DCS DATACENTRE SOLUTIONS

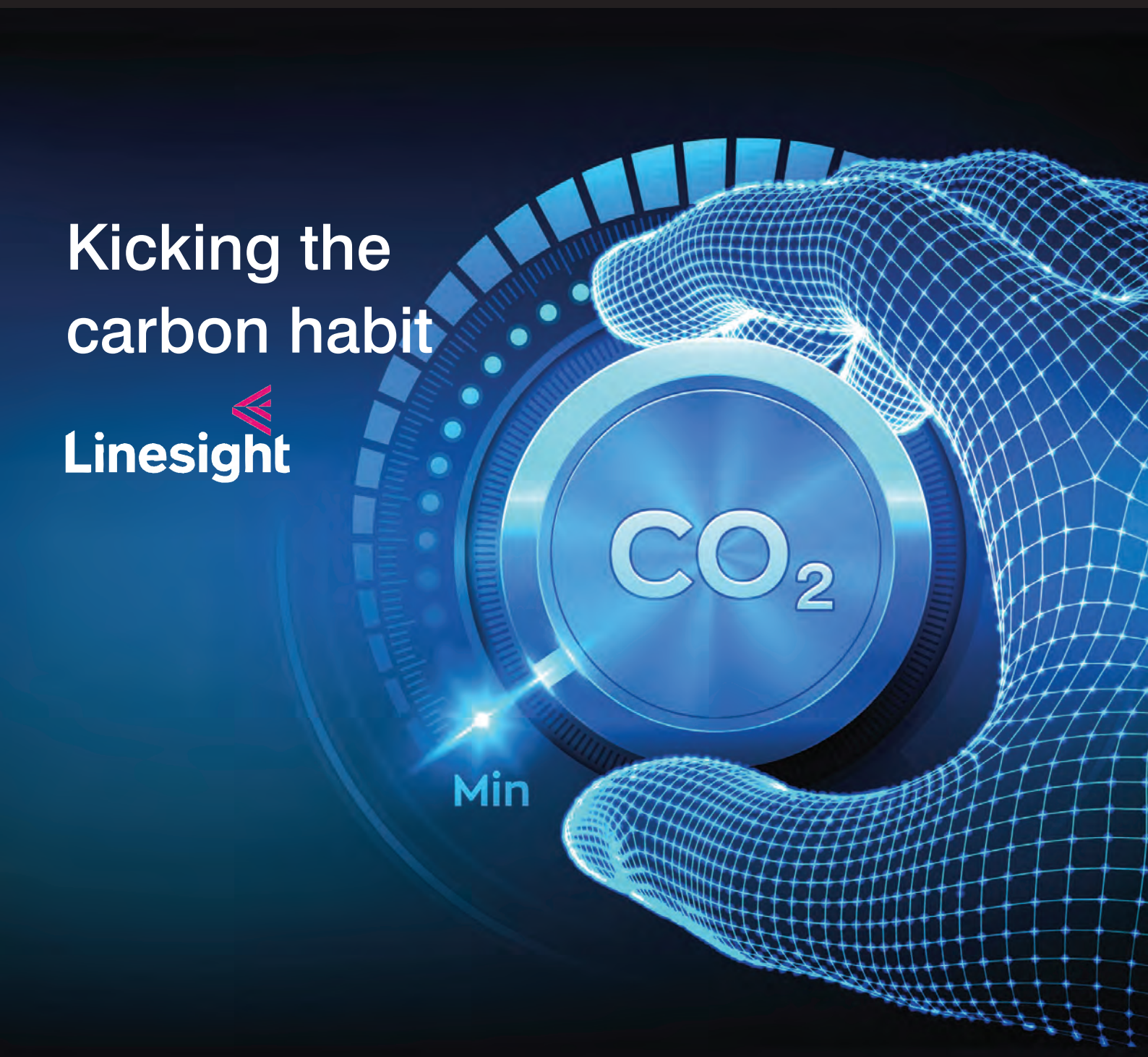
Developing digital infrastructure in a hybrid world

ISSUE IV 2021

https://datacentre.solutions

Kicking the carbon habit

Linesight



AI + Automation | Architecture + Connectivity | Cloud + Managed Services
Colocation + Hosting | Design + Infrastructure | Energy Optimisation
Management + Maintenance | Physical Security | Power + Cooling

GF Piping Systems

Leading edge piping systems for data center mission critical coolingling

Highly efficient, safe and fast

Benefits

- 25% better energy efficiency
- 100% corrosion free
- Off-site fabrication with bespoke engineer

GFDO_AD_00054_EN (02.21)

In today's digital world, data centers are an essential part of our infrastructure, that suffers from an increasing pressure to build quicker, achieve higher levels of energy efficiency, and avoid downtimes during their operations. For that, it's required mission-critical cooling plants where the equipment and piping must be highly reliable and as energy efficient as possible, but also fast in its installation. But, can plastic pipes be used in a data center? What added-value do they bring? Which applications and where? The Data Center green and brownfield market are under increasing pressure, and no risk should be taken. The Swiss company GF Piping Systems provides leading-edge piping systems for reliable mission-critical cooling. Their range of leading-edge plastic piping systems, which can be used for numerous applications in data centers, cater to these high demands of the industry, offering significant advantages during commissioning and operation.

Mark Stuart
Sales Director Data Centers Europe

Ebnatstrasse 111
8201 Schaffhausen / Switzerland
Phone +44 78 03 242 931
mark.stuart@georgfischer.com

For more information about innovative cooling solutions, calculation tools and other valuable technical data to key engineering questions, sign up in our Data Center dedicated Portal:
data-center.gfps.com

Editor's View

By Phil Alsop

COP out?!

I'M NOT SURE what any of us expected from the COP26 Summit, but I suspect many, if not all of us, are left slightly confused by the outcome. Those who think we have only a handful of years left to address the challenges of climate change will be convinced that Glasgow witnessed the merest tinkering of a few deckchairs, as the Titanic heads inexorably to the iceberg (although the iceberg might melt before the ship arrives!!); those who are still convinced that the whole environmental lobby is nothing more than a minor irritant in the march of progress (with progress being defined as rampant consumerism + capitalism) will be annoyed that some significant initiatives were announced; and the many in the middle, who kind of think that being green does matter, but still think that driving a car and flying off on holiday a couple of times a year, pandemic permitting, is acceptable, not sure what to make of the whole 'circus'.

It seems safe to say that sustainability has risen up the corporate agenda significantly, and that the data centre industry, like every other, will have questions to answer from customers who are keen to put their own houses in environmental order. And I think we can say that there's a very real ambition from many organisations to move beyond the rather crude greenwashing we've seen over the past few years, to actually make some radical changes to reduce their carbon footprint. I'm not convinced that the phrase 'Net Zero' is that helpful, in the sense that it seems to have been hijacked by anyone and everyone as their stated objective, often without any real, concrete roadmap for getting there. Furthermore, it would seem that the definition of Net Zero is somewhat elastic and, thus, open to abuse.

The good news is that the data centre industry continues to innovate to improve its environmental performance. It remains to be seen just how quickly, and radically, further changes will be implemented. For example, depending on the application, it would seem sensible, if not logical, to build many of the new data centres required to support the global digital explosion in regions of the world where the temperatures are low, and the renewable energy resources are plentiful. That doesn't seem to be happening as yet. The continuing wisdom seems to be: 'xx location needs more data centre capacity, let's build it right by xx location'. But, as the Cloud has demonstrated, for many individuals and businesses, it really doesn't matter where our IT infrastructure and applications reside, so long as they meet our expectations, and those of our customers.

Then again, once edge applications start to increase as predicted, there's going to be many more local data centres, in all kinds of climates, requiring all kind of power resources… No one ever said this climate change problem was easy to solve, but the next few years will show whether there's the will to do so, or if the majority will continue with the collective shoulder shrugging, so long as it's not their homes or local environments which end up under water, or suffering interminable droughts.

Contents

ISSUE IV 2021

The data centre trade association

DCA News

Angel BUSINESS COMMUNICATIONS

Editor Philip Alsop	philip.alsop@angelbc.com	+44 (0)7786 084559
Sales Manager Peter Davies	peter.davies@angelbc.com	+44 (0)2476 718970
Sales Executive Jessica Harrison	jessica.harrison@angelbc.com	+44 (0)2476 718970
Director of Logistics Sharon Cowley	sharon.cowley@angelbc.com	+44 (0)1923 690200
Design & Production Manager Mitch Gaynor	mitch.gaynor@angelbc.com	+44 (0)1923 690214
Publisher Jackie Cannon	jackie.cannon@angelbc.com	+44 (0)1923 690215
Circulation & Subscriptions	circ@angelbc.com	+44 (0)2476 718970

Directors
Chairman Stephen Whitehurst
CEO Sukhi Bhadal
CTO Scott Adams

Published by Angel Business Communications Ltd, 6 Bow Court, Burnsall Road, Coventry CV5 6SP
T: +44 (0)2476 718970 **E:** info@angelbc.com **W:** wwww.angelbc.com

Datacentre Solutions is published 4 times a year on a controlled circulation basis in Europe, Middle East and Africa only. Subscription rates on request. All information herein is believed to be correct at time of going to press. The publisher does not accept responsibility for any errors and omissions. The views expressed in this publication are not necessarily those of the publisher. Every effort has been made to obtain copyright permission for the material contained in this publication. Angel Business Communications Ltd will be happy to acknowledge any copyright oversights in a subsequent issue of the publication. Angel Business Communications Ltd.

The paper used within this magazine is produced by chain of custody certified manufacturers, guaranteeing sustainable sourcing. ISSN 2756-1143 (Online)

Skills and materials struggle to keep pace with data centre demand

GLOBAL SURVEY points to sustained demand through 2021/22, but also headwinds for the sector as global material and labour shortages cause delays and price volatility.

Global material shortages are causing delays to data centre construction and escalating costs in the face of rapidly accelerating demand, according to research from global professional services company Turner & Townsend.

The Data Centre Cost Index 2021 reveals the rising costs of constructing data centres across global markets. 84 percent of participants to the business' global survey reported that they are experiencing skills shortages for experienced data centre construction teams – indicating the ongoing challenges of ensuring supply can meet demand.

The research analyses construction input costs – including labour and materials – across 44 key markets, alongside industry sentiment and insight from a survey of over 200 data centre professionals. This year, Tokyo moved to first place as the most expensive market for data centre construction at $12.50 per watt, ahead of last year's top market Zurich (now $12.0 per watt).

In the US, Silicon Valley and New Jersey remained tied in third place, with the cost rising to $10.30/w this year compared to $9.80 last year. Portland joined the expanding list of markets in the US, placing tenth at $9.20/w.

The 2021 report included four new markets, reflecting growing investor appetite to meet demand for capacity outside traditional priority regions. In their first year in the index, Montevideo ($7.60/w) and Bogota ($6.30/w) ranked ahead of other key locations in developing nations such as Mumbai, Chennai, Shanghai and Beijing. Latin America continues to emerge as a market of rising interest to data centre investors looking for new sources of opportunity. This is also true of Africa, where Nairobi ($7.0/w) moved up the index reflecting a growing buoyancy in African locations.

By comparison, the mature FLAPD markets (Frankfurt, London, Amsterdam, Paris and Dublin) saw prices stabilise or fall. With the complexity of post-Brexit work permit regulations, combined with the uncertainty of COVID-19 travel restrictions, competition for data centre projects in the UK for the established supply chain is fierce. London moved down seven places from last year, with construction costs per watt remaining stable at $9.10/w.

Frankfurt, Amsterdam and Paris all remained outside the top ten, while secondary European markets such as Milan and Vienna continued to place among the middle-ranked markets. Meanwhile, new market Oslo placed in sixth at $9.50/w.

In a continuation from last year's index and survey, 70 percent of respondents consider data centres to be a recession-proof industry, such is the ever-growing level of demand. 95 percent of respondents expect demand for data centres to rise in the next year, an increase from 84 percent last year.

However, the report highlights a new challenge of meeting demand, with 87 percent agreeing that material shortages are causing delays to construction and contributing to escalating costs. Only 29 percent reported using modern methods of construction on data centre projects, which indicates a potentially high priority area of focus to successfully meet demand. The report warns of further cost escalation to meet decarbonisation goals. The survey results indicate mixed confidence in the ability of data centres to achieve net zero carbon, with a 50/50 split on whether data centre owners/operators have a clear route map to achieving net zero and only 40 percent considering net zero carbon data centres to be achievable within five years.

With continued developments to the energy efficiency of data centres themselves, there is a growing perception that innovation in construction methods and process efficiencies are the key to creating a step change in decarbonisation of the industry. Retrofit and conversion of existing shells is predicted to increase by 58 percent of survey respondents.

Commenting on the research, Dan Ayley, global head of hi-tech and manufacturing at Turner & Townsend, said:

"This year's index demonstrates the growing prominence and opportunity beyond the core traditional markets for data centre investment. We are seeing growing demand and continued optimism reflected in cost inflation, but with significant headwinds on the horizon as well.

Telehouse South

Opening February 2022

The latest addition to the Telehouse London Docklands Data Centre Campus

Interconnected to the existing data centres via a diverse Dark Fibre network

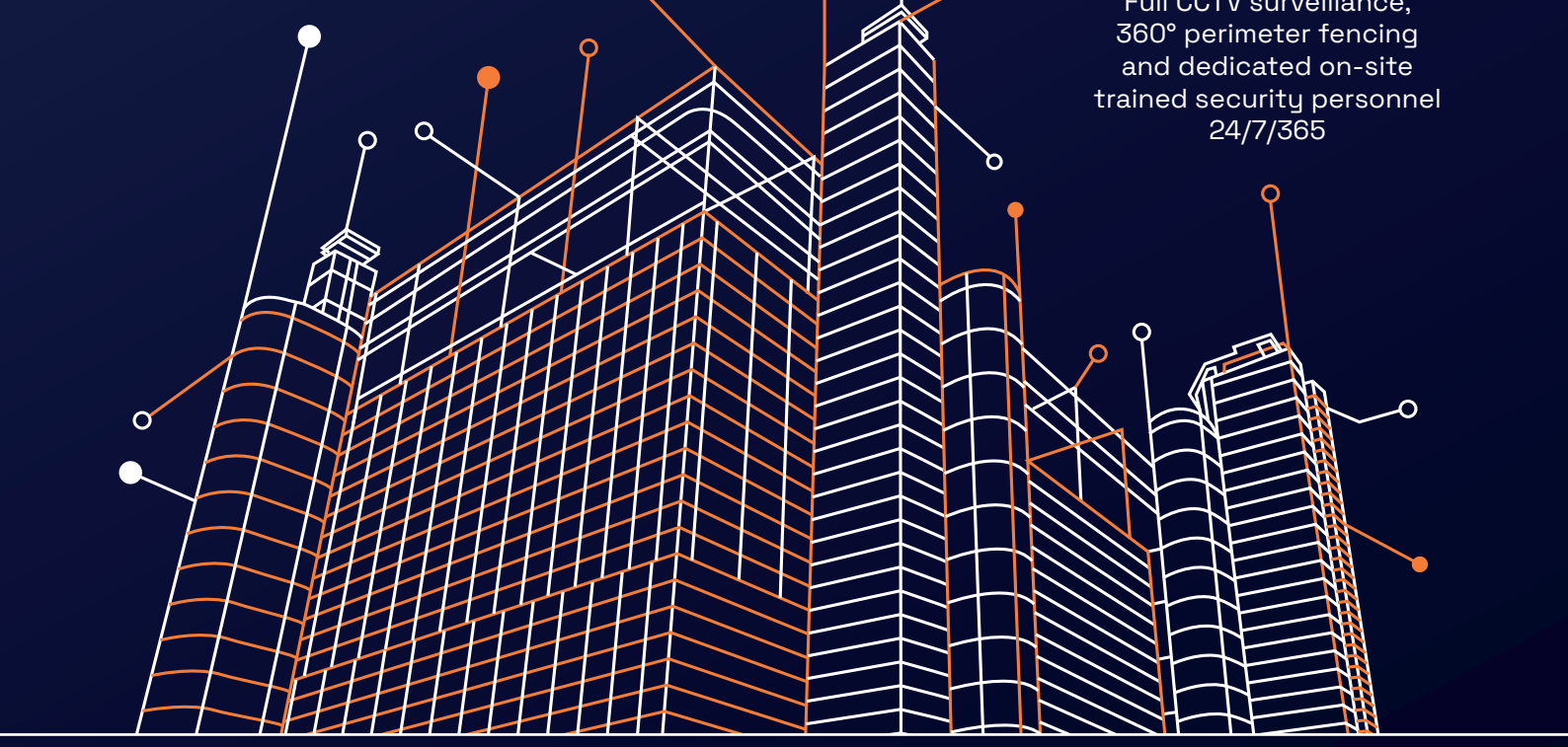
Ideally located in the heart of London – the financial capital of Europe

Part of the world's densest, most connected network of over 800 carriers, ASPs and ISPs

Telehouse is the primary home of LINX, one of the world's leading interconnection hubs

Direct access to leading cloud services including Amazon Web Services Direct Connect, Microsoft Azure ExpressRoute

Full CCTV surveillance, 360° perimeter fencing and dedicated on-site trained security personnel 24/7/365



Contact us for more information:

webenquiries@uk.telehouse.net

telehouse.net/telehouse-south

DCS AWARDS 2021 WINNER

TELEHOUSE

Skills shortages generates uncertainty for APAC data centres

RESEARCH reveals skills shortage is top concern for industry professionals.
An increasing number of data center operators in the Asia Pacific region will be migrating to the cloud or relying more heavily on managed services by 2025, as a shortage of skilled workers impacts the sector's ability to build new on-premises capacity to meet post-pandemic demand.

Research carried out by ABB in partnership with Data Center Dynamics (DCD), reveals that the current 50/50 split between data center equipment housed on-premises versus co-location or cloud-based solutions is set for a shake up over the next four years, with more than two thirds of senior industry experts (69.1 per cent) indicating that this will shift to just 25 per cent on-prem and 75 per cent in colo or cloud in the near future.

The reason for this shift in thinking may lie in the industry's struggle to build new capacity. More than 40 per cent of people asked by ABB said that data center construction in APAC hadn't been able to keep up with demand over the past 12 months, as the perfect storm of an unpredicted surge in demand and a reliance on traditional construction practices held progress back.
Three out of four respondents (76 per cent) agreed that business transformation in APAC needed hyperscale to progress, but the research revealed that these plans for growth are being hampered by a number of issues which have been created, or made worse, by the pandemic.

These include supply chain resilience (82.2 per cent), health and safety precautions (77.3 per cent) and access to specialist sub-contractors and trades (74.2 per cent) as the biggest areas of concern for the sector. The availability of specialist skills also tops the list of factors which will have the greatest effect on data center construction costs over the next three years, with 44.6 per cent of respondents mentioning it as a key issue.
The skills shortage issue in the Asia Pacific region mirrors trends in Europe, where 42 per cent of data center operators believe there's not enough skilled labor to deliver increased capacity requirements across the continent. Over 80 per cent of European companies say they have been affected by labor gaps and more than seven out of ten believe the pandemic has made the industry's skills shortages worse.

Kent Chow, ABB's Data Centre Segment Leader for Asia Pacific, Middle East and Africa Region said: "Our research shows that the data center industry in the APAC region is trying to expand and respond to growing data demand but being held back by a shortage of suitably skilled people. This is an issue the industry has been facing for many years and it can have big consequences for operators, from extra costs to delays in project delivery times.

87% of European companies to achieve zero emissions by 2030 or earlier

88% of European businesses expect IT to be driving force in reducing carbon emissions.

New research released by leading IT services provider NTT DATA and PAC, a teknowlogy Group company, reveals 88% of European business leaders expect their internal IT function to be a driving force in delivering short-term gains in their decarbonisation strategies.

While over three quarters of businesses have either implemented or are currently rolling out carbon offsetting initiatives, the study shows a clear understanding of current emissions levels is lacking, with only 6% claiming to have a "single pane of glass view" of their organisation's carbon footprint.

The study interviewed senior executives at 200 large European businesses across a variety of sectors to explore how organisations are approaching decarbonisation. The findings show that businesses understand the urgent need to cut emissions, with 94% of business leaders viewing decarbonisation as critical for the future survival of their business. 87% of European businesses expect to achieve zero emissions by 2030 or earlier.

Executives believe IT organisation will play a key role in reaching net-zero goals, particularly in the telecoms (95%) and financial services (93%) sectors.

One key obstacle facing businesses, as they seek to address decarbonisation, is the difficulty in tracking, monitoring, and reporting on emissions data. Most companies currently either use a mix of manual effort and multiple tracking tools (46%) or a patchwork of technology tools (34%). Tracking emissions is largely a manual effort for more than a quarter of financial services companies (27%) and for one fifth of manufacturers (20%).
Nick Mayes, Principal Analyst at PAC, a teknowlogy Group company, commented: "The study shows that the effective harvesting and management of emissions data is already seen as a critical success factor to delivering on net-zero. But only a very small proportion claim to have the 360-view across their organisation and beyond, so this has to be a primary focus area for the next phase of the net-zero journey."

The study also provides insight into the technologies businesses plan to invest in to accelerate their decarbonisation:

- 52% see central emissions tracking platforms as essential, with 63% of retail organisations highlighting the importance of these platforms in providing a clearer view on company-wide emissions
- Smart building energy management systems are rated as key by 60% of energy and utility businesses
- Remote collaboration platforms are cited as particularly important by leaders in the public and health sector (60%).

Keysource launches State of the Industry Report 2021

KEYSOURCE has revealed the key findings of this year's industry survey which is designed to give an insight into the decisions and considerations that UK IT directors and senior decision makers in the data centre industry are making, which in turn are influencing the market. It is titled "The New Normal & It's Green!" as it acknowledges that much of the developed world has taken the decision to 'live with the virus' and look to the future, embracing the increasingly important sustainability criteria for all businesses.

The results of the survey show that the data centre sector will continue to be at the heart of the global post pandemic recovery, as for many respondents, the ability to bounce back or accelerate growth lies in their technology and continued digital transformation.

The good news is that this is creating increased budgets which, combined with a market that is bursting with service options, suggests a positive outlook. However, a large proportion of our respondents have highlighted real concerns around the challenges in delivering these often complex and multifaceted transformation projects.

83% believe that social and economic challenges will have an impact on their ability to meet current goals and objectives. Confidence was low across all key phases of the change process alongside reports that existing investments are preventing transformation in some form.

"The industry will need to work hard to protect customers against transformation failure or worse and perhaps step up with more innovative solutions to ensure that these objectives can be delivered," says Jon Healy, Operations Director at Keysource.

IT functions to undergo radical changes

STUDY FINDS IT functions will overcome a lack of confidence and trust from within to drive true strategic value for organizations.

Global IT functions are set to go through a period of radical transformation over the next five years, according to new research by Pegasystems. The global study, conducted by research firm iResearch, surveyed IT leaders from 10 countries in the Americas, Europe, and Asia-Pacific on how IT will evolve over the coming five years.

The study found that IT leaders' confidence in their own departments is on shaky ground. More than half of all global senior IT decision makers (51%) are uncertain that their IT teams can enact positive change over the next five years -- with one in 10 (17%) having either no confidence or trust at all, or holding significant doubts.

These worries are compounded by poor technology choices: nearly two-thirds (58%) of respondents admitted they have wasted between $1 million and $10 million (USD) over the last five years on the wrong IT solutions. Just 12% reported that all their IT investments had paid off in the last five years. Despite this wasteful spending, almost a third (29%) also said IT risks being underfunded unless budgets, along with IT roles themselves, are decentralized and integrated into other departments.

The good news is that radical change is afoot; the IT function is set to undergo a significant makeover, which will allow for better decision-making, wiser investments, and greater cross-departmental collaboration. According to the survey, these future changes may include:

- IT adding greater value as a result of decentralization: The study showed that digital transformation has allowed 68% of IT leaders to disperse responsibility to other functions and 54% to decentralize it by delegating work to others. Wiser investments in technologies such as low-code platforms and intelligent automation will make it far easier for people across the business to do tasks that would previously have fallen to IT. As a result, 66% of respondents expect that digital transformation will result in work that allows IT workers to be more creative, cooperate more with other departments, and spend less time on administrative tasks.
- IT workers will develop better leadership and 'people' skills: IT workers will evolve from 'doers' to more strategic thinkers, with more than a third of survey respondents indicating that people skills will be increasingly important to them moving forward. Thirty-eight percent of respondents said that as collaborative, empowering technologies give them the freedom to expand their roles and responsibilities, leadership skills will be critical to them. Meanwhile, 37% said skills such as problem solving will become key, while 35% said emotional and social skills will be important.
- The end of specialist IT managers: Respondents said that building and learning new skills will have the biggest impact on their careers, with 78% of senior managers and 76% of managers saying that ongoing, lifelong learning will have either a big or transformational impact on them. This will mean the end of IT managers who spend their entire career specializing in one technology area, as they will increasingly be expected to fill the role of IT generalists.
- Diversity, equity, and inclusion will be critical: Nearly one in three (30%) said that in the next three to five years, diversity, equity, and inclusion will continue to gain importance. As a result, we'll likely continue to see IT adding more talent from historically marginalized groups to build more representative teams in terms of race, gender, disability, sexuality, and other traits.
- Workloads are set to increase: It's not all good news for the IT function though. Despite the fact that technology will relieve them of a lot of the routine administrative work that they do today -- meaning less recoding, redoing, and rearchitecting – 67% of respondents also believe that their workloads are set to significantly increase as IT becomes more an increasingly valued part of the business.

Hyperscale, Colocation, Enterprise.

Time-tested power distribution for every environment.

Starline Track Busway has been the leading overhead power distribution provider—and a critical infrastructure component—for all types of data centres over the past 30 years. The system requires little to no maintenance, and has earned a reputation of reliability due to its innovative busbar design.

Starline®
A brand of legrand®

StarlineDataCentre.com/DCS

Unit C Island Road | Reading RG2 0RP | UK | +44 (0) 1183 043180

Tis the season for predictions!

IDC has been busy looking into the future of digital infrastructure, work and connectedness, as well as providing some interesting thoughts on digital transformation and quantum computing spending.

DINTERNATIONAL DATA CORPORATION'S (IDC) top 10 predictions for the Future of Digital Infrastructure point to a digital infrastructure strategy that addresses resiliency and trust; data-driven operational complexity; and business outcomes-driven sourcing and autonomous operations. Organizations must invest in and foster a digital-first culture that leverages trusted industry ecosystems, generates profitable revenue growth, provides empathetic customer experiences, and demonstrates an ability to adapt operating models to complex customer requirements.

In the coming years, organizations will deploy, operate, and scale digital infrastructure to ensure consistent security, performance, and compliance across all resources, regardless of where and how they are deployed. These organizations will invest in more intelligent, autonomous operations and take advantage of flexible consumption and strategic vendor partnerships to promote agility and ensure that the business, and its digital infrastructure, can continue to perform in the face of a wide range of unexpected scenarios – social, geopolitical, economic, climate, or business related.

"Digital infrastructure spans compute, storage, network, and infrastructure software, including virtualization and containers, and the automation, AI/ML analytics, and security software and cloud services needed to maintain and optimize both legacy and modern applications and data," explained Mary Johnston Turner, research vice president, Future of Digital Infrastructure. "IDC's 2022 predictions for the future of digital infrastructure identify critical shifts in governance, operations, architecture, and sourcing that need to be factored into enterprise digital transformation strategies going forward."

The top 10 predictions from the Worldwide Future of Digital Infrastructure 2022 report are:

Prediction 1: By 2023, G2000 leaders will prioritize business objectives over infrastructure choice, deploying 50% of new strategic workloads using vendor-specific APIs that add value but reduce workload portability.

Prediction 2: In 2023, over 80% of the G2000 will cite business resiliency to drive verifiable infrastructure supply chain integrity as a mandatory and non-negotiable vendor evaluation criterion.

Prediction 3: By 2023, most C-suite leaders will

implement business critical KPIs tied to data availability, recovery, and stewardship as rising levels of cyber-attacks expose the scale of data at risk.
Prediction 4: By 2024, 75% of G2000 digital infrastructure RFPs will require vendors to prove progress on ESG/Sustainability initiatives with data, as CIOs rely on infrastructure vendors to help meet ESG goals.
Prediction 5: By 2024, due to an explosion of edge data, 65% of the G2000 will embed edge-first data stewardship, security, and network practices into data protection plans to integrate edge data into relevant processes.
Prediction 6: By 2025, a 6x explosion in high dependency workloads leads to 65% of G2000 firms using consistent architectural governance frameworks to ensure compliance reporting and audit of their infrastructure.
Prediction 7: By 2025, 60% of enterprises will fund LOB and IT projects through OPEX budgets, matching how vendors provide their services with a focus on outcomes that are determined by SLAs and KPIs.
Prediction 8: By 2025, 70% of companies will invest in alternative computing technologies to drive business differentiation by compressing time to value of insights from complex data sets.
Prediction 9: By 2026, 90% of G2000 CIOs will use AIOps solutions to drive automated remediation and workload placement decisions that include cost and performance metrics, improving resiliency and agility.
Prediction 10: By 2026, mid-market companies will shift 65% of infrastructure spending from traditional channels towards more app-centric trusted advisors.

Top 10 predictions for the Future of Work

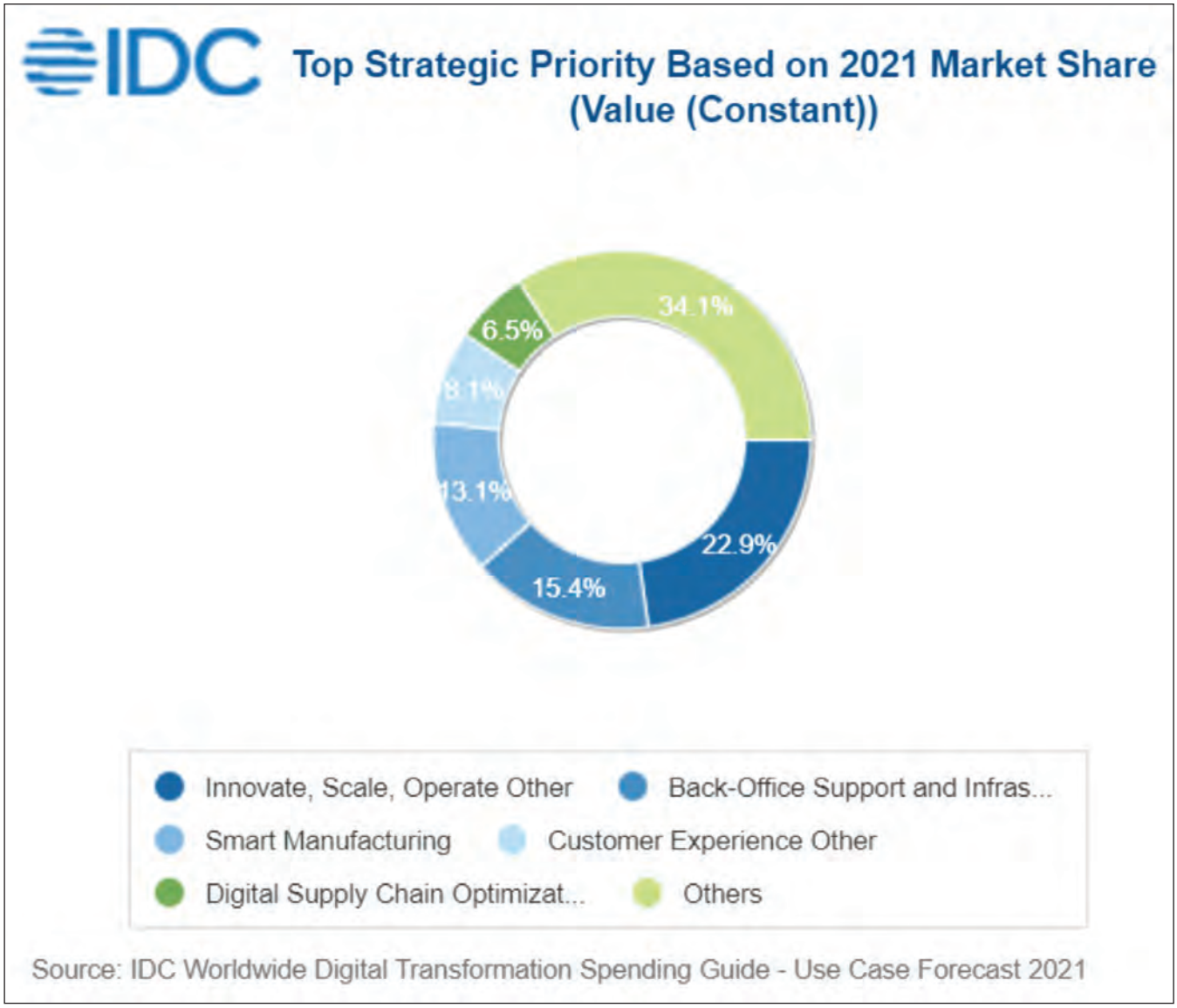
The Future of Work predictions from International Data Corporation (IDC) signal an enduring adoption of hybrid work models by a majority of G2000 organizations, supported by broad adoption of automation and artificial intelligence and machine learning (AI/ML) technologies.

To keep pace with accelerating digital transformation initiatives and the realities of global health, climate, and social challenges, organizations must adopt more dynamic and hybrid ways of working. Workers must redefine themselves as members of dynamic and reconfigurable teams that can adapt quickly to business demands and new market requirements – anytime, anywhere, and from any physical location.

Driven by senior executives and executive boards, Future of Work initiatives will be enterprise-wide imperatives. Rapid adoption of more automated, cloud-based, and AI-enabled work practices will improve work productivity and introduce new, more agile ways of working. The insights gained from these digital-first ways of working will enable organizations to respond to the needs of customers and employees, driving improvements in employee retention and customer satisfaction. “As organizations continue to define and refine work models best suited for their industries, they inevitably will need to calibrate the right deployment of automation, digital and physical workspace, and place technologies,” said Amy Loomis, research director, Future of Work. “Far from being a means to an end, deployment of these technologies is sparking new leadership conversations around empowering workers to be more autonomous and innovative working with IT, across functions and with clients.”

IDC’s Future of Work 2022 top 10 predictions are:
Prediction 1: By 2024, 80% of the G2000 will use AI/ML-enabled «digital managers» to hire, fire, and train workers in jobs measured by continuous improvement, but only 1 of 5 will realize value without human engagement.
Prediction 2: By 2023, G2000 line of business employees will use tools to automate their own work using codeless development, but 90% of these programs will fail without supporting COE and adoption methodology.
Prediction 3: 40% of the G2000 will see a 25% improvement in information usage by 2026 due to investments in intelligent knowledge networks that turn structured/unstructured data into findable and actionable knowledge.
Prediction 4: By 2023, digital transformation (DX) and business volatility will drive 70% of G2000 organizations to deploy remote or hybrid-first work models, redefining work processes and engaging diverse talent pools.
Prediction 5: 70% of enterprise businesses will have extensively invested in diversity, equality, and inclusion data, tools, and benchmarking by 2024 to define recruitment and human capital strategies.
Prediction 6: By 2023, 60% of G2000 businesses will deploy AI- and ML-enabled platforms to support the entire employee life-cycle experience from onboarding through retirement.
Prediction 7: DX-related IT skills shortages will affect 90% of organizations by 2025, costing over $6.5 trillion globally through 2025 due to delayed product releases, reduced customer satisfaction, and loss of business.
Prediction 8: By 2025, 90% of new commercial constructions/renovations will deploy smart facility technology supporting flexible workplaces and sustainably improving occupant experiences and operational performance.

To keep pace with accelerating digital transformation initiatives and the realities of global health, climate, and social challenges, organizations must adopt more dynamic and hybrid ways of working



Prediction 9: By 2023, 70% of connected workers in task-based roles will use intelligence embedded in adaptive digital workspaces from anywhere to engage clients/colleagues and drive enterprise productivity.
Prediction 10: G1000 firms will use intelligent digital workspaces with augmented visual technologies (hardware/software) in 8:10 regularly scheduled meetings by 2024 to enable high-performance distributed global teams.

Top 10 predictions for the Future of Connectedness
International Data Corporation (IDC) has announced its Future of Connectedness predictions for 2022 and beyond. Over the past 18 months, organizations have had to adapt to a new normal, where employees require anywhere-anytime access to mission critical systems and processes; customers are more digitally guided; and business leaders must align technology, policy, and operations to drive agility and revenue. IDC defines the Future of Connectedness as enabling the timely movement of data across people, things, applications, and processes to create seamless digital experiences. The technology path to connectedness requires seamless connectivity across networks, IT systems, and the cloud to keep data moving.

As employees, businesses, and consumers increasingly seek digital experiences that are supported by ubiquitous, reliable, and robust connectivity, organizations will make connectivity an investment priority.

“Businesses have been forced to adapt to more distributed operations in addition to their workforces, highlighting the importance of a robust strategy in place that embraces a wireless-first and cloud-enabled connectivity architecture,” said Paul Hughes, research director, Future of Connectedness at IDC. «As the future enterprise transforms to become more agile, IDC expects future investment initiatives to focus on eliminating physical infrastructure silos, adopting a greener and more cloud-centric roadmap, improving workforce productivity, and ensuring more resilient operations.»

IDC's Future of Connectedness 2022 top 10 predictions are:

Prediction 1: By 2023, mid-sized to large enterprises will transition 50 percent of IT staff driving connectedness from tactical legacy network support operations towards strategic business outcomes, technology innovation, and service delivery.

Prediction 2: By 2024, 45% of contact centers supporting finance, retail, and hospitality industries adopt Branch of One architectures, enabling efficient and secure enterprise-class work-from-anywhere experiences.

Prediction 3: In 2024, wireless-first becomes mainstream for wide area connectivity, accelerating 65 percent of enterprise, industrial, and public sector organization investments to «untether» their operations.

Prediction 4: By 2025, G2000 organizations are still experiencing two to three systemic service provider network outages per year, showcasing the importance of added investments in connectivity redundancy and service resiliency.

Prediction 5: By 2024, 20% of organizations will use a joint telco/cloud provider sovereign cloud running on local infrastructure to ensure compliance and limit extraterritorial connectivity, access, and data movement.

Prediction 6: By 2023, 60% of enterprises will implement hybrid, intelligent connectivity that links physical marketplaces to digital storefronts and supply chains to facilitate seamless commerce transactions.

Prediction 7: By 2023, 75% of enterprises will expect sustainability goals to be addressed in RFI responses, demonstrating responsible supply chain principles and secure IT asset disposition capabilities.

Prediction 8: By 2024, 80% of enterprises will need to transform their networks and processes to deliver more personalized and interactive online rich media experiences that meet and satisfy customer expectations.

Prediction 9: By 2025, 60% of mid-sized to large enterprises will adopt network as a service (NaaS) to enable operational agility, service customization, and flexible consumption models that support complex network and multi-cloud environments.

Prediction 10: In 2022, more than 30% of organizations will prioritize connectivity resiliency to ensure business continuity, resulting in uninterrupted digital engagement for customers, employees, and partners.

Continued growth for Digital Transformation

Global spending on the digital transformation (DX) of business practices, products, and organizations is forecast to reach $2.8 trillion in 2025, more than double the amount allocated in 2020. According to a new update to the International Data Corporation (IDC) Worldwide Digital Transformation Spending Guide, DX spending will have a compound annual growth rate (CAGR) of 16.4% over the 2021-2025 forecast period as organizations pursue a holistic digital strategy for people, processes, technology, data, and governance.

"For the first time, IDC has forecast global DX spending to exceed $10 trillion over a five-year period," said Craig Simpson, senior research manager with IDC's Customer Insights and Analysis Group. "While most DX projects remained on track in 2020 and into 2021 during the pandemic, IDC forecasts DX technology investments to accelerate in 2022, with a renewed drive towards more long term strategic digital objectives. Beyond operational DX investments, customer experience is garnering some of the largest DX technology investments from consumer-oriented industries such as securities and investment services, banking, and retail."

Organizations allocate their DX investments toward a number of strategic priorities that align with what they expect to accomplish over an extended period in pursuit of their digital mission. Many of these priorities coalesce around operational objectives, including back office support and infrastructure for core business functions such as accounting & finance, human resources, legal, security and risk, and enterprise IT. Similarly, innovate, scale, and operate priorities refer to a broad area covering large-scale operations, including making, building, and designing activities. Core business functions comprising this area include supply chain management, engineering, design and research, operations, and manufacturing plant floor operations. Finally, customer experience is a specific area covering all customer-related functions and related technologies supported by DX.

Core business functions comprising this area include customer services, marketing, and sales. While the back office support and infrastructure and innovate, scale, and operate priorities will see significantly larger spending totals throughout the forecast, customer experience investments will see faster investment growth.

Share the image

The DX use cases – discretely funded efforts that support a particular program objective – that will receive the most spending will be spread across the three strategic priorities. Investment in robotic manufacturing will grow to $120.6 billion in 2025, followed by autonomic operations and 360-degree customer and client management at $90.9 and $74.7 billion, respectively. The DX use cases with the fastest spending growth will be virtualized student workspaces (43.8% CAGR), mining operations assistance (39.1% CAGR), and augmented design management (34.5% CAGR). Of the more than 300 DX use cases identified by IDC, only five will have five-year CAGRs of less than 10% over the forecast period.

The industries that will see the largest DX spending throughout the forecast are discrete and process

manufacturing, followed by professional services and retail. Combined, the two manufacturing industries will account for nearly 30% of all DX spending, totaling more than $816 billion in 2025. The industries that will experience the fastest growth in DX spending over the 2020-2025 forecast are construction (21.0% CAGR), securities and investment services (19.2% CAGR), and banking (19.0% CAGR). All 19 industries covered in the DX Spending Guide are forecast to deliver double-digit growth over the five-year forecast.

The United States will be the largest geographic market for DX spending, delivering roughly one third of the worldwide total throughout the forecast. Western Europe will be the second largest region for DX spending, following closely by China. China will also deliver the strongest year-over-year growth in DX spending with a five-year CAGR of 18.4%. Latin America will be the region with the second fastest growth with a 17.5% CAGR.

By 2025, DX spending in Europe will reach $653 billion, which is more than double the amount spent in 2020. Moreover, by 2023, DX spending will overtake non-DX spending, confirming the strong commitment of European companies toward digital transformation

"By 2025, DX spending in Europe will reach $653 billion, which is more than double the amount spent in 2020. Moreover, by 2023, DX spending will overtake non-DX spending, confirming the strong commitment of European companies toward digital transformation," said Angela Vacca, senior research manager, European Industry Solutions, Customer Insights & Analysis. "In this context, European finance, healthcare, and professional services companies will grow their DX spending the most with strong variations across use cases as priorities keep shifting with recovery mostly in place, and companies consequently moving away from emergency needs to more strategic and longer-term bets."

Quantum Computing market to reach $8.6 billion in 2027

International Data Corporation (IDC) has published its first forecast for the worldwide quantum computing market, projecting customer spend for quantum computing to grow from $412 million in 2020 to $8.6 billion in 2027. This represents a 6-year compound annual growth rate (CAGR) of 50.9% over the 2021-2027 forecast period. The forecast includes core quantum computing as a service as well as enabling and adjacent quantum computing as a service. IDC states that major breakthroughs in quantum computing technology, a maturing quantum computing as a service infrastructure and platform market, and the growth of performance intensive computing workloads suitable for quantum technology will drive the majority of the market growth over the forecast period. IDC also expects investments in the quantum computing market will grow at a 6-year CAGR (2021-2027) of 11.3% and reach nearly $16.4 billion by the end of 2027. This includes investments made by public and privately funded institutions, government spending worldwide, internal allocation (R&D spend) from technology and services vendors, and external funding from venture capitalists and private equity firms.

Like any breakthrough technology of the last few decades, the industry will pour billions of dollars into making the technology common place and ready for mass adoption. The closest comparison is classical computing, the very technology that quantum computing is setting out to disrupt.
IDC anticipates that these investments will cause current limited quantum computing capabilities to be replaced by a new generation of quantum computing solutions, leading to the development of new use cases and market segments that will accelerate the adoption of quantum computing to gain a competitive advantage. As a result, the quantum computing market will see a surge in customer spend toward the end of the forecast period.

IDC sees 2021 as a pivotal year in the quantum computing industry. Strategic approaches implemented to reach quantum advantage became more defined as vendors published quantum computing roadmaps emphasizing methods for improving qubit scaling and error correction, sought new funding opportunities by going public or partnering with government, educational, or private entities, or merged in anticipation of offering a more full-stack approach. For most vendors, these approaches included the further development of the quantum ecosystem. This trend promises to continue into 2022 and beyond as quantum computing vendors progress towards quantum advantage and enterprise businesses seek a competitive advantage using current and emerging quantum technologies. "For many critical problems, classical computing will run out of steam in the next decade and we will see quantum computing take over as the next generation of performance-intensive computing.", said Peter Rutten, global research lead for performance intensive computing at IDC.

"Advances in quantum computing will be a drumbeat over time with the most distant advances being most relevant to the most complex problems. Organizations should start experimenting now using quantum road maps to guide their quantum journey," added Heather West, senior research analyst, Infrastructure Systems, Platforms and Technologies Group at IDC.

Batteries Not Included

UPS Battery Replacement

We can't include the batteries, but we can include the labour.

RIELLO ELETTRONICA riello ups

Reliable power for a sustainable world

*Battery replacement labour included with qualifying Riello UPS Ltd maintenance contracts.

Kicking the carbon habit

The transition to a net zero carbon industry requires a shift in the way data infrastructure is planned, designed and built.

BY CALLUM FAULDS, DIRECTOR AT LINESIGHT

WE ALL KNOW that the demand for data centres is growing rapidly, but the sheer scale of the industry is worth taking a moment to recognise. Respected industry analysts IDC estimate that the global data requirement will have reached 163 zettabytes by 2025.

That estimate is based on the expectation that the global data centre industry will have enjoyed a compound annual growth rate (CAGR) of around 17% for the period 2019 to 2023.

Data centres are energy intensive. According to various estimates, they account for 2% of the world's energy consumption – roughly equivalent to the aviation industry. While large strides forwards have been made, designing, developing and operating sustainable data centres remains one of the biggest challenges for all parts of the industry.

Besides the obvious imperative on everybody to help save the planet, the need to make data centres greener is also driven by both customers and regulatory authorities. With the former often being large multinationals with well-advanced corporate social responsibility programmes and the latter having sustainability extremely high on their agenda (a net zero carbon economy by 2050 is often the ultimate goal), the pressure to continually improve and develop is considerable.

It is important to recognise that many steps have already been taken to reduce carbon at an operational

level. We are seeing initiatives such as use of renewable power onsite, rainwater reclamation, smart control of lighting and temperature, improved use of by-products, efficient recycling and effective waste management.

However, the undoubted impact of these operational initiatives must be enhanced by driving efficiencies and better approaches during the construction phase. Among the trends that we are already seeing or expect to see over the coming years are:

1. Use of innovative materials
Use of low carbon or more sustainable materials does require significant planning and suppliers to be researched and engaged with, but there are certainly many new avenues to explore.

2. Adoption of modern building techniques
Prefabrication has a reputation for having a lower environmental impact than traditional construction. More construction off-site means less waste, as the controlled conditions and repetitive nature of the works enable output to be more precise with fewer mistakes. This approach also claims to offer more efficient recycling and waste disposal, in addition to generating fewer greenhouse gas emissions. Also, modular components reduce the time and intensity of on-site construction, which reduces the amount of waste materials, emissions, noise pollution, construction traffic and road closures

3. Hydrogen
While still very much a work-in-progress idea, the fact that hydrogen offers the highest energy per mass of any fuel (by weight) and is the most plentiful element, suggests plenty of untapped potential. Data centres are already exploring this option, but there is certainly scope for further development.

4. Data passports
Low-carbon materials are increasing in popularity and the use of "data passports" is just one method of encouraging and measuring their use.

Embodied carbon

Efforts to cut carbon have focused on the operational carbon impact of data centres, the logic being that CO2 emitted while a data centre is in use is at least double that of its embodied carbon – i.e. emissions caused by the production and transport of materials and construction. While operational carbon is relatively easy to measure, its embodied counterpart has so many different facets that measuring and monitoring are far from straightforward. Just as a guideline, Linesight estimates that, simply in the construction phase, concrete accounts for around 40% of the carbon produced, with fuel being the next biggest contributor at 25%. Reinforced and structural steel then account for around 10% each.

With clear gains to be made from reducing embodied carbon, it will become a more important area of focus as data centres strive to satisfy both regulatory and organisational carbon targets. "What gets measured, gets managed" is especially true when looking at sustainability, so measuring embodied carbon will be the foundation of all efforts to reduce embodied carbon. However, embodied carbon is challenging to measure and it is an area that we are actively working with our clients to develop strategies to address.

Specifying and gathering all the relevant data is therefore critical and, in this particular sphere, still evolving. Engaging with all the relevant parties across the supply chain will be critical in ensuring that the required large strides are made in this area in the near future. Meanwhile, the industry is also pushing itself to do better. In 2019, the UK became the first major economy to pass a net zero emissions law, requiring the UK to bring all greenhouse gas emissions to net zero by 2050. However, the data centre industry has made its own pledge, led by companies such as Google and Equinix, to achieve climate neutrality by 2030. This is the Climate Neutral Data Centre Pact (CNDCP), which requires the following:

There's no shortage of sustainable activity going in the data centre space. Hyperscalers such as Amazon, Microsoft, and Google have made carbon-neutral commitments and have made significant investments in sourcing renewable energy for their facilities. And in 2021 alone, the likes of ChinData, MTN, and IBM have made similar pledges

Increase and measure energy efficiency
There's no shortage of sustainable activity going in the data centre space. Hyperscalers such as Amazon, Microsoft, and Google have made carbon-neutral commitments and have made significant investments in sourcing renewable energy for their facilities. And in 2021 alone, the likes of ChinData, MTN, and IBM have made similar pledges. However, much of the conversation is still around operational sustainability and ensuring the facilities use as little power as possible, use green energy where they can, and have minimal or even carbon negative impacts on the local area through district heating initiatives and natural cooling. But is enough thought being given to the environmental impact of the construction phase around data centres and the material impact of the

construction materials they use? Data centres use huge amounts of concrete and steel which are major sources of CO2. And as the sustainability gains from operational efficiencies dry up, firms will have to look to embodied carbon in the construction phase if they are serious about being climate neutral.

Clean energy

Carbon neutral data centres should be powered by 100% renewable energy. The Pact states that data centre electricity demand will be matched by 75% renewable energy or hourly carbon-free energy by 2025 and by 100% by 2030.

Water efficiency

Data centres rely on vast amounts of water for computer cooling and the Pact calls for this to be minimised. The water metric target - water usage effectiveness (WUE) or other metric - may vary depending on the design specification.

A circular economy

Data centre operators must apply circular economy practices to repair and recycle servers.

Circular energy system

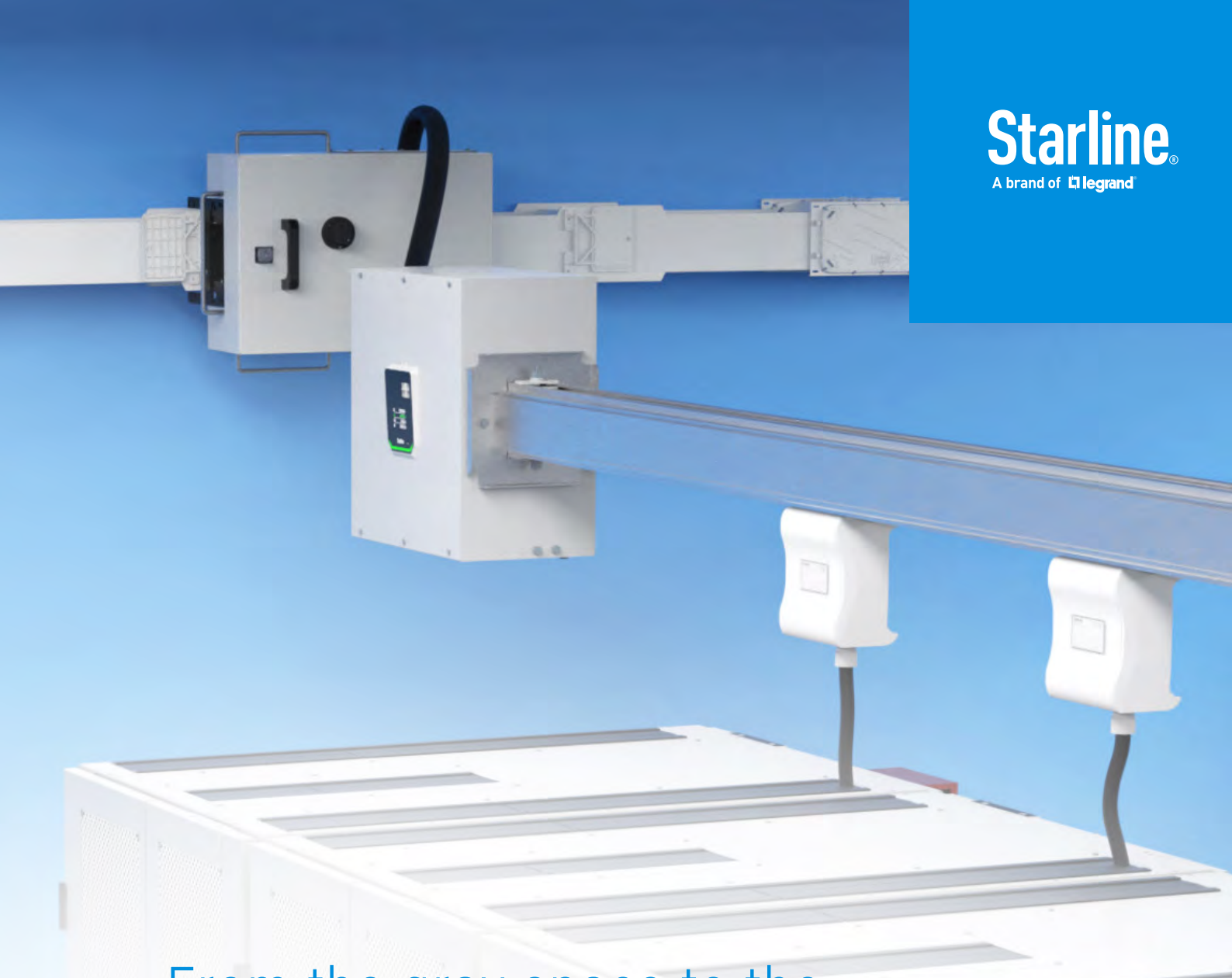
The Pact highlights the energy conservation opportunity presented for the reuse of data centre heat. Data centre operators can "explore possibilities to interconnect with district heating systems and other users of heat" in a way that is practical, environmentally sound and cost effective.

While tracking and quantifying the carbon footprint of a data centre's construction is hard to do, data is undoubtedly fundamental in quantifying, understanding and reducing the environmental impact within the construction space. What gets measured gets managed. There are things clients can do now that will help:

- Avoid landfill where possible
- Use salvaged or reclaimed materials
- Reduce cement usage in concrete mixes through fillers
- Use synthetic gypsum for plaster and drywall
- Buy green insulation such as cellulose or denim insulation/natural cotton fibre insulation
- Opt for rubberized asphalt made from recycled tires
- Utilize recycled steel where possible
- Source locally for as many materials as possible
- Use modular designs and build off-site

The transition to a net zero carbon industry requires a shift in the way data infrastructure is planned, designed and built. A Net Zero Carbon approach sets out a project pathway to embed best practice sustainable design principles into each project stage. Linesight's holistic, data-informed service delivery model tackles the building design, materials, engineering solutions, construction and operation, to provide a truly whole-life net zero project. We can also help clients to embed sustainable principles and technology to achieve energy and resource efficiencies in line with commercial objectives.

Working in partnership, we provide support right from project inception through early supply chain engagement to cost effective and pragmatic advice for design solutions and operational objectives.



Starline®
A brand of legrand®

From the gray space to the white space, your complete busbar solution provider.

Starline Track Busway has been the industry leading busbar system for white space power distribution for decades. Now Starline's dedication to busbar innovation has expanded to include a high-power solution — Starline XCP Busbar — for mission critical environments.

Designed to meet crucial uptime requirements, the XCP busbar offers:

- World-class performance that safeguards power availability
- Superior features to ensure the safety of your critical operations
- Compact busbar designs that enable system flexibility

For more information visit:
StarlinePower.com/HighPowerBusbar

Moving datacentre operations from carbon source to carbon sink with energy efficiency, advanced cooling, and waste heat recovery

It is beyond debate that data centres in the EU must decarbonise to help meet climate neutral targets by 2030, but what are the key technologies that will enable this transition?

BY EDDIE RODRIGUEZ, STRATEGIC MARKETING MANAGER FOR TURBOCOR COMPRESSORS, DANFOSS AND JULIEN SOULET, VICE PRESIDENT AND GENERAL MANAGER, FLUORINE PRODUCTS EMEA, HONEYWELL

Eddie Rodriguez

Julien Soulet

THE PUBLICATION OF the European Union's European Digital Strategy in 2020 laid down a definitive decarbonisation timetable for EU data centre operators. In addition to calling for a transition to energy-efficient cloud computing solutions, the strategy challenged operators to achieve climate-neutral data centres by 2030.

This legislative target reflected compelling data about the growth of energy consumption by EU data centres and the importance of reducing the climate impact of digitalization. It is estimated that 10% of all electricity is used within the IT ecosystem, and data centres are particularly heavy users. A study about greener cloud services published by the European Commission in 2020 estimated that without decarbonization change, the energy consumption of data centres in EU Member States would increase from 2.7% of the electricity demand in 2018 to 3.2% by 2030. This makes reducing the climate impact of digitalization a high priority.

Energy consumption in data centres naturally includes not just supplying servers with power but also the energy required to cool server rooms and remove the heat that is generated. It is estimated that cooling systems account for approximately 40% of total energy consumption in data centres.

Energy Efficient Technology

To be fair, the industry has not stood still on decarbonization. In January 2021, leading cloud infrastructure providers and data centre operators created the Climate Neutral Data Centre Pact, agreeing to a self-regulatory initiative to make European data centres climate neutral by 2030.

However, beyond legislative targets and industry commitments, the fact remains that all the actors in the industry will need new technology solutions in order to make the transition possible. Some of these solutions will come from increased use of renewable energy or the construction of new data centres in cold climate regions.

Arguably the most exciting new technologies are those which can transform data centres from energy consumers to sources of sustainable energy, using the latest technologies for both data centre cooling and heat recovery. A key enabling technology for such applications is an oil-free centrifugal compressor that can deliver high efficiency and low sound levels in a compact footprint.

A good example is the Danfoss Turbocor® compressor, which has the flexibility to be used in a wide range of chillers and heat pumps. By using

oil-free magnetic bearings, Turbocor compressors deliver consistent efficiency and capacity over the life of the compressor compared to oiled compressors. Excess oil in such compressors typically collects in areas such as heat exchangers, which reduces heat transfer and ultimately degrades performance. An independent study by Tsinghua University, a major public research university in Beijing, concluded that the efficiency level for oiled compressors drop by as much as 10% after 5 years and 20% after 10 years of operation. The European Commission advocates for the "Energy Efficiency First" principle, because the most sustainable energy is the energy we don't use.

Advanced Cooling

Using chillers with Turbocor technology, data centres can be cooled up to 30% more efficiently compared to fixed speed positive displacement compressors. Another key enabling technology is an HFO working fluid (or refrigerant) such as With such technologies, it is entirely feasible to demonstrate that digital transformation and green transition can go hand in hand.

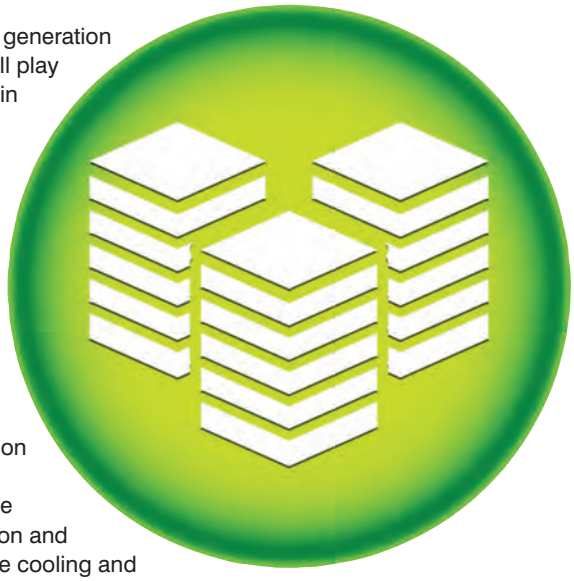
Recent enhancements to Turbocor compressors enable chillers to operate at high temperature set-points (28C+), which provides data-centre operators with substantial energy savings and flexibility over their cooling design. Other enhancements include the ability to operate in cold weather conditions or low lift operation that enables year-round cooling without having to install expensive air or waterside economizers.

To improve energy efficiency further, this time within the data centre cabinet itself, Solstice E-Cooling uses a two-phase liquid cooling process, which helps to increase the packing density at server level, to remove heat from electronic applications while reducing environmental impact and lowering costs. A two-phase process allows for more energy-efficient and uniform cooling, better heat rejection, and reduced pumping power than single-phase liquid cooling, where fluid remains in its liquid form throughout the cooling process. Solstice E-Cooling is also a dielectric solution, so it serves as an electrical insulator for equipment to prevent damage from contact with fluids.

Waste Heat Recovery

In addition to cooling, heat pumps can be used to capture and utilize the excess heat generated by server equipment during the operation of a data centre instead of allowing it to escape into the atmosphere. Heat pumps using Turbocor compressors are capable of producing heat up to 68C, enabling the waste heat from the datacentre to be uplifted into useful heat, which can provide heating and hot water to surrounding homes and buildings via a district heating network.

Almost 50% of Europe's current energy demand is consumed by heating, so by supplying a proportion of this heat this new generation of data centres will play an important role in the community. Accordingly, the combination of a flexible and highly efficient compressor with a low GWP and high-performance refrigerant, creates game-changing innovation that can both reduce data centre power consumption and efficiently integrate cooling and heating needs.



This will not only facilitate climate neutral data centres by 2030, but as the electricity grid decarbonises, it has the potential to create negative emission datacentre operations that can contribute to wider society's ambition of achieving a Net Zero world.

Danfoss decarbonises its own data centres

One of the most compelling endorsements for any technology is its in-house use by its own developers. Danfoss has done just that as part of the execution of its digital transformation-by consolidating 20 global data centres and 135 server rooms into just a handful of data centres, including at its 250,000 square meter global headquarters in Nordborg, Denmark. The company set out to build these data centres of the future using its own green technologies. The results have already been astonishing.

In 2015, the company's Nordborg headquarters were 100% heated by fossil fuels. Now, by implementing chillers and heat pumps powered by Danfoss oil-free Turbocor® compressors and technologies, the company expects this entire 250,000 square meter facility will be carbon neutral by 2022.

Not only that, reused excess heat from the data centres will provide 25% of the overall heat supply for its headquarters' factories and offices by 2024 and could increase further over time. Location played a significant role in the achievement of these results. The new data centre was established near the location of highest data use and in a place where the local area could benefit from the distribution of excess heat.

By applying advanced oil-free chiller and heat pump technologies in its own facilities, combined with HFO-based low GWP refrigerants, Danfoss has created a powerful blueprint for future-proofed climate-friendly data centres.

A crisis of power?

How electricity price volatility and the race to grid sustainability is accelerating demand response opportunities in data centres

BY KERR JOHNSTONE CEng MIET DIRECTOR AT I3 SOLUTIONS GROUP

A GLOBAL ENERGY PRICE rise that risks making critical industries unviable is probably most people's definition of a crisis.

Those running energy intensive operations such as data centres are only too aware that they don't dictate energy prices. But it is worth asking if this hopefully short-term crisis, combined with long term sustainability challenges, might be the catalyst for the industry to begin to take demand response (DR) opportunities more seriously.

To date much of the data centre sector has declared itself unready to consider demand response – otherwise called demand side response (DSR). There has often been a refusal to engage because prevailing attitudes are that it is too much trouble.

Perhaps attitudes may change now that individuals and associations representing a wide range of energy intensive industries such as glass and steelmaking are on TV news programmes warning governments that high energy costs could bankrupt them.

It is clear that even without energy price volatility there exists a strong case for using data centre onsite generation and battery storage to create a symbiotic relationship between data centres and utilities. One where both groups benefit by reducing their carbon footprints and gain mutual operational and financial rewards.

Turn and face the change…

Almost everything in global utility energy supply is changing. The fuel mix, load curtailment, frequency response, BESS, VRE, all are being adopted amid rapid phasing out of dependence on fossil fuels. But the challenge is that as the energy market transitions by transforming its infrastructure, the electricity grid must maintain a nominal voltage

and frequency within specific limits. The challenge for utilities is that supply and demand are always balanced irrespective of variations in load conditions, generation status and distribution system faults.

To achieve balance, utilities are becoming dependent on third-party embedded generation and energy storage companies as consumer demand and grid capacity fluctuate. An equilibrium is essential to ensure consumer voltage and frequency stays within mandatory operating parameters.

Hence demand response – DR - means opportunities for sites with embedded generation and storage capacity.

What even is DR or DSR?

As stated in the latest whitepaper from the i3 Solutions Group and EYP MCF GHG Abatement Group, DR is: "The adjustment in demand relative to grid generating capacity., designed to address supply and demand imbalance, high wholesale electricity prices and assist with grid reliability."

The paper provides detailed definitions of emerging DR services categories including Load Curtailment; Load Shifting; Short Term Operating Reserve (STOR) and Load Reduction; Frequency Response; Energy Arbitrage; and Time Variant Pricing.

Why should data centres bother with DR?

For data centres DR is a complex undertaking. Suitability will be dictated by parameters that range from geography to grid maturity and existing energy mixes. For example, much of the embedded power generation capacity in data centres is diesel generator based. From an emissions perspective, the willingness of grid operators to use this generating capacity will vary as different territories have different definitions of relative fuel cleanliness. This is in turn based upon their access to and historic and current reliance on different fossil fuels. Wind, Solar and tidal are cleanest, gas is cleaner than coal etc.

In GHG abatement terms for island operating of generators, the impact on GHG depends on the prevailing grid emission factor (GEF) at the time.

If for example, we assume a 50MW facility in China has natural gas generators as its emergency power source. The gas generator emission factor is approximately 486 g CO_2e/kWh, compared to the national average combined margin grid emission factor of 852 g CO_2e/kWh. For the purposes of this example, we will assume 852 g CO_2e/kWh is the prevailing GEF when the generators are operating. With the standby generators running in island mode for 10 hours, this results in 18,300kg CO_2e saving. There is also marginal emissions reduction to consider. Marginal emissions occur when the utility brings a different type of generating plant on the grid such as wind or photovoltaics. What happens when demand outstrips capacity even by 1MW and the only current alternative is to start up a coal fired power station?

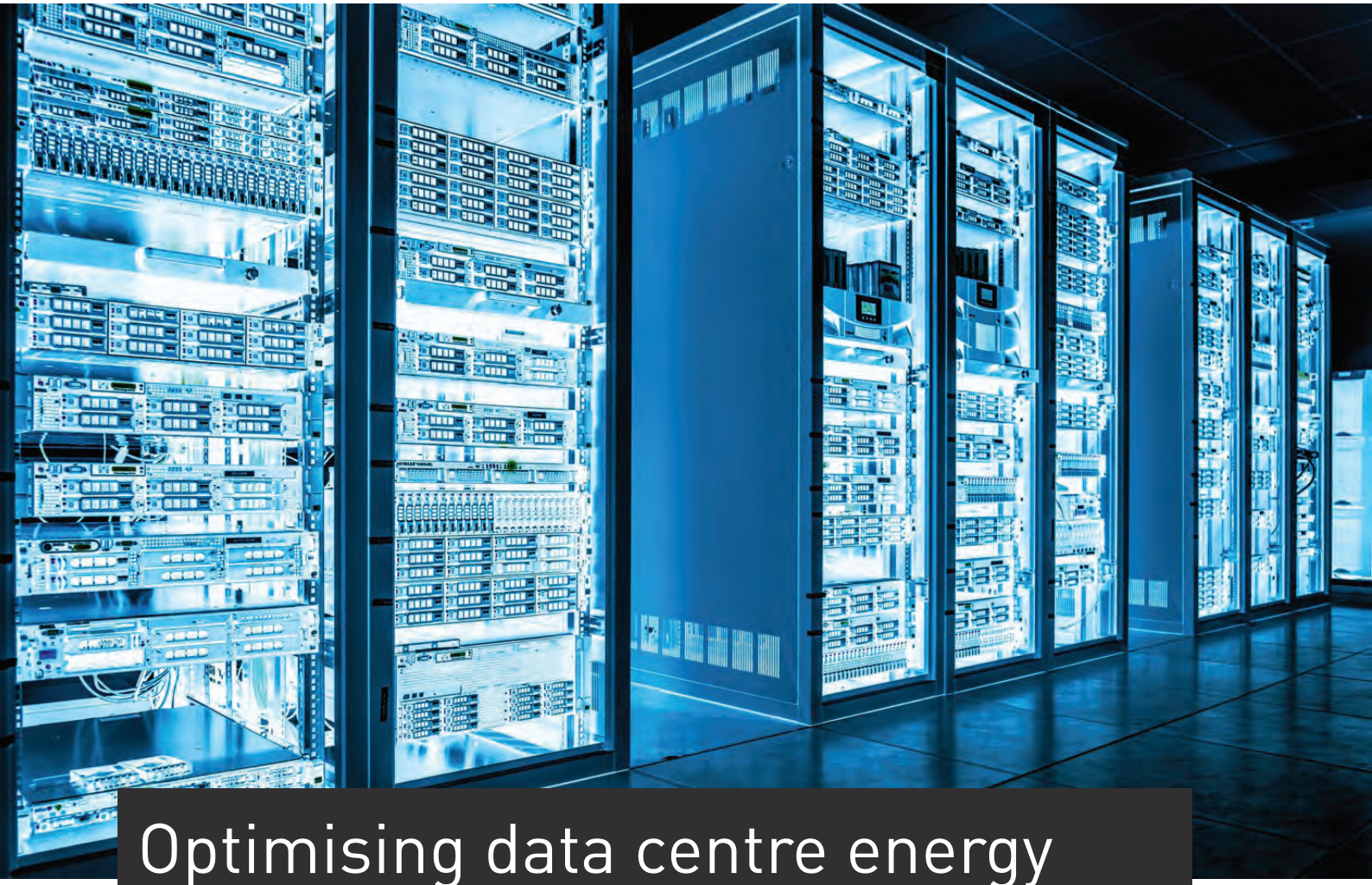
In the industry we all know that there exists much over-provisioned power capacity, storage and distribution infrastructure within the world's existing data centres. There is more to come as new data centre capacity comes online.

Crisis, what crisis?

Demand response is an evolving market that will attract new participants.

Data centres represent a significant and increasing load on the grid. Given the sustainability imperatives and the obvious desire to improve margins, especially margins that are negatively impacted by rising energy costs, it seems logical that the data centre industry will increasingly participate in DR programs.
The reality is that when grid operators wake up to the data centre industry's existing power capacity that could be integrated for feeding power into the system, it could change everything.

But that can only happen if the data centre industry itself is also open to the opportunity. For a deeper dive into the points raised, download a copy of Demand Response Opportunities for Data Centre Embedded Generation and Energy Storage Systems.
This is the fourth Whitepaper from i3 Solutions Group and EYP MCF GHG Abatement Group addressing changing power provision and use in the 21st Century in the time of climate crisis.



Optimising data centre energy efficiency

To optimise energy efficiency it's important to talk to the right people. Joined up thinking, taking into consideration the latest developments and ideas around how to reduce energy is necessary from the outset.

BY LOUIS MCGARRY, SALES AND MARKETING DIRECTOR, CENTIEL UK

THE GREEN GRID has suggested a metric known as Power Usage Efficiency (PUE) for determining datacentre efficiency, which can be calculated by dividing the Total Datacentre Power by the Information Communication Technologies (ICT) Power, i.e. total power supplied to the facility divided by useable IT computing power. However, PUE is a measurement which varies. It's possible to take an average over a year to establish a datacentre's PUE as a measure of its overall efficiency but, on a daily, weekly or monthly basis this will change due to a multitude of variables.

The main consumer of power in a datacentre is the load, other attributors are: Uninterruptible Power Supplies (UPS), Heating, Ventilation, and Cooling (HVAC). However, the reality is that everything can affect PUE including room layout, lighting, servers, transformers, cables, generators, system architecture and configuration. Even the seasons and the time of day can have a big impact, external temperatures and the need to control humidity levels will increase the energy used. Legacy equipment will also have a negative impact. As components age, they become less efficient, can generate more heat and so on. It doesn't take much in terms of change to one or more of these elements to have a considerable effect on a datacentre's PUE. For example: something as simple as switching to LED lighting will use

significantly less energy than conventional lighting. It also creates less heat, so air-conditioning is reduced. So, how else can datacentres optimise their energy efficiency when it comes to the UPS element of their facility?

Variable Efficiency Optimisation

Advancements in the latest UPS technology means that losses in efficiency can be minimised to less than 3%. Selecting a UPS that automatically adapts to the load demand, to ensure that it is always hitting its optimum efficiency, can help to make long term gains. Over the lifecycle of the UPS, this will make a big difference, especially when you consider that datacentres are running continuosly for 365 days a year and need a lot of power.

Proving Your Systems Efficiency

When selecting a UPS, buyers need to be diligent. Interpretations of efficiency levels can vary, even in the specifications, and clever marketing can be misleading. How can you be sure that you are really getting the most efficient UPS available on the market? Check the fine print. So often we see efficiency levels being promoted with caveats, for example: 99% efficiency (in eco-mode/static bypass mode).

Running the UPS this way will provide energy savings. However, it means that you are bypassing the rectifier and inverter, defeating the purpose of having a true online double conversion system. A UPS's true efficiency should only be evaluated based on its performance during true online double conversion. There are various levels of testing available to prove the performance of a UPS system, for example: efficiency can be proven by the UPS manufacturer during a Factory Acceptance Test (FAT) ahead of installation. However, once you have purchased your UPS and witnessed its level of efficiency, how do you know it will continue to perform this well once installed? Best practice would be to analyse the input and the output power values of the UPS, which will illustrate the losses of the overall system. This type of montioring can be done on an adhoc basis or continuously, by building it into the infrastructure.

Sustainable Lifecycle Replacement

Closer monitoring and management of a system is certainly a key way to manage efficiency. It also enables decisions to be made about the best time to replace components. Due to technological advancements and aging components, we know that legacy UPS systems are not as efficient as new ones. So, total cost of ownership (TCO) calculations can be made to establish if it is better to replace systems sooner or later. It is possible to refresh individual UPS modules rather than an entire system.

The infrastructure remains, while individual elements are replaced. The highest quality true modular UPS are so robust now, that parts can actually be re-conditioned, re-certified, re-stamped and re-used. This ensures the components within a system are always in optimal condition.

Some leading datacentres are now looking at sustainable lifecycle replacement programmes on a rolling basis. This is highly preferable than the 'let's see if we can get it to limp over the line' approach employed by some organisations whichcan reduce CapEx, but allows OpEx to rocket. Yes, some UPS solutions can last 15-20 years but is it ideal to keep them going for that long, burning more and more energy than necessary?

Battery Management

Management of battery banks is a further way to optimise energy use. Electricity is expensive, therefore, one approach to reducing costs could be to switch to UPS rather than using energy from the grid. Depleting the battery bank in a controlled manner means that datacentres can cleverly and safely save on electricity. Datacentres will need to ensure that enough stored energy is available in the event of a mains failure to inact their power protection plan, i.e start the generator or conduct a graceful shutdown. Traditional VRLA batteries will not be able to stand the quantity of discharge and recharge cycles, including the recharge time required to adopt this approach. However, advances in Li-ion battery technology offer this possibility and we are working with several datacentres experimenting with this innovative way of working. Li-ion batteries are capable of literally thousands of cycles. As well as occupying less space, they also work at much higher temperatures meaning less air conditioning is required to keep them cool.

One of our international clients has now chosen Li-ion to support its UPS systems across multiple sites. As a result, they have been able to switch the air conditioning off permanently. Although Li-ion is more expensive to purchase than traditional lead-acid batteries, this organisation has calculated the payback from reduced energy usage alone will be recouped within 4-5 years.

Modular Data Centre Approach

Other innovative approaches we are seeing to reduce energy use within leading datacentres include the

Datacentres will need to ensure that enough stored energy is available in the event of a mains failure to inact their power protection plan, i.e start the generator or conduct a graceful shutdown

introduction of a complete modular infrastructure concept . Rooms within rooms! Hot Aisle Containment Systems (HACS) and Cold Aisle Containment Systems (CACS) encase sections of the datacentre, generally within two rows and prevent the mixing of hot and cold air. The temperature within these systems are controlled separately to the rest of the datacentre room.

These systems are already proven as an effective way to reduce cooling, so why not build on this concept? Grouping together aspects of the infrastructure into managable rooms can significantly reduce or even remove the need for cooling in some areas. For example: UPS systems and associated switchgear could be run warmer (30 – 35 degrees). The batteries could also be in a separate room with an ambient temperature of 22 degrees.

Joined Up Approach

To optimise energy efficiency it's important to talk to the right people. Joined up thinking, taking into consideration the latest developments and ideas around how to reduce energy is necessary from the outset. So many organisations request a 2D design, but manufacturers and consultants need to evaluate the site thoroughly on the ground, to understand the challenges and come up with workable, long term and flexible solutions.

Once a plan is created many fall in to the trap of 'cutting costs' by buying cheaper, inferior elements of the system. CapEx can be reduced but at the expense of escalating OpEx. A long term view is required includling reful TCO calculations to see how higher quality equipment which lasts longer and is more efficient, affects the overall financial and energy usage equation and therefore the PUE.

When working to reduce the energy use of a datacentre, there are many elements to consider. At CENTIEL our technical sales engineers are always available to discuss how to optimise efficiency when designing UPS systems and to help make the relevant calculations. We work in partnership with our clients to ensure they can always maximise system availability and reduce their PUE over the long term.

Grouping together aspects of the infrastructure into managable rooms can significantly reduce or even remove the need for cooling in some areas

teledata tm
people and technology together

Premium data centres, colocation and cloud hosting. Built to power your business.

Delivering the highest levels of service and support, **we put people** at the heart of our technology.

We build secure, resilient solutions that are designed to help optimise your business performance and help you to grow.

We bring people and technology together, and you can bank on our team of passionate technical experts to support you every step of the way.

Secure Colocation

Dual-site Cloud

Data Centre Services

Workplace Recovery

DCS AWARDS 2020 WINNER

teledata tm

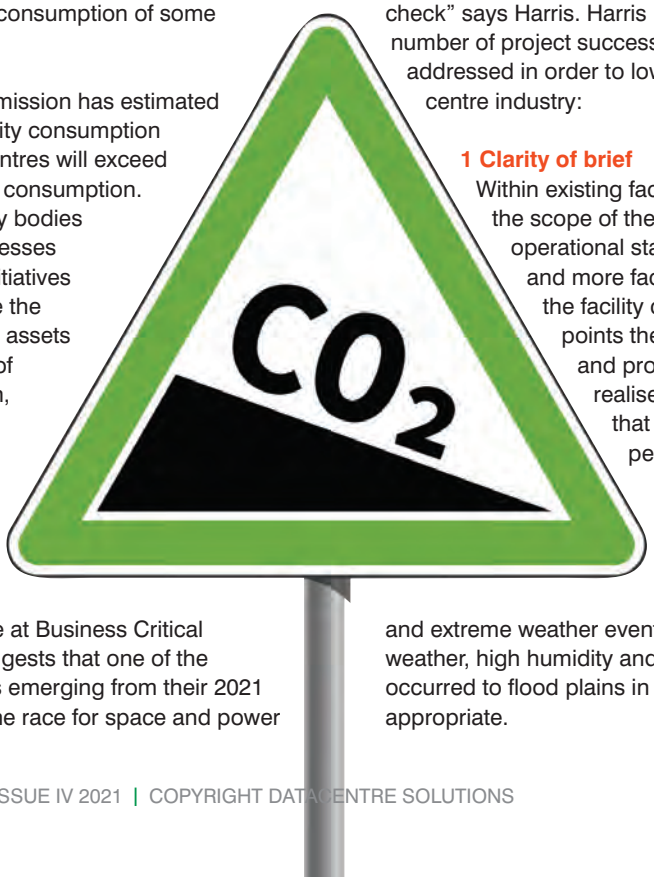
t: 0161 498 1200 **e:** enquiries@teledata.co.uk **w:** www.teledata.co.uk

The top 10 project success factors for emissions reduction in the data centre industry

SIMON HARRIS, HEAD OF CRITICAL INFRASTRUCTURE AT BUSINESS CRITICAL SOLUTIONS (BCS) suggests that one of the fundamental themes emerging from their 2021 Summer Report is the race for space and power that is playing out across the thirty-eight European countries from which we have received insight.

AS THE WORLD increasingly turns its attention to the action required to limit the damage being done to the environment by human activity, the data centre sector is getting to grips with the role it must play in reducing carbon emissions. Energy consumed by data centres is attracting more attention as a matter of concern, as global computing capacity continues to rapidly increase. Already, data centres use an estimated 200 terawatt hours (TWh) each year, more than the national energy consumption of some countries.

The European Commission has estimated that by 2030 electricity consumption in European data centres will exceed 3% of global energy consumption. In response, industry bodies and individual businesses are committing to initiatives designed to improve the performance of their assets including the areas of energy consumption, carbon impact and water use aligned with their ESG imperatives.



Simon Harris, Head of Critical Infrastructure at Business Critical Solutions (BCS) suggests that one of the fundamental themes emerging from their 2021 Summer Report is the race for space and power that is playing out across the thirty-eight European countries from which we have received insight. "Nearly three quarters of the respondents in our survey cited power availability as the most important consideration for data centre location selection. A significant risk exists that rapidly growing demand for information services and compute-intensive applications will begin to outpace the efficiency gains that have historically kept data centre energy use in check" says Harris. Harris believes that there are a number of project success factors that need to be addressed in order to lower emissions in the data centre industry:

1 Clarity of brief

Within existing facilities, it is easy to allow the scope of the project to expand as operational stakeholders have their say and more facts and shortcomings about the facility come to light. The brief points the way in preventing budget and programme pressures being realised by focussing on scope that enhances or protects asset performance and value.

Clients should take the opportunity to consider adaptations required to respond to climate change and extreme weather events including periods of hot weather, high humidity and any changes that have occurred to flood plains in order to future proof where appropriate.

2. Surveys and validation of record information
It is often assumed that record information is accurate and up to date. That assumption should never be made. Surveys and validations should always be commissioned early in the project. Energy monitoring surveys conducted in the early stages of a project should identify easy wins that can be executed quickly and provide a baseline from which to measure delivered benefits for the project as a whole.

3. Budget setting and consideration of the detail of the project
Broad-brush cost estimates based upon historic norms are usually inappropriate and likely to give misleading answers. Consideration needs to be given to the project specifics and prevailing working constraints. Benchmarking of elements or the entirety of the scheme may be useful to give confidence that estimates are in the correct order of magnitude but not as the sole basis for business case approval.

4. Recognition of working constraints
Operational procedures at data centre sites often prevent uninterrupted working and change freezes are not uncommon. Projects tend to have extended execution times compared to new construction. Additionally, as a result of Covid protocols we are seeing restrictions on workforces coming onto functioning sites. Typical constraints include limits on where personnel have been in the two weeks prior (overseas or in other facilities) or only being permitted onto site if vaccinated. These restrictions, whilst often appropriate, make resourcing projects more challenging with inevitable programme effects.

5. Risk management processes
Project planning and execution needs to be aligned to operational risk issues and downstream impacts. Well considered risk registers are required providing clarity about owners and actions. Risk plans require review at appropriate intervals to ensure they are relevant, up to date and in active use.

6. High levels of engagement with operational teams
Ensuring that project work can take place in a way that is congruent with the continuing business as usual operation of the facility is essential. High quality look ahead planning will be needed to integrate construction and operation activities.

7. Back out plans agreed before change overs are executed
Many projects will have one or several key change over activities that require right first-time execution. These will often be programmed to occur over evenings or weekends. To ensure full service availability at key times, plans should exist to determine when and how reverse out plans should be enacted if work does not proceed as planned.

8. Capable teams with relevant expertise and experience
Selection of skilled and experienced design and construction teams are essential to successful project delivery. Appointing project participants should therefore be done on the basis of a thorough pre-qualification process or through pre-existing knowledge of the capability of organisations key individuals. Skills shortages in the sector make this process essential.

9. Financial considerations
Full project financial picture must be considered, inclusive of the tax position. Government tax Incentives in the form of capital allowances are available to support and encourage businesses to undertake capital investment. These incentives are obtained through savings in Corporation Tax. With expenditure on qualifying plant and machinery likely to be substantial, Corporation Tax paying UK based data centre owners should ensure that capital allowance benefits are maximised in order to improve their return on investment.

Obtaining the relief is not an automatic process and the tax rules are complex and often misunderstood. As a result, many businesses miss out on the tax relief available to them. Appointing a specialist capital allowances consultant with complex engineering systems experience will deliver tangible benefits.

10. Potential efficiency gains through investment
Potential remains for substantial efficiency gains, but investments in next-generation computing, storage, and heat removal technologies will be required to avoid potentially steep energy use growth later this decade. Parallel investments in renewable power sourcing will be required to minimize the climate implications of unavoidable data centre energy use.

There is no doubt that the years between now and 2030 are critical in the race to net zero. For the world to get on track, there will need to be an immediate, unprecedented acceleration in deployment of new and existing technologies within renewable energy generation.

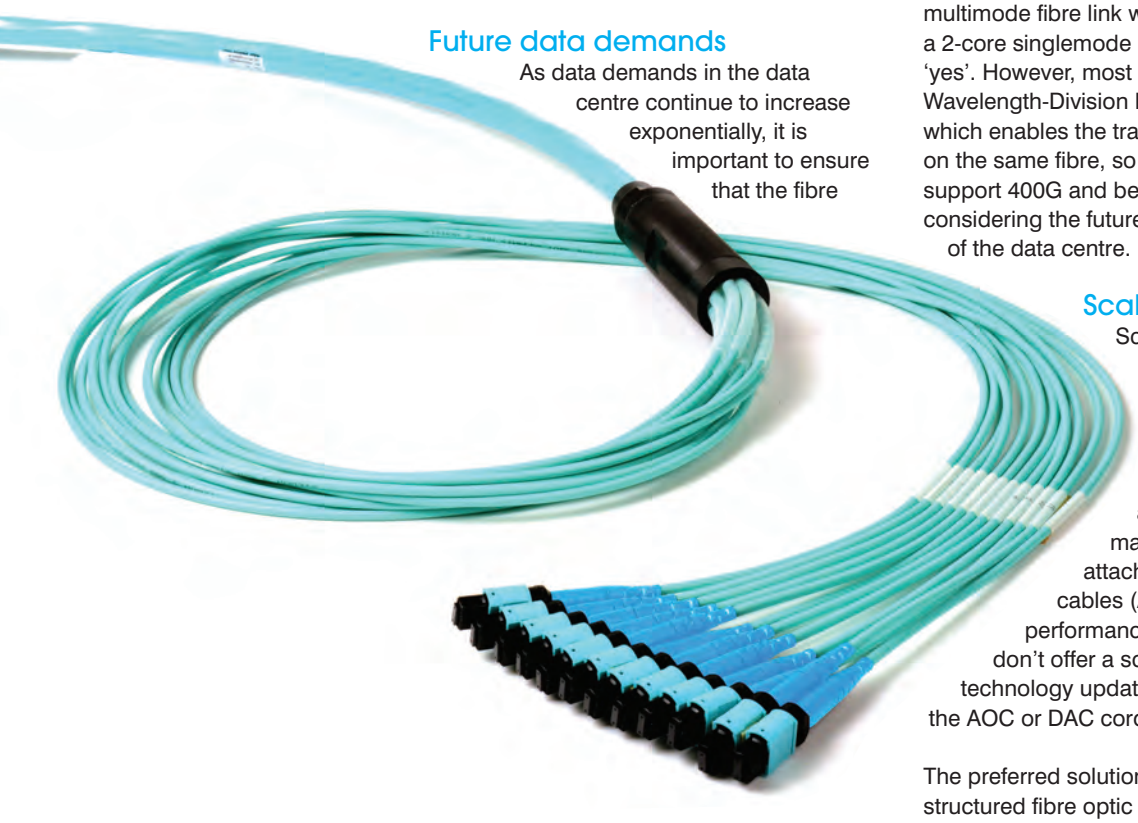
We have already seen a trend amongst technology businesses announcing their plans or achievements in moving to green power. These businesses have been using their muscle to hoover up large amounts of green power availability but the simple expedient of going 100% green will not be sufficient. Efficiency improvement opportunities within existing facilities need to be taken whether that is through smarter management of the IT itself or the supporting engineering infrastructure.

According to Harris: “At BCS we have seen significant energy efficiency improvements delivered as part of a general refreshment of assets that are beyond their economic life.”

The right type of fibre

NICOLAS ROUSSEL, TECHNICAL MANAGER AT SIEMON, discusses whether to select singlemode or multimode fibre cabling for the data centre

WHEN DESIGNING a new fibre infrastructure for the data centre, it is important to understand your projected need for future bandwidth and application usage. The goal must be to select a cabling solution that meets the growing data demands of the business, that is scalable and that ensures reliability and rapid deployment. The traditional discussion between singlemode or multimode fibre is no longer a simple one as the costs are very comparable between both these fibre types. We are now seeing the above four factors that will allow for better infrastructure planning and design with future growth in mind and will help businesses to economically scale up over time without impacting on performance or uptime.



Future data demands

As data demands in the data centre continue to increase exponentially, it is important to ensure that the fibre type selected will comply not only with the current application needs (ranging from 10Gb/s to 100Gb/s) but also with future needs (400Gb/s to 800Gb/s).

If we take a closer look at 400G applications, multimode fibre can support a maximum length of 100 to 150m while singlemode (depending on the transmission method) can reach 2km or more. At first glance, a singlemode link has an advantage on the supported length but multimode fibre would reduce active component costs. Multimode QSFPs are typically cheaper than singlemode equivalents when using parallel optic applications that require more than 8-core fibre. So the question is if an 8-core multimode fibre link would be more cost effective than a 2-core singlemode link and the answer is typically 'yes'. However, most singlemode applications use Wavelength-Division Multiplexing (WDM) technology which enables the transmission of several signals on the same fibre, so that a duplex connection can support 400G and beyond. It all rather depends on considering the future requirements and data demand of the data centre.

Scalability

Scalability and future proofing are key when designing a fibre infrastructure and the first metric in terms of scalability is length. For very short distances, especially in Top of Rack (ToR) and breakout applications, many data centres deploy direct attach cables (DACs) or active optical cables (AOCs), which provide a high performance and reliable solution, but they don't offer a scalable migration path. With each technology update the user is required to change the AOC or DAC cord.

The preferred solution in these instances remains a structured fibre optic cabling system which utilises

transceivers. This provides the maximum amount of options for scalability and migration in the future as the active components can be easily upgraded without changing the underlying infrastructure.
We are also seeing data centre architectures evolve to more simplified architectures with less network layers, thereby reducing the length and optical loss budget on the fibre channel. Those simplified architectures with shorter distances (knowing that 93 per cent of data centre channels are shorter than 100m) will better support lower cost multimode high-speed applications.

What about future higher speeds?

Even if multimode fibre cabling would be sufficient for enterprise data centres because of shorter distance and speed requirements compared to cloud data centres, the need for higher speeds in the future remains. Will port aggregation applications (8 lanes of 50G) be more cost effective once enterprise data centres move to 400G speed? Looking at current IEEE drafts, we are seeing more singlemode application developments above 400G. The objective of the IEEE beyond 400Gb/s Ethernet study group is to achieve 800G and 1.6 Terabit over singlemode fibre from a distance of 500m up to 40km; while multimode is being considered only for 800G applications up to 50 or 100m and currently not on 1.6T.

These developments help to reinforce that all current and future applications are supported by all fibre types. However, while a singlemode fibre infrastructure installed 25 years ago using the same duplex connector is still viable today, a multimode infrastructure has to upgrade from OM1 to OM2, OM3, OM4, with OM5 now emerging.

Multimode can efficiently absorb most of the dynamic traffic that is localised within the data centre. It is a highly useful media to support greater bandwidths of 40G with duplex LC interfaces using BiDi technology and 100G/200G/400G utilising parallel optics, so its continued relevance within data centre designs is clear.

With this in mind, multimode connectivity needs more design considerations in terms of connector type and also the maximum channel attenuation. These two factors (performance and connector type) need to be reviewed to ensure the solution specified is capable of supporting the application.

Rapid deployment

With the availability of pre-terminated links, both fibre types are simple to install, require less time than field terminations and are therefore more cost effective. As recommended by the latest cabling standards, pre-terminated fibre cabling is the preferred deployment type but it needs to be carefully tested and cleaned to ensure the right performance.

For multimode cabling, technicians need to ensure the lowest attenuation to support high speed connections where attenuation becomes more critical than length. Just a small dust particle can impact the signal. Therefore, cabling manufacturers like Siemon provide low-loss components and the Standards require a more professional cleaning method. Looking at singlemode fibre, cleaning is just as crucial to ensure that the signal will be transmitted. Even if there is more room for attenuation with singlemode applications, dust can create critical signal distortion as the signal needs to be transmitted in 9μ fibre core (compared to 50μ for multimode).

With different fibre technologies available in the data centre space today, it can be difficult for data centre owners and operators to make the right choice. While multimode clearly has its place for distances up to 100m and for longer term application use, an OS2 singlemode optical fibre infrastructure would be the suggested first choice to guarantee application assurance as we transition to higher speeds as it allows for high data availability and throughput within your various data centre environments.

Creating a greener and digitalised world with sustainable fibre optic networks

Designing fibre solutions and optimising supply chain processes with the environment in mind will have a huge impact.

BY ALAIN BERTAINA, BUSINESS DEVELOPMENT AND PRODUCT STRATEGY DIRECTOR TELECOM BUSINESS AT PRYSMIAN GROUP

BROADBAND TRAFFIC has risen significantly over the past 18 months, with extended periods of home working and a heightened reliance on the internet for schooling, entertainment and communication purposes. According to data from DATAREPORTAL, almost 62 percent of the world's total population (4.88 billion people) used the internet in October 2021.

The growing demand means that the need for effective, high-capacity networks has never been greater. However, the recent G20 and COP26 conferences, in Rome and Glasgow respectively, have again highlighted the worldwide efforts required to lessen the impact of climate change. Global operators can play their part in operating with the environment in mind, as fibre networks have proven to be more energy efficient than its rivals. By utilising fibre solutions that are more energy efficient and use eco-friendly materials, any unnecessary supply chain emissions are reduced, and digital infrastructure can be enhanced in a sustainable manner.

Improving energy efficiency

Despite the rise in broadband transmissions, optical fibre connections account for just 26 percent of total broadband connections on average in the Organisation for Economic Co-operation and Development (OECD). To deliver connectivity at an optimum speed and low latency, increasing the share of fibre connections will be crucial in ensuring that countries can benefit from next-generation, high-capacity technologies. The sky-rocketing growth of data traffic means that more energy will have to be dedicated to processing this data, but its environmental impact can be reduced with fibre. While it is more energy efficient than its rivals ADSL, PSTN and mobile, fibre's near-unlimited bandwidth capacity ensures it is well-placed to comfortably manage the increasing data traffic.

Optical fibre helps to reduce energy consumption in production, as well as in use. During the production process, this is facilitated, for instance, by the ability to switch off when the graphite furnace is underutilised. These gains can then be further built upon when optical fibre is being deployed across networks, from fixed networks to mobile front, back and midhaul, and for last mile connectivity. This is due to its use of spectrum, which can be lit on demand at each end point, rather than constantly. Additionally, bend-insensitive single mode fibre is also the only fibre capable of securing the whole fibre spectrum, especially at the longer wavelengths, by minimising losses linked to macro- and micro bends.

Fibre is also more efficient due to its enhanced stability, reliability and long lifespan. Fibre's bend resistance means that it has a longer expected network lifetime, which is especially important in dynamic network environments. While this saves money for companies, more importantly it reduces the carbon footprint as there is less material being used. Fibre solutions should also be future-proofed where possible, to ensure that operators can reap the benefits for years to come. This will help to prevent the need for entire sets of equipment to be replaced. Instead, solutions should be easy to install, optimise total cost of ownership and encourage scalability and upgrade options.

Fibre for mobile

The use of fibre enhances the efficiency of mobile networks, especially when used to connect an antenna. This makes it vital for telecoms networks and the fixed, enterprise and mobile customers they serve. This is particularly important due to the increasing wavelength requirements of passive optical networks, and the rising impact of 5G as it is rolled out across the globe.

Sustainable supply chains

While fibre itself is an energy efficient choice for networks, there is still work that needs to be done in terms of reducing emissions and the carbon footprint

of the supply chain for fibre solutions. Re-using materials to create fibre-optic networks can have a significant impact. In one instance, using 100 percent sustainable germanium for optical fibre production resulted in annual company CO2 emissions being reduced by 60 percent. This is the equivalent to removing circa 6,800 combustion-engine cars off the road. Moreover, through savings on logistics, storage and packaging materials, the supply chain can be transformed to a greener process. Fibre solutions that are smaller and lighter are positively contributing to this, as besides consuming less energy, they can also be packed more tightly into a reduced number of vehicles for transportation.

A recent trial by Prysmian found that 11,000 connections required six fewer full freight transports than if the conventional cable and duct system had been used. The research showed a 31 percent saving on CO2 emissions for transport. If all fibre solutions are created to be as small and light as possible, whilst still offering a high performance, the impact on the number of emissions and overall carbon footprint will be substantial.

A greener world

As the amount of data traffic rises due to an increasingly connected society, global operators can play a part in the journey towards a greener, more digital and resilient world. Fibre offers enhanced stability, reliability and has a longer expected network lifetime, reducing the environmental impact significantly. Designing fibre solutions and optimising supply chain processes with the environment in mind will have a huge impact. This is not just the responsibility of one or two companies, but the entire telecoms industry as a whole must work together to deliver a greener future.

The role of containment in mission-critical edge deployments

Today, edge data centers need to provide a highly efficient, resilient, dynamic, scalable and sustainable environment for critical IT applications. At Subzero Engineering, we believe containment has a vital role to play in addressing these requirements.

BY GORDON JOHNSON, SENIOR CFD ENGINEER AT SUBZERO ENGINEERING

IN RECENT YEARS edge computing has become one of the most prevalent topics of discussion within our industry. In many respects, the main purpose of edge data centers is to reduce latency and delays in transmitting data and to store critical IT applications securely. In other words, edge data centers store and process data and services as close to the end user as possible.

Edge is a term that's also become synonymous with some of the world's most cutting-edge technologies. Autonomous vehicles have often been discussed as one of the truest examples of the edge in action, where anything less than near real-time data processing and ultra-low latency could have fatal consequences for the user.

There are also many mission-critical scenarios, including within retail, logistics and healthcare, where a typically high density computing environment, packed into a relatively small footprint and a high kW/rack load is housed within an edge environment.

Drivers at the edge

According to Gartner, by 2020, internet capable devices worldwide reached over 20 billion, and are expected to double by 2025. It is also estimated that approximately 463 exabytes of data (1 exabyte is equivalent to 1 billion gigabytes) will be generated each day by people as of 2025, which equates to the same volume of data as 212,765,957 DVDs per day! While the Internet of Things (IoT) was the initial driver of edge computing, especially for smart devices, these examples have been joined by content delivery networks, video streaming and remote monitoring services, with augmented and virtual reality software, expected to be another key use case. What's more, transformational 5G connectivity has yet to have its predicted, major impact on the edge.

Clearly, there are significant benefits in decentralizing computing power away from a traditional data center and moving it closer to the point where data is generated and/or consumed. Right now, edge computing is still evolving but one thing we can say with certainty, is that the demand for local, near real-time computing represents a major shift in what types of services edge data centers will need to provide.

Efficiency and optimization remain key

An optimized edge data center environment is required to meet a long list of criteria, the first being reliability as edge facilities are often remote and have no on-site maintenance capabilities. Secondly, they require modularity and scalability, the ability to grow with demands. Thirdly, there's the issue of a lack of a 'true' definition. Customers still need to define the edge in the context of their business requirements, deploying infrastructure in line with business demands, which can of course affect the design of their environment. And finally, speed of installation. For many end-users time to market is critical, so an edge data center often needs to be built and delivered on-site in a matter of weeks.

There is, however, one more important factor to consider. An edge data center should offer true flexibility, allowing the user to quickly adapt or capitalize on new business opportunities while offering sustainable and energy efficient performance. Edge data centers are, in many respects, no different from traditional facilities when it comes to the twin imperatives of efficiency and sustainability. PUE as a measure of energy efficiency applies to the edge as much as to large, centralized facilities.

And sustainability, especially the drive towards Net Zero, is a major focus for the sector in its entirety. However, what will change over time is the ratio of edge data centers. By 2040, it's predicted that 80% of total data center energy consumption will be from edge data centers, which begs an obvious question: what will make the edge energy efficient, environmentally responsible, reliable and sustainable all at the same time?

The role of containment

Containment is almost certainly the easiest way to increase efficiency in the data center. It also makes a data center environmentally conscious because, instead of consuming energy, containment saves it. This is especially true at the edge.

Containment helps users get the most out of an edge deployment because containment prevents cold supply from mixing with hot exhaust air. This allows supply temperatures at the server inlets to be increased.

Since today's servers are recommended to operate at temperatures as high as 80.6 degrees Fahrenheit (27 degrees Celsius), containment allows for higher supply temperatures, less overall cooling, lower fan speeds, increased use of free cooling and reduced water consumption – all important factors when it comes to improving efficiency and reducing carbon footprint at the edge.

Further, a contained solution consumes less power than an application without it, which means an environmentally friendly, cost-effective environment. Additionally, it improves reliability, delivering longer Mean Time Between Failures (MTBF) for the IT equipment, as well as lower PUE.

Uncertainty demands flexibility

At Subzero we believe an edge data center needs to be flexible and both quick and easy to install. It needs to be right-sized for the here and now, but capable of incremental, scalable growth. Further, it should allow the customer to specify the key components, such as the IT, storage, power and cooling solutions, without constraining them by size or vendor selection.

Thankfully, there are edge data center providers who now offer an enclosure built on-site in a matter of days, with ground-supported or ceiling-hung infrastructure to support ladder racks, cable trays, racks and cooling equipment.

These architectures mean the customer can choose their own power and cooling systems and once the IT stack is on-site and the power is connected, the data center can be up and running in a matter of days. Back in 2018, Gartner predicted that, by 2023, three-quarters of all enterprise-generated data would be created and processed outside a traditional, centralized data center.

As more and more applications move from large, centralized data centers to small edge environments, we anticipate that only a flexible, containerized architecture will offer end-users the perfect balance of efficiency, sustainability and performance.

The latest Subzero White Paper by Gordon Johnson – Making the Edge Efficient, Scalable, and Sustainable can be found here.

Modular design eases the commissioning and expansion of data centres

With demand for cloud services growing so rapidly, data-centre architects are looking for efficient, cost-effective ways to build facilities that enable them to match the level of capital investment to current demand, while providing a low-cost way to expand to meet future demand.

BY IAN WILCOXSON, CHANNEL MANAGER (DATA CENTRES) EMEA POWER SOLUTIONS, KOHLER

DATA CENTRES are the factories of the Information Age, automating and standardising the processing of vast amounts of data into information, entertainment, and insight. Data centres must operate 24/7/365, as close to peak capacity as possible, to make the most of the capital invested in them.

The same is true when it comes to building data centres: the entire project must be carefully specified, meticulously planned, and implemented with great precision, to minimise the time that capital is lying idle. With internet traffic growing around 3% a month, delaying the completion of a data centre can leave significant opportunities untapped.

One response to the industry's demand for capacity is to modularise the process of building data centres. In this approach, servers, networking equipment and ancillary services such as back-up power generation are built at the supplier's factories and then delivered to site for 'plug and play' installation.

This approach also means that data-centre architects can specify and build the infrastructure for very large

data centres, but only populate them with enough equipment to meet current demand. Again, this ensures that capital investment matches current capacity requirements.

A modular approach can streamline the build process, reduce its carbon footprint, and lower costs. For example, rather than having to support changes to complex systems such as backup generators (gensets) onsite, modular designs can be configured to meet customer needs in the equipment maker's factory. This speeds up the installation process. It also gives equipment makers the confidence to offer more product options and greater customisation, because they can have direct access to in-house planners, designers, manufacturing expertise, testing equipment, and quality-control systems.

Enabling this kind of modularity requires deep engineering experience and innovative design strategies to make it work. For gensets, it means developing own-brand engines, cooling systems and ancillary equipment and then integrating them seamlessly into robust containers or canopies fitted with the latest soundproofing. This requires a lot of in-house expertise, as well as one-stop-shop manufacturing capabilities, with generators and their external housings being produced in the same factory to ensure quality and consistent technical performance.

This one-stop-shop approach can be extended to the whole process of planning, specifying, building, delivering, commissioning, and maintaining a genset. This is attractive to data-centre architects, who are focused on ensuring that the solution they specify is right for the job and will work when it is needed. And it makes sense for the supplier, who can take end-to-end responsibility for building, integrating, and testing the equipment in their factories so that they can deliver, commission, and maintain it without calling in third parties.

Centralising genset engineering also increases the determinism in the process and reduces the chances of unexpected delays. It does away with the need to rely upon the efforts of third-party fabricators, whose service quality may vary. It increases product quality, because all the parts are made in a dedicated facility, for a single purpose, under a common quality-control scheme. And it increases reliability, since it is easier to track any issues, find their root causes and rectify them quickly when all the work is being done in-house.

At Kohler, all these processes are handled within one manufacturing plant – usually at headquarters in Brest, France – eliminating the need for third-party fabricators and packagers. This helps ensure consistent build quality for a range of power solutions optimised for data-centre applications.

With demand for cloud services growing so rapidly, data-centre architects are looking for efficient, cost-effective ways to build facilities that enable them to match the level of capital investment to current demand, while providing a low-cost way to expand to meet future demand. Modular data centres, and the modular ancillary equipment such as backup gensets that enable them, make this capital-efficient approach to the design, commissioning, operation, and expansion of data centres much easier to implement.

Bridging the gap - why data centres must commit to liquid cooling

When it comes to data center cooling, operators have long known that liquid is a far more efficient medium for removing heat compared to air. However, to date there have been many barriers to adopting and benefiting from liquid cooling strategies, which comes some way to explaining why the data center industry remains in transition today.

BY JASON MATTESON, ICEOTOPE DIRECTOR OF PRODUCT STRATEGY

THE LEADING OBSTACLE to the adoption of liquid cooling is the perception of risk. In an historically conservative industry, where, e.g., reliability trumps efficiency, risk aversion has opened up a chasm between the understanding of potential benefits which could be accrued with liquid cooling and the business decision that could deliver those gains. How can the industry finally bridge this gap?

Perception of Risk #1; Leaking Liquids in the Data Center

One classic risk perception has led to concerns about the chance of leakage of water or other liquids that could interfere with the operation of the servers or other IT equipment. This has been especially true of water direct-to-chip solutions, where cold plates are installed inside the servers. The risk of leakage coupled with the use of water as a coolant has unfortunately proven to be a real concern as well as the source of actual damage.

While it is not openly admitted, it cannot be denied that water damage or leakage has been a major cause of downtime over the years. Putting running water alongside electrical equipment is not only risky, but potentially dangerous. Not unnaturally therefore, some operators have felt the potential benefits accrued by deploying liquid cooling don't outweigh the apparent risk to valuable IT loads, especially where costs can accumulate from lost data, damaged equipment and downtime.

It is not unusual for a customer to simply say that they don't want to have water in the data center. Despite this, the customer's site would undoubtedly have liquid circulating the technical space underfloor and through their air handlers. Typically, a chilled water loop would be in place, cooling the air that was moving around the room. However, the customer journey didn't reflect this understanding at the time.

Perception of Risk #2; Isn't Air-based Data Center Cooling Sufficient?

The next question often became about whether the data center operator really needs liquid cooling - isn't air sufficient? The answer is that while we might well have managed with air for decades, the reality today is that air cooling is no longer sufficient to ensure the reliable operation of data center loads. A recent paper published out by ASHRAE TC9.9, The Emergence of Liquid Cooling in Mainstream Data Center highlights exactly this point.

New technologies are just on the horizon which requires liquid direct to rack and chip, says the ASHRAE TC9.9 technical committee – generally considered to be a leading global authority on data center power and cooling trends and best practices. Not only is the need for liquid cooling being driven by chip density as well as application performance, it says, there is also an urgent need for the industry to prepare for liquid technologies now.

By way of example, the high-performance computing (HPC) community has for sometime deployed liquid cooling as an industry norm. With no seeming ill-effect on uptime or availability, the technology has enabled CPUs and GPUs to be reliably run at maximum performance while minimizing its leakage power. This in a market sector where data processing speed and volume matters, and even fractional percentage improvements can make a real difference.

Amongst most industry players, there is growing awareness of the significant value which liquid cooling brings. For example, it allows higher density racks to be deployed making white space more productive; it facilitates greater data processing capacity and performance (the real work of the data center), increased energy efficiency, lower carbon impact and the opportunity for heat recovery. Pilots with technology such as precision immersion, chassis-level liquid cooling, suggest that IT equipment is also more reliable and requires fewer manual service interventions when installed in dielectric-cooled environments.

The future doesn't have to resemble the past

Technology has evolved, as it does. At the same time, data center cooling technology has reached an inflection point, meaning the change that was already happening is now gathering momentum. The newest chipsets and related solutions being launched by all the major vendors, increasingly require liquid cooling solutions. Many websites and much documentation already state this need.

The underlying challenge is that superficial changes to the air cooling system, like adding more fans or reducing the hardware density, will no longer be enough. IBM, for example, has just announced 2nm chipsets promising 45% higher performance than today's most advanced 7nm processors, further empowering the rise of analytics, AI and machine learning.

By way of example, the high-performance computing (HPC) community has for sometime deployed liquid cooling as an industry norm. With no seeming ill-effect on uptime or availability, the technology has enabled CPUs and GPUs to be reliably run at maximum performance while minimizing its leakage power

Progressively, enterprise CIOs and IT strategists are increasingly being tasked with solving newer challenges - from advanced analytics, machine learning and artificial intelligence to 5G, the internet of things (IoT) and edge compute. That means the data center operators and digital infrastructure that underpin them must support much higher power demands and rack densities too. For many companies, the question facing the data center sector is no longer "if", but when and how will liquid cooling start to become ubiquitous.

The cooling stakes in the data center, not just for hyperscalers and university supercomputers and other pioneers but for colo providers and 'standard' enterprise-level server rooms, have risen. Cooling and dissipating heat from increasingly hot and hungry systems and hardware has suddenly become much more challenging. This is largely because this slow-moving and conservative industry remains wedded to the use of hugely inefficient air-based cooling systems.

Solutions for the liquid risk-reward equation

Power users like HPC specialists and high-end researchers have been immersed in the world of liquid cooling for years now. Partly as a result, the range of liquid cooled solutions has developed and grown. Latterly, more specific innovations to suit the requirements of mainstream and colocation data centers have also become available.

Today, there are a few different liquid cooled technologies that are key, each with its own pros and

cons. While thermal engineers argue that direct-to-chip is the superior approach, not every customer will need that level of performance right down to CPU or chip level. For others, an immersion cooling solution might deliver sufficient thermal improvement.

One question we have not mentioned is around the serviceability of IT equipment and the ongoing process of IT moves, adds and replacements in the white space. If your servers are submerged in an immersion tank, how do you access them safely for essential maintenance and repairs and what might that mean for warranties?

The latest innovation is precision immersion, or chassis-level precision immersion is essentially a hybrid of liquid cooling approaches combining the best features of full immersion and direct-to-chip. Optimised at chassis-level, precision cooling is focussed on user convenience; it can be retro-fitted into the data center using standard equipment racks, reducing risk and complexity whilst simplifying deployment.

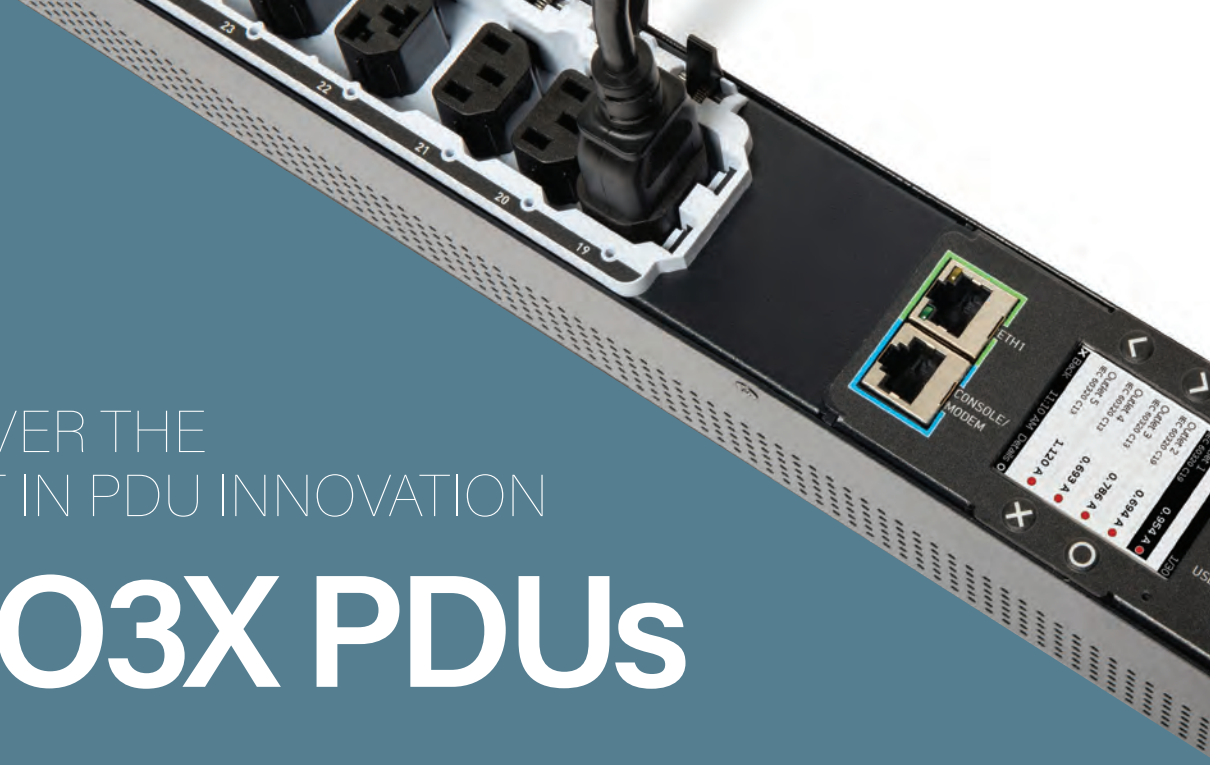
Bridging the budget gap

A recent white paper by data center physical infrastructure leader, Schneider Electric investigated the capital costs of immersive liquid cooling versus air cooling in the large data center and the typical cost differential is not as large as one might expect. In fact, Schneider were able to demonstrate that at a like-for-like rack density of 10 kW in a 2 MW data center, the CAPEX requirement is broadly the same.

Because compaction is a key benefit of liquid cooling, Schneider have also quantified the capex difference when liquid cooling is deployed at 20 kW per rack and 40 kW per rack for the same capacity data center, respectively achieving 10% and 14% CAPEX savings. More recently, a white paper published by multi-disciplinary engineering company, Cundall, suggests that up 20% savings in CAPEX should be expected.

The choice to bridge the gap and deploy liquid cooling involves a complex equation with a lot of moving parts, but it will usually end up coming down to the dollar, pound or euro. Newer chassis-level technologies will continue to meet the cooling requirements of high-density CPUs and GPUs for the foreseeable future. What's more, the technology can deliver space savings, efficiency savings and lower TCO. For the astute data center operator, chassis-level precision liquid cooling is a sound engineering and business case.

For more information on delivering liquid cooling anywhere, any time to maximise efficiency, contact Iceotope - learn more at www.iceotope.com/resources



DISCOVER THE
LATEST IN PDU INNOVATION

PRO3X PDUs

MORE BENEFITS IN A SINGLE PDU SOLUTION

JUST SOME OF THE PRO3X PDU BENEFITS:

- **Improve uptime** with mechanical locking outlets
- **Increase flexibility** with outlets accommodating both C14 and C20 plugs in a single outlet
- **More intelligence** from a technology platform that enables complete power chain visibility, remote management, advanced alerting and security
- **Improved airflow and load balancing** with alternating phase design

STAY POWERED AND ENSURE UPTIME WITH INDUSTRY LEADING INNOVATION

Learn more about the PRO3X PDU at:
https://www.servertech.com/solutions/pro3x-pdu-solutions

Server Technology®
A brand of legrand®

DCS AWARDS 2020 WINNER

www.servertech.com | sales@servertech.com | 800-835-1515

Why is engaging loadbank testing expertise important?

For data centre providers, system failure can represent the worst possible scenario, with every minute of downtime leading to rising costs and reputational damage. This situation is usually a result of failing equipment, which can occur due to ineffective testing of critical infrastructure for periods of high demand. With this in mind, **GREGER RUUD, SECTOR DEVELOPMENT MANAGER – NORDICS DATACENTERS AT AGGREKO,** discusses the importance and effects of carrying out loadbank testing at the commissioning stage.

DATA CENTRES are increasingly vital to the continued running of the modern world, meaning system failure can be seen as nothing short of catastrophic. With breakdowns punished financially and reputationally, failures of this kind should be regarded must-avoid situation.

The disruption of power supplies is often to blame for data centres being taken offline. Consequently, it is vital facility owners and operators take steps to ensure uptime is constantly maintained and safeguarded. One such way of doing this is through the comprehensive testing of critical infrastructure, including power and temperature control systems.

Consequences of downtime

Not carrying out this necessary procedure can be costly, as shown when an untested data centre went offline in 2019 during a significant IT migration for a UK bank. With the IT services arm of the bank's owners opting to test only one facility ahead of time, the cause of the major outage at the other data centre was impossible to identify.

Two million customers were therefore unable to

access their accounts for a prolonged period, with the bank being fined £370m in 'post-migration charges' as a result. These severe consequences could have been avoided if effective testing had been carried out before the data centre went online and put into a demanding situation, as potential concerns could have been pinpointed and remedied beforehand.

The Nordics

In terms of infrastructure, demand, and applications no two data centres are the same. The Nordics in particular host a wide variety of facilities, from large hyperscale sites in rural Denmark, Sweden and Finland facilitating low-latency data, to comparatively smaller enterprise and co-location facilities situated in or near capital cities.

Technical expertise is therefore required to ensure different types of testing can be carried out appropriately and effectively. Consequently, there are multiple organisations with specialised equipment and expertise to carry out effective loadbank testing processes, and help data centre providers reap the benefits of these well-executed strategies.

The coronavirus has also presented organisations with logistical concerns in the data centre market, necessitating a pragmatic approach. Specifically, the effect COVID-19 has had on supply chains has been pronounced and ongoing, with British and Irish professionals sought after for their expertise, subject to travel protocols. As well as this, skills shortages in the construction sector present further roadblocks for building new data centres.

Faced with these pressures, alongside a continually booming data centres market in the Nordics and often-ambitious deadlines, the ability to access readily available expertise from commission experts and suppliers such as Aggreko has become even more important. Indeed, considering the penalties that may be accrued from disruption to project deadlines and the consequences of inadequate testing, identifying organisations that can carry out effective loadbank testing, while remaining on schedule, has become a paramount concern.

International reach

Alongside being able to better ensure the availability of necessary expertise within deadline-friendly time windows, suppliers with an international reach can also offer standardised, first-rate equipment testing. So, while different regions may have divergent conditions, climates and pose different obstacles, the fact a baseline of quality exists regardless of these variables is crucial to negating the possibility of disrupted data centre operations.

Fundamentally, these suppliers need to provide a balance of local knowledge and globally-recognised expertise for facility owners and operators looking to source testing and commissioning professionals.

In terms of infrastructure, demand, and applications no two data centres are the same. The Nordics in particular host a wide variety of facilities, from large hyperscale sites in rural Denmark, Sweden and Finland facilitating low-latency data, to comparatively smaller enterprise and co-location facilities situated in or near capital cities

The ability to offer a standardised service at all levels, including factory and site acceptance testing, to pre-functional, individual and integrated systems testing is already a must for contractors.

Combining this with an awareness of location-specific factors that could affect this testing turns a previously good service into a marketing-leading one. In the Nordics, this includes taking account of the traditionally colder climate, its impact on humidity and moisture levels, and the ensuing risks of equipment failure.

Considering areas such as Lapland have also experienced record-breaking highs in temperature earlier this year, a level of flexibility between the seasons may also be required. Such a level of knowledge is vital for contractors looking to put systems in place to negate the possibility of equipment failure.

Conversely, a lack of awareness could lead to measures not being put in place, with disastrous consequences if effective testing has not been carried out under full load demand conditions.

Cost-effective maintenance

An additional benefit of sourcing testing suppliers with local and global reach is that this ranging expertise can help improve a facility's operational efficiency. Indeed, putting in place precautions around key equipment, such as power and cooling infrastructure, will optimise performance, resulting in lower ongoing opex and maintenance costs. Yet alongside providing data centre stakeholders with peace-of-mind that

systems have been comprehensively installed and integrated, these processes can also help owners and operators avoid costly issues and unplanned downtime across a facility's lifetime.

Because equipment has been tested to correct levels during the commissioning phase, issues can be identified and resolved earlier on. Due to this, data centre owners and operators are able to prioritise the implementation of effective procedures for effective maintenance of their facility. Consequently, the environment can be made more efficient and safer for those on site. Alongside this, the large quantities of data acquired during this testing process can be used to benchmark the impact of system changes and identify ongoing performance trends. It can also be used to negate potential issues before they arise and hamper operations, by allowing stakeholders to put predictive procedures and maintenance strategies.

Offsetting commissioning costs

From a financial standpoint, these loadbank testing benefits, effectively executed by sector experts, will more than offset commissioning costs. Putting these processes in place will subsequently give facility owners and operators confidence in the resilience of their critical infrastructure even under demanding loads increasingly expected of modern data centres. Yet sourcing necessary expertise may be difficult in a market affected by labour shortages and COVID, meaning assurances around carrying out testing within tight construction deadlines are more important than ever.

Aggreko, for example, has a sizeable team available to data centre contractors and operators working in the Nordics, providing resistive-only AC loadbanks, DC loadbanks, and combined resistive and reactive loadbanks in single or multiple units. Able to be controlled remotely via laptops or hand-held devices, they can be used on single or three-phase systems and are available in varying sizes. Consequently, they can easily collect data for bespoke loadbank testing and data collection for future reference.

Travel restrictions and issues in the labour market remain an ongoing concern for data centre providers, so being able to engage expertise on-time and to budget is invaluable. By using service providers such as Aggreko, facility owners and operators can implement readily available expertise to ensure optimal resilient, reliable and high-performing data centres from the outset.

HUAWEI

Bring digital to every person, home and organization for a fully connected, intelligent world

Safety in Li-ion batteries for UPS is a matter of choice

Lithium-ion (Li-ion) batteries have much to offer a data centre UPS (uninterruptible power supply) system in terms of high-performance back-up, cost savings and sustainability. They are safe too, provided you choose the right specification for this application.

BY GARETH HACKETT,LARGE-FORMAT LI-ION BATTERY SPECIALIST AT SAFT

WHEN A SUPPLY OUTAGE STRIKES, back-up batteries keep the data centre operating until the UPS can apply an alternative power source such as a diesel generator. If serious damage to the business and its reputation is to be avoided, confidence in battery reliability and performance is essential. Given their well-established superiority over the VRLA (valve-regulated lead-acid) alternative, Li-ion batteries make perfect sense in this crucial role.

An important point to recognise at the outset is that 'Li-ion' is an umbrella term for a whole family of batteries whose electrochemistry varies enormously. Specifying the most appropriate chemistry, design and set-up is the key to achieving each application's optimum battery characteristics. For data centres, that includes maximising safety.

Why is Li-ion better?

Li-ion is more reliable and offers much higher performance. Its total cost of ownership (TCO) is lower, thanks to a combination of longer calendar life, minimal maintenance needs, high energy efficiency and tolerance of higher temperatures. In comparison, the reliability and lifetime of VRLA (valve-regulated lead-acid) batteries reduces drastically at elevated

temperatures, which in turn means more cooling, with higher energy consumption and higher CO2 emissions.

High power and energy density also enable further savings on real estate and infrastructure. Being smaller in size, and six times lighter, they take up less space and require less structural support.
When called upon, they discharge power rapidly to meet the UPS system's needs. Between outages, they charge quickly – ready for the next emergency.

As their electronic monitoring and management systems integrate easily with those of the building, operators are kept fully aware of their condition and availability. At any time, you can be sure of their state of charge (SOC) and remaining calendar life, also known as state of health (SOH). Their electronics also enable easy scalability and optimisation for the application, in terms of voltage, power and energy.

What can go wrong?

Damage or misuse may lead to a short circuit in a Li-ion cell, leading to a chain reaction, known as thermal runaway. This produces a large discharge of heat which, if propagated into neighbouring cells, can initiate their breakdown and to release of hot flammable gases.

Widely reported thermal runaway incidents include an Arizona battery energy storage system fire in 2019 and TV presenter Richard Hammond's escape from a burning supercar in 2017 during shooting for Amazon's The Grand Tour. Importantly, the Li-ion battery specification in both cases was different to that which would be recommended for data centres.

Which chemistries are safest?

While we talk about Li-ion batteries, the term actually covers a whole family of chemistries with different characteristics, such as lifespan, power and energy density, and ability to operate across a wide temperature range. These chemistries can be selected and even blended to adjust the balance of these properties. A battery's ability to manage performance and contain heat is also heavily influenced by its mechanical, electrical, and electronic design.
There are two main Li-ion battery types, named according to their cathode material: metal oxides and iron phosphates. Another group, with titanate anode material, is used in high-power applications with frequent charge and discharge cycles, like railway traction or underground mining vehicles.

Metal oxides, including lithium nickel cobalt aluminium oxide (NCA), lithium nickel manganese cobalt oxide (NMC) and lithium manganese oxide (LMO), offer the highest energy density. They are ideal in electric vehicles, for instance, as their chemistry is highly active – but the downside is that in a thermal runaway event, they release oxygen. This can feed the fire, potentially enabling temperatures to reach 800 or even 1,000 C. And because they release oxygen, oxygen-reducing fire suppression systems and advanced extinguishing agents like fluoroketones are not effective in this situation.

Iron phosphates, such as lithium iron phosphate (LFP) and Saft's own proprietary Super Lithium Iron Phosphate (SLFP), are inherently much safer. The oxygen in their phosphate molecules is tightly bonded and is not released in combustion. This limits potential temperatures of thermal runaway events to around 200 to 250 C, making propagation between cells unlikely. The downside is a lower energy density (about 30% less) and lower cell voltage compared to metal oxides, but they are ideal when safety is critical. They also offer long service life, even at high temperatures, and good discharge/recharge cyclability.

What UL and IEC safety certification applies?

International standards IFC 2018 and NFPA 855 for fire safety in buildings seek to reduce risk by limiting Li-ion battery energy content to 20 kWh per system or 600 kWh per installation. They also demand an air gap of around a metre between cabinets.

However, many data centre operators need larger systems. Approval for unlimited energy content, without spaces, can be gained by passing rigorous UL 9540A tests on thermal runaway potential.
When tested to failure, some metal oxide systems have been reported in UL 9540A test records as experiencing cell-to-cell and module-to-module heat

propagation, flaming, thermal runaway, and even ejection of small internal cell components.

By contrast, Saft's Flex'ion phosphate-based system passed UL 9540A testing without cell-to-cell propagation or flaming under similar conditions. During an incident, phosphate-based systems vent much lower amounts of combustible and other harmful gases, and these remain cooler, allowing easier and safer removal by gas extraction systems. For further safety assurance, Flex'ion has achieved UL 1973 certification, passed IEC 62619 testing, and complies fully with IEC 62485-5.

What role does battery management play in safety?

Aside from their electrochemistry, there are physical differences between Li-ion battery systems which affect their properties. Each Li-ion battery consists of a collection of cells, together with battery management system (BMS) electrical circuitry, enclosed within a protective case.

The BMS is vitally important to optimising safety, reliability and TCO

A good BMS will monitor both voltage in each individual cell as indicators of its charge status, health, and safe condition. Through control of charging and discharging at the cell level, it evens out temperatures across the battery to maximise longevity as temperature is closely related to battery ageing. It should also monitor and manage the temperature of the power connections, which can be higher than cell temperature during discharge. Each single cabinet has one Battery Management Module (BMM) to oversee multiple battery modules. However, when scaling up, the BMS may combine multiple BMMs across multiple cabinets to establish a master battery management module (MBMM) governing the whole system.

How do UPS batteries differ from other applications?

A further point is that ideally, Li-ion battery systems used for data centre UPS applications should be specifically designed for that role. Their primary purpose is very different from that in a battery energy storage system (BESS), for example. BESS batteries are income-generating assets which must be protected, so their BMS will prevent them ever being discharged fully – a state that Li-ion batteries cannot recover from.

However, batteries in a data centre UPS are there to protect the business by ensuring continuity of power supply. If necessary, their BMS will permit complete discharge to gain vital extra seconds of power in an emergency, even if this means sacrificing the battery. In back-up provision as well as safety, there must be no compromise.

More information is available in Saft's white paper on safety aspects of Li-ion batteries in mission-critical UPS systems for data centres.

open-e JovianDSS

Create your hyper-converged infrastructure on a rock of the most stable storage management solution on a market.

STORAGE

BACKUP & RECOVERY

BUSINESS CONTINUITY

Get the easiest to use tool and **ensure your data reliability and integrity** with optimal data **storage**, **protection** and **recovery**.

What you can expect from the Open-E JovianDSS?

- **Safe and Fast Hyper-converged Storage**
- **Unlimited Scalability**
- **On and Off-site Data Protection**
- **High Availability Clustering**

Start the free trial ›

Is your lighting compromising your data security?

If you're in the business of data, you'll know that it's a valuable asset that must be protected. You'll also be acutely aware that wherever there is data, there is risk, and not just to your data. Physical security – the protection of people, property and assets should also be considered for their potential vulnerabilities.

BY STEVE MANSELL, DIVISIONAL DIRECTOR CRITICAL FACILITIES, ZUMTOBEL GROUP

WHILE DATA CENTRES are famously secure, '6 layers deep' in some cases, data theft still occurs. With a number of high-profile cases in the media, questions have been rightly raised over cybersecurity in the Internet of Things (IoT) and unfortunately, lighting and lighting control systems are not immune.
We ask Steve Mansell, Divisional Director of Critical Facilities for Zumtobel Group, how building services, such as lighting and controls, could be increasing your risk.

The Potential Threats

Data centre operators have come to expect that the products installed within their data hall meet certain criteria. Equipment should save energy, be sustainably sourced, but most of all, be safe and secure. However, technology is not without its vulnerabilities; we have all heard 'that case' with regards to 'sub-standard' data centres, security breaches and spying. As more things become connected, new levels of exposure are being discovered.

Considerations for a Connected Lighting System

Physical security

It is important to note that connected (wired) lighting systems without an IP address only communicate within your building. They post a relatively low-security risk because a person has to be in the facility to attack the system. For example, a conventional wired DALI lighting control system could only be breached if the attacker physically connected to the network.

Device-to-device security
Lighting and control systems in a wireless network communicate outside of the building. It is common practise to use encryption, which means only devices with the correct 'key' can communicate with your system.

Correct commissioning is therefore vital.
We know for some businesses, the fear of the unknown makes them reluctant to embrace and invest in new technologies through the fear of being exposed to potential attacks. They instil a culture of "if it's not broken, it doesn't need to be fixed", but with cyber-attacks increasing in sophistication, there is every reason to be more vigilant. After all, an ounce of prevention is worth a pound of cure.

This paper has therefore been designed to help data centre operators, who work tirelessly to ensure they have the in-house cybersecurity knowledge and expertise to make sound investments, stay a step ahead of attackers.

The Risks

As soon as systems get connected to the IoT (Cloud) proper protocols need to be in place. Potential forms of attack on connected lighting systems might include vectoring, Distributed Denial of Service (DDoS) and sniffing.

DDos
A Distributed Denial of Service attack is an attempt to make an online service unavailable to its users by temporarily or disrupting services indefinitely.

Vectoring
Occurs when there is a security breach that uses an unsecured system to gain access to other networked systems.

Sniffing
An attacker sees a packet (data) in transmission from one point to other systems that utilise protocols that are not encrypted. Because it's not encrypted the information can be modified i.e. to turn off the lights or CCTV.

How to Mitigate Risk

When it comes to the physical building infrastructure ecosystem, there are many different facets that need to be considered before you can be assured that the product meets your security criteria.

When considering the threats, we recommend starting at the beginning: with a rigorous procurement process, including developing trusted supply chain partnerships.

For example, when a luminaire or control system is specified, are you aware of every component that goes into that product?

Do you know if the manufacturer makes all components themselves? Or, do they rely on third-party suppliers? If so, you're placing an enormous amount of trust in a potentially unknown supply chain: leaving systems open to security risks and significantly affecting quality control standards

Quality Assurance

So, what is the answer?
We'd recommend always working with a single-source supplier who can evidence where their components have been sourced and who offer full transparency of their supply chain partners.

For example, the Zumtobel Group, are in complete control of their entire value chain.

The Group comprises three core brands - Tridonic, Thorn and Zumtobel. Tridonic is a leading manufacturer of components and control gear used by various manufacturers worldwide due to its uncompromising reputation for product quality. Fortunately for Thorn and Zumtobel lighting, having a sister company that specialises in components and control gear certainly has its advantages since there is complete oversight on where their componentry is sourced. Every individual product that makes up a Thorn or Zumtobel luminaire is therefore carefully selected, tested, and secured through the use of intelligent software and hardware protocols. When the manufacturer controls its own supply chain, there is

We know for some businesses, the fear of the unknown makes them reluctant to embrace and invest in new technologies through the fear of being exposed to potential attacks. They instil a culture of "if it's not broken, it doesn't need to be fixed", but with cyber-attacks increasing in sophistication, there is every reason to be more vigilant

complete end-to-end traceability and accountability, mitigating potential external threats. As part of the product selection, thorough testing of both hardware and software used in any connected lighting and controls system is highly advisable.

Futureproofing for Tomorrow

There is also another advantage of working with fewer trusted supply chain partners. Not only does consolidating manufacturers into as few as possible make it easier to combat security vulnerabilities, it can also allow for future add-on services to be integrated at a later stage.

For example, it might be a lighting trunking system when installed, but it can also be a flexible infrastructure for future digital services.

A lighting track system such as TECTON or TECTON IP from Zumtobel can provide a backbone for adding future monitoring services that can grow with the data centre's needs. It is simply a case of integrating sensors to accurately record the data a facility is interested in monitoring, for example, heat, to ensure the optimum operating temperature within the facility. Instead of having to purchase/install a whole new system for thermal management within a facility, operators and their technical teams can liaise with Zumtobel to plan the required system upgrade then the additional products/sensors can be fitted directly to the TECTON track without the need to power the system down.

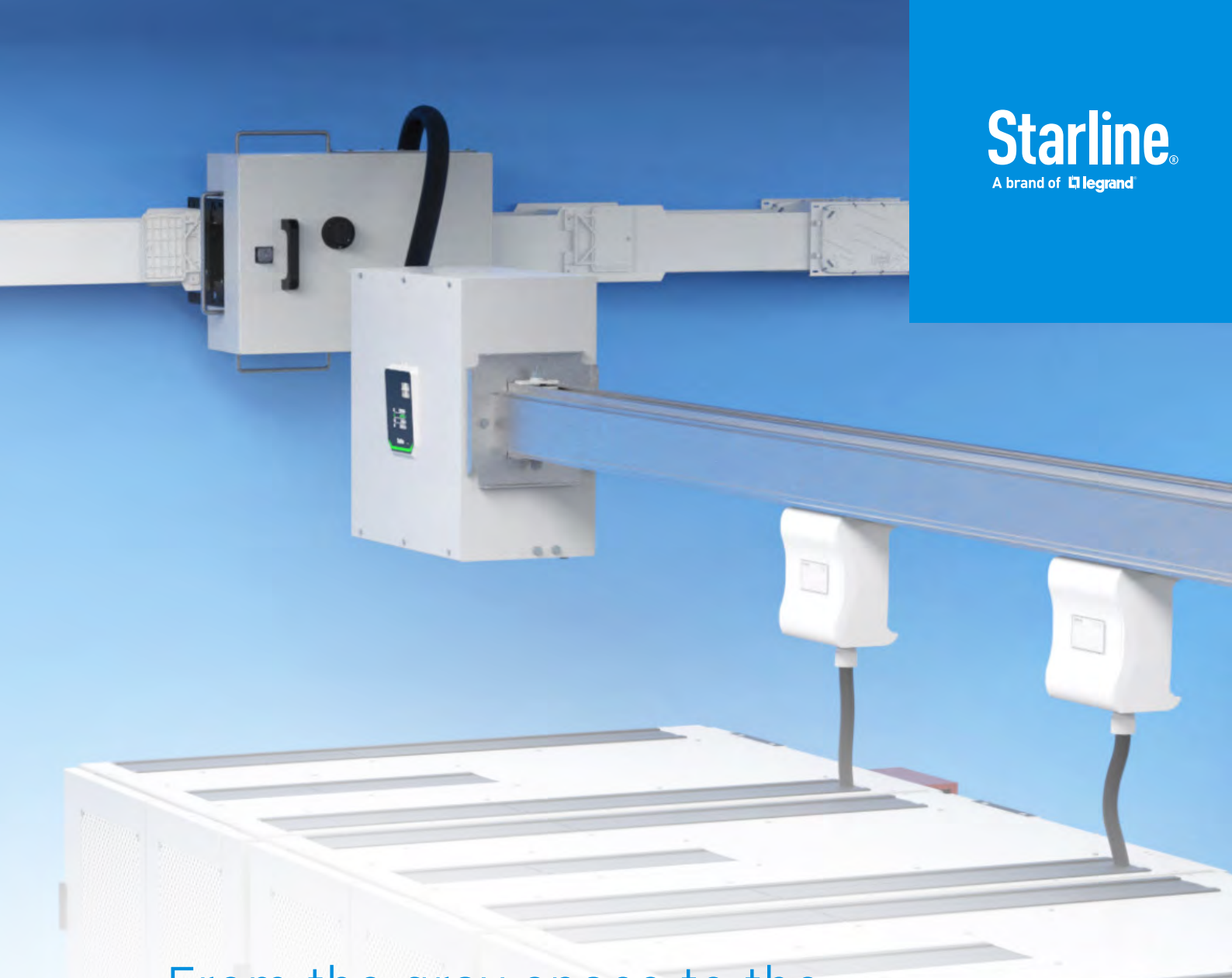
Alternatively, if a new sensor is required to measure other variables such as air quality, occupancy and motion, it is easy to remove the original sensor and add on the new one without reconfiguring the entire infrastructure. This naturally saves a significant amount of money in the long term, making it a fully flexible and future proof solution.

In Summary

New connected lighting and control systems offer exciting improvements in energy and operational efficiencies, but care must be taken to ensure they are secure and not a chink in your data security armour. We believe that it is crucial to focus on security from the very beginning of your product specification and selection process.

Data centre operators and their design teams should focus on working with supply chain partners who understand system security and who offer safe, strong and secure links to enable campus wide integration.

Mitigate risks by choosing a single source manufacturing partner - like Zumtobel; who are able to offer full traceability and accountability of your lighting ecosystem and offer long term support through a range of services when required.



Starline®
A brand of legrand®

From the gray space to the white space, your complete busbar solution provider.

Starline Track Busway has been the industry leading busbar system for white space power distribution for decades. Now Starline's dedication to busbar innovation has expanded to include a high-power solution — Starline XCP Busbar — for mission critical environments.

Designed to meet crucial uptime requirements, the XCP busbar offers:

- World-class performance that safeguards power availability
- Superior features to ensure the safety of your critical operations
- Compact busbar designs that enable system flexibility

For more information visit:
StarlinePower.com/HighPowerBusbar

Ranking of choice factors for new data centres

In this year's BCS Summer report, which contains the views of over 3,000 senior level data centre professionals across Europe there were some particularly interesting findings around the most important factors for new data centres.

BY JAMES HART, CEO AT BCS (BUSINESS CRITICAL SOLUTIONS), THE DIGITAL INFRASTRUCTURE SPECIALISTS

The importance of power

The availability of power remains the single most important factor driving data centre choice amongst our respondents, with nearly three-quarters citing this as their number one driving choice in our latest survey. This represents an increase on the 62% who did so last winter. Indeed, amongst our developer and investor respondents the ability to have access to a secure and economic power source is rated even more highly, with around 85% placing it first.

The Skills shortage

One factor which has become more popular is the availability of specialist data centre construction skills which is cited by around 7% of our respondents as the top ranked factor, more than double the 3% seen six months previously, providing some evidence of a potential skills gap growing in the industry. Interestingly, for our developer and investor respondents, following power availability, skills availability is the second most highly rated factor and

sits ahead of the total build-out cost and land price.

Location, Location, Location

Location remains as the second most popular factor, with just over half of all respondents ranking it at least in their top two choices, up from 40% six months ago and back close to the long-term tracking average. The proportion of respondents choosing it as their top choice stands at 16% a proportion largely unchanged over the past three surveys and perhaps unsurprising bearing in mind the proliferation of Edge computing, a concept based on strategic data centre locations.

he political and social landscape

Over the past few years Political/social stability has become increasingly more highly ranked by respondents. This may well reflect the unease felt across several European political and social landscapes as well as the wider global platform. The UK's exit from the European Union, for example has been a significant economic and political shift, with the fall-out on several major issues still uncertain and perhaps masked by the on-going focus on COVID-19.

Long standing political differences in the Middle East have re-surfaced recently and doubts exist over the roll-out of a global vaccination programme in response to the COVID-19 pandemic creating further uncertainties. Just over a quarter of respondents have cited this social and political instability as one of their top two ranked factors, whilst this is below the jump to 45%, we reported six months ago, it is substantially above the long-term average.

Conclusion

These findings raise concerns that the continued confidence in future demand levels in the datacentre sector could be hampered by the challenges around the availability of power and people – and both are real challenges.

The fortunes of the data centre industry are inextricably linked to the ability to source and utilise power in the most efficient and cost-effective manner and the delivery of sufficient new stock reliant on having sufficiently qualified professionals available to the industry. As the total amount of data created, captured and consumed in the world is forecast to continue to increase exponentially, few would argue against the importance of the need for a secure, flexible and efficient data centre infrastructure platform to house it. The question is can we overcome the inherent challenges?

You can download the full BCS report, TECHNOLOGY & POWER: THE ENERGY CONUNDRUM : https://www.bcs.uk.com/technology-power-the-energy-conundrum-summer-2021/

A consultative approach to high performance, sustainable, colocation services

atNorth is a leading Nordic data center services organization based in Reykjavik, Iceland. It offers environmentally responsible, power-efficient, and cost-optimized data center hosting facilities, with the capabilities to deliver high-performance computing (HPC) services. By working with Subzero Engineering, a leading provider of data center containment solutions, the company was able to standardize its approach to HPC colocation; using a scalable, energy efficient, and ultra-secure, fault-tolerant cold aisle containment (CAC) methodology to replicate its sustainability and performance capabilities across multiple sites.

Customer Background

atNorth is a leading Nordic data center services company offering environmentally sustainable, power-efficient, and cost-optimized data center hosting facilities. Its Tier III, redundant design and its innovative ability to support rack densities ranging from 40kW – 100kW make it the perfect partner for organizations using high-performance computing (HPC) to solve some of the world's most challenging problems.

With operations in Stockholm, Sweden and Reykjavik, Iceland, the company's mission is to offer more compute for a better world, leveraging innovative data center designs, power efficiency, and intelligent clusters to support the disruptive technologies used by customers. This includes workloads that require High Performance Computing (HPC) infrastructure, such as simulations, scientific calculations, artificial intelligence (AI), deep learning, and blockchain applications.

At its Icelandic Thor DC and Mjölnir DC colocation campuses, the company continues to push the boundaries of Nordic data centers; using 100% renewable energy resources from hydropower and geothermal sources to power their facilities, which are optimized for ultra-energy efficiency, maximum reliability, and industry-leading performance. With this approach that incorporates Direct Free Air cooling and carbon-free energy, atNorth delivers a Power Usage Effectiveness (PUE) rating below 1.2 at its Tier III Mjölnir DC. A strategy that offers customers a reduced total cost of ownership (TCO), increased operational and energy efficiency, and a secure, scalable data center platform to protect the long-term lifecycle requirements of their infrastructure deployments.

Challenges

When designing its second 80MW, Mjölnir DC data center campus in Reykjanesbaer, Iceland, atNorth was looking for a containment partner that was able to deliver to demanding timescales.

The company required a high-quality, robust, and secure containment solution that would offer the ability to standardize their design, while delivering repeatable performance, sustainability, and efficiency capabilities across multiple sites. Further, due to its reputation for sustainable HPC and colocation, and for building long-term customer relationships, the company was looking to establish a new supply chain partner who could work with them as the company grew.

Proposed Solution

Working to meet the company's requirements for speed, efficiency, and precision, Subzero Engineering quickly engaged with Jóhann Þór Jónsson, atNorth's Director Project Management and Business Development. Rather than offer a simple proposal containing a product specification and cost, the

companies' engineers provided consultative expertise from a remote location in the USA, offering valuable insight that would help to future-proof the data center and meet growing customer demand.

Once a relationship was established, Subzero specified its Essential Plus+ product line, offering a vendor-neutral, quick-to-deploy, and flexible containment system. Available globally, the Essential Plus+ products would provide atNorth with a standardized containment architecture, which would accommodate any customers' HPC rack, server, or storage requirement.

"Subzero's response time was exceptional," said Jóhann Þór Jónsson, Director Project Management and Business Development, atNorth. "They not only specified a cold aisle containment architecture complete with security doors and top roofs, but worked with us consultatively to engineer a robust, clean, and energy efficient system that would look visually impactful and fit with the site's geothermal surroundings."

Results

The sleek look and feel, best-in-class materials, and energy efficient architecture of the Essential Plus+ products met atNorth's requirements for a customizable, robust and high-quality containment solution. Moreover, it would enable them to standardize and quickly scale across new sites, using a methodology that delivers increased security, performance, and sustainability. This is a pivotal approach, and has informed the design, construction and development of its third climate-positive data center in Stockholm.

"Subzero Engineering has given us a standardized, repeatable, and physically secure containment system, which fits well with our own philosophy," said Jóhann Þór Jónsson, Director Project Management and Business Development, atNorth. "They have offered us a flexible containment solution, focused on both performance and efficiency, but which is easy to customize with the changing requirements of our intensive computing customers."

Further, the synergies between the companies were clear from the outset, both having values ingrained with pushing the boundaries of performance, sustainability, and energy efficiency. Subzero's containment solutions would not only contribute towards atNorth's industry-leading low PUE, but their approach would deliver exceptional value: establishing them as a long-term partner for the company's high performance, sustainable, colocation services.

"As a business, we're always focused on the long-term objectives of our customers, and we choose to work with companies whose values are aligned with ours," continued Jóhann Þór Jónsson, Director Project Management and Business Development, atNorth. "Subzero Engineering remained service-minded, agile, and worked to truly understand our business: providing a consultative, value-add and intricate data center solution that meets our demands for performance and efficiency both now, and in the future."

DCS AWARDS 2021

CATEGORY	WINNER
DCS PROJECT AWARDS	
Data Centre Energy Efficiency Project of the Year	Interact supporting University of East London
New Design/Build Data Centre Project of the Year	Sudlows supporting Teledata
Data Centre Consolidation/Upgrade Refresh Project of the Year	Huawei supporting Global Switch
Cloud Project of the Year	Data Dynamics, Inc. supporting Fortune 10
Managed Services Project of the Year	Rackspace Technology supporting Tessitura Network
Data Security / Compliance Project of the Year	Commvault supporting ORIIUM
Pandemic Impact Project of the Year	Green Mountain supporting NEC Deutschland GmbH
SPECIAL PROJECT AWARD	
Sustainability in the Data Centre Project of the Year	Schneider Electric supporting Newcastle City Council
DATA CENTRE FACILITIES INNOVATION AWARDS	
Data Centre Power Innovation of the Year	Huawei
Data Centre Cooling Innovation of the Year	Huawei
Data Centre Intelligent Automation and Management Innovation of the Year	RiT Tech
Data Centre Physical Connectivity Innovation of the Year	Corning Optical Communications
Data Centre Safety, Security & Fire Suppression Innovation of the Year	Johnson Controls
Hosting/Colocation Innovation of the Year	OVHcloud
Edge Computing Innovation of the Year	Iceotope
Data Centre Energy Efficiency Innovation of the Year	Power Control
DATA CENTRE ICT INNOVATION AWARDS	
Data Centre ICT Storage Product of the Year	Open-E
Data Centre ICT Security Product of the Year	CrowdStrike
Data Centre ICT Networking Product of the Year	Bridgeworks
Data Centre ICT Compute Product of the Year	Turkcell
Data Centre ICT Automation/Orchestration Innovation of the Year	RiT Tech
Open Source Innovation of the Year	Granulate
Data Centre Managed Services Innovation of the Year	Park Place Technologies

DCS AWARDS 2021

DCS COMPANY AWARDS

Data Centre Hosting/co-location Supplier of the Year	Telehouse Europe
Data Centre Cloud Vendor of the Year	Navisite
Data Centre Facilities Vendor of the Year	Huawei
Data Centre ICT Systems Vendor of the Year	AMAG Technology
Outstanding Contribution to Sustainability and Efficiency Award	Schneider Electric
Excellence in Data Centre Services Award	Park Place Technologies

DCS INDIVIDUAL AWARDS

Data Centre Manager of the Year	CBRE Data Centre Solutions - Roland Fenwick
Data Centre Engineer of the Year	Optimum Group Services - Lewis Mears
Data Centre Industry Contribution of the Year	Sudlows - Andy Hirst

Introduction - Future Views

By DCA CEO Steve Hone

IN THIS EDITION we are taking a break from the DCA Special Interest and Focus Groups. We have taken this opportunity to share the thoughts of several our partners and their views on the Future might hold for us in 2022.

Thank you to Noveus Energy, EkkoSense and Schneider Electric for their contributions. Many thanks also, to Advisory Board Members Mark Acton and Venessa Moffat for their comments.

We now find ourselves at the end of another challenging year and I know I am keen to move forward to next year and an improved situation. Best efforts with digital technology have meant we have all been able to keep in touch via zoom, teams or similar but nothing has pleased me more than being able to attend 'in person' events again in the last few weeks.

Datacloud UK & Ireland Event in September was a great start point, this was a well-attended event, with a great agenda/ format and large number of DCA Partners speaking on panels. For the 11th year running The DCA once again were proud supporters of the DCS Awards that took place at the end of October, so congratulations to all those shortlisted and I was delighted to be able to present the awards on the night especially to DCA Corporate Partners – Teledata, Schneider Electric and Chatsworth Products who among others were all worthy winners.

The DCA ventured over to Ireland in November with a stand at Data Centres Ireland, again the event was well supported as always, Hugh Robinson staged an excellent event despite the social distancing restrictions in place.

Finally, thank you to Caroline Hitchins of Datacentre.me for hosting a great networking event in London, it was great to see so many faces from the sector out and about again at this year's data centre Christmas kick-off party.

The DCA are now working to ensure normal service is resumed. For 2022 we have a series of 10 x 10 networking events throughout the year, the Data Centre Transformation Conference in late spring, along with a golf day and race day later in the year. Look out for the imminent DCA Marketing & PR Guide that will provide all the details of key events planned in 2022 or contact us directly: **info@dca-global.org**

2022 Predictions: Digitising the design and build of data centres

Steven Carlini, Vice President, Innovation and Data Centre, Schneider Electric

DATA CENTRES have become the very heart of the digital economy, and critical to our ever more digitised way of life. As we adapt to a new and hybrid world, greater innovation will be necessary to help overcome many of the remaining challenges, including the need for increased sustainability, more efficient use of energy, and for our industry to meet accelerated demands for capacity. Let's take a closer look at five trends that are influencing the direction of data centres.

Digital design tools speed development

I expect to see greater innovation in the digitisation of data centre design and build. One of the top challenges customers are experiencing is the need to meet demands for new data centre capacity. To help address this challenge, new software tools are emerging that speed up the design and construction of data centres. Schneider Electric's partner ETAP produces software (essentially a digital twins tool) that allows designers to model the electrical powertrain for availability, efficiency, and sustainability. Another company, in which Schneider Electric has a stake, is RIB, which develops construction management software.

Traditional computer-aided design (CAD) platforms have long allowed users to design the layout of a facility, however, the use of ETAP's software allows detailed modelling of the powertrain while RIB's enables time and cost modelling. Although CAD tools have been familiar for many years, the ability to model the powertrain is new. End-users can now choose or substitute components and subsystems based on their environmental impact or energy efficiency - evaluating the effects on technical performance and pricing via digital twins before committing to physical prototypes.

The 6G effect

Fifth generation networks have been expected to make an impact for some time, but the fast millimetre wave 5G variant has been slow to materialise. 5G is, however, beginning to make an impact in open spaces with few physical barriers such as stadiums, airports, and shipyards. The problem remains that a killer application to drive the need for mass adoption has yet to materialise.

An exciting prospect is 6G networks, which could offer life and experience changing functionality. 6G operates at THz frequencies and has access speeds of 1Tbps, which will deliver near 'air latency'. Whereas high band 5G hits speeds around 500Mbps, with air latency aimed at 8-12ms. Potential use cases for 6G include embedded technology for controlling artificial limbs (prosthetics) through wireless Brain-Computer Interactions (BCI), which is an incredible prospect! In the 6G world, people could interact with their environment and other people using devices that could be held, worn, or implanted.

6G networks also have the potential to eliminate traditional base station and antenna networks because their high frequencies need a ubiquitous mesh network where everything around you has an antenna function. In theory everything that powers up will have a built in antenna function and become part of this new 'antenna free' network. While the network architecture may change with 6G, the computing capacity will need to grow, so placement at the edge will become even more crucial.

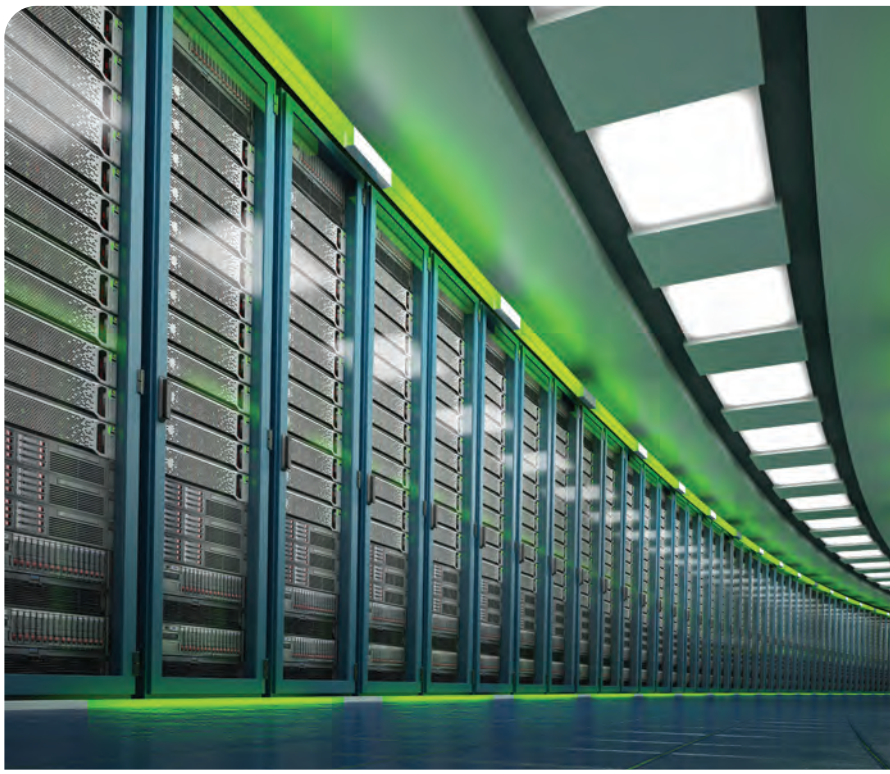
Energy concerns at the edge

Adoption of edge infrastructure will also continue to grow. However, energy efficiency will become a critical factor, with customers demanding that edge deployments match the capabilities of larger data centres in terms of resilience, efficiency, and sustainability. Edge deployments may be smaller than traditional facilities, but the scale and volume at which the infrastructure is likely to be deployed demands its environmental impact be minimised.

Building a sustainable edge at scale requires greater attention when selecting components, during the design and deployment stages, and use of comprehensive management systems to drive operational efficiency. Cooling will remain an essential part of the efficiency requirements, but the challenges presented by edge deployments, especially those in unmanned environments, will require innovative approaches in terms of technology and topology. Air cooling is often unsuitable for edge deployments, which are frequently located in urbanised and harsh locations where dust and other contaminants abound. Blowing such material around an unmanned or remote edge data centre is far from ideal, and even if filters were attached, the task of frequent replacement and servicing remains a key challenge – especially where cost and circularity are concerned.

With sealed and unmanned edge data centres, therefore, liquid cooling will be required, although it is not yet clear what sort of topology will be best suited. As such, new liquid cooled architectures may emerge for the edge at scale. Whether that involves direct-to-chip liquid cooling or chassis-based immersive cooling is yet to be seen.

Standardised metrics for sustainability



The circular economy - the ability to reduce, reuse, and recycle technologies deployed at the edge - will be an important consideration in 2022 and beyond. However, another area growing in importance is the need for standardised sustainability metrics. Today, there are a plethora of metrics from which to choose, with data centre operators each reporting their own preferred measurements. However, I believe there is a need to measure sustainable progress in a consistent and organised way.

According to the Uptime Institute, IT and Power consumption, and Power Usage Effectiveness (PUE) remain the top sustainability metrics tracked across the industry. While PUE has long been an excellent marker of efficiency, we must also agree on metrics for the other categories of environmental sustainability – greenhouse gas emissions, water use, waste, and biodiversity.

Going forward, I believe sustainability metrics within the industry must evolve and become more standardised. This effort can leverage business processes, like GAAP balance sheets and income statements, to provide a ledger where each company can state the results using established rules and units of measurement. An approach such as this ensures comprehensive reporting that is universally understood and provides a baseline to measure success. Further, it makes it possible to compare sustainability results with other companies.

At Schneider Electric, we know that not all companies are at the same stage of their sustainability journey, which is why we recommend a framework for

Beginning, Advanced, and Leading. Beginning companies will report on energy use, Greenhouse Gas Emissions (GHG), and water utilisation. The 11 metrics for this level are a mix of measured values like GHG emissions in mtCO2e and ratios like Carbon usage effectiveness (CUE) in mtCO2e/kWh. 'Advanced' metrics bring in the 'waste' category and 'Leading' metrics will include a category for land and biodiversity.

Data centre functions become services

Data Centre as a Service (DCaaS) offerings are beginning to gain popularity. The trend is enabled by standardising power, cooling, IT and storage in data centres to offer the same user experience and data access from everywhere. Companies like Microsoft and Amazon have already started offering such services with their Azure and Outposts initiatives, extending versions of their cloud architecture into the edge environment where customers can pay a monthly service fee for their capacity.

Many traditional IT companies such as Dell and HPE have positioned themselves as IT advisors to help companies design and run business application or workloads in the cloud (consulting services, engineering, integration and management), rather than as IT hardware and software suppliers, so one might predict that DCaaS will continue to gain traction.

Overall, I believe data centre capacity will continue to grow at both the core and edge driven by digital acceleration and enabled by high capacity networking 4/5/6G and WiFi 6. Model based software will be leveraged to bring efficient, resilient, and sustainable data centre capacity online faster, which is great timing, as we are at the precipice of edge being deployed at scale.

Four power supply cornerstones to consider in 2022

By Noveus Energy

AS WE STEP INTO 2022, what can data centres expect concerning power supplies. Here, I look at four cornerstones – connectivity, renewables, metering, and purchasing – and ask what's in store for 2022.

1. Connectivity is further questioned

Data centres use a lot of energy. A single data centre can consume as much power as a small city, with the world's biggest centre's requiring more than 100 megawatts of power (that's enough to power 80,000 homes), according to thinktank Energy Innovation [1]. It's estimated that the world's data centres collectively consume more energy than Germany [1].

Because data centres are so energy-hungry, there have been concerns within the industry regarding the demand they place on power systems nationally [3]. There is a high probability we may see further barriers put in the way of data centres trying to connect to grids across the UK and Europe – unless they can demonstrate flexibility by reducing consumption when requested and supply back to the grid through on-site generation and storage.

While this may seem an imposition, there are opportunities to generate revenues through local distribution networks and the national grid, which data centres are well placed to do and, in our opinion, should be investigated at the very least.

However, industry-led voices are putting the case for data centre connectivity. A study published by research company BloombergNEF (BNEF), in partnership with Eaton and Statkraft, found that data centres are a largely untapped resource to support the grid and not just a demand on power systems [4], in that they can support the grid with back-up generation in times of need.

With our digital lifestyles requiring increased data processing power and reliability, there is also a strong argument that digital infrastructure has proven itself as a vital national resource, argues Steve Hone, co-founder of the UK's Data Centre Alliance: "Rather than putting hurdles in the way of data centres connecting to national grids, connectivity should be a national priority, supporting our increasingly digital lifestyles."

2. Renewables remain the focus

At the end of last year, COP26 shone a light on climate change, net-zero initiatives, and renewable energy

sources. Yet today, electrical power for most of the world's data centres still comes from non-renewable sources such as coal, gas, and oil.

The Global e-Sustainability Initiative highlights that global data traffic accounts for more than two per cent of global climate emissions, nearly equivalent to the entire global airline industry [5]. In 2022, a central challenge for data centres will continue to focus on reducing such emissions and achieving net zero targets.

Yet, it's clear that data centres worldwide have already reduced energy consumption by optimising and becoming more efficient. A recent report in the Journal of Science backs up the energy-reducing role already played by centres worldwide – the study found that while data centre workloads increased six-fold from 2010 and 2020, the overall energy consumption has not increased by the same degree [6].

So, what else can data centres do in 2022? Answers will undoubtedly be found in renewable corporate power purchasing agreements (CPAs) or hybrid power purchase agreements (HPPA).

Such agreements are a win-win. The renewables project gets a route to market for its energy and can maximise the overall value of a site's output via initiatives such as battery storage. The procuring corporation secures a greener energy supply and/or credits to offset its emissions. While hybrid PPAs provide an alternative, allowing for an element of both CPPAs and grid power, and are becoming increasingly attractive as the duration of contract is more like 3-5 years compared to 10-15 for CPPAs.

In 2022, we expect a greater scrutiny when it comes to green energy and green offsets. The market will increasingly ask: how green and ethical is the green energy or offset I am purchasing? There will be more of a focus on how to add actual renewable energy to the grid, rather than simply purchasing green offset credits (for energy that already exists).

3. Sub-metering becomes a must

As more and more data processing power is required, hyper-scale data centres have emerged and become more prevalent.

Hyper-scale centres are very large-scale critical sites processing vast volumes of data, with one sizeable extra high-voltage electricity supply into the building then distributed to tenants. However, hyper-scale tenants will likely want to negotiate, purchase, and manage their energy contracts and supplies directly with suppliers in the framework of their net zero plans and targets.

At Noveus Energy, we're seeing more hyper-scale data centres looking for sub-metering arrangements, enabling their tenants to purchase energy directly, and expect to see more in 2022. This has been supported by the Electricity Settlements Process, which means power can now be sub-metered, going directly to tenants who would have their own purchasing power and an installed, recognised and agreed fiscal meter.

Fiscal sub-metering of data centres is a very specialist area which requires detailed knowledge and practical know how. With increased focus on this subject, there could be a skills gap in the future limiting the application of direct metered solutions

For existing hyper-scale data centres there are several ways to approach a retro fit for existing centres. Most will require special dispensation from Elexon, but there are other solutions which don't – and these are less time consuming and less costly to implement.

If you're a new hyper-scale data centre looking to accommodate the growing needs of technology companies, direct metering should be part of the initial design criteria. It is easier and cheaper to have made that decision in advance, as opposed to retrospectively remodelling the electrical infrastructure with approval from Elexon.

Fiscal sub-metering of data centres is a very specialist area which requires detailed knowledge and practical know how. With increased focus on this subject, there could be a skills gap in the future limiting the application of direct metered solutions.

4. Purchasing should be approached dynamically

A number of datacentres in the UK purchase green energy through their supply contract via either a Renewable Energy Guarantee of Origin (REGO) or EU Guarantee of Origin (GOO) certificate. But could buying green become more difficult in 2022?

The transparency of green energy tariffs is being reviewed by government to ensure consumers are clear on the carbon content when choosing their energy services and products. In addition, the EU has stopped recognising Guarantee of Origin (GOO) certificates issued in the UK – with the UK government in-turn stating they will review this position and may follow suit, and not recognise any certificates issued in the EU.

The impact of either or both measures would be to reduce the amount of green energy readily available

to procure in the UK through energy suppliers, which would almost certainly drive prices upwards.

With soaring energy costs and extreme market volatility during 2021, our mantra of using a dynamic approach to energy purchasing is more relevant now than ever. What we mean by this is how and when you purchase, which is constantly reviewed and adjusted with a dynamic approach.

Such an approach helps you to understand the market, highlight risks and adjust your purchases in step with market changes and the market's volatility, enabling you to buy at the right time and lower your costs. In today's market, a dynamic approach can deliver savings of up to 10% and in our opinion should be an essential part of your risk management strategy.

It is essential you work with a team who understand the market, constantly review risks and can adjust how and when you purchase on a continual basis.

At Noveus Energy we specialise in the data centre market, and we support our data centre clients to adopt an integrated view of energy power supplies – from connectivity and renewables through to metering and purchasing.

If you would like an informal discussion about our approach or want to talk through anything else discussed in this article, please feel free to get in touch at:
https://dca-global.org/companies/profile/2135/noveus-energy

References:
[1] https://www.egi.co.uk/news/data-centres-feel-the-heat-over-energy-consumption/
[2] https://www.statkraft.com/newsroom/news-and-stories/archive/2018/data-centres-the-new-power-intensive-industry/
[3] https://noveusenergy.com/blog/power-systems-considering-greater-restrictions-for-data-centres/
[4] https://www.intelligentdatacentres.com/2021/10/20/european-data-centre-power-demand-could-play-critical-role-in-enabling-renewable-energy/
[5] https://www.statkraft.com/newsroom/news-and-stories/archive/2018/data-centres-the-new-power-intensive-industry/
[6] https://datacentremagazine.com/data-centres/green-data-centres-flourish-2021

Giving data centre operations teams more control in 2022

By Dr. Stu Redshaw, Chief Technical Innovation Officer, EkkoSense

2022 SHOULD PROVE to be a key year for those organisations that have made clear commitments towards achieving net zero. And while the UK Government has signed up to a 2050 net zero target, many leading brands have been much more ambitious – setting themselves a goal for their operations to reach net zero by as soon as 2030.

This is going to place huge pressures on organisations. Already proposed Treasury rules suggest that financial institutions and companies with shares listed on the London Stock Exchange will need to come up with net-zero transition plans that detail their greenhouse gas emissions targets and the steps they will be taking to achieve them. As the full impact of corporate net zero commitments starts to bite, there's going to be sustained pressure on the high energy users within organisations to start securing serious energy savings.

And with data centres already established as one of larger corporate consumers of energy, it's clear that 2022 will see data centre IT operations teams focused on doing everything they can to deliver quick carbon reduction wins. That's why it's vital that bodies such as the Data Centre Alliance, ASHRAE and the EU with its Code of Conduct do everything they can to help organisations optimise their data centre energy usage – particularly given some of the key challenges the industry currently faces.

Key issues that need addressing for 2022
However there are some issues that need to be addressed before data centre teams can really get started on a more structured approach to carbon reduction - specifically around current efficiency momentum, understanding where they are starting from in terms of energy usage, and – critically – in data centre resourcing.

Energy price fluctuations and the potential for overloading national electrical grids also open up the possibility of load shedding as a potential short-term solution in 2022. Will governments look towards major

energy consumers such as data centres to absorb any reductions in available power by throttling back or running on local power?

Uptime Institute highlighted the issue of momentum in its 2021 global data centre survey, citing the flat-lining of average annualised PUE (Power Usage Effectiveness). According to the report, while new builds might deliver PUEs of 1.3 or even better, older data centres seem to have stalled in terms of PUE reduction, having already received gains from replacing aging equipment and improving airflow management. It appears many are now uncertain what to do next to achieve further PUE improvements.

It's also difficult for data centre teams to deliver a precise carbon reduction on their operations if they don't know exactly how much energy they're using in the first place. Our own research at EkkoSense suggests that only 5% of M&E teams currently monitor and report actively on an individual rack-by-rack basis, and even less collect real-time cooling duty information. This suggests that very few teams really know how their rooms are performing from a cooling, capacity and power perspective. So, it's perhaps no surprise that the default position for many organisations is still to keep throwing more cooling at a problem should any issues arise. This clearly adds to the data centre's overall carbon footprint, and often does little to resolve potential optimisation concerns.

Additionally if data centre teams are being tasked with unlocking carbon savings, it's essential that they have the right people in place to drive this net zero transformation across their operations. But with demand for digital services showing no sign of slowing down, 2022 will continue to see a shortage of skilled professionals across data centres. Indeed, Uptime's recent global survey reported that almost half of those polled were having difficulty in finding qualified candidates for open jobs. These recruitment concerns are also being amplified by 'the great resignation', with a recent Randstad recruitment survey suggesting that 24% of employees plan to change their job within the next three to six months.

Over the next year we expect organisations look for further innovative ways to support their data centre operations through this skills shortage. We're certainly seeing a number of universities now setting up dedicated courses to support the data centre sector, and it would be great if these students could establish themselves in our industry before our skills gap grows any wider.

Providing this new generation of engineers with tools to enable them to work smarter will also be essential. Central to this will be the ability to decouple skilled staff from specific locations, with the latest cloud-based optimisation solutions helping teams to optimise cooling capacity and minimise energy usage - regardless of location.

The impact of the pandemic – particularly the difficulties involved in getting people into a critical facility, plus the emergence of remote 'dark' Edge sites - means that people are increasingly looking at both enhancing remote monitoring, as well as identifying management capabilities where there is no routine human presence onsite. The great resignation will only accelerate this shift during 2022.

And while most CIOs believe that AI and automation will help in terms of managing data centre staffing levels, Upsite's research suggests that 50% feel that these benefits will not be realised in the next five years. Certainly, when it comes to optimisation, many still have concerns around trusting AI to make operational decisions. While it's true that automated controls can enact smart actions immediately post optimisation, they're much less able to accommodate the continual, inevitable changes that always happen in data centres. We've seen 400 kW sites suddenly introduce a further 75 kW of additional DC power usage within days of optimisation, so you simply can't rely on rooms ever staying the same.

Rather than treat machine learning and AI as a universal solution to data centre concerns, we expect to see data centre teams in 2022 focusing on those areas – such as cooling optimisation and airflow management - where these technologies can be applied and deliver significant results. But rather than rely on unwieldy automation solutions, we see a light touch DCIM approach becoming a smarter choice in 2022 and beyond.

For this we envisage cooling, power and space data being collected at a highly granular level – ideally with each individual rack featuring multiple sensor points. Data centre teams will benefit from accessible 3D visualisations that are easy to interpret, while AI algorithms will draw on potentially billions of machine learning data points to provide actionable insights. The key difference for operations teams will be that they are provided with actionable recommendations that they can validate before pursuing.

It's this combination of granular real-time data, a clear understanding of the relationship or zones of influence that are established and maintained between specific cooling assets and the racks they're cooling, and AI-powered recommendations that will put the control back in the hands of data centre teams. Optimisation done this way via a new style of light-touch DCIM will give operations teams the insights they need to make the kind of smart optimisation choices that can actually reduce cooling energy usage across sites.

Our experience suggests that following this kind of approach can help keep data centre teams on track in their journey to achieve average 30% reductions in their cooling energy savings. And in the post-COP26 world of 2022, that could be a real bonus for data centres as they move quickly to identity and secure the carbon savings their organisations need to deliver on their net zero commitments.

www.ekkosense.com

Prediction - Where will be the most popular region for data centre development over the coming year and why?

Comments from Mark Acton and Venessa Moffat, DCA Advisory Board Members

The data centre sector has experienced strong momentum in 2021, which will continue into the coming year.

The main drivers behind this growth are the following:

- Significant additional levels of funding available as a result of investors moving away from more traditional asset classes to data centres, which can show significantly improved returns.
- The next new normal in form of remote work, re-architecting to support greater volumes of digital services.
- Digitisation of existing business processes, and digital transformation of sectors such as construction.
- Growing use of Over-the-Top (OTT) services by traditional telecoms providers, a method of delivering film and television directly via the internet.
- Development of data-generating and data-hungry technologies, sand recognition of the increasing capability and value of data analytics such as available from IoT, Edge, and smart city initiatives.
- The continuous adoption of cloud services and increasing hyperscale infrastructures.

All of these trends are driving change across the globe, and of course 5G will be an enabler for network growth as well. Additionally, huge investment in ambitious new subsea cables are bring opportunities to build and operate large data centres in locations that have previously not had this capability. This is offering digital infrastructure to significant populations which are currently underserved.

The landing points for those cables will provide the connectivity and bandwidth required by larger data centres to support the capacity and edge infrastructure needed to accommodate the increase in digital services, data processing, storage and data transmission - all with the low latency now expected by populations in all parts of the world.

Other factors in choosing locations for data centres include the following:

- Safety and security
- Political stability.
- Reliability of grid energy.
- Low likelihood of natural disasters such as earthquake, flood hurricane etc...
- Environmental sustainability factors such as renewable energy sources.
- Diverse high bandwidth network connectivity.
- Internet download speed / current telco infrastructure.
- Total cost of ownership (inc. real estate and energy)
- Favourable local taxation and regulation environment
- Proximity to end-users (for Edge).
- Availability of grid energy (Ireland, Netherlands, Singapore).
- Proximity to skilled labour.
- Data sovereignty – control over citizen data.

Taking all the above into account, we think it will be unlikely that the highest growth will be in tier 1 cities, such as London, Amsterdam, Frankfurt and Paris in Europe. With the addition of more edge infrastructure, we'll be looking at more tier 2 and tier 3 cities for higher growth and investment. The exciting regions to keep an eye on will be various parts of Africa where the subsea cables land. With renewable energy supplies becoming more of a genuine option, we might start to see some innovative designs come along with the levels of investment now available. Lastly the Nordics will continue to be a good option and will experience steady growth over the coming year.

Angel
BUSINESS COMMUNICATIONS

WEBINARS

Specialists with 30 year+ pedigree and in-depth knowledge in overlapping sectors:

Expertise: Moderators, Markets, 30 Years + Pedigree
Reach: Specialist vertical databases
Branding: Message delivery to high level influencers via various in house established magazines, websites, events and social media

Semiconductor (Silicon/Compound)
Publications & Websites include:
Compound Semiconductor, Silicon Semiconductor, CS China, SiS China **Event:** CS International

Power Electronics
Publication & Website:
Power Electronics World

Future Mobility
Publication: TaaS Technology

Data Centres
Publication & website include: Data Centre Solutions
Event: DCS Awards

SmartSolar UK & Ireland
Publications & websites include:
Solar and Power Management, Solar UK and Ireland

Sensors
Publications & website include: Sensor Solutions
Event: Sensor Solutions International

Digitalisation
Publications & website include: Digitalisation World,

Photonic Integrated Circuits Publication & Website
Publication: PIC Magazine,
Event: PIC International Conference

Expert Moderators

Dedicated technical and time-served experts/editors

MARK ANDREWS
Mark Andrews is Editor of Silicon Semiconductor, PIC Magazine and Power Electronics World. His experience focuses on RF and photonic solutions for infrastructure, mobile device, aerospace, aviation and defence industries

PHIL ALSOP
Journalist and editor in the business to business publishing sector for more than 30 years currently focusing on intelligent automation, DevOps, Big Data and analytics, alongside the IT staples of computing, networks and storage

JACKIE CANNON
Jackie is Director of Publishing, with over 17 years' experience of Semiconductor and Power Electronics and Solar markets

DR RICHARD STEVENSON
Dr Richard Stevenson is a seasoned science and technology journalist with valuable experience in industry and academia. For almost a decade, he has been the Editor of Compound Semiconductor magazine, as well as the programme manager for the CS International Conference

For more information contact:

Jackie Cannon **T:** 01923 690205 **E:** jackie@angelwebinar.co.uk **W:** www.angelwebinar.co.uk
Angel Business Communications Ltd, 6 Bow Court, Fletchworth Gate, Burnsall Road, Coventry, CV5 6SP. UK
T: +44(0)2476 718 970 **E:** info@angelbc.com **W:** www.angelbc.com