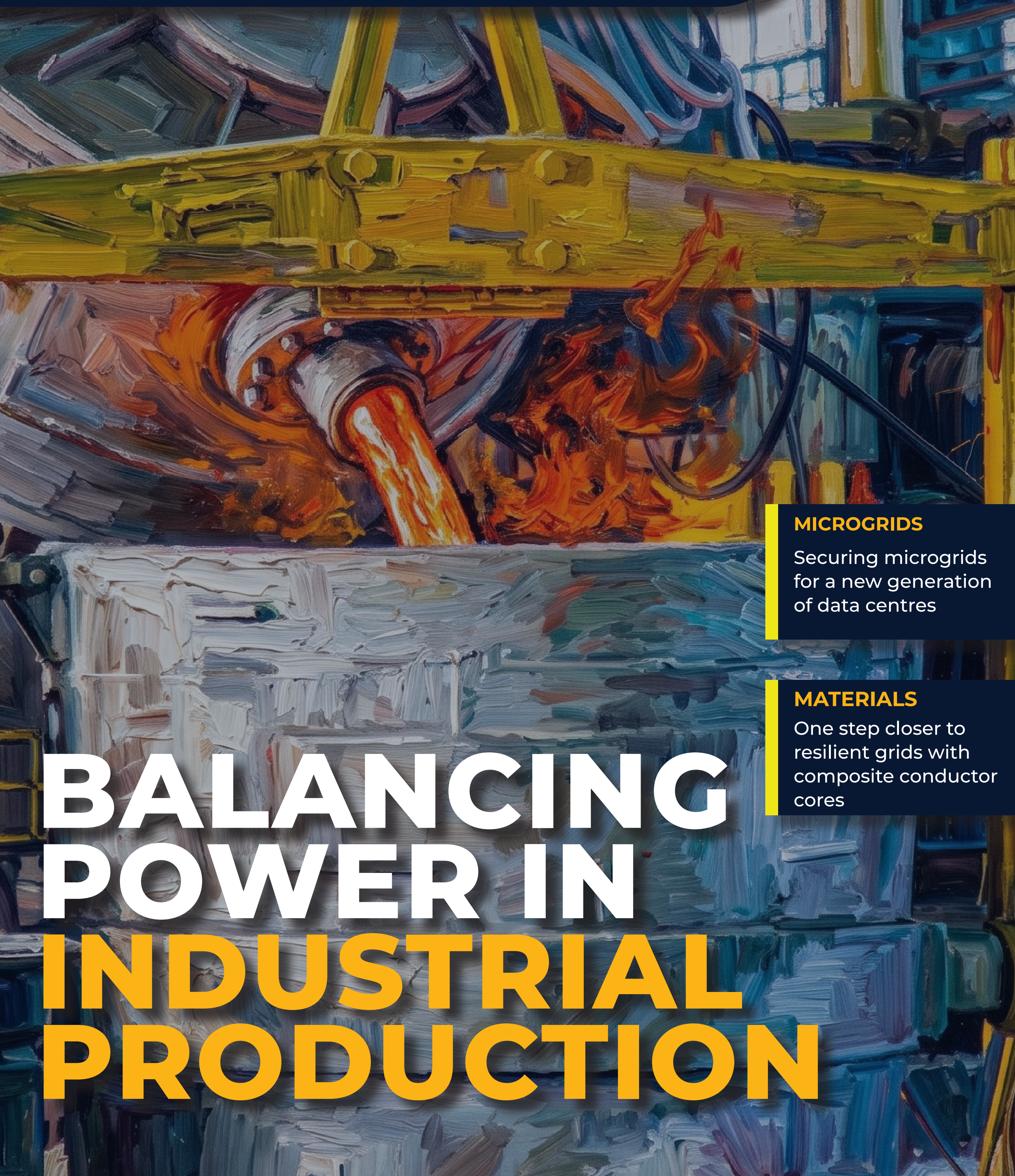
Issue 3 2026

IN POWER



MICROGRIDS

Securing microgrids for a new generation of data centres

MATERIALS

One step closer to resilient grids with composite conductor cores

BALANCING POWER IN INDUSTRIAL PRODUCTION

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INTRODUCTION

As we enter the — in theory — quieter period of summer and take moments to pause, relax, unwind and possibly reflect on things, it's not difficult to imagine that many within the industry will still have a nagging dilemma at the back of their mind.

Power sector debate has spent years circling generation targets, yet it unavoidably evident that the greater challenge is ensuring that networks, markets, and supply chains can keep pace with the capacity now being built.

The UK has just posted a record quarter for renewables: 53.1% of generation, with wind alone overtaking gas. Meanwhile, NESO's reworked connections process issued offers to more than 700 projects representing around 37GW. Those figures suggest momentum, but connection offers alone do not deliver transformers, cables, substations, planning consent, or the skilled workforce required to turn paper capacity into dependable infrastructure.

At the same time, demand is shifting faster than many system forecasts anticipated, as transport and industry electrify and data centres emerge as major loads. We can see in this issue some of the transformations taking place in industry and data centres. It's all in all a time of great change and greater pressure.

The IEA expects global electricity demand to rise by 3.6% a year through 2030, even as grid queues, equipment shortages, and long project lead times tighten across the sector.

Generation records will count for little unless power can move when and where it is needed. That isn't new information to any electrical engineer or executive; but it is information that is likely to stick with them through the summer holiday period.

Still, we have to unwind as best we can. Much like with the physical grid infrastructure, being tired and worn down is no good for anybody.

This issue is a lighter read — let's take five for summer and regroup.

— Jon Hughes, **Editor**

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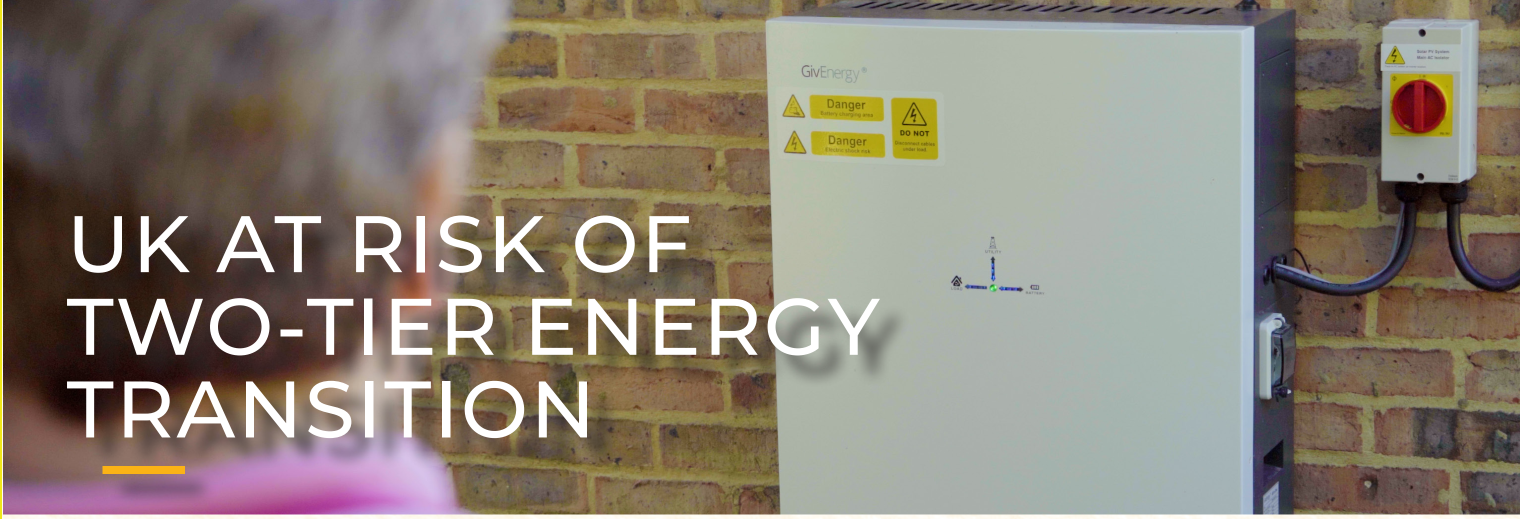


UK AT RISK OF TWO-TIER ENERGY TRANSITION

The UK could create a “two-tier” energy transition unless cleaner, smarter home technologies become affordable to more households, according to a report from **E.ON** and the **Purpose Coalition**.

Powering Fairer Energy: Breaking Down Barriers argues that the transition will increasingly be judged by whether it can deliver permanent reductions in household bills, rather than benefits limited to consumers able to fund energy-saving equipment upfront.

Polling commissioned by E.ON found that 91% of households feel under financial pressure from energy bills, while 59% would prefer long-term cost security measures to short-term support. Nearly two-thirds said high energy costs were affecting their quality of life.

The research also identified concerns over fairness. Seven in ten respondents said it was unfair that some households can access technologies that reduce bills while others cannot. Awareness of home battery technology remains limited, with 73% unaware that batteries can cut energy costs without being paired with solar panels.

Chris Norbury, chief executive of E.ON UK, said households wanted “lasting change and more control over how and when they use energy”, warning that those most in need risk being excluded from technologies capable of lowering bills over the long term.

E.ON is calling for wider access to batteries, flexible tariffs, and smart energy systems, supported by investment in homes and local energy infrastructure. The company said its programmes had reduced bills by £250 on average, while also easing network pressure and improving energy security.

Projects include free batteries for households in Coventry, Starbeck, Crowle, and Glasgow, alongside a new-build proposition integrating solar, battery storage, and smart controls.

The report concludes that affordability, inclusion, and system flexibility must be treated as core infrastructure priorities. Without broader access to these technologies, the benefits of electrification risk remaining concentrated among households already best placed to invest..

VIRTUS INSTALLS SUPER-GRID TRANSFORMERS AT WUSTERMARK

VIRTUS Data Centres has installed two 185MVA super-grid transformers at its Wustermark campus in Brandenburg, marking a major step in the development of the 300MW facility.

The transformers are among the largest deployed at a European data centre and will support the campus' planned connection to the 380kV transmission network. VIRTUS said Wustermark will become the first data centre campus in the Berlin-Brandenburg region to operate as a closed distribution network and connect at this voltage.

Power will be supplied through a dedicated 500MW substation with dual links to the 50Hertz grid. The architecture is intended to provide high resilience, lower transmission losses, and greater electrical efficiency for power-intensive AI workloads.

The site will retain diesel generator capacity, but customers will also be able to select a zero-generator configuration. VIRTUS said this could reduce carbon emissions, system usage charges, and long-term operating costs.

Mike Golding, senior vice-president of construction at VIRTUS Data Centres, said the project had been designed to provide “resilience and scalability” while supporting AI-scale growth and reducing reliance on backup generators.

GLAMOX TO LIGHT TENNET ONSHORE SUBSTATION

Glamox has secured a contract to supply 1,500 connected LED luminaires for the IJmuiden Ver Alpha onshore substation in Borssele, Zeeland, part of TenneT's 2GW offshore wind programme.

The facility is the first of eight planned Dutch land-based substations and will convert 525kV direct current from offshore wind farms into 380kV alternating current for transmission through the national high-voltage grid. Converting power to DC offshore reduces losses over long subsea cable routes before conversion back to AC on land.

SPIE Nederland will install the lighting package, which includes customised DALI-connected linear luminaires, explosion-proof fittings, emergency lighting, downlights, ceiling luminaires, wall lights, and exterior street lighting. Several products have been adapted to meet project-specific lux levels, environmental requirements, and certification standards.

The award extends Glamox's involvement in TenneT's programme following earlier contracts to provide connected marine lighting and control systems for 11 offshore HVDC converter platforms.

Deliveries will be made in six shipments through October 2026, with the substation expected to enter service in 2029.

Jeroen de Jonge, managing director of Glamox in the Netherlands, said the contract demonstrated the company's ability to support both offshore and onshore elements of large-scale renewable energy infrastructure.

ABB AND ØRSTED PUT AI ON TRIAL IN DENMARK POWER STATION

Ørsted is piloting an AI-based fault prediction system from ABB at Avedøre Power Station in Denmark to improve reliability and reduce the risk of unplanned outages.

The system analyses operational data already collected by the plant's protection relays and centralised control infrastructure, looking for subtle changes that could indicate developing electrical faults. Earlier warnings should allow maintenance teams to prioritise inspections, schedule interventions, and avoid disruptive downtime.

The pilot will be introduced alongside an ongoing relay replacement programme, giving Ørsted a phased route to test advanced analytics in live operations without adding significant complexity.

Søren Bagge Skou, sales manager at ABB Distribution Solutions in Denmark, said the technology gives operators "earlier warning and more time to act".

Michael Jeppesen, lead electrical systems specialist at Ørsted, commented: "If this pilot helps us act earlier on even one developing issue, it will be a strong proof point."

Avedøre supplies district heating to more than 215,000 homes and electricity equivalent to over 600,000 households. ABB will support site teams during the pilot's first year.

UNITED INFRASTRUCTURE JOINS £640M GRID FRAMEWORK

United Infrastructure has been appointed as one of eight delivery partners on National Grid UK's cable installation framework, which carries a potential value of up to £640 million.

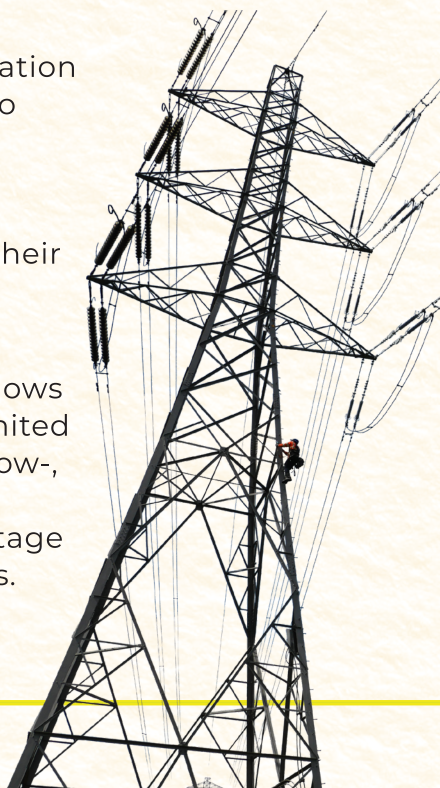
The agreement will support electricity infrastructure projects across National Grid's transmission, distribution, and UK operations, with work intended to strengthen network resilience and support the energy transition.

United Infrastructure will deliver cable installation for 66kV, 132kV, and lower-voltage circuits, together with jointing, testing, and commissioning services for National Grid Electricity Distribution projects.

The framework can also be used by National Grid Electricity Transmission, National Grid Ventures, and distribution businesses covering the East Midlands, West Midlands, South West, and South Wales.

Campbell Crawford, Managing Director Power T&D commented: "We're delighted to have been appointed to National Grid's new cable installation framework and to continue our long-standing relationship with NGED as one of their trusted delivery partners."

The award follows growth across United Infrastructure's low-, high-, and transmission-voltage power operations.

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SECURING MICROGRIDS FOR A NEW GENERATION OF DATA CENTRES

Rafael Narezzi, CEO, Centrii

Data centre capacity is undergoing unprecedented growth, driven by the demands of cloud services, AI and other power-hungry applications.

The UK alone hosts over 500 data centres, one of the highest concentrations in the world, with nearly 100 new projects in the pipeline. While cloud service providers like Amazon Web Services, Microsoft Azure and Google Cloud are investing billions of dollars in building new data centres across the US.

While this new generation of bigger, better data centres is being built, they are more power-hungry than ever before. But they are only as resilient as the power feeding them.

The sheer scale of expansion will significantly increase the risks to operational technology (OT) systems powering them, including generators, switchgear and energy management systems.

A single compromise could shut down onsite generation instantly, interrupting operations and resulting in a breach of service level agreements and compliance obligations. But downtime and disruption to services from an attack are the tip of the iceberg. Factor in financial and reputational loss, together with the insurance implications, and the consequences go very deep indeed.

POWERING RAPID DATA CENTRE GROWTH

As data centres transform from simple IT facilities into some of the biggest energy consumers, the question is where all of this power will come from.

Development decisions for new data centres increasingly revolve around renewable availability, prioritising sites where clean energy is already part of the grid mix or where they can easily add new solar and wind capacity. Some are developing on-site microgrids that pull on the combined power of renewable energy resources, such as wind and solar power and battery energy storage (BESS) to create partially self-sufficient campuses.

By becoming ‘prosumers’ – both energy producers and energy consumers – operators can accelerate their timelines and bring capacity online faster, directly connecting power generation to data centres. Analysis by the Centre for Net Zero suggests that renewable microgrids could meet around 80% of a large data centre’s constant annual electricity need.

This shift toward decentralised energy production and consumption promises greater flexibility, and a cleaner, cheaper alternative to traditional grid connections. But as systems become more distributed – and in turn more interconnected – the risk of cyberattacks grows.

INTEGRATION OF IT AND OT

As renewable energy sources become more deeply integrated into critical infrastructure, including data centres, growing reliance on digital control technologies may unintentionally increase the vulnerability of the very systems they underpin.

Data centres have traditionally focused their cybersecurity efforts on IT systems servers, networks, applications and user access. But as these facilities begin integrating renewable energy assets like solar panels, BESS and smart inverters, they are also inheriting a set of OT risks that are often less well understood.

Renewable energy systems are controlled through a range of OT protocols, including SCADA systems, PLCs and vendor-managed software platforms. These were never designed with modern cyber threats in mind. Many rely on outdated firmware, default passwords or unsecured remote access channels. Once integrated into a high-availability environment like a data centre, they become prime targets for attackers.

Further down the supply chain, the risks are often underestimated.

Turbines, solar inverters and battery components may come from international suppliers, sometimes involving firmware developed overseas. Without strong third-party risk assessments and firmware validation policies, operators unknowingly expose their infrastructure to embedded vulnerabilities.

Attackers gaining a foothold through a single vulnerable device can move laterally and take control of entire critical systems.

VISIBILITY: A MAJOR CHALLENGE

There is also the complexity of monitoring and defending hybrid IT and OT environments. Traditional security tools like firewalls and antivirus do little to detect anomalies in operational networks. Specialised tools for OT visibility are essential but often not deployed in digital infrastructure environments.

Visibility in this type of environment is not optional but integral. Without continuous, validated visibility into operational states, data centre operators are managing blind.

Data centre expansion combined with the development of renewable energy sources like microgrids is reshaping the digital landscape. For those building the next generation of data centres powered by renewables, this brings a new set of risks and responsibilities – and a new approach to cybersecurity.

WHY BEHIND-THE-METER SOLUTIONS ARE RESHAPING UK DEVELOPMENTS

Brian Loft, Director of Operations,
Leep Utilities

The UK's electricity infrastructure is undergoing a quiet but profound transformation, as developers across the country start to implement microgrids on projects from housing estates to electric vehicle charging hubs. These localised electricity networks are usually a combination of solar generation and battery storage, and increasingly, intelligent energy management.

We're seeing this shift accelerate month by month, driven by compelling economics and practical necessity.

Firstly, the retirement of older gas-powered combined heat and power (CHP) plants is removing a power generation option that many developments might have relied upon. Secondly, the electrification of heat is dramatically increasing power demands on sites, as heat pumps replace gas boilers. Thirdly, and perhaps most significantly, access to the national grid is severely constrained, with connection waiting times and capacity limitations forcing developers to look elsewhere for solutions.

The result is a rethinking of how we power new developments, with more developers looking to behind-the-meter solutions to reduce the cost of building their electricity networks. And it's a trend that will continue to grow as more developers recognise how microgrids can enable them to increase the viability or value of a site.

The financial case for microgrids has reached a tipping point. By generating and storing electricity on-site, developments can significantly reduce their reliance on the national grid. The potential cost savings of this approach are already recognised at a consumer level – solar panels generate power during the day, battery systems store excess capacity, and the stored power is used in preference to expensive grid power.

The principle remains the same for larger developments, but as the size of the development increases, so can the size and output of the microgrid. With the right planning, equipment and installation, microgrids make it possible to shrink the overall capacity of grid connection a development needs. This can reduce the overall cost of development, while also speeding up timescales currently affected by long grid connection wait times. This tactical use of microgrids can help developers meet increasingly stringent planning requirements, and achieve core business objectives around sustainability.

A good example of this is EV charging hubs, where we're seeing solar and battery elements becoming standard rather than optional. The financial viability of these sites improves dramatically when they can generate their own power and avoid costly grid reinforcement charges. For housing developments, the economics work similarly – a microgrid reduces both the developer's infrastructure costs, and residents' ongoing energy bills. Later savings can be sizeable, particularly for developments with substantial common areas, EV charging infrastructure, or heat pumps.

NEW CHALLENGES REQUIRE NEW THINKING

Although a welcome transformation, the use of microgrids brings challenges that the industry must address. Perhaps the most critical is safety. Utility companies have traditionally assumed that a site disconnected from mains supply is safe to work on. That assumption no longer holds. With battery storage and solar panels potentially continuing to generate and store power even when grid supply is isolated, work practices must evolve.

At Leep, we're updating our safety protocols to account for this new reality. Every site now requires a thorough assessment of behind-the-meter generation before work begins – our teams are being trained to identify and safely isolate all potential power sources, not just the grid connection. It's a significant shift in operations that needs to be adopted across the entire utilities sector.

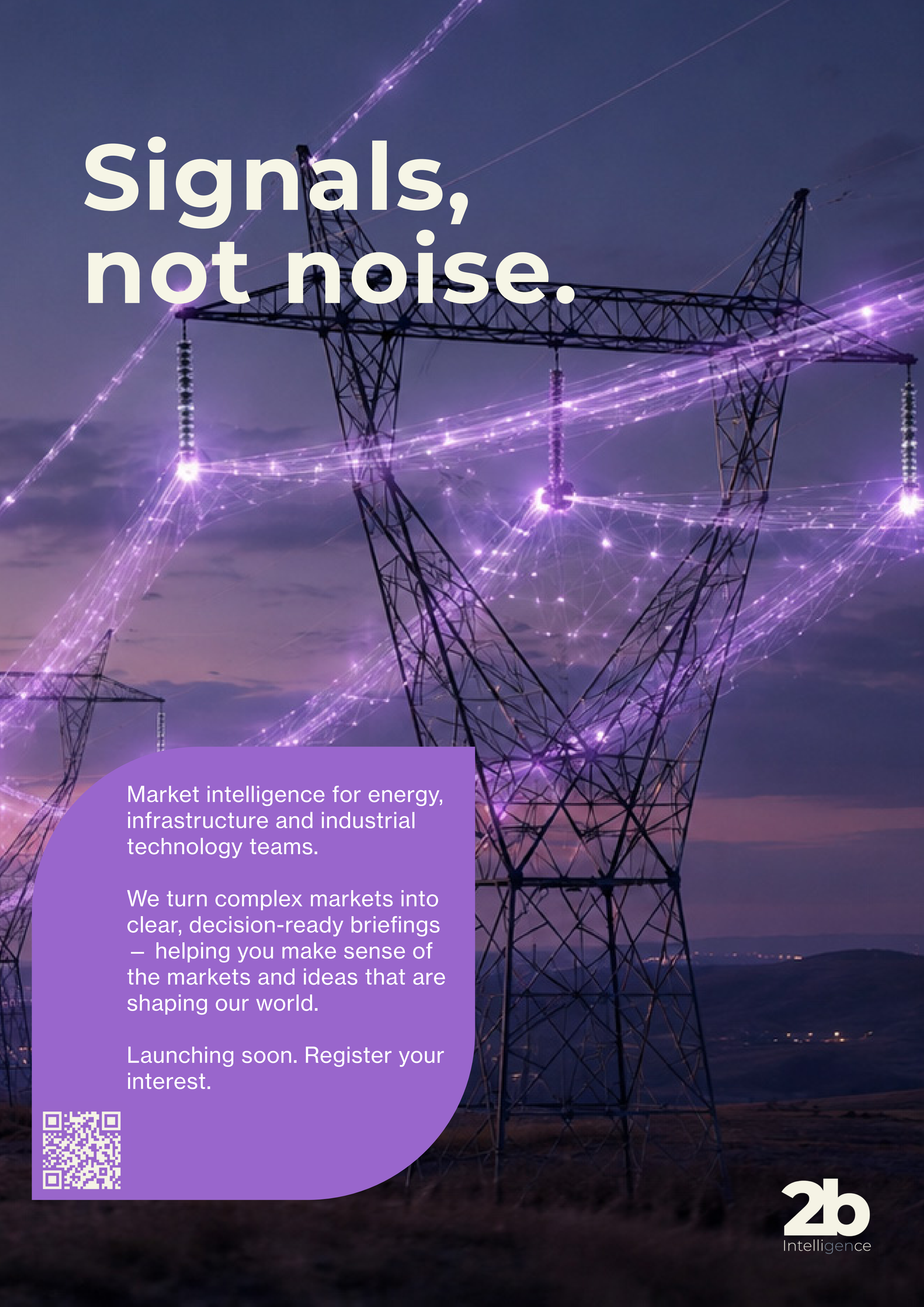
Monitoring presents another challenge. Networks need enhanced capabilities to track behind-the-meter generation, understand load patterns, and maintain system reliability. The traditional model of centralised grid management is giving way to a more distributed approach, where intelligence sits at the edge of the network as well as the centre.

THE IMPACT ON DEVELOPERS

For developers, microgrid solutions should be considered from the earliest stages of project planning, not retrofitted as an afterthought. The optimal configuration of solar capacity, battery storage and grid connection will depend heavily on the site's specific characteristics – the mix of residential and commercial space, the presence of EV charging, the building orientation, and local planning requirements.

For residents in these developments, the implications of microgrids are largely positive. Energy costs should be lower than in traditional developments, which is of great value in a time when electricity prices remain volatile. The infrastructure is typically managed by the IDNO or residents' management company, making it largely invisible to individual households. However, homeowners should understand that their energy system is more sophisticated than a simple grid connection. Maintenance requirements differ, and the presence of solar panels and batteries may affect ongoing maintenance and service charges. Transparency from developers about how these systems work and who maintains them will be crucial.

All this is true for more than residential projects – microgrids can also deliver significant benefits to commercial projects ranging from charging hubs, small commercial sites, or even an eHGV depot. In short, behind-the-meter solutions can often make viable a site that would otherwise face prohibitive grid connection costs or impossibly long waiting times. They can also help satisfy planning conditions around sustainability and carbon reduction. As grid constraints worsen, we expect these solutions to transition from a competitive advantage to basic necessity for many developments.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LOOKING AHEAD

The microgrid trend reflects a broader shift toward decentralisation in energy systems. As renewable generation becomes cheaper, battery technology improves, and grid constraints persist, the logic of generating and storing power close to where it's consumed becomes clear. We're moving towards a hybrid model where local generation and storage work in partnership with the wider network.

For the utilities sector, this requires adaptation. Our infrastructure designs, work practices, monitoring systems and commercial models all need to evolve. At Leep Utilities, we're embracing this change, working with developers to design and implement microgrid solutions that deliver reliability, sustainability and value.

ONE STEP CLOSER TO RESILIENT GRIDS WITH COMPOSITE CONDUCTOR CORES

Heini Kloster, Product Manager, Exel Composites

In the quest for a more sustainable and efficient power grid, technologies are being developed to support the on-going energy transition and grid modernization, such as the use of PMC cores in overhead line (OHL) conductors. These cores offer a higher strength-to-weight ratio and lower thermal expansion rate than traditional steel-cores used in aluminum conductor steel reinforced (ACSR) conductors. This way they increase transmission capacity and reduce energy losses, helping grids operate more efficiently without costly upgrades.

PMC conductor cores come in two main types: single-wire and multi-wire. The first generation single-wire core often uses a hybrid structure, a carbon fiber core coated with glass fiber. While these have been on the market for some time, they are relatively inflexible and more prone to damage if mishandled. That's why the second-generation multi-wire cores have several small rods stranded together. This design provides greater flexibility and safety, as no single wire carries the entire load of the line. Its flexibility closely matches that of traditional ACSR conductors, making damage during installation or handling highly unlikely.

The multi-wire structure of the conductor core ensures that, even if there is an individual damaged strand inside the core, the conductor and the electrical line still stay intact. This event was the object of a study published by CIGRE in May 2025, carried out in collaboration with Exel Composites and De Angeli Prodotti titled, "Influence of Broken Wire on Multistrand Core". The research, commissioned by Belgium's transmission system operator ELIA, examined how individual wire damage affects overall conductor performance.

To simulate real-world defects, a single wire was intentionally damaged using transverse compression, reducing its tensile strength by around 30 per cent. 6+1 wires were then stranded to form a multi-wire core, which was put through tensile testing to break the pre-damaged wire and see how it affects the rest of the core. The results clearly demonstrate that, even with a broken wire, the core maintained strength above the specified minimum, and no damage occurred to the surrounding wires. This demonstrates the high residual strength and reliability of multi-wire PMC cores in practical use.

Another study published by CIGRE late last year tested the resilience of conductor cores in real-world scenarios. Titled “From Single to Multistrand Carbon Core Conductors: A Deep Dive into the advanced PMC HTLS Conductors”, the study focused on the flexibility of single- and multi-wire composite cores. To stimulate damage during installation, the multi-wire core was bent on a very tight radius. Tensile strength remained very high even after the core was bent over safety limits, showing that the bending radius of a multi-wire core is well below the minimum set for the ACSR, making the conductor behavior more dependent on the overall conductor structure than of just the core.

IMPLICATIONS FOR THE POWER GRID

These studies demonstrate that PMC multi-wire cores maintain their structural integrity even under rough handling or if individual strands are damaged. This reliability ensures safe, consistent performance when deployed in overhead lines, giving TSOs confidence in using these next-generation conductors.

The research also provides valuable insights into the mechanical behavior of multi-wire PMC cores, reinforcing their robustness and suitability for modern grids. We, and the conductor manufacturers we work with, are eager to share these findings with the industry and continue supporting TSOs in strengthening transmission networks while meeting growing demand efficiently.

As electricity demands rise and grids are pushed to their limits and transmission operators are tasked with finding solutions, PMC multi-wire core conductors offer a proven, resilient option. With high strength, flexibility, and the ability to retain performance even when individual strands are damaged, these next-generation conductors give operators confidence in modern transmission networks.

BALANCING POWER IN ELECTRIFIED METALS PRODUCTION

Frederik Esterhuizen, Global Business Line Manager for Metals & Power Conversion, ABB

Metals producers are under pressure to automate, decarbonise and digitalise, but none of these priorities can be separated from the basic requirement to keep the plant running. The steel industry, for example, still accounts for roughly 11% of global CO2 emissions, but faces pressure to improve energy intensity while maintaining output.

In response to mounting decarbonisation pressure, the metals industry is becoming more electrified. Electric arc furnace production accounts for 29% of global crude steel output, according to World Steel Association, and the share is far higher in markets such as Italy and the United States.

Yet power quality, a less visible but still significant player in steel and aluminium processing, is emerging as a determinant of success for these investments. Steel and aluminium production will remain high-energy, high-consequence operating environments where a process interruption is rarely just an electrical event. It can cause production loss, safety exposure, and commercial challenges.

This creates practical tension. Electrification is central to many lower-carbon metals pathways, but it is not simply a matter of replacing one energy source with another. In metals, it means connecting highly dynamic, high-power consuming processes to electrical networks that may already be constrained, variable, or subject to tighter grid requirements.

WHEN ELECTRICAL INSTABILITY BECOMES A PRODUCTION PROBLEM

For a metals plant, power quality is a core element of process stability – with reliability, availability, and compliance becoming just as important as efficiency.

Poor power quality can appear as nuisance trips, voltage dips, unexplained stoppages, unstable furnace operation, higher wear on equipment, flicker complaints, harmonic distortion, transformer stress or variability in downstream quality. Operators may first see the symptoms in the process, not in the electrical room. That is what makes it critical.

Systems need to supply electricity but also actively stabilise it, especially in dynamic industrial environments, to enable reliable and high performing outputs. This is especially critical in metals processing where high-powered machinery like electric arc furnaces and rolling mills place extreme stress on electrical networks.

Poor power standard is not an abstract compliance issue. A rolling mill can experience speed instability, for example, but often remain unnoticed in normal operations because they are managed in the background. However, with dynamic loads, constrained grids and rising electrification, disturbances like voltage dips or harmonics can cause instability, control issues and downtime, making power increasingly important as process tolerances become stricter.

The problem is becoming more acute because metals plants are being asked to do two things at once. They must become more precise internally, through automation, digital control and tighter process windows, while maintaining operational stability as external energy conditions become less predictable. As electrification scales, the interface between the grid and the process becomes a control point in its own right.

THE IMPACT OF POOR POWER QUALITY

The strongest energy strategies start before equipment selection. They begin with the operating profile of the plant: load dynamics, grid strength, expected disturbances, required ride-through capability, harmonic limits, flicker constraints, maintenance philosophy and the metallurgical process being served.

A brownfield electric arc furnace conversion, a new mini mill, an aluminium potline and an electrowinning operation will not have the same electrical risk profile. Treating them as standard electrical packages is where problems begin.

The industry sometimes talks about electrification as a primarily a process decision – but is not. It is a system decision, meaning power and process must be engineered together.

A power quality solution that looks strong on paper but is difficult to maintain, hard to restore or poorly integrated with the process control philosophy will not solve the

operational problem. In energy-intensive metals environments, availability often matters more than marginal efficiency gains – and the best system is not always the most efficient one.

The commercial risk is straightforward. If the plant cannot stay connected, stable and compliant, investments in upgrades will not deliver the business case promised. Digital tools can improve visibility, but they cannot compensate for an unstable electrical foundation. Automation can tighten control, but it relies on dependable energy. Electrified production can reduce emissions exposure but only if it protects availability.

That is why power quality should be treated as part of process stability, not as an electrical afterthought.

BUILDING STABILITY INTO ELECTRIFIED OPERATIONS

Treating power quality as part of process stability means integrating it into plant design, operations and transformation planning from the outset, not addressing it only after disturbances occur. In practice, this requires metals producers to evaluate how dynamic loads, automation systems, power conversion equipment and grid conditions interact under real operating conditions.

For many producers, this includes improving ride-through capability for critical processes, strengthening integration between power and automation systems, monitoring harmonics, voltage stability and network disturbances in real time, and designing systems around maintainability and recovery time rather than efficiency alone.

As these environments become more complex, many metals producers are working more closely with technology partners that can integrate power quality, automation and process expertise into a single operational strategy. Technology partners that understand both the electrical and process dimensions of metals production can help producers design systems that are resilient and capable of supporting long-term electrification and digitalsation strategies.

POWER QUALITY AS A PRODUCTION STRATEGY

For decision makers, the practical questions are changing. It is no longer enough to ask how much energy a plant needs, but how that energy performs under real operating conditions.

As electrification scales, power quality becomes inseparable from production performance. The challenge is not only managing dynamic loads and grid compliance, but ensuring power conversion, automation and protection systems are fully integrated, maintainable and engineered to support reliable operations over decades.

Poor power quality is no longer an electrical detail sitting behind modern metals production. It is one of the key factors that determines whether electrification and automation can deliver stable and reliable output in real operating conditions.


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