yet decide to switch to a different form of carbon tax and will consult later this year on how that might be designed.

What, where, when

The UK ETS will apply energy intensive industries (EIIs), the power generation sector and aviation, plus sectors including refining, heavy industry and manufacturing.

Proposed aviation routes include UK domestic flights, flights between the UK and Gibraltar, flights from the UK to EEA states, and flights from the UK to Switzerland.

The Department for Business, Energy & Industrial Strategy said it would start the scheme by setting emissions limits 5% lower than EU ETS equivalents and will align the limits with the UK's net zero targets no later than 2024.

The auction for carbon credits will initially have a

minimum reserve price of £15, but government will include cost containment mechanisms within its design to smooth out "very high" price spikes, should they occur.

While the scheme is intended to capture all sites with more than 20MW of generation, hospitals with up to 35MW net rated thermal capacity will be able to opt out. There will also be an 'Ultra-Small Emitter Exemption' for installations with emissions below 2,500t CO₂e per annum.

Bristol City Council to cut its losses as it looks to offload Bristol Energy



Bristol City Council hopes to sell Bristol Energy, the municipally owned energy supply company which has struggled financially since being set up in 2015.

The council appointed EY in May to assess its viability and has now reviewed the



Mayor Marvin Rees: 'Turnaround not possible, we're cutting losses'

auditor's recommendations. Bristol mayor Marvin Rees commented: "Establishing an energy company was always a high risk for the council, and one which has brought continued challenges.

"The energy market is dominated by well-established, far larger energy providers." Rees said he



Establishing an energy company was always a high risk for the council, and one which has brought continued challenges

had inherited a failing company from the previous administration and that turning it around had "proved impossible in such a volatile marketplace".

To date, the council's cash investment in the energy company stands at £36.5m, against a total cash funding envelope of £37.7m.

Bristol Energy posted an adjusted operating loss of £10.1m for the financial year 2018-19, its third year of trading. That was roughly the same loss as the previous year, despite increasing turnover by 45% to £76.2m.

It has 100,000 customers including a small number of businesses. It has power purchase agreements with 54 renewable generators.

Fellow council-owned supply company Nottingham Energy is also struggling with heavy losses and has appointed auditor Deloitte.

Given the collapse in business demand and likely bad debt issues arising from COVID-19, another round of supplier failures is likely.

Ofgem is attempting to flatten the peak of market exits by brokering a £350m loan via deferred network payments.

£4k grant for heat pumps plus green gas subsidies

The government is planning to offer grants of £4,000 in a bid to boost heat pump uptake.

The grant, for both businesses and households for schemes up to 45kW, is detailed in a consultation on future support for low carbon heat.

The consultation also outlines subsidy support for

biomethane injected into the grid – a mechanism the government "would like to be in place as soon as practicable" so that there are no gaps in support when the non domestic RHI closes to new applicants next March.

As such, BEIS said the Green Gas Support Scheme will begin in financial year

2021/22 and will run until financial year 2025/26.

It plans to tier subsidies to favour larger plant and is considering 15-year payments, though seeks views on 10- or 12-year support.

For the heat pump

scheme, all technologies will be eligible, and BEIS said the grant may work particularly well in shared ground loop schemes.

Separately, the department is consulting on the closure of the non-domestic RHI.



Lockdown lows make 'renewables the new baseload'

Europe's biggest grids are delivering glitch-free supply, even as renewables contribute record shares of depressed demand, according to analyst Cornwall Insight.

Coronavirus shutdowns from late March pushed demand on average 20% lower in the continent's top five markets, including Germany and Britain. But wind, solar – and geothermal in some markets – have stepped into the breach.

"Many system operators are now proving able to manage grids at 70% or more renewable energy, and with a much lower level of demand than would – even a few months ago – have been expected," said Tom Andrews, senior analyst at Cornwall Insight.

"Arguably, renewables have stepped into the baseload role, with gas and limited amounts of coal fulfilling a peaking role both when demand does pick up, and when renewables output dips."

In the four weeks from March 23, Britain's generation fell by 17.2% compared with the same period last year. Carbon intensity of the reduced generation was down 17.5%, as managers scaled back CCGT output by almost 90%, the analysts report.

Germany saw even steeper



grid decarbonisation. Electricity generation fell 11.5% over the four weeks, but its carbon intensity tumbled 35%, Cornwall found.

Over Easter, renewables made up 55% of German output. Negative wholesale prices were the result. German generators have long experienced the problem, made more intense during current suppressed demand.

Operators have for some years outlined the increasing challenge of managing low transmission demand with increased embedded generation over summer.

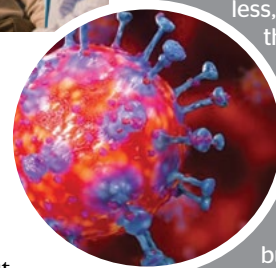
GB system operator National Grid ESO has called for urgent code changes to allow it to stop generators connected to the distribution network from exporting. It is also launching a new footroom service, which pays generators to stop

exporting, or for businesses to use more power in a bid to keep the system stable.

The ESO has also struck a deal with EDF to reduce output from Sizewell B this summer.

While those measures, implemented at speed, underline the challenges facing grid operators this summer, Cornwall Insight suggests the exercise will prepare the industry for what is to come.

"The generation balance is likely to return to normal as countries come off lockdown," said Andrews. "However, [this survey] has demonstrated that managing a grid with high renewable penetration is feasible. This may become the new normal as more renewable generation is deployed across Europe."



Eon: Business energy demand falls

Business energy demand has dropped by 38% on average since the start of coronavirus lockdowns, according to Eon.

Leisure, hospitality and real estate sectors have taken bigger hits.

Even essential sectors, such as water, agriculture and IT, are using approximately 20%

less, according to the supplier's consumption figures.

Electricity is the largest part of Eon's B2B business and director of business energy sales, Iain Walker,

stated in a blog that the firm "expects electricity demand to remain this way for some time to come".

As much of the population is largely confined to their homes, National Grid ESO's figures show weekday electricity demand is down about 20%. That compares to around 14% declines in the first four weeks of lockdown.

To mitigate low demand, the system operator has now launched a new service that will pay businesses to use more power, or stop exporting onsite generation to the grid.

Ofgem brokers £350m loan to keep suppliers afloat

Ofgem has effectively facilitated a £350m loan in a bid to help energy suppliers stay afloat as COVID-19 hits severely impacts revenue.

Keen to flatten the peak of suppliers going bust, the regulator will allow them to defer network payments, which make up about a quarter of domestic bills (but can be more for

businesses). That means network operators – stable, regulated businesses – will carry the cost for suppliers up until March 2021.

Ofgem said it expects suppliers to first try and access commercial loans, but many may find banks unwilling to lend: Energy suppliers have been collapsing in numbers in recent years even

before the current crisis.

Many have struggled to pay Renewable Obligation buyouts and Capacity Market payments. This year will likely see record shortfalls – and more suppliers going bust.

Suppliers and shippers shunned by banks will not have to offer networks security – but they will have to pay 8% interest.

Per network licence area, the relief is capped at £1.6m per electricity supplier group and at £1m per gas shipper.

If suppliers go bust without paying networks back, and network operators cannot get the money back via liquidators, Ofgem will allow them to recover the costs next year through customer bills.

Legal & General buys stake in heat pump firm Kensa

Legal & General Capital has acquired a 36% stake in heat pump firm Kensa as it amasses a portfolio of companies aiming to decarbonise heat and transport.

Legal & General increased its stake in electric vehicle charging company Pod Point when the firm was acquired by EDF earlier this year.

Announcing the Kensa deal, which is involved with another EDF company, Pivot Power, in the Oxford ‘Superhub’ project, L&G said it is “investing in sub-scale industries that it can use its platform to grow rapidly in the post-crisis period”.

Heat pump growth in the UK to date has been disappointing. However, many, including Legal & General, believe the sector is on the cusp of a boom.

The company points out that government is set to ban new homes from taking fossil fuel heating within five years, creating a large addressable market. Meanwhile, mooted changes to carbon factors within Building Regulations could end up tipping the scales towards heat pumps over other technologies.

Retrofiting, while more challenging, also represents a “significant” market opportunity, according to the firm. Kensa’s new factory in Cornwall, ready to produce up



A borehole drill rig for a ground source heat pump

to 30,000 units per annum, suggests some confidence in incoming market growth.

Legal & General’s housing business spans build-to-rent, build-to-sell, later living and affordable housing and the company aims to make all its new housing stock “operationally net carbon neutral between now and 2030”.

For starters, Kensa, which specialises in ground source heat pumps, looks set to deploy its technology across Legal & General’s retirement homes business. The Inspired Villages Group currently operates seven communities, and is set to commence building one of the UK’s largest at Legal & General’s former HQ in Kingswood, Surrey.

“We invest our capital in clean energy assets,

businesses and technologies which will help accelerate the UK’s progress to a low-cost, low-carbon economy,” said Legal & General Capital CEO Kerrigan Procter.

“Our investment in Kensa will enable the business to scale up at pace, bringing vital capacity to the sector. Our partnership marks a major milestone for Legal & General as we look to invest in the transformation of the energy system, and also add critical capabilities to deliver our own ambitious target to achieve net zero homes.”

Procter added that “tackling climate change should dominate the agenda” post Covid-19, with the company anticipating “further accelerated growth” within the green economy.

Green light for UK’s biggest onshore wind farm

SSE is set to build Britain’s biggest onshore wind farm, the 443MW Viking project on Shetland.

At peak output, Viking’s 103 turbines will generate around 1.9TWh a year. A projected load factor of 48% makes it Britain’s most productive farm, as well as its biggest, say the developers.

Long delayed in Scotland’s courts, Viking won Ofgem’s approval earlier this year, on condition that SSE can build the islands’ first connector to the mainland. Ofgem has indicated its ‘minded-to’ approval for the 600MW link, and is expected to confirm its view in July.

SSE insisted the investment depends on code changes still being negotiated. Critical are those deciding how much of the connector’s cost will be borne by SHEPD, the DNO serving the islands.

The developers are targeting April 2024 for full commissioning of the turbines and the 120-mile link. Gas-fired generation from the islands’ sole station at Lerwick is due to be scaled back from 2025. Decarbonising the town’s servicing of offshore oil and gas operations will be an added benefit.

Eon and Npower’s industrial and commercial businesses to merge

Eon and Npower’s business energy supply units are to merge.

Npower’s business supply unit was originally left out of the deal, which saw its domestic retail division being rolled into Eon after the German parent companies did an asset swap.

However, Eon said it

now makes sense to bring everything under one roof.

“Bringing together our two successful Industrial & Commercial units into a single organisation creates one of the largest B2B energy businesses in the UK,” said CEO Mike Lewis.

“These are fundamentally two complementary companies that bring together wider expertise in different areas of the market. What this means for British business is an expansion of our abilities to offer a greater range of smarter and personalised support to help

meet their business efficiency and zero carbon ambitions.

“This is the latest stage of a process to build a more sustainable business and to succeed in this extremely challenging market.”

Eon is hoping to integrate the two businesses, including migrating them to a single IT system, by the end of next year.

It is not yet clear how many roles may be at risk due to duplication.

InterGen to pay £37m for market abuse following Ofgem probe

Global power generation firm InterGen is to pay £37.2m for market manipulation in winter 2016.

The decision follows a three-year investigation by Ofgem. The regulator found InterGen, which owns UK gas-fired power stations including Spalding, Coryton and Rocksavage, had played the system in order to profit from wafer thin capacity margins.

Ofgem said its investigation found evidence of manipulation over four days, when staff “deliberately sent misleading signals to National Grid by falsely claiming that some of its power stations would not be generating during the critical ‘darkness peak’ evening period when demand is highest. To boost profits even further, the company also deliberately sent misleading signals to National Grid about its power plants’ capabilities”.

As a result, National Grid paid the firm higher prices to generate to ensure the lights stayed on, with InterGen making £12.8m.

But the alarm was soon raised by another power generator suspicious of InterGen’s activities.

Following the investigation, InterGen has agreed to pay back the £12.8m and pay a £24.5m penalty.

Genuine remorse

Ofgem said the company has put in place measures to avoid repeats and shown “genuine remorse and a desire to put things right”.

As such, the regulator reduced InterGen’s penalty from a proposed £47.8m to £37m.

“InterGen misled National Grid system operator into paying millions more than it needed to for electricity generated by the company,” said Ofgem CEO Jonathan Brearley.

“This strong action sends a signal that Ofgem will not tolerate any form of market abuse that

undermines the integrity of the wholesale market that can ultimately harm consumers.”

InterGen CEO Jim Lightfoot commented: “We deeply regret and sincerely apologise for the behaviour of former traders in these 2016 incidents. We take this matter incredibly seriously and have co-operated with Ofgem’s investigation. None of the traders involved in 2016 are still with the company.

“As acknowledged by Ofgem we have undertaken a thorough overhaul of our people, processes and systems since 2016, so that nothing like this happens again. This has included detailed compliance training, strengthened management oversight processes, an internal restructuring, and experienced hires being made to the trading desk.

“InterGen is proud to have been an important part of Britain’s power system for more than 20 years. We apologise again for these historic incidents and

look forward to continuing to help the UK keep the lights on and transition to a net zero economy.”



123MW of flex contracts – EVs included

UK Power Networks has awarded contracts for 123MW of flexible power worth £14m, with flexibility from electric vehicles making up part of the mix. The DNO said the procurement round, it’s biggest by far, includes a “world first” agreement for flexibility on a low voltage network.

The tender aimed to find flexibility solutions for 55 high voltage zones and 60 low voltage zones. It managed to contract with 16 providers for 42 of the high voltages zones and 15 of the low voltage areas.

UKPN said flexibility contracted will come from the usual sources – distributed generation and batteries – as well as domestic flexibility from virtual power plants aggregating heat pumps, household batteries and EVs.

Head of smart grid development, Sotiris Georgiopoulos, said the latest tender round shows the market is starting to mature. “Three years ago we set out our Flexibility Roadmap and hitting more than 100MW is an important milestone that shows the market is really gathering pace.

“It gives us the flexibility we need to enable more renewable energy and forms a crucial element of the journey towards Net Zero.”

Hydrogen lobby warns Sunak not to let UK get left behind

Big business has urged the Chancellor to back a UK-wide hydrogen strategy and unlock thousands of jobs and billions in investment.

In a letter to Rishi Sunak, the firms point out that Germany has already outlined a €9bn hydrogen plan, and the EU is putting together a strategy for investment across the bloc,

expected to be announced 8 July.

“It is now clear that hydrogen is going to play an essential role in the world’s future, low-carbon economy and the increasingly bold steps being taken by other nations underlines the need for the UK to bring forward urgent measures to establish a hydrogen strategy and unlock investment and

innovation,” per the letter. “We should not risk falling behind other nations in developing our hydrogen industry.”

Signatories include gas majors and gas networks, which need hydrogen to replace natural gas if they do not wish to see their assets stranded over the next couple of decades, as well as consultants, appliance

manufacturers and utilities. They say they “stand ready” to invest up to £1.5bn if government sets out the framework that will protect their investment.

The letter comes as the solar lobby calls on business secretary Alok Sharma to set a 2030 target of 40GW and provide more money in the contracts for difference support scheme.

National Grid's new measures to push power off the system offer a glimpse of the not-too-distant future: Without greater flexibility, balancing gets harder and more expensive, especially when demand is low

If we don't get 10GW of storage fast, EFR prices 'will look like peanuts'

To manage the demand drop caused by coronavirus, National Grid has launched a new footroom tool, which pays distributed generators to stop exporting power or businesses to consume more grid electricity.

The ESO has attracted more than 2.5GW of Optional Downward Footroom Management (ODFM) in remarkably quick time. Over the late May bank holiday weekend, much of it was instructed. According to Elexon data:

- Maximum 1006MW (capacity of 2,633MW) was instructed for delivery between 23:00 22/05/2020

- and 06:00 on 23/05/2020
- Maximum 1,920MW (capacity of 2633MW) was instructed for delivery between 06:00 23/05/2020 and 16:30 on 23/05/2020
- Maximum 855MW (capacity of 1610MW) was instructed for delivery between 23:00 23/05/2020 and 09:30 on 24/05/2020
- Maximum 1,048MW (capacity of 1,578MW) was instructed for delivery between 10:00 25/05/2020 and 16:30 on 25/05/2020.

But who's counting

The ESO is also paying EDF to halve output from Sizewell B over summer (see

box, right). But all of this comes at a cost, at a time when energy companies are already struggling with rising bad debt as customers, particularly businesses facing an uncertain future, stop paying their bills. Many are also left with significant hedging issues following the collapse in demand.

National Grid says its actions will save £213m in balancing costs (BSUoS) over the summer. But its forecast of BSUoS costs for the year has increased from less than £1.5bn in February to about £2bn in May. In May alone, costs doubled from about £60-70m to an expected £130m.

Between June and August these are predicted to be much higher, between £117m and £133m extra per month.

Nervous energy

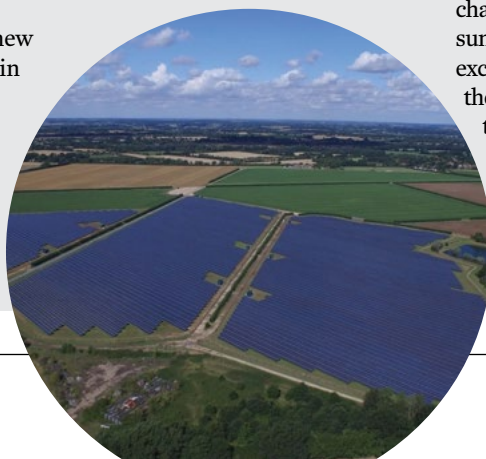
Energy firms are worried. SSE says the impact of extra balancing actions create "a high probability of BSUoS in individual periods effectively doubling the total cost of electricity".

It has tabled a motion to cap additional COVID-19 balancing costs at £500m and defer payment until 2021, spreading it out across the year. Suppliers and generators, it argues, could not have forecasted such an increase in costs ahead of time.

National Grid outlines new footroom service to

National Grid ESO went live with a new footroom service in May, paying people to use more power over the summer or to stop exporting it.

While high levels of embedded solar PV have posed



challenges for some years, this summer the ESO must manage exceptionally low demand on the transmission system due to the coronavirus lockdown.

The Optional Downward Flexibility Management (ODFM) service requires a minimum 1MW commitment (which

can be aggregated if from the same grid supply point) and the ability to deliver for three hours.

Providers cannot be separately registered as balancing mechanism (BM) units, or otherwise active in the BM and they cannot be participating in or contracted to any other balancing/flexibility



Meanwhile, firms are also lobbying for deferral of other bill items, such as network charges and levies, which risks creating an even bigger bill further down the line.

Flexible demeanour

The winners for now are flexible assets. Battery storage operators, for example, are rubbing their hands, suggesting the current situation foreshadows how the grid may look in five years' time, when National Grid has committed to run solely on zero carbon sources whenever it can.

Kiwi Power head trader Aaron Lally said the firm traded batteries across services including ODFM footroom over the weekend.

"If this trend continued for the whole year, we could see battery costs recovered in two to three years," he said, suggesting that the push to decarbonise the grid means "the business case for battery storage, driven by contracted markets, has never been more attractive".

Lally echoed suggestions by Gresham House Energy Storage fund investment director Ben Guest, who said that the UK will need 10GW of storage before 2025.

"We need 10GW," said Lally. "Any less, the market is imbalanced and existing asset owners will be making profits that will make the original EFR contracts look like peanuts." te

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We could see battery costs recovered in two to three years. The business case for battery storage, driven by contracted markets, has never been more attractive

tackle lockdown lows

or related service during periods when the service is offered, per the draft guidance document.

Neither can they be signed up to a DNO's active network management scheme or flexible connection.

However, aggregators and service providers will welcome

Grid's decision to treat ODFM as an 'applicable balancing service'. That means, unlike the original Demand Turn Up service launched in 2016, providers will not be exposed to imbalance price risk.

Aggregators suggest that makes it far more likely that people will participate.



PIC: John Fielding

National Grid pays EDF to turn down Sizewell B

National Grid ESO is paying EDF to reduce output from the Sizewell B nuclear power station in Suffolk over the summer to help keep the power system stable.

The system operator said it had agreed a "one-off, fixed-term" contract instead of making daily payments to the generator via the balancing mechanism. It said that approach is "more cost efficient and secure" and gives its control room greater options.

Despite the challenges posed by coronavirus lockdowns, the ESO said it has the tools and resource to cope.

"Great Britain relies on us to keep the lights on and I want to reassure everyone that we have robust plans in place to keep our system working throughout the coronavirus outbreak," said ESO head of national control and chief engineer, Roisin Quinn (pictured).

"Our control engineers have decades of experience balancing supply and demand in all conditions and scenarios, including reduced demand, and we do not anticipate any issues in continuing to reliably supply electricity."



ESO gets emergency powers to disconnect embedded generators

Ofgem granted an urgent modification from National Grid ESO in May to clarify its powers to instruct distribution network operators to disconnect generation connected to their networks if all other actions have been exhausted.

The ESO argued the code was too ambiguous and "would potentially leave DNOs in a position that they would feel exposed them to legal risk". Ofgem agreed and granted it temporarily, until 25 October. But it told the ESO to waste no more time in coming up with a "market-based enduring solution, eg opening up balancing service markets to a broader range of participants".



Businesses need to prepare for time-of-use tariff changes

Changes to time-of-use tariffs for electricity network charges will kick in from April 2021.

Chris Hurcombe, CEO of third party intermediary Catalyst Commercial Services, outlines what businesses need to know

Network charges make up around a fifth of the total power bill. Larger businesses tend to be settled on a half hourly basis, and have advanced metering to support that. Their network charges have generally been banded into red, amber and green periods – with red the most expensive and green the cheapest. These vary by region and distribution network operator (DNO).

Smaller businesses

have tended not to be settled on a half hourly basis, so historically have paid a flat rate throughout the day.

As the UK moves towards a smarter, more flexible power system, Ofgem wants everybody to ultimately be settled on a half hourly basis. This will enable more granular

price signals – eg time-of-use tariffs – and is one of the main reasons behind the smart meter rollout.

With more variable renewable power on the system – and greater demand on the networks from electric vehicles and electrification of heat – households and businesses will need to respond to system needs. These needs will change locally as well as nationally.

But at the moment, the energy industry argues that the disparity between half hourly settled and non-half hourly settled tariff structures makes

it difficult for suppliers to come up with tariff structures to enable that smarter system. There are 33 distribution tariffs under the current rules.

As such Ofgem and industry embarked on a rule change – or code modification DCP268 – four years ago. Next year, it starts to come into effect.

The incoming change

The rule change means non-half hourly metered businesses and households will now also be charged on a red, amber, green (RAG) basis. Meanwhile, all unmetered supplies will



Chris Hurcombe:
Prepare for incoming charging changes



be charged on a comparable 'black, yellow, green' basis.

It is important to note that for non-half hourly settled sites these charges will be based on aggregated consumption estimates – ie not on what you actually use.

The rule change also affects distribution-connected generation. Whereas generators have historically been paid different credits depending on whether they are intermittent (eg solar or wind) or non-intermittent (eg a CHP engine), they will instead receive the same unit rate credits on a RAG basis. The aim is also to pay all generators more reflectively.

All of which means the various tariffs applied by DNOs will reduce from 33 to 16. In theory, that should mean suppliers will soon come up with more innovative tariffs that reward consumers for helping the system.

The implications

For generators, the impact assessment suggests their credits will increase – from around 1% to a maximum of 18%, depending on where they are located (as DNO charges/credits vary by region).

However, for most power consumers, the impact assessment suggests a slight overall increase in chargers of up to 2.6%.

Suppliers and other market participants now need to change their billing systems to accommodate the changes. It will be interesting to see how they account for them, and whether any existing contracts need to be unlocked to accommodate the new charges.

Meanwhile, businesses with advanced or smart metering can opt to be settled on a half hourly basis. Should they wish to be billed only for what they use – and when – now might be the time to start thinking about it. **te**



When **energy** matters



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Before coronavirus (COVID-19) forced the mass lockdown of industries across Europe, the market for corporate power purchase agreements (CPPAs) was booming.

Demand for clean energy was soaring and renewable energy suppliers were in a strong position to negotiate terms with corporate buyers.

Now, following the imposition of drastic government measures to curb the spread of the virus, which has necessitated the temporary closure of offices, manufacturing plants and some transport systems, the negotiation process has slowed to a crawl at best.

Prices

While the hiatus in contract negotiations is partly due to logistical reasons, there is also a marked nervousness about CPPA pricing, following a steep decline in energy demand and the corresponding nosedive in electricity prices.

In wholesale energy markets, traditional demand patterns have also shifted as industry and members of the wider workforce change their working patterns.

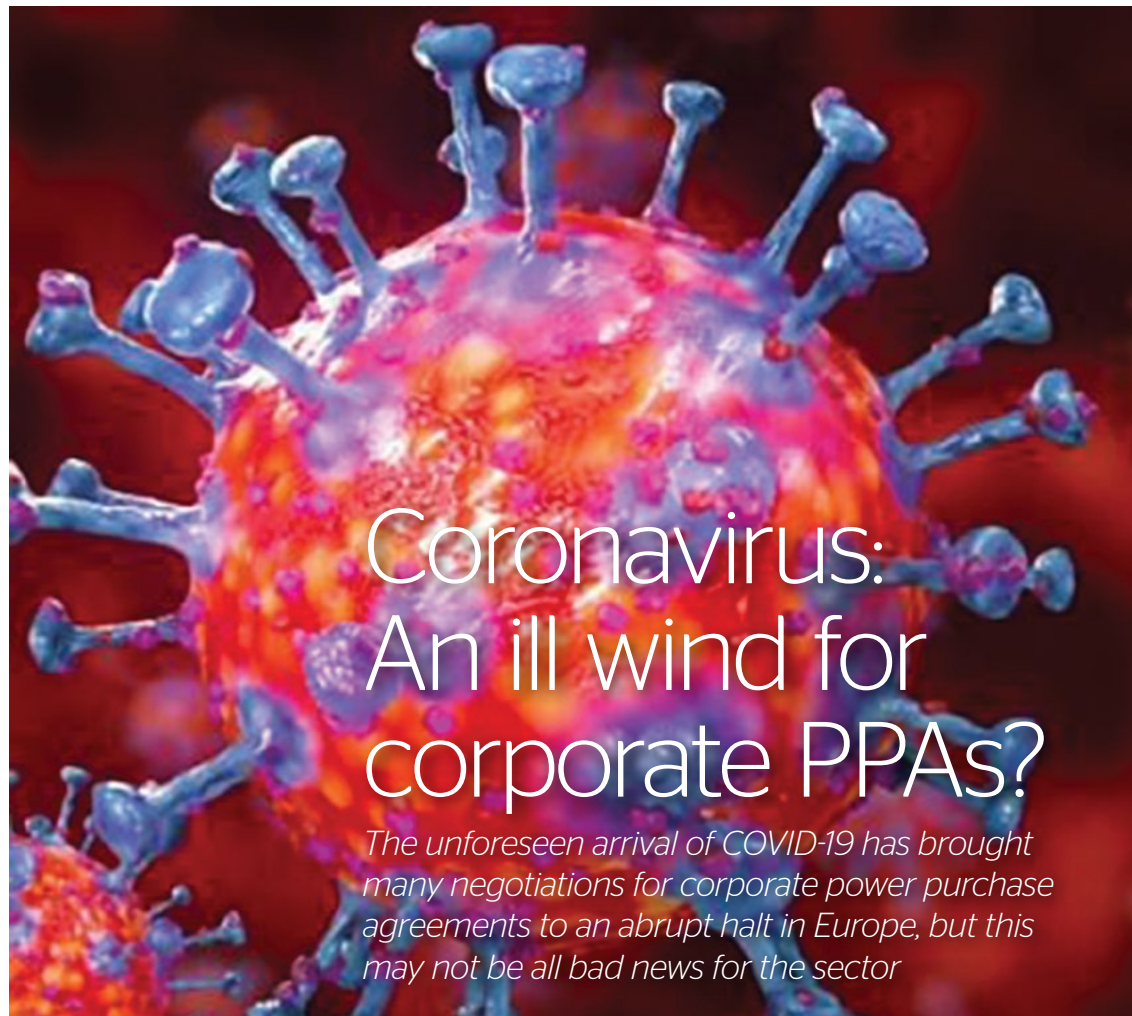
The consensus view is that this is just a temporary blip, and that normal patterns will resume once the pandemic abates and people return to normal working routines.

But energy pricing is notoriously difficult to predict, and it is unclear whether and how quickly prices will rebound to pre-pandemic levels.

Force majeure

Since the coronavirus crisis took hold in Europe in March, most lawyers have had more discussions about force majeure clauses than they have in the whole of the past 10 years.

Force majeure is not a standalone concept in English law, and contractual performance will only be



Coronavirus:
An ill wind for
corporate PPAs?

The unforeseen arrival of COVID-19 has brought many negotiations for corporate power purchase agreements to an abrupt halt in Europe, but this may not be all bad news for the sector

excused due to unexpected circumstances, if the relevant contract provides specifically for relief.

In UK contracts, there is generally a two-pronged test for invoking force majeure. The first part, whether or not there has been a force majeure event, is likely to be satisfied by the advent of coronavirus.

The more difficult issue as far as CPPAs are concerned is the second part, which is the need to prove that coronavirus has prevented performance of the affected party's obligations under the contract.

Further compounding the issue for offtakers is the fact

that most contracts, both under English and continental European laws, will expressly exclude an inability to pay or lack of funds from the definition of force majeure.

In a CPPA contract, generally speaking, the obligations are for the generator to produce electricity, and for the buyer, to take that electricity and pay for it. These obligations are not obviously affected by coronavirus.

That demand for the electricity has decreased, or that customers cannot pay for the electricity, are not directly related to these contractual obligations.

This has given rise to some complex negotiations between CPPA parties in the past few weeks, and more are likely to follow as the coronavirus situation persists.

In civil law jurisdictions, across most of Central and Western Europe, there is more leeway to discuss the implications of coronavirus on parties' ability to perform their contractual obligations in good faith.

However, there are still several questions on this matter pending resolution by lawyers and arbitrators, and it remains to be seen how this issue is dealt with in respect of CPPAs.

With the benefit of hindsight, the lesson from coronavirus is that parties should be as specific as possible in change of circumstances clauses, for CPPAs and in all other types of contract.

“*Energy pricing is notoriously difficult to predict, and it is unclear whether and how quickly prices will rebound to pre-pandemic levels*”



Since the start of the coronavirus pandemic, there has been much greater focus on specific ‘corona clauses’ and more detailed material adverse change (MAC) clauses, involving significant back and forth between parties on these points.

This is a broadly constructive development, if it yields contracts with provisions that mitigate damages in the short term and, in the medium term, provide mechanisms for restoring the economic balance originally envisaged at the start of the contract, without the need to resort to expensive litigation.

Opening up the market

Prior to the coronavirus lockdown, there was significant pressure on timelines for signing and delivering CPPAs.

Now that a lot of CPPA

projects have been put on hold, there is more flexibility for projects to be negotiated under different subsidy regimes, such as feed-in tariffs (FITs) and contracts for difference (CfDs), or their equivalent in other jurisdictions.

Similarly, auctions (many of which were oversubscribed) and tender deadlines have been frozen or pushed back, giving participants more time to consider their options.

Applying the brakes to the frenzied pace of Europe’s renewable energy market may have a beneficial impact on the CPPA sector in the long term, if it redresses some

of the sharper imbalances in bargaining power.

What next for the CPPA market?

The drop in energy prices and uncertainty about near-term industrial energy demand has brought a very sudden halt to many CPPA negotiations.

On the developer and financing side, there is reluctance to sign CPPAs while energy prices are at current levels, so most discussions have been postponed until there is a clearer view of when and to what extent industry will start up again.

On the corporate side, companies are unwilling to

commit to volumes until they know what they will require once economies begin to emerge from the shutdown.

However, the coronavirus pandemic has given the still largely immature CPPA market a chance to pause and reflect on its direction of travel, and what emerges may be a more sophisticated sector than it was pre-crisis.

What seems certain is that demand for low-cost renewable energy will survive the coronavirus outbreak, as corporate sourcing of renewable electricity is going to be an essential part of the transition to a low-carbon society. **te**



This article was authored by, from l-r: Daniel Marhewka, Lis Blunsdon and David Haverbeke, energy specialists at European law firm Fieldfisher. The comments reflect discussions held during a series of webinars around the launch of Fieldfisher’s thought leadership report, *Think GIG: The rise of corporate PPAs*.

In domestic contracts, there are no volume limits on what customers can consume, and given the regulatory protections in place for these customers it is hard to see this changing in the near term; so this article focuses on B2B contracts where there is potential for short-term changes. However, the policy questions raised are equally valid for domestic and B2B customers.

The problem with volume
Energy supply is unique in the way it is supplied to customers in that each customer has a direct connection to an inexhaustible grid connection; can take what they want when they want without telling their supplier; and generally pays a fixed price per unit from the supplier for doing so – despite the costs that the supplier pays varying in real time for amongst the most volatile commodity in the world.

Although a core part of a supplier's business is to manage this risk, and they are paid to do so as part of their pricing, in extreme events it is reasonable for suppliers to have recourse to customers. After all, it is the customer that is generally in control of how much it is using.

Contractual volume protection
Most suppliers have contractual protection in B2B supply contracts, providing for recourse to the customer in the event that their volume changes by more than a predetermined amount in an annual period (typically $\pm 15\%$).

The recourse is generally aimed at recouping only commodity price impacts, which as we will explore may be inadequate in today's market.

However, in recent years the fierce competitive pressure of the market has led to some brokers and customers requesting this clause to be widened or removed. A simple action at the time, it is likely to be causing headaches across the market at the moment



The small print: how the current shutdown could impact contract terms

How much time do you spend reading the small print of your supply contract? It is likely that the odds are not very much, but in times like this the terms in a contract become critical to determine who is exposed to what risks. In this article, Cielo Energy examines volume risks, how the shift in consumption patterns may impact future contract terms, and what it tells us about the state of the market

and exposes risks at the heart of the energy industry.

From a portfolio risk management perspective, volume tolerance is an easy negotiation give away; after all, in a large portfolio an individual customer generally

makes little difference to overall portfolio demand; and risk diversification would generally result in some using more while others used less. Would any risk analyst have looked at modelling the shock event of what would

happen if all customers stopped consuming at the same time? While it would be an interesting intellectual exercise, the probability would have been so low as to be ignored, and charging customers for the risk would



likely lead to no sales.

Contractual enforcement of volume tolerance terms is also complex, particularly without explicit detailed drafting, and many contracts do not have much depth to how any calculation will be made.

How suppliers would recover costs in the event of a claim in the absence of such clarity would be fraught with legal challenge.

Overall, despite having the right to enforce volume tolerance, the ability to actually recover losses is potentially complicated – so many commercial teams offered removal of volume limits as a way of securing sales.

Volume tolerance and reforecasting

In order to protect themselves, suppliers introduced protections giving customers the right to reforecast volumes, a way of managing their

exposure to volume tolerance limits. The advantage of this to suppliers is the ability to be forewarned about volume changes for customers. For customers it avoids being exposed to volume tolerance, although for suppliers it does nothing to manage the exposure to price volatility that is associated with volume risks.

The impact of volume on profitability...

a) price volatility

In a world where commodity prices are flat, any change in customer volume compared to expectations carries no exposure to the commodity price itself. From a supplier perspective more volume would mean more margin, less volume would mean less margin.

However, in the real world where commodity prices are incredibly volatile, suppliers are exposed to not only margin impacts but also

cost base impacts. In the current downturn, wholesale commodity prices have fallen dramatically in response to global oversupply. This leaves suppliers with a large financial loss on volume that customers would have been expected to consume but are not.

As an example, imagine a customer who took out a one-year contract starting in October 2019 for electricity supply. During September 2019 when the contract was agreed one-year baseload electricity was valued at approximately £50/MWh; current day ahead electricity is trading at about £25/MWh. This represents a loss of £25/MWh on each MWh not being consumed by an end user.

Where next - volume and risk protection

Recent history has seen suppliers taking more risks from both end users and other parts of the energy value chain for no increase in reward. It would be reasonable to expect at least the terms on which suppliers are willing to contract to be reviewed following the current shutdown. Suppliers do not control the obligations to which they are subjected, but they can set the terms on which they contract with customers and what gets passed on.

Making contractual terms more solid, and including non-commodity costs within them would seem to be sensible from suppliers, and provide a more sustainable model. Risk

“ *A simple action at the time, it is likely to be causing headaches across the market at the moment and exposes risks at the heart of the energy industry* ”

b) non-commodity costs

Suppliers recover many costs on behalf of other industry parties, and in support of government schemes associated with low carbon generation and related policy.

While many of these costs are recovered on a volumetric basis, they are in effect financing fixed capital costs, so underlying the calculation is an expected national demand level to smear costs across.

In the event of a demand shock of the kind currently being seen, mechanisms exist to push the full cost on to suppliers in future periods. Suppliers face being forced to take costs to support companies to which they are obligated to pay, irrespective of whether the end customer has paid them or not. Having been exposed to various cost mutualisation events in the past two years, it looks certain that more are coming.

committees are more likely to focus on contract terms in future, as suppliers protect themselves from the in-direct risks to which they are exposed.

In the wider policy context, the mantra of the past decade of passing complex risks to suppliers to manage on behalf of the whole industry, while at the same time not allowing them to make reasonable returns, has been well and truly stretched over the past couple of years.

Both suppliers, customers and regulators would be well advised to read the small print, and make sure risk allocation makes sense both now and for the long term as we move towards net zero and all the opportunities (and risks) that will create. **te**

Cielo Energy is a UK-based energy advisory business, offering advice and support to consumers, suppliers and generators. Contact info@cieloenergy.co.uk

To date, UK electric car drivers have tended to be early adopter private owners.

Last year, battery electric vehicles and hybrids made up 3.1% of new registrations, according to figures from the Society of Motor Manufacturers and Traders.

But changes to benefit in kind (BIK) rates effectively give company car drivers a free car.

That has blown concerns around range anxiety out of the water, according to Arval consultant David Watts. As a result, the leasing company saw EVs nudge 10% of total orders for the first two months of 2020.

However, that figure includes Arval's retail operation, where BIK has no bearing. Within its business leasing operation, the firm is seeing "significantly higher" growth rates, says Watts, with EVs making up 14% of its corporate business overall for January and February. "In one channel it is 20%," he adds.

Watts puts the surge squarely down to BIK changes, which mean company car drivers pay 0% this tax year, only 1% for 2021/22 and 2% for 2022/23.

"It is amazing how people can make things work when it is free," he said. "Overnight, those barriers around range and models have disappeared."

As a result, Watts believes electric vehicles will "become the norm" for company car drivers over the next few years.

"Unless you have an horrific experience, you are not going back [to petrol or diesel]."

More models

As well as tax breaks, Watts says the ramp up from manufacturers is driving demand – with lead times less of an issue than some might believe.

Perceptions of lengthy waits were exacerbated when Hyundai launched its Kona and Kia its e-Niro. With limited numbers and high demand, both were effectively back off the market almost immediately.

That episode "tarnished EVs

Business sector will drive growth

UK electric vehicles are on the cusp of a boom, with new benefit-in-kind company car tax rules fuelling unprecedented demand



as a whole", suggests Watts. Most other models, he suggests, are close to conventional lead times of about 8-12 weeks. "Anything up to six months people are OK with," says Watts, "it is only when it gets longer that it becomes a problem."

Watts says as more EVs come to market, "you spread the pressure" on individual models, "so that position is only ever going to improve".

Pricing

Manufacturers say they are not making any money from EVs – but that is due to high investment

“

It is amazing how people can make things work when it is free. Overnight, those barriers around range and models have disappeared
David Watts, Arval



and lack of scale. Watts points to Volkswagen, which last year started production of its ID.3 and next year aims to produce 330,000 EVs from its Zwickau plant in Germany.

"That's the same ball park as the diesel models it was producing. Once you have that volume, the economies of scale start to kick in, and battery prices continue to fall," says Watts, "so they ought to be making money."

That means prices should improve. But for

company car drivers, Watts believes "as long as companies are operating on a whole life, total cost of ownership basis, the cars will always fit within a grade somewhere".

For the next couple of years, as OEMs ramp up and model range remains relatively limited, he thinks drivers "will be willing to compromise in order to access the technology due to extremely cheap tax".

Keep it simple

Watts believes there is a tendency to overthink

incorporating EVs into company car policy, and dealing with reconciliation.

"My standard message is keep it simple. It is just a car that you fuel slightly differently. People think you have to put a raft of new policy in place, but I don't think that is the case," says Watts.

"As long as the vehicle is in the right place in terms of grade structures and choice, there isn't much else you have to do, other than mileage reimbursement at the government rate, 4p/mile, claimed through expenses."

He says policies should just make clear to employees that if they are choosing an electric vehicle, they must accept and adjust to the differences that will entail.

"I don't think that there should be any rule bar one: It is your choice, so you have to make it work. Drivers will need to behave differently, but as long as they are making an informed decision, they will be fine," says Watts.

"You don't need to profile them, or check if they have off-street parking. That is just another can of worms. Keep it simple. It is all about the education." **te**



Net zero post-pandemic – keeping sustainability on track

During recent times, the focus for the business community has, quite rightly, been on operational resiliency. However, as businesses start to get back to work, many believe that the economic recovery should go hand-in-hand with a focus on sustainability, with any taxpayer support only going to companies that are committed to decarbonisation. With an increased focus to ensure sustainability is at the heart of the recovery, what technologies are available to help UK business’ decarbonise?



By Matthew Dowdeswell, Innovation Manager at Inspired Energy

‘Net zero’ has become a common part of language in the energy and sustainability world since the UK government legislated to hit net zero carbon emissions by 2050 almost a year ago. However, since then, many businesses have had to put sustainability plans and investments on hold as they attempt to assess the impact COVID-19 will have on their short, medium and long term plans.

That said, our own insight shows that, despite the upheaval caused by the coronavirus crisis, sustainability and net zero remains a priority for many organisations. As we emerge into a ‘new normal’ way of working, the opportunity to increase business resilience through implementing an effective net zero strategy has come to the fore.

So, what steps can organisations take to ensure sustainability stays on track post-pandemic? The good news is that there are many practical and reliable ways to reduce energy consumption:

1. Measurement and monitoring Meters can measure almost every utility, so it makes sense for a business to use the available meters and assess the data for any gaps. Where gaps do exist,

installing sub-meters or data loggers will enable a company to get a complete view of energy consumption across the business. However, data is only as good as the analysis behind it. Online dashboards are available to help gather and present data in an accessible way, and having an expert view to analyse it means a business can turn the data into meaningful actions.

2. Consumption & Reduction There are two areas to look at here – buildings and plant and equipment. There are various ways a building’s envelope, ie the roof, ceiling, flooring, walls and glazing, can be made more energy efficient, including better insulation or using sustainable glass solutions. There are now many options to choose from, and each organisation will have different requirements, so an expert analysis can help identify the best solutions for your business.

With plant and equipment – the lighting, heating and cooling, building controls (BMS) and process and industrial plant equipment – again, a full audit will be able to determine the best options for the business in question.

3. Renewable utilities Much has been said about the opportunities for renewables, and – where capex or funding allows – installing onsite generation can make sound business sense. This can be both in terms of using clean energy, and allowing a business to be more self reliant. Again, the right technology – solar PV, wind, EVs – should be assessed on a case by case basis.

In short, the road to net zero should be starting now, and adopting a more sustainable approach to business can help build greater resiliency in the longer term.

For support with your net zero strategy, please email hello@inspiredenergy.co.uk or call 01772 689 250.

Managed charging key to widespread adoption

Western Power Distribution preparing for 16-fold increase in EV chargers on its network by 2023

Distribution network operator WPD says flexibility and managed charging will be key to ensure its power infrastructure can handle widespread adoption of electric vehicles.

“With EV adoption increasing at the current rate, it is expected some 217,000 chargers will be connected to the network by 2023,” states WPD’s updated EV strategy.

At the end of March 2020 there were about 13,760 EV chargers installed on the network, per the report, suggesting a 1,500% increase over the next three years. WPD cites changes to company car tax rates (Benefit in Kind), plus a significant ramp up from carmakers as driving factors.

Charge every five days

The document reiterates that WPD’s transformers will only be able to accommodate one 35kWh for cars and vans every five days for each of the customers connected to it.

WPD says that should be sufficient for most users, if charging is managed appropriately – and the document outlines a number of approaches.

These include timed connections, smart charging and potentially vehicle to grid initiatives. WPD said it has

something the whole industry must consider, said WPD.

It also expressed support for broader incentives for customers that can provide ‘whole system flexibility’.

“As vehicle to grid solutions and smart charging develop, WPD will have the opportunity to make use of these flexible

“*A customer who makes use of local generation, storage and EV charging could actually reduce their impact on the network and help avoid conventional reinforcement*”

adapted its Flexible Power platform, which it is using to procure flexibility to manage network constraints, to enable domestic EV aggregation.

However, commercial flexibility through larger clusters of EV chargers may provide more immediately scalable solutions. The flexibility that will be available at Park & Ride sites or long stay car park locations is

solutions on the network. In fact, a customer who makes use of local generation, storage and EV charging could actually reduce their impact on the network and help avoid conventional reinforcement,” states the report.

However, where it has to upgrade the network to manage clusters of EVs that overload the network, WPD said it developed technology

to “throttle back the load” in response to local overloads.

That tool is now available to all of its teams, said WPD, but stated it will only be used while the networks are being upgraded – not on an ongoing basis.

Fleets, commercial flex and timed connections

WPD’s document outlines the cost and timescales to connect different types of charger

The report also outlines WPDs plans to enable businesses to install numbers of EV chargers without having to pay for conventional reinforcement.

As well as the potential for depots and long stay car parks to participate in flexibility programmes within constraint zones, WPD also plans to offer timed connections.

For example, a depot that only charges vehicles at night might be able to avoid paying for reinforcement by using capacity that is already present for daytime industrial use.

WPD said that approach then can lead to a fuller active network management solution, where customers react dynamically to network signals to restrict charging at peak times.

To signpost where it may need flexibility, the DNO has developed a heat map of capacity at each of its local transformers. However, WPD said traditional reinforcement will also be required. **te**

Tesla applies for UK power generation licence

The Hornsdale Power Reserve has showcased Tesla Powerpack storage technology in South Australia

Tesla Motors has applied for a UK power generation licence.

The company’s application, signed off by Tesla energy products sales director Evan Rice, was published by energy regulator Ofgem.

The move suggests Tesla may be planning to build large-scale battery storage projects in the UK, as it has done in countries such as Australia, where it constructed a

100MW scheme in less than 100 days in late 2016.

However, it may mark Tesla’s first UK move into aggregation, as it eyes the virtual power plant (VPP) market.

The company’s ‘autobidder’ platform aims to make money from distributed batteries via real time trading and optimisation.

As well as its electric car business, Tesla also supplies battery storage for homes and

businesses, plus solar roof tiles. The autobidder platform aims to harness everything from behind-the-meter home batteries to utility scale assets, bidding in flexibility to all available markets.

Some car manufacturers such as Nissan, BMW, Honda and VW are also looking at building virtual power plants via their car batteries, or creating standalone energy businesses. **te**

Government to co-fund 350kW chargers

England's electric vehicle charging infrastructure set for significant investment as Department for Transport confirms part-funding of grid connections for new high-powered chargers



The government's Rapid Charging Fund aims to have at least six high powered chargers serving each of England's motorway service stations by 2023.

According to current growth rates, those chargers will be needed: Western Power Distribution is anticipating a 16-fold increase in EVs on its networks within the next three years.

By 2035, the DfT claims the scheme will part-finance installation of as many as 6,000 rapid and ultra-rapid power points – between 150kW and 350kW – beside motorways and major UK roads.

Foreshadowed in the March Budget as part of Rishi Sunak's £500m investment in e-mobility infrastructure, the fund will focus on hard-to-connect sites, or where grid capacity is constrained.

To qualify, new public points must charge all EV brands, operate across providers' different billing platforms, and deliver at

least 99% uptime, backed by 24/7 technical support.

EV chargepoint operators will welcome the announcement as network upgrades required for high powered chargers can be expensive.

Western Power Distribution, charges up to £120,000 to connect a 130kW 'super'

charger, or multiple 43kW rapid chargers. Installing 350kW chargers, as DfT intends to part finance, will cost significantly more (see Figure 1).

Dispelling range anxiety
Management of Britain's strategic roads is devolved to national governments. As

Chargepoint type and power output	Likely installation location	Approx connection lead time	Network considerations	Approx connection cost
Slow - up to 3kW	Domestic	Intermediate	None	None
Fast - 3.7kW	Domestic or street side	Intermediate in most cases	Usually none	Usually none
Fast - 7kW	Domestic or street side	Usually none	Likely upgrade to service cable and local mains	£1,000 to £3,000
Fast - 22kW	Street side or public charging location	8-12 weeks	Streetworks and permissions	£3,500 to £12,000
Rapid - 43kW	Public charging location	8-12 weeks	Streetworks and permissions	£3,500 to £12,000
Super - 130kW or multiple rapid chargers	Public charging location	16 weeks	Streetworks, permissions and cost of land for transformer	£70,000 to £120,000

Figure 1: WPD charger connection costs. Source: WPD EV strategy

Standardisation is a priority

The UK's EV charging network is currently highly fragmented, lacking standardisation and interoperability. Addressing that challenge is a key priority highlighted by the Office for Low Emissions Vehicles-appointed EV Taskforce.

While the taskforce has urged cross-market data sharing and interoperability by 2025, some operators are actively working on commercial partnerships to enable better cross network roaming.

In May, power retailer Octopus Energy launched Electric Juice, offering EV owners a single bill, presenting charges from multiple charging providers.

Meanwhile, Engenie offers pay-as-you-go functionality across its rapid charging network – and is also negotiating further commercial arrangements with energy suppliers and charging network operators.

of January 2020, England's highways were already served by 809 open-access rapid or ultra-rapid powered chargers, excluding Tesla Superchargers.

The DfT calculates that no EV owner is more than 25 miles from an open-access charge point.

The DfT has not disclosed sums for the new fund, but made clear developers and site operators will be expected to meet at least part of installation costs. Its Charging Infrastructure Investment Fund, announced in 2017, has recently raised a further £80m from private backers, with fund manager Zouk Capital suggesting it is on track to hit £400m.

Now all the UK needs is cars that can take high powered charging. **te**

Arrival's game changer

Technology company looks beyond electric vans to transport as a service and hydrogen lorries

UK technology company Arrival is planning to do way more than just make electric vans.

It is looking at “the whole vehicle ecosystem”, according to chief of commercial vehicles Glenn Saint. This will include charging infrastructure and potentially depots.

Arrival, which last year secured €100m investment from Hyundai and Kia, is thinking big. It is also getting big. Across the group it now employs approximately 1,000 people, more than half of whom are software engineers.

However, it must now transition from an R&D technology company to a production company to deliver its first vehicle, a four-tonne modular van. Customer and investor UPS is expecting 10,000 units by 2024.

“The initial vehicles will be going to UPS early next year,” says Saint, with Arrival building production facilities in the UK at Bicester and in the US, while “looking at other facilities globally”.

These will not be typical vehicle manufacturing plants. Instead of centralised production facilities producing units to ship globally, Arrival plans to build “microfactories” close to demand around the world.

“Each of them is about 10,000 square feet, a standard warehouse building. We can put our assembly facility inside those units and be up and running in three to six months,” says Saint.

“And each facility can produce up to 10,000 vans a year. So we are very scalable and can add these factories as market demand increases.”

“

Components can be easily scaled up, so over the next few years there will be more and more vehicles to market based on our modular architecture
Glenn Saint, Arrival

Larger trucks coming

While the first vehicles will be four tonners, the modular design system, or “Lego-based tech” in layman’s terms, means Arrival can quickly build larger vehicles.

Saint claims it plans to develop vehicles “up to 26 tonnes over the next four years” based on modules of its launch vehicle.

“Components can be easily scaled up, so over the next few years there will be more and more vehicles to market based on our modular architecture,” says Saint.

However, he adds that the biggest trucks will likely require different power sources.

“Battery electric vehicles will not fit the entire market. We don’t see battery operated articulated lorries as the way to go. We can’t change physics; even with fantastic improvements in

battery technology, we still have to deliver that power into a vehicle in a reasonable amount of time.

So we are looking at alternatives,” says Saint, “one of which may very well be hydrogen.”

Transport as a service

As well as starting vehicle design and production from scratch, Arrival aims to reinvent the wheel when it comes to business models.

“Of course, we can just

sell you a vehicle and get on with it. But we are also looking at other models,” says Saint. This could conceivably include infrastructure, even depots, he suggests.

Meanwhile, he says all Arrival vehicles will be “autonomous ready”. While the government is unlikely to sanction autonomous vehicles on UK roads in the near future, Saint says they can be used in private, controlled environments today – such as depots.

But for now, he says there is increasing demand for its core proposition: an electric commercial vehicle that costs no more than a diesel.

“That has been the goal since day one. Operating costs are lower, emissions are lower, there are no breathable emissions at point of use – and if the price is no more than a combustion engine, then there is a commercial benefit from having an EV,” says Saint.

“That is the game changer. To date, EVs have been more expensive. If you remove that barrier, the market will explode.” **te**



Reinventing the wheel:
Price parity equals
explosive growth

EV sales hold up as car market crashes

Sales of electric vehicles held up in April despite a coronavirus-induced market-wide collapse, according to latest industry data

A total of 1,374 battery electric vehicles were registered in April, down 9.7% year on year.

However, sales of petrol and diesel models plunged by 98% as dealers shuttered showrooms.

The Society of Motor Manufacturers and Traders (SMMT) said other European markets faced similar historic lows, with France down 88% and Italy 97.5%.



The market's worst performance in living memory is hardly surprising

Across all categories, SMMT forecasts 2020 UK registrations to fall 27% compared with 2019.

However, it forecasts electric vehicle sales will increase by 100% year on year to more than 77,000 units, despite the havoc wreaked by the coronavirus pandemic.

Changes to company car tax allowances will likely drive that growth, as employees can effectively get a free car. New Benefit in Kind rates mean company car drivers pay 0% this tax year, only 1% for 2021-22 and 2% for 2022-23.

However, the wider industry is now under acute stress.

"With the UK's showrooms closed for the whole of April, the market's worst performance in living memory is hardly surprising," said SMMT chief executive Mike Hawes.

"These figures, however,

	2020	2019	% change	Market share -20	Market share -19
Diesel	1,079	45,239	-97.6%	25%	28.1%
Petrol	1,553	101,153	-98.5%	35.9%	62.8%
BEV	1,374	1,522	-9.7%	31.8%	0.9%
PHEV	95	1,922	-95.1%	2.2%	1.2%
HEV	48	6,752	-99.3%	1.1%	4.2%
MHEV diesel	75	1,435	-94.8%	1.7%	0.9%
MHEV petrol	97	3,041	-96.8%	2.2%	1.9%
Total	4,321	161,064	-97.3%		

Figure 1: Vehicle sales in April. Source: SMMT

2020		Year-to-date	
1 Tesla Model 3	658	1 Ford Fiesta	15,952
2 Jaguar I-Pace	367	2 Volkswagen Golf	14,627
3 Vauxhall Corsa	264	3 Ford Focus	14,092
4 Vauxhall Crossland X	143	4 Vauxhall Corsa	12,328
5 Ford Torneo Custom	108	5 Nissan Qashqai	11,857
6 Peugeot Rifter	94	6 Mercedes-Benz A-Class	10,285
7 Seat León	80	7 MINI	8,617
8 Mercedes-Benz A-Class	72	8 Kia Sportage	8,429
9 Nissan Leaf	72	9 BMW 3 Series	7,900
10 Peugeot 308	67	10 Volkswagen Polo	7,355

Figure 2: Best selling vehicles. Source: SMMT

still make for exceptionally grim reading, not least for the hundreds of thousands of people whose livelihoods depend on the sector. A strong

new car market supports a healthy economy and as Britain starts to plan for recovery, we need car retail to be in the vanguard." **te**

Lotus and Centrica sign smart grid tech deal

Niche carmaker Lotus has inked a deal with Centrica in a bid to develop electric vehicle and smart energy technology, including using vehicles to balance the grid.

The announcement comes as the Norwich-based manufacturer preps its first EV, the Evija (pictured), set to launch later this year.

Owned by Malaysia's Proton Group, Lotus Cars sells the bulk of its production outside the UK. Data site Statista, suggests UK sales in 2019 were fewer than 250 units.

According to Centrica, the two will work on:

- a dedicated EV strategy for Lotus;
- charging infrastructure for the carmaker's customers and global distribution network;
- creating a smart 'digital mobility' platform.

As part of the agreement, Centrica is also tasked with helping the manufacturer decarbonise its worldwide operations.

It looks like vehicle-to-grid is part of the plan. Per the press release, the aim is to make "the car an extension of the home, capable of storing electricity, minimising emissions and generating new

income by providing services to the energy market".

"We see a future where the customer, car and home are connected, enabling new services beyond charging the car, and new products and experiences replacing the unremarkable standard relationship with energy and the ownership of a car today," suggested Centrica Innovations' Carl Bayliss. Centrica is backing smart technologies and services to revive its fortunes.

As energy and transport converge, volume carmakers without

development links to at least one energy company are starting to become the exception, not the rule.

BMW plans to pilot V2G with network operator Tennet next year, and Volkswagen seeks to control 350GWh of battery storage by 2025. It has also launched its own energy company. EDF has struck deals with PSA Group and Nissan, while Honda has launched its own energy management arm. **te**





Wehner led the development and rollout of self-serve kiosks at McDonald's

Electrons to go...

EV charging firm hires McDonald's global product director as it looks to make electric vehicle charging a frictionless exercise

Electric vehicle charging network Engenie has hired former McDonald's global product director James Wehner as chief technology officer.

The company aims to tap Wehner's customer experience expertise to make electric vehicle charging a frictionless exercise.

While swapping fast food for rapid charging is not an obvious career move, Wehner thinks electric vehicles are approaching a tipping point – and that effort to solve charging challenges sooner rather than later will pay dividend.

At McDonald's, Wehner led the development and rollout of self-serve kiosks, which quickly became a \$3bn channel for the company, delivering higher value sales per order while reducing queues and making things more efficient on both sides of the counter.

"McDonald's was a fantastic opportunity. The work we did was on huge scales – incredible numbers," said

Wehner. "But there reaches a point in every job where you have achieved what you set out to do, which was deliver a significantly better experience for customers in restaurants."

Mulling a new role – and purchasing his first electric car – Wehner was open to Engenie's approach.

"Engenie wants to become a leader in its field by putting the driver at the forefront of what it does, literally driving the customer experience. I've spent the last 10 years focusing on that side of things. So it was an opportunity I couldn't walk away from."

Special sauce

Wehner says progress is built upon solving "simple challenges" for drivers one step at a time. "If you don't have off street parking, charging is pretty inconsistent. There are lots of glaring issues – people are putting them on social media the whole time. Engenie has resolved a lot of

the issues – it has pay as you go functionality at the chargepoint already. But there are a lot of other opportunities to reduce friction points and make the overall experience better."

Success is a world where interoperability issues are a thing of the past, "where everything just works", according to Wehner.

To enable that world, commercial partnerships will

“

Engenie wants to become a leader in its field by putting the driver at the forefront of what it does, literally driving the customer experience
James Wehner



Placing an order?

While Engenie is working on further relationships with food and leisure operators, Wehner says he couldn't

comment on McDonald's UK EV rollout strategy.

"They have started mass deployments in a couple of European markets, and I know it is on the roadmap. But it is not a global initiative – it's driven by local appetite to do so," he says.

"But obviously if they want us to help we are happy to do so." **te**

be key. Engenie is "working with competitor networks to allow our customers or drivers to charge on their networks and vice versa as seamlessly as possible. We are talking to car manufacturers about integrating with in car navigation and talking with others around map integration," added Wehner.

The company is also working on commercial agreements with suppliers so that people's EV charge can be added to their domestic energy bill.

Happy meals

Once transactional and interoperability issues are solved, networks and their partners can start competing more fully on service and personalisation via system intelligence, Wehner believes.

Providing smart route optimisation and offering incentives to drivers (charge and enjoy a special offer lunch at this pub, or earn a reward for using this chargepoint at the start of your shift instead of the end) will also assist with optimising demand across its network, ensuring better returns for investors and a quicker path to profitability.

Gridserve secures funding for solar and charging network

Multimillion-pound loan facility will enable firm to develop its proposed network of charging stations, battery storage and solar farms

Gridserve has agreed a multimillion-pound loan facility with Hitachi Capital that will enable it to start developing hybrid solar farms in Gloucestershire and Lincolnshire, and its first 'electric forecourt' near Braintree in Essex.

The forecourts, akin to motorway service stations, will house 24 EV chargers enabled to charge at up to 350kW so that future EV models can quickly charge.

The company has plans to develop about 100 sites. As well as the Braintree site, CEO Toddington Harper currently has three other active forecourt companies, according to Companies House – Minehead, Stevenage and Uckfield.

Harper helped set up and lead the UK arm of solar and storage firm Belectric until it was sold to RWE in late 2016.

Last year Gridserve completed a major co-location project for Warrington Borough Council. The 34.7MW solar and 27MW storage farm at York was constructed in five months. It is also developing a 25.7MW solar farm at Hull for the council.

The company will need a significant amount of capital to build its proposed charging network. Pointing to EDF's acquisition of Pivot Power, which aims to build a network of 50MW batteries to power EV charging stations, Harper has suggested that further consolidation is "inevitable" to fund the UK's net zero ambitions.

As well as a loan facility, Hitachi Capital – a major vehicle leasing and fleet management firm – will work with Gridserve to bundle EVs with charging at its forecourt network included, plus electric bus charging projects. **te**

Pod Point picks up shortfall on workplace charging grants

EDF-owned charging provider Pod Point is offering temporarily to make up subsidy cuts for workplace electric vehicle charging stations.

In March, OLEV trimmed grants under the Workplace Charging Scheme by up to £150.

PodPoint said it will make up the shortfall until July, offering up to £200 per socket for bulk workplace and fleet orders. Combining the deal with WCS money, purchasers can hypothetically reduce unit costs by a maximum of £550 per socket, according to the firm.

"We're topping the grant back up ... to make it easier for businesses to transition to EVs," said CEO Erik Fairbairn.

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Frequency response prices rise as STOR procurement is suspended

Rising prices for firm frequency response at the tail end of 2019 brought more providers back into play, according to National Grid ESO. Meanwhile Triad avoidance reached a multiyear high – with batteries driving the shift – and STOR procurement is suspended while the system operator works out how to bring procurement in line with new EU requirements

The Power Responsive annual report provides a detailed breakdown of services procured during the year, plus a view of incoming developments. Overall, it provides a positive outlook, though flags that changes to embedded benefits will hit some flexibility providers, and that Ofgem’s decision to allow DNOs to provide some services could damage competition.

Triad: Batteries drive big shift

Last winter saw businesses shift up to 2.4GW of demand during evening peak periods in a bid to cut transmission charges, known as Triad avoidance.

The largest loadshift for at least a decade, the ESO puts it down to the growing number of batteries deployed at large end user sites. Per the report: “Last winter, for the first time, we saw frequency deviations in the settlement period before expected Triad avoidance activity. National Grid ESO believes this is as a result of batteries switching.”

STOR

The report shows Short Term Operating Reserve (STOR) utilisation significantly decreased in 2019. However, of what was used, demand-side flexibility (DSF) provided a higher proportion than normal, as DSF tends to accept lower utilisation prices than traditional providers, such as larger power generators.

Meanwhile, they are also more willing to forego availability fees and tender into the flexible STOR market

TA season	No. of occurrences	Max TA (GW)
2009/10	15	1
2010/11	14	1.2
2011/12	17	1
2012/13	14	1.2
2013/14	22	1.8
2014/15	24	1.2
2015/16	36	2
2016/17	48	2
2017/18	33	2
2018/19	30	2.4

Figure 1: Loadshift during peak evening periods.

Source: National Grid ESO/Power Responsive

– where they can decide not to deliver without penalty if a better opportunity comes up.

MCPD – no impact on diesel

The Medium Combustion Plant Directive (MCPD) was expected to have a significant impact on the number of diesel generators providing STOR services. The Directive stipulates generators that take on balancing services contracts have to meet strict emissions limits, which unabated diesels cannot do.

However, the ESO said it had “only seen only a small decrease in the proportion of diesel generators being tendered in”, with around 598MW of diesel generators still providing services in 2019, versus 616MW in 2019.

For now, STOR is suspended, as the EU’s clean energy package requires the ESO to make procurement changes. Under the package, contracts must be procured no more than a day ahead – and can be for no longer than a day.

Rising prices at the back end of 2019 brought more traditional providers back to the dynamic frequency response markets. Meanwhile, the ESO had a higher requirement – 1,719MW versus 1,400MW after bringing some of the mandatory market into the FFR envelope.

While prices for dynamic FFR averaged £4.76/MW/h for the majority of 2019, the higher volume requirement later in the year saw average accepted prices rise to £11.50/MW/h.

That bought the large traditional assets back into play, but the report states that DSF providers still won the lion’s share, achieving three times the capacity of traditional units in the dynamic service.

National Grid is now trialling a weekly frequency response auction. The ESO said it provides a view of relatively stable prices across different day parts. A year’s worth of results should give investors some confidence around pricing, it stated.

Longer term, FFR services will migrate to that auction platform. Meanwhile, a new Dynamic Containment product will also reduce FFR volumes. The auction ultimately aims to move to day ahead auctions – but as yet, there is no firm timetable.

New services ahead

The Power Responsive report outlined a number of tender opportunities for the year ahead. These include stability, voltage and constraint pathfinder projects. Meanwhile, the ESO will start to procure Dynamic Containment, designed to quickly bring frequency back within its permitted parameters, “before summer”.

Dynamic Moderation, designed to manage sudden imbalances in supply and demand, and Dynamic Regulation, designed to correct small, continuous frequency deviations, are set to follow.

Wider access to the Balancing Mechanism and Terre, the trans-European replacement reserve service, will likely “significantly change requirements for reserve services”, according to the document. Terre is still scheduled to go live in June. **te**





DSR can bid for 15-year capacity market agreements

Demand-side response will be able to bid for 15-year capacity market agreements under changes to government's flagship policy intended to keep the lights on over winter and incentivise new build power stations

The government has agreed to make changes to the Capacity Market after the European Commission was forced to undertake a formal investigation of the policy following a successful legal challenge by Tempus Energy that led to the market being suspended.

Tempus, a demand-side response company, launched the challenge because founder Sara Bell argued it was anticompetitive to allow some technologies to bid for multi-year agreements but DSR to only bid for one-year contracts.

The old Department of Energy & Climate Change, however, dismissed Bell's arguments, with then energy minister Matt Hancock telling

MPs in 2015 that DECC was "very confident" of winning the case and that the "[European] Commission is very confident that it is lawful".

It wasn't and the market was suspended, leaving those with a billion pounds worth of contracts in limbo.

The market was eventually reinstated following an investigation, with the Department for Business, Energy & Industrial Strategy (BEIS) given a list of amendments to make by the Commission.



Sarah Bell

As a result, BEIS now says DSR can bid for 15-year agreements, which many businesses with DSR assets will welcome.



Matt Hancock

However, providers will have to demonstrate they meet capital expenditure thresholds to justify those terms, which

may mean few 15-year DSR agreements are awarded.

The consultation has also:

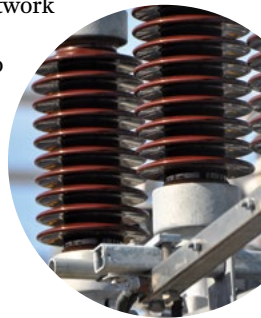
- halved the minimum threshold to 1MW;
- removed the block on those with long-term STOR contracts from participating; and
- confirmed plans to introduce a 'reporting and verification mechanism for the introduction of CO₂ emission limits'.

BEIS said it is still concerned about potential fraud in the Capacity Market, but will not act until "further investigation" has been undertaken.

Meanwhile, BEIS has made "easements" to accommodate COVID-19 disruption. Among other allowances, it means for the current delivery year, providers whose payments are suspended because they could not complete their testing requirements in time will get their money as and when they can complete performance tests. **te**

ENA gets closer to standardised flex contract as DNOs eye 2GW

Distribution network operators are getting closer to a standardised way of buying flexibility in what could be a breakthrough year.



After much legal legwork, industry body the Energy Networks Association has drafted a common agreement with input from DNOs and National Grid ESO.

The ENA said the contract, which caps liabilities and indemnities at contract value, should boost market confidence and participation.

It plans to launch a second version "that aligns with the needs of the ESO following a consultation later this year".

Market participants have long urged DNOs to standardise procurement if they are serious about buying flexibility over network reinforcement.

Western Power Distribution has been most successful in terms of volumes procured to date, followed by UK Power Networks.

However, both Scottish network operators aim to significantly step up flex procurement this year.

According to the ENA, DNOs will attempt to procure about 2GW of flexibility in 2020. Of that, Scottish and Southern Energy Networks and Scottish Power Energy Networks are together eyeing about a gigawatt.

Western Power Distribution aims to buy up to 667MW; UK Power Networks 170MW and Northern Powergrid 100MW.

Flex keeping lights on, study finds

Flexibility providers are succeeding in stabilising grids stressed by depressed power demand and renewables' intermittency, academics advising biomass giant Drax suggest.

Margins for grid failure narrowed in the first three months of 2020, experts from Imperial College note in their latest Electric Insights, as Britain endured its coldest, wettest winter since records began. As severe storms swept Britain, output from wind farms soared, up 40% compared with 2019.

When wind output plummeted on calm days, stresses to the grid increased. In one incident, Imperial notes, just 0.2GW of spare generation capacity was available, compared to more than 4GW the following day.

"It was flexible power stations, and action from businesses able to reduce their electricity usage, which helped prevent blackouts during cold, calm spells", lead author Dr Iain Staffell writes.

During the quarter, renewables contributed 40% of generation, outstripping fossil fuels for the first time, and now effectively becoming baseload.

The start of lockdown in March reduced weekday demand as much as 13%, adding to system volatility. Day ahead spot prices fell to £28/MWh, down a third year on year.

The quarter's extreme conditions highlight how National Grid ESO and DNOs are having to manage complexity and multiple partners like never before. The report - and to date, no blackouts - suggests they are rising to the challenge.



Gresham House to hit 364MW at it warns UK needs 10GW fast

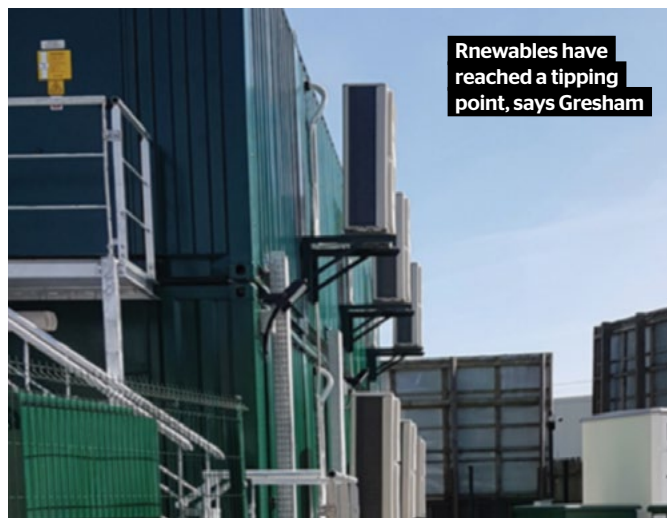
Specialist energy storage fund director says UK needs to increase its current battery storage capacity tenfold by 2024

Gresham House Energy Storage Fund remains on the acquisition trail, with assets committed to double its 174MW portfolio this year alone.

In its first full-year results posted, John Leggate and Ben Guest's listed vehicle reports a net asset value of £205.9m, up 6.5% year on year.

Since its IPO in October 2018, the fund has cumulatively raised £238m, including £31m this February. Recent confirmed buys on grid-connected sites include 50MW projects in Suffolk and Yorkshire.

Chairman Leggate said exclusivity agreements covering four further projects will bring Gresham's



operational capacity up to 364MW by December 2020.

Leggate says Britain currently has 1GW of battery storage currently in operation,

which Gresham believes must grow tenfold by 2024.

Investment director Guest added that increasing periods of negative prices underpin the

fund's strategy. "As ... renewable energy grows, the amount of temporary excess generation will get worse," he stated.

"By our estimates, instances of more than 10GW of excess power from renewables will occur frequently within the next four years, requiring 10GW of energy storage. In 10 years, this could reach 30GW?"

He added: "Now that renewables have reached a tipping point, every additional unit of power generation will cause an increasing oversupply at certain times, while also reducing the market available for baseload, forcing this type of generation out of existence and creating a deeper trough in generation when renewables do not generate." **te**

Statkraft adds Warrington Council's solar-storage to VPP as it hits 2.6GW aggregate generation



Staskraft has signed a hybrid power purchase agreement with Warrington Borough Council for its 35MW solar farm in York, co-located with 27MWh of battery storage.

Under the deal, Statkraft will take all the power from the site and trade the flexibility from the batteries in a bid to get best

returns across merchant and contracted services.

Statkraft said it hoped the bespoke PPA "sets a blueprint" for other local authorities to follow.

Adding Warrington to its 'Unity' virtual power plant, Statkraft revealed that the VPP now exceeds 2.6GW of aggregated generation in the UK, across solar, gas, wind and batteries.

Statkraft is the largest offtaker of renewable energy and the largest long-term offtaker in the UK market. As such, the VPP is set for further substantial

growth, with a deal struck last year with Statera to add another gigawatt.

In Germany, the Norwegian state-owned firm's VPP tops 12GW and wraps in small scale distributed assets.

The company ultimately hopes to take a similar approach in the UK via subsidiary b2b supply arm Bryt Energy.

The York solar-storage scheme was built in five months by Gridserve, a company which is also bidding to build out a network of EV charging forecourts alongside co-located solar and storage.



National Grid and SSE to harness surplus wind to heat off-grid homes

Pilot under way to use excess wind generation to heat homes in the Scottish Highlands

Scottish and Southern Electricity Networks, National Grid ESO, plus partners Delta-EE, Everoze and PassivSystems, think up to 380,000 households could benefit from a project to use excess wind generation to heat homes in the Scottish Highlands.

The 4D Heat pilot, with spending allowed under Ofgem's innovation programme, will target communities north of the Highlands that are off the gas grid, but already in hot-spots of electrified home heating, and – importantly – where there is potential to expand those hot-spots.

If successful, the project addresses multiple problems. National Grid ESO spends tens of millions of pounds curtailing

output from wind farms each year. It does this to keep the grid stable. With more wind coming onto the system, there will be more periods of excess generation.

Using excess power to heat homes helps solve that challenge. If the heat infrastructure is also made smart, it can become an additional source of flexibility for local and national system operators.

Meanwhile, homes off the gas grid tend to pay more to heat their homes, and are more likely to be in fuel poverty.

The 4D Heat pilot could help address both issues, as well as helping to decarbonise heat, one of the biggest challenges in delivering net zero.

Additionally, it should help



The 4D Heat pilot will target communities that are off the gas grid

gauge the impact on power grids of greater electrification of heat. All new Scots homes built after 2023 must be heated from low-carbon sources, following a Holyrood edict

announced in January.

“Reducing the amount of wind curtailed, as well as improving the business case for low-carbon electric heat, would be a major step forward on our path to a net zero carbon economy,” said Cian McLeavey-Reville, innovation strategy manager at NG-ESO.

Kate Jones, SSEN's project manager

commented: “This project will look at how people's homes can be made warm and comfortable, while making best use of the energy available. It will also investigate how smart electric heating can help to balance the grid, which as the network operator we would welcome, to help keep costs low for everyone.” **te**

Piclo: Flexibility will halve network investment by 2050

Use of flexible energy technologies could halve network investment out to 2050, and shave tens of billions of pounds off the cost of decarbonisation, according to a new report.

Published by flexibility marketplace provider Piclo, the report suggests properly harnessing flexible demand and distributed resource, such as batteries, electric vehicles and heat pumps, would save up to £5bn per annum by 2050.

Report co-authors include UK Research and Innovation/InnovateUK,

Local Energy Oxfordshire (LEO) and consultant Graham Oakes, a founder of aggregator Upside Energy.

It suggests a flexible approach would reduce the need for peaking plant by 15GW, cut use of dispatchable plant by 22TWh per annum, reduce curtailment of renewables by 22TWh per annum and lower the cost of network reinforcement by two thirds.

The group also produced an accompanying report outlining the value of centralised and distributed storage. It explores the interplay, competition and

cannibalisation between large scale storage and distributed storage technologies such as aggregated electric vehicles.

It centres around the risk of sub-optimal solutions – and excess cost – if large-scale storage is allowed to take all the early spoils, thereby locking out more cost effective solutions.

The report suggests more distributed storage, such as that enabled by a nationwide electric vehicle rollout, “is required to maximise the value of flexibility, especially on the low voltage network”.

Duo land reactive power contracts

PeakGen and Zenobe have won £8.7m in contracts to provide reactive power, which helps keep voltage stable, in Mersey.

National Grid picked the two firms from 15 bidders.

Zenobe owns and operates a network of battery storage schemes. PeakGen runs diesel farms and battery assets.

However, the ESO said the contract will result in a novel approach: a reactor which absorbs reactive power, and battery which will be able to operate in additional markets alongside its reactive power contract.

The nine-year contracts run from 2022.

The battery storage market is being failed by its traders

In the medium term, only the best traders will survive in the battery storage market, suggests Kiwi Power head energy merchant Aaron Lally

Battery storage has pushed itself to the forefront of many investors' and developers' plans in the past couple of years given the large fall in development costs. Many potential owners are still struggling to make the business case add up, however.

How can this be when we see revenue streams (without stacking) yielding £70,000-100,000 per MW per year over the past 12-18 months?

The issues facing merchant trading of battery storage revolve around the following points: potential investors being shown incorrect revenue forecasts; lack of trading and revenue generation expertise in the sector; and the lack of trading infrastructure for battery storage.

Incorrect revenue forecasts

In too many cases, battery storage owners are being lied to. Plain and simple. They are being shown 'perfect world' revenue forecasts for trading with salespeople convincing them they are able to achieve these numbers. This happened in 2018/19 with FFR price forecasts showing prices 2020

Aaron Lally: Traders trump consultants

onwards at £15+ MW/h and has happened more recently during 2019/20 with trading forecasts of £60,000+ per MW/h per year. These numbers are unachievable in the current market.

Asset owners are too often pushed into opaque revenue streams with no visibility of the opportunity cost of entering these revenue streams

and what could be achieved using other strategies. They are often signed to long-term management contracts and unable to switch out to other more lucrative revenue streams because their trader does not cover that market/service.

Only one company currently offers full access to all revenue streams in the UK. This is

abysmal for an industry which has been talking about merchant trading for several years. Battery storage traders have to hold themselves to account.

How can this be rectified? Speak to experienced traders, not former consultants, for real world trading numbers. Get the trader to register your asset as a BMU so you can see when

Man + machine + money

Looking to the future, the market is moving forward with longer duration assets and standardisation of technology. The battery storage market will very quickly start to look like other commodity storage markets, particularly the gas storage market.

Few in the battery space have knowledge of this area outside of the large utilities, which will be operating their own battery assets.

Independent storage traders will be the route to market for third party-owned assets unless asset owners want to sit in line

behind the gigawatts that will be owned and operated by the large utilities. How can the independents compete with the large incumbents?

Independents will need more working capital to trade and less AI trading algorithms as trading decisions will move from a minute-to-minute basis to a daily decision-making process and then a re-optimisation in the futures market. The capital to trade in the futures and options markets is many multiples that required to participate in the intraday market for example and requires a very different skill set to that being touted by the battery industry as the requirement for battery storage assets.

Many start-ups will not be able to access these markets

due to this high capital requirement.

Consultancy will not beat trading expertise in this space. The solution for asset owners has to revolve around experienced trading personnel operating with fully automated trading tools and price prediction algorithms.

Many battery storage traders try to stress the differences of the assets versus traditional generation to impress upon investors their expertise.

The truth is if you are the best at predicting price (whether trading markets or ancillary services) you will extract the most revenue out of the battery storage asset. Power station owners have been trying to do this since the liberalisation of electricity markets decades ago. Perhaps battery storage assets are not that different after all.





the asset is generating and at what price. Lastly, and most importantly, stress test these revenue numbers yourself. Are assets in the market currently achieving these numbers? If not how can your trader? Do not settle for AI algorithms and machine learning as an uplift when presented with theoretical revenues.

Look under the hood at what these traders are doing. If they are achieving what they claim, they will happily show you their trading software and real-world examples of revenue generation.

Lack of trading and revenue generation experience

Trading and revenue generation is reliant on market experience: the companies that extract the most revenue from assets are the best proprietary traders. This is shown in every commodity storage market: Glencore, Trafigura and Vitol in oil markets; Louis



Battery storage owners are being lied to. Plain and simple

Dreyfus, Bunge and Cargill in Agriculture; the list goes on.

Why is battery storage and electricity any different? Market expertise has to become the focus of battery storage traders' efforts to succeed. Asset owners have to select traders with market expertise to see returns that justify the large upfront investment today.

Lack of trading infrastructure

Trading infrastructure in the battery storage space is limited and normally developed in-house by battery trading companies. This gives asset owners limited visibility over what their asset is doing

and how revenue is being generated as well as any costs applied to trading.

I believe in the medium term we will see many start-ups in the battery storage trading space specialise and start selling their software to asset owners instead of providing route to market services. Too many are trying to leverage their expertise in consultancy or development and apply it to trading. Companies will return their focus to different parts of the value chain: development consultancy, degradation systems, risk management systems, dispatch systems etc.

Protecting yourself as an asset owner

How can you work out how your asset is being managed today if you cannot see it as a BMU and there is no appropriate software? If you only see a cashflow at the end of each month how do you work out if the trader

is applying hidden charges or worse still not dispatching your asset when they report they are and incurring large penalties?

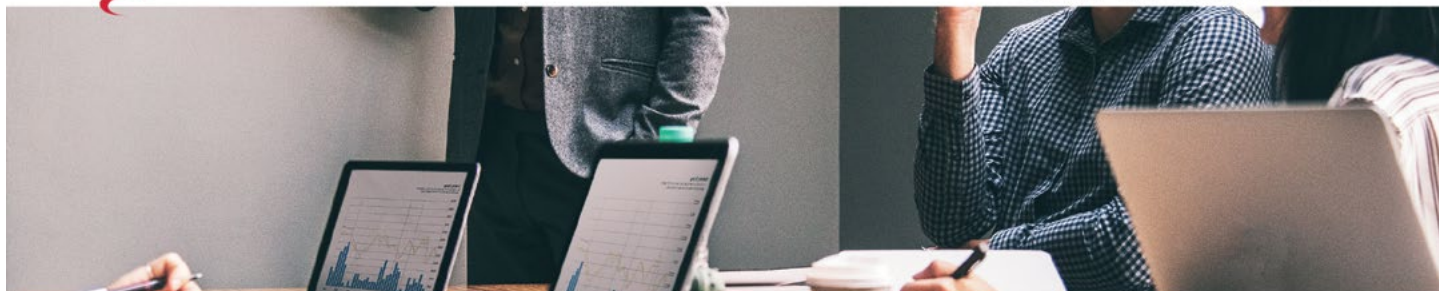
How do you know the trader is even trading the asset themselves and not handing over full trading rights to a third party and paying a fee? (This sounds ridiculous but this does currently happen with some of the largest battery storage traders.)

The answer is you do not unless your asset is registered as a BMU and/or you have software that can oversee what your trader is doing.

In summary: to protect yourself as an asset owner stress test all revenue numbers you are given and look to real world examples. Select the trader with the greatest amount of trading expertise and get them to register your asset as a BMU so you can monitor dispatching and prices achieved. Make sure they are actually trading themselves. **te**



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The urgent need to make use of flexibility has been highlighted by COVID-19's low-demand, high-renewables system. Over the follow six pages we look at the progress being made. This article was first published in Energyst sister publication New Power Report



Opening up the market

Can a blockchain provide the platform to bring local flexibility into play? A new application could bypass the regulatory logjam

There are 35-40 different business models being used across Europe by ‘prosumers’ and local energy projects, according to Steve Hall of the University of Leeds. That figure came during surveys for a report, *Prosumers for the Energy Union: Mainstreaming active participation of citizens in the energy transition*, the outcome of an EU-funded project. Prosumers are active energy users who both produce and consume energy from renewable sources.

Hall said that there was little sign of any of those business models being replicated at scale either nationally or across the EU. An enduring barrier was a regulatory framework unsuited to small participants.

In the UK, for example, there had been progress in one local energy project in Brixton, where the peer to peer (P2P) framework now allows the building owner to sell power (from its PV) to residents as well as communal areas. But that still requires a supplier licence.

“A lot of developments have set up private wire networks as microgrids. Derogation from a supplier licence is the key measure that makes it work,” he says.

Alongside the regulatory framework, another barrier is the economics of P2P, where high transaction costs make it hard for consumers to benefit from trading small amounts of energy. That requires innovation. How it might

work is illustrated by Power Transition, a start-up currently raising investment that aims to benefit from blockchain (or distributed ledger technology, DLT) technology while avoiding its inherent problems.

Chief executive Anthony Morgan explains that most blockchain technologies use ‘proof of work’ that require a lot of energy – Ethereum, a well-known example, can complete only 1,700 transactions per second and uses 55kWh per transaction. Power Transition is based on a public blockchain (Hedera Hashgraph) which uses 0.001kWh per transaction and it can currently complete 10,000 transactions per second, a total which will increase as the blockchain is expanded.

“It is a globally scalable solution,” says Morgan. It has its roots in financial systems and Morgan says it passes much higher cybersecurity tests than other distributed ledger technologies (DLTs).

Power Transition uses the DLT to create a digital ‘cypher’. Morgan says: “Every time a unit of energy is generated we create this cypher, which can contain all kinds of information – the location of the device that generates, the energy in a certain time period, power quality – frequency, voltage harmonics – that you can combine with other data such as weather data. You can choose the information.” It can be done in very short time intervals providing real-time information.

In use, “we take the

encrypted data and we can apply artificial intelligence and feed information back. It is a two-way process,” says Morgan.

The data can come from any asset, from an electric vehicle to a wind generator or battery.

“It is uploaded to the cloud and combined with other data like the amount of power being used in the grid, and you can start making decisions. You can make localised decisions on that information.”

“There are two parts of the market we [Power Transition] are interested in,” says Morgan. “One is the raw data, providing energy suppliers with more accurate data. We can provide data right up to the settlement period – far greater granularity than smart meters. The other is site data that provides flexibility in the market.”

He is talking about ‘dynamic balancing’, so rather than taking fast action to respond to calls from the system operator (‘products’ such as fast frequency response), the site adjusts its demand (and supply) according to market signals. That would allow mean the site owner could benefit from being on the ‘right side’ of cash-out prices. And at times when there is an excess of power available “part of what we propose to do is manage that far more dynamically so we can use the renewables more effectively”, says Morgan.

“A lot of it is around providing optimisation for third parties and we can tap into other systems to improve them by the quality »

“ We can provide data right up to the settlement period – far greater granularity than smart meters. The other is site data that provides flexibility in the market

« of the data we can provide.”

The company is currently looking to raise £1.3m investment. It is being done via Crowdcube. Power Transition has already sparked interest from some high net worth individuals and corporates.

Morgan says that it has been attractive because “with a lot of these platforms, once you scratch the surface it’s not much more than a spreadsheet but we can demonstrate that it is proven”.

Of the funding, £100k will be required to install a microgrid in Corby, which is where the platform has been demonstrated.

In that project 47 houses are connected to the system and each has PV, battery storage and a heat pump and EV connection. A PLC manages the assets in the house in response to grid conditions.

“We respond as fast as the market provides a signal,” Morgan says.

In that project (supported by Innovate UK) “we found that it was far more scalable than we anticipated”, says Morgan. With it proven in a virtual environment, now “we want to implement it in a real-world environment. But because of the regulatory situation you can’t do peer to peer trading unless it is behind the meter. We are looking to do it as a microgrid so we can demonstrate it”.

It should also demonstrate that the control is ‘fractal’ – so the same system used to control a single house can be used at any scale. The project has been delayed by COVID-19 but should be delivered by December.

Commercialisation

As for the bulk of the funding, Morgan says: “We are starting to commercialise and we have some further development. We have identified a number of use cases and we need to develop them into products.” Among his target customer



“

There is an incentive there for property developers and infrastructure owners. We can provide a service that will reduce their costs and provide a value-add for customers to buy those houses

list are sites where there are multiple assets or a grid under pressure, which include both industrial sites and housing.

New housing developments are of particular interest. Morgan says: “With the move towards electrification of heat and increased electric vehicles, IDNOs and developers have challenges around the need to increase capacity to each property. At the moment, typically you have 1.25kW of connection capacity per house. To manage even a 7.5kW EV charger is a considerable increase. But we can manage that demand on the low voltage side of the grid more efficiently.”

It will not take the problem away entirely, but it will reduce the extra copper, transformer capacity etc that is required.

“There is an incentive there for property developers and infrastructure owners. We can provide a service that will reduce their costs and provide a value-add for customers

to buy those houses.

“We have ongoing dialogue with iDNOs, [and DNOs]: it’s about peak lopping and making sure you have tighter control over the electricity going through the grid. But it needs to be demonstrated.”

The next step for Power Transition is to work with BankEnergi on optimising energy on large sites. “They are looking for opportunities to create energy trading,” says Morgan.

BankEnergi is working with Nodes, the flexibility trading platform. “Nodes is interesting, it is not DLT-based and it has quite a high financial cost,” says Morgan.

“We can work with them but we are particularly interested in the low-voltage side of the grid. We can interface with them to provide trading signals at the local grid level.”

In the ‘fractal’ approach, local balancing would be performed by a service like Power Transition’s and any remaining imbalance would be traded more widely on a platform like Nodes.

Morgan insists that the cost of implementation is a lot lower for Power Transition, “with lots of functionality straight out of the box”.

Echoing the comments from Steve Hall, he says “the regulation is not there to support that”. But ahead of regulatory change, there remain immediate opportunities from ‘behind the meter’ systems.

One Power Transitions demonstration under discussion is at a refrigeration haulage company based in Kent. That would optimise “several megawatts” of cold store, add new assets including onsite generation, and would also allow the site to participate in the balancing market (with the participation of an aggregator).

Not for the first time, regulation is moving much more slowly than technology. te

Local electricity markets have found it hard to establish themselves in part because the gains from electricity price arbitrage are small under current arrangements.

Meanwhile, the industry has been grappling with another cost issue: the need to reinforce networks to carry more power.

The two issues are linked – where there are network constraints the price of traded electricity increases. But for a long time those two costs were treated as separate. Generators and suppliers traded power in markets on the assumption that the network would be there to carry it (eventually if not immediately). Network operators were tasked with extending and maintaining their wires.

In recent years the common ground between those aspects of the industry has become more obvious, as the cost of reinforcing the network has been exposed.

Flexibility platform Nodes has arisen from this juncture between capital and energy costs and its aim is to “establish what a market solution looks like” that allow flexibility providers to easily access the savings made in avoiding capital investment, as well as arbitrage in energy-only markets.

Richard Sarti, director of marketing and sales at Nodes, summarises the system as bringing grid constraints “into a more open arrangement, where we create price signals and a market-based solution that establishes something like a merit-order stack of the different types of flexibility that are available, and when that flexibility can be utilised.”

The genesis of the system – originally a smart grid project, and then a joint venture of NordPool and Agder Energi that has now been spun off – was a Norwegian substation overloaded for just a few days a year. Instead of reinforcing it, they looked at how to



Making the link between flex and reinforcement

Accessing constraint costs and avoiding reinforcement are the key to unlocking local markets, argues Richard Sarti

reduce the load at those times. Sarti says the local system operator “recognised that as the network operator they should not be determining which entity is operating in order to manage the network.”

That brought into focus a longstanding need for “an independent operator to facilitate the buying and selling of flexibility to alleviate grid constraints, allowing the system to operate more cost effectively by removing large capital expenditure grid reinforcement projects.”

Sarti says decentralisation means the grid will operate very

differently and so will the way we solve problems. He gives the example of an area of Germany where grid constraints meant wind farms were paid not to generate. “We have created a market-based solution that tells the industrial park when is the best time to start operating their units. The grid operator is no longer paying the generators to curtail generation.”

How does it work? “The DSO would identify an area of constraint, highlight it and publicise the

map on our platform. The flex providers would identify assets they have in that area, and the area of constraint becomes an order book.” That could include bundling together different voltage levels into a single order book on the platform.

When assets register on the platform they provide characteristics like the type of asset, whether it has ramping constraints and the baseline at which the asset can run.



Richard Sarti

Aggregators offer a price they will run at (ie flex up or down). The local network makes the choice.

The bottom-up approach

Sarti says: “Historically we look at balancing as a top-down approach. The TSO determines what actions the DNOs need to take to keep grid stability at a national level. So the DNOs have no real mechanism to address issues created by the TSOs when [the TSOs are] managing grid stability at a national level.”

The network also has fewer large generators to bring on or off or use to provide supply stability. Again, Sarti says: “The ability to address this will be run at the local level. We could see in 10-15 years time whether there is a need for a national system, as DSOs will be able to address those issues locally. It will be the DSOs who are selling that service back to the TSO,” and giving signals about what flexibility they have available. That trend will be reinforced because as we »

« move towards more renewables, generation will be closer to the user, and there will be both more volatility and a change in customer demand patterns.

Local markets

That brings us back to network capacity and the cost of constraint. “In our opinion, creating a market-based system the price signals will determine whether reinforcement has to be done at a local level or there is enough flexibility available locally to defer it – and the cost.

“The way that regulation has to evolve will also have an influence. Objectives in the Clean Energy Package talk about local energy markets and there is a clear view that these constraint issues have to be addressed locally before they are managed nationally,” Sarti says.

“Where the Nodes platform sits is that historically there has been no connectivity between the DSO at the regional level and the aggregator and the flex service provider network operation has been independent. We are acting as a facilitator and connecting the DSO directly with the flex provider, the aggregator and balance-responsible parties,” Sarti adds, and he believes this is where Nodes differs from other platforms such as Piclo and the Cornwall local energy market (LEM).

“As a company we feel that we understand the challenges that a DSO has in operating its network,” he says.

Nodes has tried to offer low barriers to entry for flexibility, “in recognition of the fact that it is not going to be the traditional types of flex providers that materialise in future. It will be much smaller volumes – kilowatts not megawatts – and refrigeration, smart homes, EVs.”

The platform is bottom-up, because “if we go in with our historical way of thinking, the risk is that we create barriers to entry for small suppliers and a high cost”.

Another difference is that Nodes sets out parameters instead of products, so the DSO or flexibility provider can determine the type of flexibility they want to buy or sell. It may be determined on location, time period, type of asset, ramp rate or stability characteristics, or price, for example.

“You can tailor your requirements,” says Sarti, so that in one area the buyer may want to search only for low-carbon assets, in another for batteries.

Also, he says, Nodes addresses an issue whereby parties who offer flexibility, hence using more or less power than planned, are left out of pocket elsewhere because they have previously agreed contracts in the wholesale market. With Nodes, Sarti explains, “you sell the flex and balance out your position in the wholesale market”.

The platform can be deployed at whatever scale the user wants it – potentially every ‘node’ on the network. Some markets (for example one in the US) operate a pricing structure where constraint prices are revealed on every ‘node’, feeding possibly thousands of local prices into the calculation.

The UK has not taken that approach so far, but “We think ultimately you will end up with some kind of nodal pricing structure,” says Sarti, in central Europe, if not in the UK. Nodal pricing is not on the agenda at present but Sarti says establishing flexibility markets will nevertheless provide clear signals about where the best value can be gained from siting new assets. **te**

“If we go in with our historical way of thinking, the risk is that we create barriers to entry for small suppliers and a high cost”

Accelerating radical change

LF Energy's Shuli Goodman looks ahead to the future as software drives the energy industry

Linux Foundation Energy is a non-profit initiative from the Linux Foundation, which describes its mission as accelerating the energy, electricity, and electric mobility sectors’ worldwide decarbonisation goals through open-source technology.

It aims to address system ‘pain-points’ such as cybersecurity, interoperability, interconnection, control, optimization, and the digital orchestration and management of distributed energy, energy efficiency and demand response peripheral devices.

In February, Dutch distribution system operator Alliander decided to move its smart systems platform, formerly known as Open Smart Grid Platform, to open source through LF Energy to speed up development.

- Other projects include:
- the Energy Market Methods Consortium, which is developing standardised methods, linked to open source code, to enable demand flexibility as a resource;
 - the OpenEEmeter project, an open source engine that quantifies monthly, daily, and hourly changes in behind-the-meter energy consumption, to define consistent transactional units; and
 - the Open Energy Data Initiative, which aims to improve and automate access to high-value energy (and related) datasets to make data actionable and discoverable by researchers and industry.

Shuli Goodman is executive

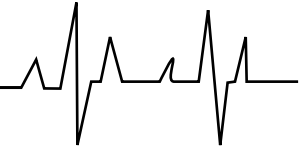
director at LF Energy. I ask her about the role of ‘open source’ in the digitalisation of energy.

She says it will do half the heavy lifting in transforming the industry. “Digitalisation abstracts the complexity of hardware and begins to create the foundations for automation and virtualisation. As we move towards that – as other industries have gone through – what it begins to do is decrease the cost, because the cost of [open source] software, after it has been developed, is close to nil. [In comparison] The cost of hardware grows over time because of the cost of maintenance, etc. So there will be increasing virtualisation.”

The industry has a ‘real’ footprint, she admits. “Electrons are physical things too, I am not suggesting it will be like a packet of data but the role of data and information on electrons is going to be remarkable because it is going to allow us to orchestrate energy in new ways that we have not yet been able to engage in.”

In the past, she says, “energy was essentially straightforward and you had control systems that treated like it was on or off. But we are thinking about the future ... and how you match demand and supply by being able to orchestrate how much you use, when you use it, and how you do that with variable sources.

“As other industries have discovered, software ‘ate’ hardware, because it was so much cheaper. And open source ‘ate’ software... From 70% to 90% of software is basically Lego blocks that get put together, so when I think of the future, I think of the pieces that have



to be brought together to build the grid of the future.”

LF Energy has seven projects under way and Goodman expects – COVID-19 permitting – to double that by the end of the year.

We are at the very beginning of the transformation, “but like anything, at the beginning you have to look at what the DNA is. Look at the patterns of how the transformation has happened in various industries.”

I ask what industry would be a good model for the electricity industry to see its potential future? “Telecommunications is probably the most important industry for energy to look at in terms of the process of transformation.”

Telecoms systems, she says, “were also [previously] regulated, they were very hardware-centric and they realised that to get to 5G they had to shift to 75% virtualisation and that none of them could do it alone. I think in energy we are in a similar place, where we have to shift to at least 50% virtualisations and software-defined networks. We have to do it urgently, in order to be able to transform transportation and how we relate to our energy systems.”

The other industry that Goodman suggests is close to energy is cloud computing. That is a ‘distributed computing’ paradigm. “What we are trying to do is execute a distributed energy paradigm.”

She says using the commonalities between those industries and electricity, “we need to be able to take those things, begin to build the tech architecture of the future and figure out where the holes are”.

I ask whether the platforms used in these other industries can be ‘lifted and shifted’ very simply into energy. If so, that could mean there is a potential for short-notice and rapid transformation.

Goodman says that lift and shift “is completely what LF Energy is about”. In the telecoms sector, she says it was three



From 70% to 90% of software is basically Lego blocks that get put together, so when I think of the future, I think of the pieces that have to be brought together to build the grid of the future

**Shuli
Goodman**



years ago that AT&T put a large software platform into the Linus Foundation.

Two key projects have arisen from that, one on orchestration and automation and one on network function virtualisation.

“I believe that both of those things are going to be critical. What we are doing is overlaying a communications structure on energy systems in order to facilitate the orchestration of electrons,” she says.

Making the transformation

In order to speed up the transformation and accelerate it, she says, you have to say: “This is what the grid of the future looks like from a functional point of view, and this is what it looks like from a technical standpoint,” and then ensure that we are all using the same data standards so there is communication that links these viewpoints.

I ask more about the kind of timeframe, as experienced in telecoms, that she calls fast. She says that in telecoms it has happened in well under four years. “So when I think about energy I think

about letting people know that we are gathering and we are coming together. [In telecoms] AT&T started banging the drum about five years ago around 5G and digitalisation. They were having a hard time getting anyone to listen, because they were so far ahead. Today 70% of all mobile traffic is collaborating on LF and 70% of mobile traffic is going over open source.”

Electricity will be slower. There will not be a similar commercial rollout in the next five years, because there is a lot of new software that has to be created. “But I think that within 3-5 years we will have hundreds of utilities co-operatively working together on building the grid of the future.”

First the industry has to develop the right human capabilities. “We need to build capacity in the industry. Network operators still think of themselves as hardware folks. When you think about what needs to happen in the next decade, I would propose that 5-10 years from now 50-80% of network operators’ employees will be digital – and they may even be digital natives, learning about energy for the first time.

“We need to be prepared to completely transform our industry, because even if you use vendors for your software, a utility is going to need to understand how those things all fit together or they will be displaced. They will be disaggregated for their customers who will have the ability to execute in a digital environment”

She insists that is the case for network operators as much as the supply sector, so what

does it mean for companies as they prepare for the next price control period? Should networks imagine that by the end of RIIO-2 they will be software-led, and plan their staffing accordingly?

Goodman says the hardware will not go away. But “there will be increasing levels of virtualisation on hardware and it will happen in a very surprising way. For example, Apple, Google and Amazon joined together in the ZigBee alliance to build something called the ‘connected home’ over IP. They are taking the connected devices and turning them into the gateway for the house, and once they do it with residential they are going to move on to commercial and industrial.”

Consider the implication, she says: “A singular device that will manage and be an interface to appliances and consumer electronics. If done correctly they will have the capacity to aggregate and arbitrage energy. I don’t think that most utilities see this coming”

Google and Amazon are both members, alongside LF Energy, of the US Open Energy Data Initiative.

I ask how a new electricity ‘universe’ includes these players. “It could be selling energy or it could be arbitragers to the network operators ... to balance and shape load to resources. That level of collaboration is entirely software-defined. Underneath it is hardware – appliances, heat pumps, dishwashers, air conditioning – the hardware is there but it is the software-defined network that orchestrates it. That is happening.”

What happens to utilities that are not ready for this new world? Can they delay it – for example by holding on to data? Goodman says: “I don’t think they can. They are going to get disintermediated with their customers if they don’t actively jump on board. The more utilities try to go it alone, the more they will become dinosaurs. This is something we have to do together.” **te**





Price volatility the new norm

Ville Rimali, Wärtsilä's director, Growth & Development, says COVID-19 highlights the vital role for storage in unlocking 100% renewable energy future

Across Europe, decreased energy demand due to the COVID-19 lockdown has accelerated the electricity system transition, with the level of renewable penetration up by about 10% on last year.

However, the transition in Europe is already making such progress that a 10% increase was expected by 2024 regardless, according to Bloomberg forecasts.

For many years, sceptics have questioned whether our grids will be able to stand up to a significant increase in renewable penetration, but this crisis has proven without doubt that they can.

A huge part of that success has been due to energy storage and flexible generation.

With high renewable penetration and low demand, average market prices in the UK, for example, have dropped by

21%

Upturn in energy storage income from 24 March to 23 April 2020 compared with the previous year

about 45%, and that means that baseload thermal generation is making less money.

However, the opposite is true of energy storage, which is more profitable than ever. UK operators saw a 21% upturn in income from 24 March to 23 April 2020 compared with the previous year. On an annual basis this would mean an increase in income of more than £280,000 for 50MW/50MWh

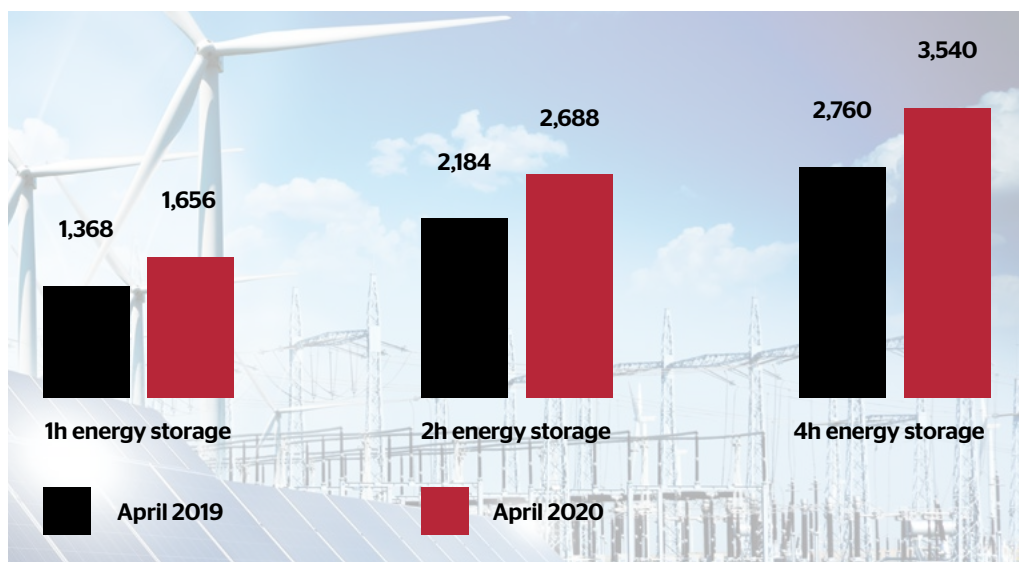


Figure 1: UK operators' income from energy storage (£000s). Source: Wärtsilä's PLEXOS model

installation (see Figure 1).

And not only are we seeing an increase in income for storage but we are seeing more utilisation, too. Average cycles in the UK are up from 2.7 to 2.9 per day.

These positive numbers are due to the significant increase in market volatility caused by the uplift in renewable penetration. This is because storage profits on volatility as providers are exposed to the difference in price rather than the price itself, and can leverage the relative price differential by charging when prices are low and discharging when prices turn back up.

A sign of things to come?

I have been amazed by the speed of change caused by COVID-19. We have seen a revolution in the power system almost overnight.

But this is only a glimpse into our energy future. The revenues from storage will increase hand in hand with the share of renewables, so I would expect this 21% increase in income to continue to

grow in the years to come.

When the share of renewables increases, it will limit the need for traditional baseload fossil fuel generation. This transition must therefore be supported by an increase in flexible capacity that can be used when the sun isn't shining and the wind isn't blowing.

Investors around the world have already shown real interest in storage technology, but these new numbers – which explicitly tie the income for storage to the increase in renewables – will give them even greater confidence.

That confidence is underlined by the decreasing price of storage, which has fallen to US\$150 per MWh for lithium-ion battery storage with four hours' discharge duration, according to BloombergNEF.

Embracing volatility

The COVID-19 crisis has had an extraordinary impact on our energy markets, as demonstrated by our new free-to-use tool, the Energy

Transition Lab, which provides open data and insights for European energy markets to help accelerate the transition to 100% renewables.

The platform reveals the incredible spikes we are currently seeing in terms of energy pricing and generation on a daily basis.

But this is a vision of the future that we must embrace. Average prices are low right now due to the high level of renewables and reduced demand, and that means that industry and consumers are getting cheap and clean electricity. The significant volatility is already driving investments for flexibility and these two factors will help to accelerate the future energy grid that we need.

So my advice to policy makers is to let the market work. Do not try to interfere or limit any price volatility as it must become the new normal as we look to enable the transition to 100% renewable energy. **te**

The importance of being local

Community energy projects already generate more than 160MW of electricity in the UK, enough to supply 60,000 homes with renewable energy. But the positive ripple effects extend well beyond cutting CO₂, as they also deliver immeasurable social, environmental and economic benefits, writes Northern Powergrid's Anda Baumerte

At a time when the benefits are needed most, distribution network operators (DNOs) and local authorities are uniquely placed to support community energy, build on the momentum of the togetherness that has been necessitated by COVID-19, and 'Build Back Better' once the pandemic has passed.

The pandemic has had a significant impact on each and every one of us, but as with any crisis, it has also highlighted our best examples of resilience, ingenuity and togetherness.

Few would have predicted that renewables could contribute to the majority of our energy mix without a significant disruption just a few months ago.

Now, the drop in our energy demand and the ability to flex our electricity network means we are doing just that. Over the recent bank holiday weekend, the grid carbon intensity dipped to 46gCO₂/kWh – a new UK record. This is a 15g less than the previous record, set just the day before, and 30g less than the record before that, which was set in August 2019.

These changes demonstrate that a renewables-led energy system is within reach and that communities can be the driving force behind it, while protecting our prosperity and wellbeing.

This is a unique opportunity for our communities, local authorities and DNOs to



collaborate and 'Build Back Better'. Community energy, as the name suggests, connects the generation or use of clean energy directly to the community that it powers.

Without the collaboration from those that manage local systems, and a joint support for clean energy solutions, we risk going back to business as usual and ignoring the lessons from COVID-19 that could help accelerate the transition to net zero carbon emissions.

DNOs and local authorities have an important responsibility to support community energy projects – something that is keenly felt at Northern Powergrid and the local authorities in our operating area, as we have more than 20 within our region.

We recently published our Community Energy Engagement Strategy, detailing exactly how



Anda Baumerte

“
A renewables-led energy system is within reach and that communities can be the driving force behind it

we plan to foster the growth of this community energy, but the core principles remain the same across all DNOs.

Community energy projects are often motivated by the enthusiasm and passion of local people who recognise the economic, social and environmental value that these projects can bring. It is rare that we see community energy projects developed by energy professionals or those familiar with the connections process.

As local anchor organisations, DNOs and local authorities are also perfectly placed to help enable community energy organisations to flourish. This might be information

on where to find financial support, data, useful tools, or even advice on how to build industry relationships.

Ensuring they have a key point of contact to pose these questions to is perhaps the simplest but most effective way to meet this challenge. Holding regular customer surgeries and having our contact details publicly available are two straight-forward ways to meet this need. Feedback from meetings and events can then also go on to inform and enhance further work.

Recognising the importance of data and digital tools, we have also launched two new online tools in close collaboration with our local authorities. Our Distribution Future Energy Scenarios (DFES) takes an open data approach and uses a visualisation tool to explore what the decarbonisation pathways for our region might look like and exposes the scale of change needed.

Our free AutoDesign tool enables anyone to access indicative costs for new connections, within minutes instead of days, and provides greater transparency about network capacity to enable informed decisions about where to connect.

These are just some examples of the type of work all DNOs are delivering to support the growth of local, low-carbon energy. However, we can't afford to become complacent. Only by working together with our local authorities and communities can we deliver the best possible outcomes for all our customers. **te**

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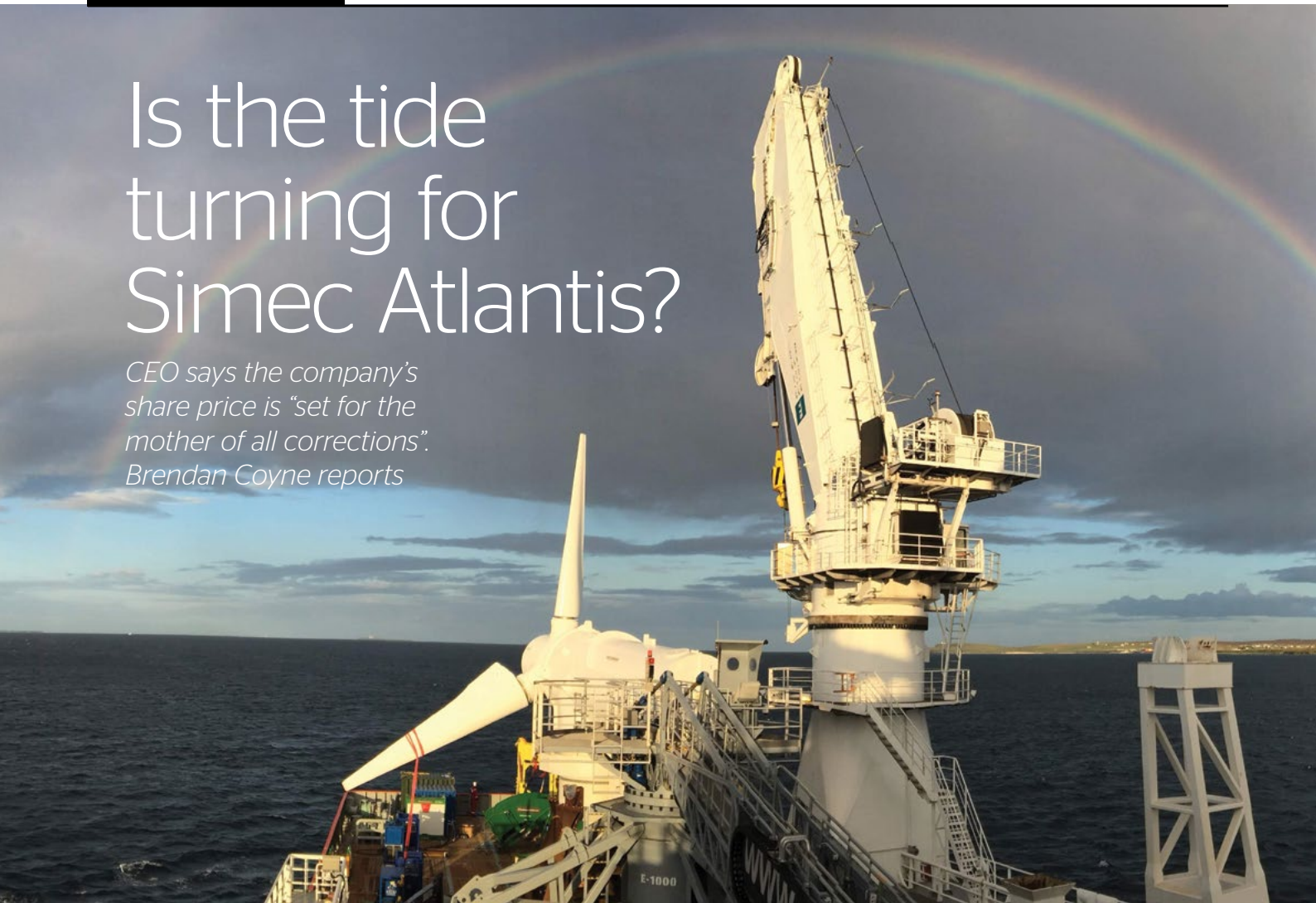
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Is the tide turning for Simec Atlantis?

CEO says the company's share price is "set for the mother of all corrections".
Brendan Coyne reports



Simec Atlantis CEO Tim Cornelius thinks the firm's share price, just 7% of its 2014 IPO, is "set for the mother of all corrections".

His confidence is predicated partially on hopes of a clean run at government contracts for difference that look set to be ring-fenced so that offshore wind is in a class of its own, leaving less mature technologies with a better chance of winning.

Landing one of those contracts, says Cornelius, will enable the firm to "get to financial close on 80MW of tidal power". It would also green light construction of a data centre powered by tidal energy and a private wire,



Tim Cornelius:
Bullish

which Cornelius, says could be operational by 2023.

He thinks the data centre will go ahead "regardless" of whether Atlantis lands the CfD.

"There's a lot of political momentum behind it," says Cornelius, given

Scotland's push for digital independence.

But the prime mover of his predicted price boom is Uskmouth, where the firm is attempting to convert a coal-fired power station to burn non-recyclable waste.

Attitude adjuster

"The share price is a complete anathema," says Cornelius, who has spent 14 years at the helm.

"The dislocation between the value of the company and the share price is primarily reflected by the

structure of its holding."

The vast majority, he says, is held by "non-trading" long-term holders. But that means "a few retail investors can change your fortunes by trading £1,000 worth of stock, which is infuriating, given we have never issued a profit warning or missed a target."

But Cornelius insists the tide will turn, and that the price will rise considerably.

The value of the tidal business alone "is multiple orders of magnitude of the market cap, so we anticipate a moment of awakening," he says.

"As soon as we achieve financial close on

Prime mover:
Uskmouth power station is being converted

Uskmouth ... you will see an immediate correction."

Achieving financial close requires planning, permitting and consenting, which Cornelius claims are "going very well."

The company has launched a pre-application consultation on its plans, which have switched away from producing the 'subcoal' waste-derived



pellets onsite, to bringing them in via rail, which will require significant new infrastructure. Atlantis hopes Newport City Council will may a decision on its application by Q4 this year.

Technology-wise, he says the burn test results, being undertaken by Mitsubishi Hitachi Power Systems Europe at the site, are due in days. Volume production and milling tests of the subcoal pellets were published in March.

"I'm not sure if people understand the implications [of Uskmouth]," says Cornelius. "It is not a technology risk. We have created a fuel that can be used as a substitute for coal. Mitsubishi Hitachi burners are used in hundreds of coal stations and the fuel can be used in each of those burners. So the implications for us, Hitachi and GE and others are huge."

Once those burn tests are complete, Cornelius predicts a "glide path to the end of the year to be pulling together financial close".

While the energy-from-waste sector is heating up, illustrated by KKR's £4.2bn acquisition of Viridor from Pennon, Cornelius claims Uskmouth puts Simec Atlantis in a category of one.

"The energy-from-waste boom is creating competition for black-bag waste. But the non-recyclable bit is what nobody knows what to do with – don't think straws, think car dashboards," says Cornelius.

"China has shut the gates, followed by Malaysia, then Poland and the Netherlands. So there is a substantial increase in disposal costs. But that waste is what we take [to make the fuel pellets]," he says. "So we provide a route to market that is not in competition with all the existing EfW plants."

Meanwhile, he says the technology will allow existing coal plants to stay open. As such, the company is in "advanced negotiations" with operators in both the UK and Europe and has "hosted

parties from Asia and North America," says Cornelius.

"Anyone that owns a coal-fired generation asset has to make a decision – either shut it down or try and convert it. Some of the Chinese and Japanese asset owners have tens of plant and they face huge decommissioning costs," says Cornelius.

"In Europe, operators like EPH have been buying up coal stations across the continent."

As such, Uskmouth is of "substantial interest" to that class of operator, he says.

Tidal power and floating wind

In a consultation in March, government sought views on its plans to separate offshore wind into a separate pot for

But the government wants optionality, to not put all of its eggs into one basket. If it confirms the decision to split off offshore wind into a third 'pot', it will leave technologies such as floating wind and tidal power competing with each other to secure funds. Cornelius thinks Atlantis will be the biggest winner.

"There are hardly any consented floating offshore wind projects. So we will get a much better run at competing [in the 2021 auction]," says Cornelius. "They will all be aiming for 2023-25. We have a fully consented project."

However, when floating wind does "get going", Cornelius says developers will be customers for its subsea hub, essentially

“We have created a fuel that can be used as a substitute for coal... in each of those burners... so the implications for us, Hitachi and GE and others are huge

contracts for difference (CfDs), the UK's main renewable generation incentive scheme.

CfD winners secure a set price for power via 15-year government contracts. The auction-based mechanism reduces market risk and enables developers to finance projects. To date it has driven down the cost of offshore wind, but less mature technologies cannot compete on cost.

Whether tidal power can ever compete with offshore wind on price is questionable.

an offshore multi-socket plug point. He says the company is "close" to sealing deals to connect floating offshore wind demonstrator projects.

Tidal powered data centre

Cornelius says the Caithness data centre project "has piqued investor interest from all over the world" as operators seek to reduce their carbon footprints. Meanwhile, he says the Scottish government is keen to become digitally independent as it regroups



for a second shot at becoming a fully independent nation.

Whereas the UK has more than 50 major fibre optic connections to the outside world, Scotland has one, says Cornelius – and relatively little data centre capacity.

The plan for the Caithness project is to link both via the FARICE cable to Iceland and the new Celtic Norse cable, connectivity that Cornelius says will be attractive to developers.

"So we have fibre connections and an existing grid connection, which gives us a huge advantage," says Cornelius.

"We are doing all of the pre-work in terms of planning and application. After the CfD auction results, we hope to get to financial close on 80MW of tidal power, and then ... 2022 for construction and 2023 for full operations. But I think it will go ahead regardless, there is a lot of momentum behind it." **te**

Maygen tidal upgrade

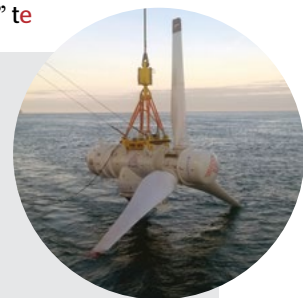
Atlantis' original tidal project, MayGen, has clocked up close to 30GWh. The firm is now upgrading the Atlantis turbine (the 6MW project uses three AAH turbines and one designed and built by Atlantis) and Cornelius hopes that will go back in the water this month.

"It has performed above expectation, with huge reliability," says Cornelius. Two years of commercial operations, he says, have given buyers confidence.

"After 20GWh, people started placing orders, because it is de-risked," he says, pointing to a deal earlier this year to supply and install a 500kW turbine off Nagasaki for Japanese utility KME. Cornelius is hopeful more sales will follow in the archipelago.

Meanwhile China is now looking seriously at tidal energy, with Simec Atlantis involved in the design of a 500kW turbine installed near Wuhan in April.

"They went from sketch to installed in 18 months, which is unheard of," says Cornelius. "Hopefully that will roll on and grow the market globally."



Renewable UK: Green hydrogen key to net zero



Green hydrogen created from carbon-free power including wind will be key to decarbonising the economy by 2050

Lobby group Renewable UK is calling for annual capacity auctions to spur more wind investment.

More wind capacity will be needed if hydrogen is to be produced in the required quantities via electrolysis, 120GW, according to Renewable UK's *Vision of*

the Transition document.

But it suggests green hydrogen will become cost-competitive earlier in this country than elsewhere, if build out of renewables capacity and falling cost curves continue their trajectories.

The report suggests green hydrogen can be

used in converted gas-fired power stations as well in industrial and domestic boilers. Replacing carbon-based methane in heavy manufacturing is increasingly possible, the document argues, as one steel maker recently proved.

Meanwhile, trucks and ships can run on hydrogen-powered

fuel cells, as UK manufacturer Arrival is planning.

Green hydrogen is winning serious backing from investors and government. In Sheffield later this year, ITM Power will open what it claims to be the world's biggest electrolyser plant.

Other forms of hydrogen are also gaining traction. In March the government launched its Hydrogen Taskforce, with energy heavyweights Shell and BOC as members.

Several of Renewable UK's member companies are also backing hydrogen, which would require them to both build more turbines, and create a new market for their power.

Ørsted has established a dedicated hydrogen business unit. Vattenfall also aims to operate across the hydrogen supply chain using its wind resource to power production.

Currently, the vast majority of the world's hydrogen is produced via steam methane reforming, using gas, or gasification using coal. It is carbon intensive and requires carbon capture and storage to work in order to be considered a method of decarbonisation.

Approximately 0.4% of global hydrogen production is via electrolysis, according to the International Energy Agency, with a fraction of that powered by renewables. **te**

Hydrogen and CCS firms eye more funding

Companies working to build UK hydrogen and carbon capture markets have landed initial government funding. Now they will compete for a bigger prize

UK Research and Innovation has announced first-stage winners among firms competing for £131m to speed British industry's conversion to low carbon energy.

As part of Whitehall's Industrial Decarbonisation Challenge, UKRI set aside £2m as stage-one cash for firms to prove their technology's commercial credibility in cutting emissions from heat, manufacturing and transport.

To be eligible, entrants developing clean hydrogen or carbon capture and storage (CCS) had to prove their relevance to the government's six Industrial decarbonisation clusters. Claimed as a world first, the six clusters are tasked with eliminating all industrial carbon emissions by 2040.

First-stage winners include firms or partnerships capable of deploying novel technology at scale. They include hydrogen company ITM Power, which is

building what is believed to be the world's biggest electrolyser factory in Sheffield. Winners will now compete at second stage for a £131m funding pot, awarded on the achievable reductions in their target cluster by 2030.

Also rewarded by UKRI are consortia aiming to deliver and extend "roadmap" goals to decarbonise one of the geographical clusters. Co-operations with local authorities, or with universities in applied research, stand to benefit. **te**

PosHYdon adventure: Green hydrogen from seawater

Oil and gas company Neptune Energy is prepping a project to produce the world's first seawater-sourced green hydrogen from an offshore production platform in the North Sea

The PosHYdon pilot partners UK-registered Neptune with leading Dutch pipeline operators and Nexstep, the nation's agency tasked to repurpose redundant marine rigs.

Together they will use a Neptune platform located 13km off Scheveningen to extract the clean gas from purified seawater.

Electricity from offshore wind farms could ultimately power hydrolysis on the rig, splitting off clean hydrogen (though for now the 1MW containerised unit will be powered via onshore cable). The green gas will



be pumped onshore over existing pipelines reaching as far as northern Germany.

Dutch grid operator GasUnie has signed up to the two-year pilot. Its backers hope to begin production next year, yielding up to 5,000MWh of clean hydrogen in the first 12 months.

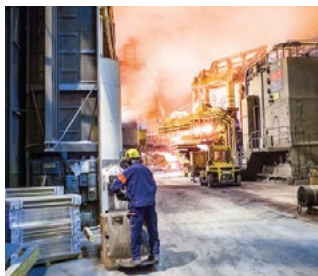
Costs of transporting hydrogen over existing natural

gas pipes is a major research focus, as is assessing corrosion effects of seawater on the electrolyser's components.

PosHYdon is a spin-off from the North Sea Energy programme, backed by 30 private and government Dutch bodies seeking a low carbon energy system for the region by 2030.

Hydrogen appears to be riding an investment wave. In March the UK government launched its Hydrogen Taskforce, offering a consortium of major producers, storage specialists and manufacturers up to £1bn of public money to start building the foundations of a hydrogen economy. **te**

Steelmaker swaps LPG for hydrogen



Pic credit: Peter Phillips

Swedish steel maker Ovako has claimed a world-lead first as it replaced conventional LPG as a heat source with clean-burning hydrogen. The process breakthrough promises major implications for one of the world's heaviest carbon-emitting industries

Swedish steel maker Ovako, working with German provider Linde Gas, is conducting hydrogen trials in a rolling mill at its plant in Hofors, southern Sweden.

The quality of the steel output was unaffected by the switch, Ovako reported. Now it is considering expanding its use of the clean-burning gas in future production.

"This is the first time hydrogen has been used to heat steel in an existing production environment" said Ovako's head of technology Göran Nyström. "Thanks to the trial, we know that hydrogen can be used simply and flexibly ... mean(ing) a very large reduction in carbon footprint.

"We have worked closely with Linde for many years and are proud to be doing this together," he added.

Ovako's hydrogen trial used recycled scrap only, producing 'secondary' steel, lower in emissions than ore-derived 'primary steel'.

Quantities of output from the trial were not revealed by the parties. But Ovako calculates it can save an initial 20,000 tonnes of CO₂e per annum – which is "just the beginning", according to the firm. Thanks to existing sustainability commitments, the company already claims its unit emissions are 80% below average for the steelmaking industry.

In 2017 the International Energy Agency calculated that steel production via various processes, accounted for around 7% of the world's industrial greenhouse emissions. Surging demand puts that on track for over 30% by mid-century, said the IEA.

Heavy emitters, such as steel

and cement, now face serious pressure to decarbonise and "must transform themselves if they are to survive the low carbon transition", investors managing assets worth £14tn recently warned.

While gas firms such as Linde are investing in hydrogen to decarbonise industry, Nordic utilities are also weighing up investments to harness excess renewable generation via electrolysis.

Vattenfall is working with heavy industry in Sweden, including steel and paper makers and aims to own the entire hydrogen supply chain – from power generation through production to storage.

Denmark's Ørsted has also set up a standalone hydrogen unit, with funded projects now under way in the UK and Denmark, plus activities in Germany and the Netherlands. **te**



Industrial emission statement

Hydrogen is now a key energy vector in the UK's and the EU's plans for a net zero economy by 2050. From a handful of fuel stations on UK motorways ITM Power's electrolysis technology could be the enabler for a major reduction in industrial emissions. Janet Wood spoke with ITM Power's chief executive, Graham Cooley

The last time *Energyst* sister publication *New Power Report* interviewed ITM Power chief executive Graham Cooley, in 2016, the hydrogen economy was still of interest mainly to specialists. ITM was rolling out its first 'power to hydrogen' filling stations, using electrolysis to provide transport fuel.

Four years later, the world has moved on. Energy minister Kwasi Kwarteng described green hydrogen as a "key technology" for the future, saying that "the question is how we can produce hydrogen

cleanly". He set out the benefits of hydrogen, as well as carbon capture and storage (CCS), in maintaining security of supply and reducing whole-system costs – and developing export markets for UK manufacturing.

"At the moment our exports are services, and we are not exporting [for example] wind turbines. That shows the nature of the problem," and the UK needed domestic manufacturing and markets for these technologies so it could develop export markets. It is also high on the agenda for the EU.

The reality of new

government impetus on green or blue hydrogen remain to be seen, when the White Paper finally sees the light of day. Meanwhile the balance of activity within ITM has shifted, with game-changing investment and the needs of industrial users now leading the hydrogen development stream.

An example is the Shell Rhineland Refinery in Wesseling, Germany, where ITM is installing and Shell will operate a 10MW hydrogen electrolyser. The Refhyne project is funded by the European Commission's Fuel Cells and Hydrogen Joint

Undertaking (FCH JU).

Cooley says: "What this project showed us, is that to scale this business we need an EPC partner and that's one of the reasons we partnered with Linde. To attack this market we want to concentrate just on making electrolyser modules and the EPC will be done by Linde.

"So we have built the modules. There are five sized at 2MW. The building is nearly up and the electrolysers are built and will be installed on site as soon as we emerge from the [COVID-19] restrictions."

That is a drop in the ocean,

he says. On a macro level, Cooley cites a raft of reports that put demand for electrolyzers in the tens of GW within the decade. Europe will need 80GW by 2030 and the UK alone will need 6-17GW.

Why the demand? Today the two biggest uses of industrial hydrogen are in ammonia production and in refineries, and they will soon have to comply with new environmental restrictions.

Cooley says: "Refinery hydrogen is being included in the EU Renewable Energy Directive. It's the first type of hydrogen that has been included in the directive and it requires oil and gas companies to make 6% of their product renewably. So electrolyzers at refineries are a great entry point for large-scale electrolysis."

Although the Refhyme electrolyser will be the largest PEM electrolyser in the world, it provides just 1% of the hydrogen to its host refinery. "They would need a gigawatt to decarbonise the hydrogen at that refinery and that is one refinery of one company. The market for green hydrogen at refineries [is huge]. If you only used 10% green hydrogen that is a €90bn market in electrolyser capital investment," says Cooley.

He cites figures from a Hydrogen Europe report. "The current demand – which is all brown hydrogen – is 400TWh/yr. That is equivalent to 150GW of electrolysis at a 50% load factor. Today industry is already using that much hydrogen. Hydrogen Europe estimates that will go to 2250TWh in 2050. That is 840GW of electrolysis at 50% load factor."

Cooley reflects on

the scale-up of an industry that is being built – like PV or battery storage – by mass replication of small modules. "We have gone from defining and building our first product in 2011 to 10MW products and that is three orders of magnitude in less than 10 years," says Cooley.

The company itself has also passed a watershed, Cooley explains: "In October of last year we raised £58.8m in investment and got a strategic investor in Linde, the largest speciality gas company in the world. It now owns 20% of ITM. We formed a 50:50 joint venture called ITM Linde Electrolysis [ILE] based in Dresden."

About £8m of the new funding is going towards fitting

where the Hornsea One offshore wind farm [rated at 1.2GW] is being connected and the power will also come from Hornsea Two [1.4GW] to that substation.

"So it is the perfect place to put a large electrolyser to connect direct to the offshore wind and decarbonise the refinery. That's the rationale: we have the end user, the renewable energy supplier and the EPC contractor and electrolyser supplier all in one project."

Down the cost curve

Cooley says there are just three drivers to reduce the cost of green hydrogen. The levelised cost of the electricity that goes in is the most important thing – and that is driven by reductions in the renewable

Part of the Gigastack investment will fund semi-automation in the factory, which will also reduce costs.

Cooley thinks stepping up electrolyser module size from 2MW to 5MW "is about where we should be for plants up to about 500MW".

ILE has begun a second project with Ørsted, investigating whether an electrolyser could be placed inside the tower of an offshore wind turbine, producing hydrogen which could be piped ashore. Ørsted says hydrogen pipework would be cheaper to fabricate and install than laying power cable (see article, this issue, about the risks of offshore cable connections).

Cooley says that although some of the partners are the

“ They would need a gigawatt to decarbonise the hydrogen at that refinery and that is one refinery of one company. The market for green hydrogen at refineries [is huge]. If you only used 10% green hydrogen that is a €90bn market in electrolyser capital investment

out a new factory making ITM's 'PEM' electrolysers. Its output in terms of electrolysis will be 1GW/yr.

"It's the biggest in the world and it is in the UK, in Sheffield," says Cooley.

Construction is under way and it was originally due to start up in August, but he says: "It was delayed by the pandemic and we are now saying it will be in November."

From mega to giga

The next step up for the partners is a Humberside project called Gigastack, where ITM Linde Electrolysis is doing a feed study on a 100MW plant and jointly with Ørsted and Phillips 66.

Why Humberside? Cooley says: "It is the most carbonising industrial cluster in the UK. Also the main substation in Humberside – right next to Phillips 66 – is

energy price. The other two issues are the capital cost of the electrolyser and the electrolyser load factor. Modularisation should allow electrolysis to get green hydrogen down the cost curve as fast as possible.

The Immingham project is using the same 2MW modules as Refhyme, to be fabricated in the new Sheffield factory, but Cooley describes them as 'third generation'. The fourth generation – also being funded by Gigastack – will step up from a 2MW to a 5MW module.

I ask whether there are risks in scaling up a successful module design – large battery installations, for example, simply stack tiny units. Cooley says the risk is outweighed by the cost reduction opportunity: "What it does is decrease the cost of installation and balance of plant, as well as the cost of electrolysis. The number of interconnections, bus bars, pipes, connections and sensors you need is vastly reduced."

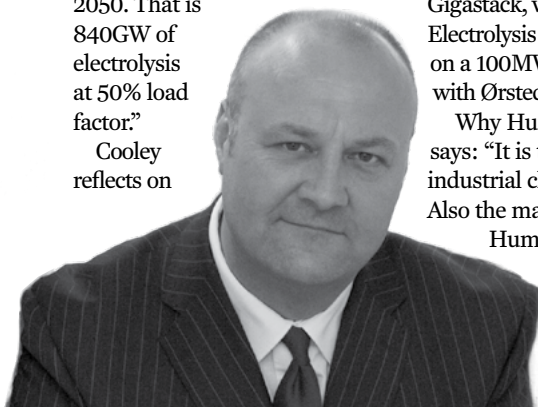
same, "doing anything with electrolysers offshore is years off". The hydrogen turbine tower is a development project "but Giga Stack is a real deployment project", he insists.

Going green

With hydrogen firmly on the future energy roadmap, there are competing options for its supply. The jargon dubs hydrogen produced by electrolysis as 'green'.

The so-called 'blue' option would see hydrogen produced from methane via steam reforming, with carbon dioxide as a by-product that has to be dealt with using carbon capture and storage (CCS).

Half the technology – steam reforming – is in common use. CCS has been regarded as a necessary technology for years but making it work on an industrial scale in the UK has proved problematic. Energy minister Kwasi Kwarteng implied in his May remarks »



Graham Cooley

ITM is installing a 10MW hydrogen electrolyser at the Shell Rhineland Refinery in Wesseling, Germany

« that blue hydrogen was an ambitious option, available “once we have landed carbon capture and storage”.

More CCS funding was promised in the Budget and Kwarteng said: “We have committed to it twice [with funds, now reallocated, for demonstration projects]... It’s not a promise we can easily climb down from and I expect to see progress.”

But Cooley says that blue hydrogen is the wrong direction. “It captures a certain amount of carbon but it retains a big infrastructure and it retains the existing methane infrastructure. And that infrastructure leaks – small [methane] leaks eliminate the advantage of using hydrogen.” CCS also requires financing for carbon dioxide transport

Also CCS requires huge investment before the first installation. “To do a CCS project you have to spend billions. You have to spend hundreds of millions just doing the FEED study. With electrolysis you can start with tens of megawatts and build up to hundreds of megawatts because it is modular. You can incrementally introduce green hydrogen, whereas with blue hydrogen you have to introduce a very large scheme,” Cooley says.

“The point about that is that the amount of risk you take on

is very high. When you go down the cost curve, the technology that you pick becomes a self-fulfilling prophecy. So the important thing for the UK government is to invest in green hydrogen from day one. And the reason you invest in green hydrogen to go down the cost curve is that it is the net zero solution. You have to start where you want to end up.”

I compare this to the huge investment of time and expertise, long development time and high cost hurdle, that makes a nuclear project so hard to deliver even if it will result in an equally huge amount of capacity. In that case, more PV capacity was installed and the technology cost fell dramatically, because it could be done in tiny increments with low barriers.

It is no surprise that Cooley likes the analogy. He adds: “On nuclear, we signed a long-term contract at 93p/kWh and when the contract was compared to renewables?”

The price quickly looked unwarranted. “The reason was that they did not look at the way cost reduction is accelerating for renewable power. They looked at it as a snapshot and it only took five years for everyone to say: ‘We told you so.’”

Looking at the cost curve for green hydrogen Cooley says: “In

the long term, the very long run EU target price for electrolysis is €400/kWh. We will achieve that in the mid 2020s. In the last three years we have halved the cost of our electrolysers and we now sell at €0.8M/MW if it is over 10MW. That is achieved by the new [5MW] stack and by volume through the factory.”

He says with a 50% load factor at Hornsea, Ørsted will be able to produce hydrogen at the Immingham for 4p/kWh. And he believes that a pathway to get to lower cost than methane “is very achievable: it requires further reduction in the capital cost of the electrolyser, a high load factor and low cost renewables. If you get these together, the Hydrogen Council says the lowest cost energy gas will be green hydrogen.”

Tri-market

With industrial hydrogen use taking centre stage, where does that leave ITM’s original automotive interest? The low-carbon transport offering remains – government has firmly announced the end for new fossil-fuelled vehicles and the debate is over when that will be achieved. While pure electric vehicles are expected to take the lion’s share of the transport market, hydrogen is viewed as an important solution for heavy haulage, trains etc.

The company has responded

by restructuring and setting up a new division, ITM Motive, to be “driven to profitability”. Cooley says: “Heavy goods, buses, trains are great applications for hydrogen. They always go back to the same places to refuel, they value payload, they value long range and being refuelled quickly.”

He explains how the markets work together: “The demand centre is the existing uses of hydrogen – ie industry. If you are decarbonising a large industrial process with a big electrolyser you can also use some of that for transport, which is a high-value application. So you can combine a high-value application with a high-volume application and you have the high-volume one taking the main volume and then take some of the hydrogen for a high-value application.”

A third potential market lies in replacing methane in the existing gas distribution networks. That’s a language change, Cooley says: “The UK government needs to give a level playing field between green hydrogen and biomethane. We don’t have an incentive for hydrogen right now and there has to be some way to incentivise commercial companies to provide green hydrogen for the gas grid.”

But Cooley notes that with local electrolysis there is less need for a hydrogen transport infrastructure, because you can use the electricity grid: “You can put an electrolyser down by the customer, you don’t have to transport the hydrogen.” te

“The UK government needs to give a level playing field between green hydrogen and biomethane. We don’t have an incentive for hydrogen right now and there has to be some way to incentivise commercial companies to provide green hydrogen for the gas grid

This article first appeared in *Energy* sister publication *New Power Report*.

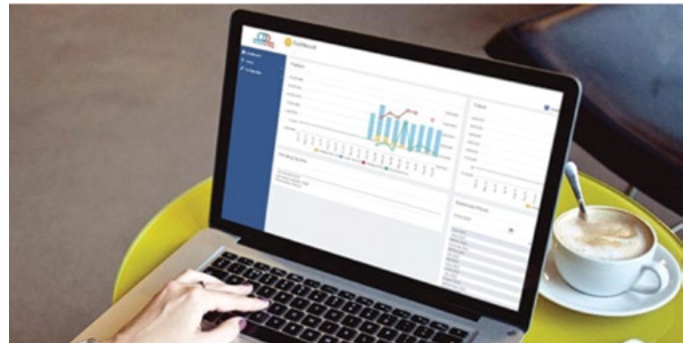
Self-serve flexible PPA platform

Marubeni-owned Smartest Energy claims its new self-serve trading portal helps unlock better value from flexible power purchase agreements (flexible PPAs).

Smartest Energy claims by digitising its flexible PPA product via the ‘SmartFlex’ portal, generators have greater control over how and when they sell their power. They can track the market and are able to trade with

a single click, instead of having to call the Hedging Desk to trade their volume.

It teamed up with Dutch firm Jules Energy to launch the self-serve platform. James Graham, VP sales and marketing, says: “This online trading platform has allowed us to start digitising our product offering so we can provide a better user experience for our customers, both on the generation and supply side. We’ve launched SmartFlex as part of our enhanced FlexiPPA product, with a view to gradually digitise all our flexible products. The real benefit for customers



is that they can self-serve.

“The platform will give them access to live pricing, position management tools and the ability to instantly transact online, everything they need to be able to react quickly to changing market

conditions. It will help them become more engaged in the wholesale market and ultimately create more value from their energy assets. Customers will still be able to access support from our team when they need it.”

Mandate hydrogen-ready boilers by 2025

Responding to the Hydrogen Taskforce’s report, Baxi is calling for £1bn of investment to prepare the UK for hydrogen production, distribution and storage at scale, which will be necessary if the UK is to develop a hydrogen future and meet net zero.

Baxi Heating head of external affairs, Jeff House, comments: “Baxi and others in the heating industry are preparing to deliver clean heating and play our part in tackling climate change. We now call on the government to match our commitment with a clear message that hydrogen is one of the key solutions to deliver net zero by committing £1bn towards readying the

UK for hydrogen in the upcoming Spending Review.”

He continued: “Hydrogen offers a straightforward and practical solution for the consumer and we urge government to prioritise it in its future plans.”

The Hydrogen Taskforce brings together 10 leading organisations at the heart of the current and future UK energy system to offer a shared vision of the role of hydrogen in the UK’s transition to net zero. The Taskforce has agreed a collective position on the next steps to ensure the UK capitalises on an opportunity to decarbonise heat which accounts for 37% of UK carbon emissions.

“I would like to see public trials in occupied buildings of 100% hydrogen heating both in the domestic and commercial settings,” says House.

“Given the current UK domestic gas boiler market is around 1.6 million units per year, a mandate that all boiler installations from 2025 are hydrogen-ready would mean that a significant proportion of the existing housing stock is prepared for a future changeover.”



LED Tubes for existing ballasts, require no rewiring



Goodlight has unveiled a brand-new range of Plug and Play T5 and T8 LED Tubes. Existing fluorescent tubes can now be upgraded to long-lasting, energy efficient LED lighting with Goodlight InstaFit Plug and Play LED Tubes that slot straight into existing fittings without rewiring or the need to remove the ballast. The Goodlight InstaFit Plug and Play LED Tube range works with all driver types including, HF, Electronic, Magnetic and direct to the mains.

These instant fit Plug and Play LED Tubes reduce installation time and eliminate maintenance overheads. With energy savings of up to 75% and maintenance costs all but eliminated, this range is suitable for any internal application including offices, commercial, display and retail, industrial, warehouses, cold storage and refrigeration, and amenity lighting.

Available in 2ft, 4ft and 5ft lengths, these new LED InstaFit Plug and Play Tubes are also offered in a range of colour temperatures including Daylight (6,000K), Natural (4,000K) and Warm (3,000K). The InstaFit T8 LED Tube is also a true LED retrofit replacement for the T10 and T12 fluorescent tubes as well. They deliver up to 150Lm/W output from their 140° beam angle, providing a wide, adequate spread of illumination and are protected to IP20. They are rated for 50,000 hours and supported by a 5-year guarantee.

The new InstaFit Plug and Play LED Tube range qualify for pay-as-you-save purchase through programmes such as the Bright Plan Funding Scheme, allowing businesses to fund the cost of a new LED lighting upgrade through monthly energy savings.

Who would you least like to share a lift with? I hear that when asked this question lots of people seem to say Noel Edmonds. However, I don't mind him. Personally, I wouldn't like to share a lift with anyone that talks too much and talks all about themselves. I am aware of the irony as I am writing this statement at the start of a Q&A all about me.

You're God for the day. What's the first thing you do? I have got a real big thing about pollution, specifically plastic. If we don't stop doing what we are doing, there will be more plastic in the sea than fish by 2050. Therefore the first job would be to remove the suggested 12 million tones of plastic currently in our oceans. If I had any time left after doing this, I would then turn my attention to stopping the Palm Oil producers responsible for endangering species such as orangutans.

If you could travel back in time to a period in history, what would it be? I've always liked the idea of 2,000 years ago, not necessarily Roman times per say but the beginning of buildings, forts, roads and baths. That time and that part of the world has always interested me, of course I would be a gladiator.

Who or what are you enjoying listening to? I've recently rediscovered the *Ricky Gervais Show* podcast, 15 years on from

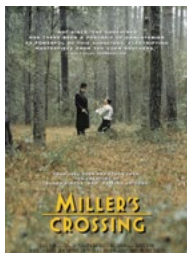
Louis McGarry

Centiel UK's sales and marketing director



when it was first released. It still makes me laugh today.

What unsolved mystery would you like the answers to? From the moon landing to twin towers to the latest COVID-19, everything seems to have a conspiracy theory attached to it and an associated unsolved mystery. For me, I want the simplest thing in life to be explained. For example: although a cake and the biscuit are made from the same ingredients, why does a cake go hard and a biscuit go soft when left out? Answers on a postcard please.



What would you take to a desert island? I would take tins of Heinz Spaghetti. Not only is it one of your five a day but it is marketed as 'bringing smiles to mealtimes since 1926', so if I am stuck alone on a desert island, I'd have no reason to be unhappy.

What's your favourite film (or book)? My favourite film has to be *Miller's Crossing*, a Cohen Brothers' film. It is a story set during the prohibition in the 1920s, with complex romance, intense scenes and suspense. It has everything that you would want from a mobster film.

If you could perpetuate a myth about yourself, what would it be? If I had to perpetuate a myth, it would be that a couple of years ago when I applied for *MasterChef* I made it through to the production team interview stage. I was asked to leave, as the casting team had falsely heard that Rick Stein was my uncle and it would give me an unfair advantage.

What would your super power be and why? I have always wanted to be able to read minds, purely for my own curiosity and self-indulgence. People don't always tell you their honest opinion or desires. Just imagine how many problems you could solve quickly and easily if you knew everything?

What would you do with a million pounds? Many people know that I like nice watches and I enjoy cars. Think about the number of watches and cars I could buy for a million? That's a nice amount of quality items but how long would that million last? If it's given to me to spend, I will spend it, but wisely.

What's your greatest extravagance? I have a passion for watches. My hobby is researching, collecting and trading particular watches. Telling time is a given but their use in all walks of life – from deep sea diving to piloting aircrafts to combat – defines the true value of a watch.

If you were blessed with any talent, what would your dream job be and why? I have always wanted to play the guitar; how cool would it be to have that talent. I want to be able to play and entertain loads of people, I would not mind the lifestyle that goes along with it, too.

What is the best piece of advice you've ever been given? "I wouldn't do that if I were you". I hear this on a daily basis, as it is something that my wife says to me constantly. You would have thought that after so many years of



Just imagine how many problems you could solve quickly and easily if you knew everything?

being married I would have learnt my lesson by now.

What irritates you the most in life? Lateness, I can't bear it. There is no reason for it.

What should businesses be doing to help themselves energy-wise? With joined up thinking between designers, suppliers and end users we can ensure the most efficient solutions are delivered and with TCO calculations, suppliers can help you to optimise these solutions to reduce energy usage.



What's the best thing - work wise - that you did recently? The critical power industry allows me to be involved in some very interesting and fulfilling projects with some fantastic people. Recently, my team delivered a 7.2MW UPS solution to a critical facility as part of a five-week programme of works. For me personally, this is one of the largest projects that I have not only sold but had the pleasure of leading. The most impressive part of this project wasn't just the size of the systems and the short time scales, it was about how we delivered as a team, working in an intense environment, pulling together to make it happen. **te**

Pic: Universal Studios and Dreamworks LLC



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