

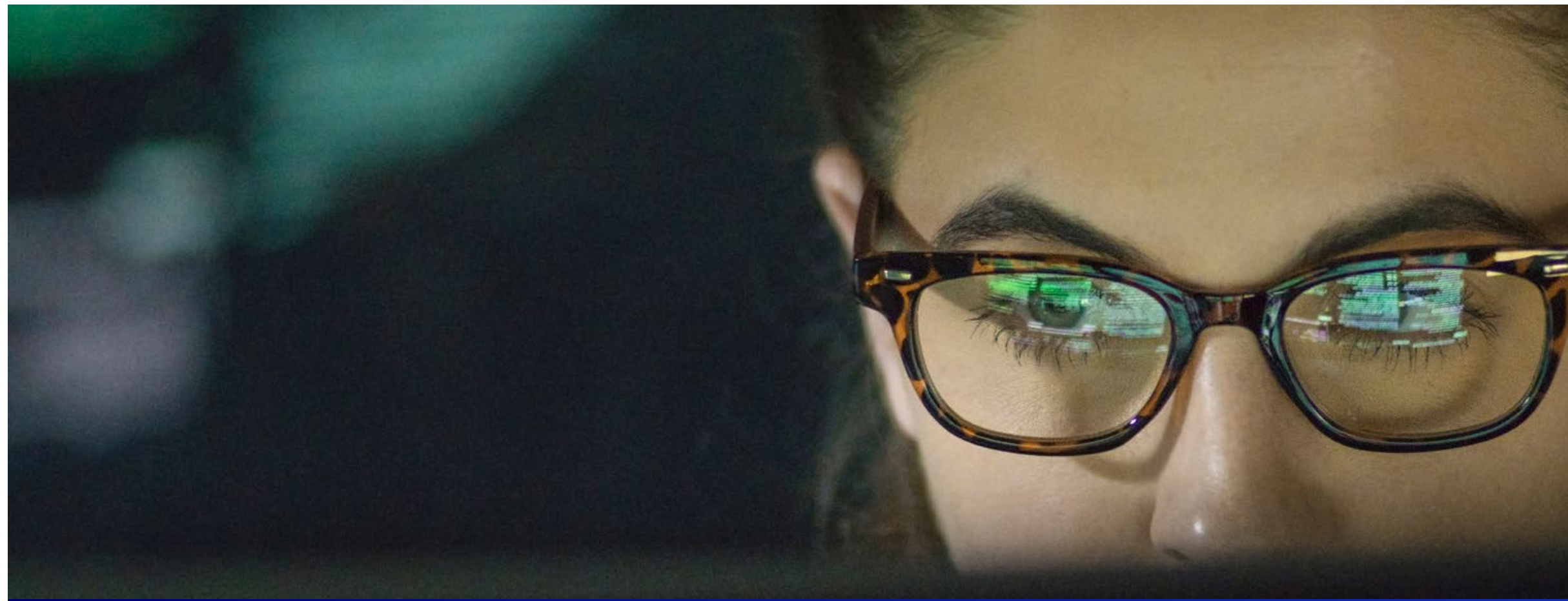
Data centres today: **Where innovation meets infrastructure**

Insight and expert opinion on the current state
of data centres in the UK.

The power behind **your mission**



Executive summary:
Understanding data centres
is imperative for shaping a
sustainable and thriving future.



The backbone of business technology: Recognising the
evolving requirements of the data centre environment



Today's data centre priorities: Where
should you focus your attention?



How Johnson Controls can help:
Solutions for data centres



Success stories



The future and beyond: The reliance on our data centres will deepen
over time – are you prioritising yours?



Executive summary

In today's unpredictable and constantly evolving technological landscape, data centres are the cornerstone of our digital infrastructure. A place where innovation meets infrastructure. A foundation on which to build the digital domain.

Increasingly relied upon to facilitate transformation and growth, data centres are unsurprisingly subject to considerable pressures, and data centre owners and service providers have many challenges to face – as well as priorities to manage. Data centres are at the epicentre of digital operations, enabling the storage, processing, and distribution of colossal volumes of information. As data consumption has skyrocketed recently, challenges have consequently emerged in areas such as energy consumption, uptime, fire safety, sustainability, scalability and security.

Just think about this for a second: [data centres consume roughly 3% of electrical energy globally¹](#). That's enormous. Current growth forecasts predict that data centre energy demands could reach 4% of global electricity by 2030¹. Therefore balancing the escalating demand for computing power with efficient energy usage and reduced environmental impact has become a pressing priority. Moreover, safeguarding data integrity, meeting cooling and fire safety needs and protecting against cyber threats also pose ongoing concerns.

It's up to us whether to view these challenges as obstacles or opportunities. At [Johnson Controls](#), we prefer to choose the latter.



“Understanding data centres on a deeper level is not just an advantage – it’s imperative for shaping a sustainable and thriving future. This guide delves into the intricacies of the contemporary data centre landscape. It outlines the key challenges data centre owners face, sheds light on innovative solutions, and offers strategic insights to tackle the challenges head-on.”



Cihan Hergüner,
Data Centres Expert
Johnson Controls

The imperative to reduce carbon footprints and adopt eco-friendly solutions is reshaping data centre design and operations for the better. Advancements in fire detection and suppression technologies and security improvements are helping to build resilience. Innovations in cooling technologies and improved building management systems are rapidly driving down energy consumption and increasing Power usage Effectiveness (PuE) within facilities, allowing data centre operators to maintain profitability amid rising costs.

To succeed in the dynamic data centre sector, a multi-pronged approach is crucial. A careful blend of the right solutions. Expert guidance. Collaboration is key. The most successful data centre owners will be the ones who can operate flexibly, scale rapidly and deliver operational efficiency in the face of change – and to achieve all this, they’ll be working with a trusted partner to gain the support they need.

At Johnson Controls, we have the expertise and experience in data centres to make a difference. You’ll quickly start to see in this guide the valuable insight and unique perspectives we offer – I sincerely hope you find it as useful as we intend.

The backbone of business technology

Recognising the evolving requirements of the data centre environment

Data centres have evolved at a rapid rate over the last few years. The increase in digitalisation, along with a growing demand for remote and hybrid working and data-driven technologies, has put greater pressure on data centre operators – emphasising its importance and accelerating the sector's expansion.

Indeed, data centres and telecommunication hubs have become vital parts of our economy, the backbone of business technology. They've evolved from on-premise server room environments to a combination of private and public clouds. Large colocation facilities and hyperscale data centres are becoming more commonplace.

And they're now being designed – and relied upon – to support the needs of companies processing large amounts of data.

The data centre industry is projected to reach a staggering 235 billion euros by 2026². And this meteoric growth is creating new demands and requirements,

resulting in complex challenges for data centre owners and operators.

Compared to traditional data centres, today's vast facilities need more automation to operate efficiently. They have multifaceted security, safety, energy and cooling needs.

And because they must operate with four nines (99.99%) or better uptime, just one minute of downtime a day could have catastrophic implications.

That's not all. The industry is facing increasing pressure to become more sustainable. There's consequently a growing need to shift to renewable energy sources, improve cooling systems and increase energy efficiency. Supply chain delays and labour shortages have also emerged as key issues. Add to that economic fluctuations, organisational growth, new applications, cloud computing, increasing demand for AI workloads, compliance, and advanced security and fire safety needs – and it's a lot to think about.

The data centre industry is projected to reach a staggering
235 billion euros by 2026².

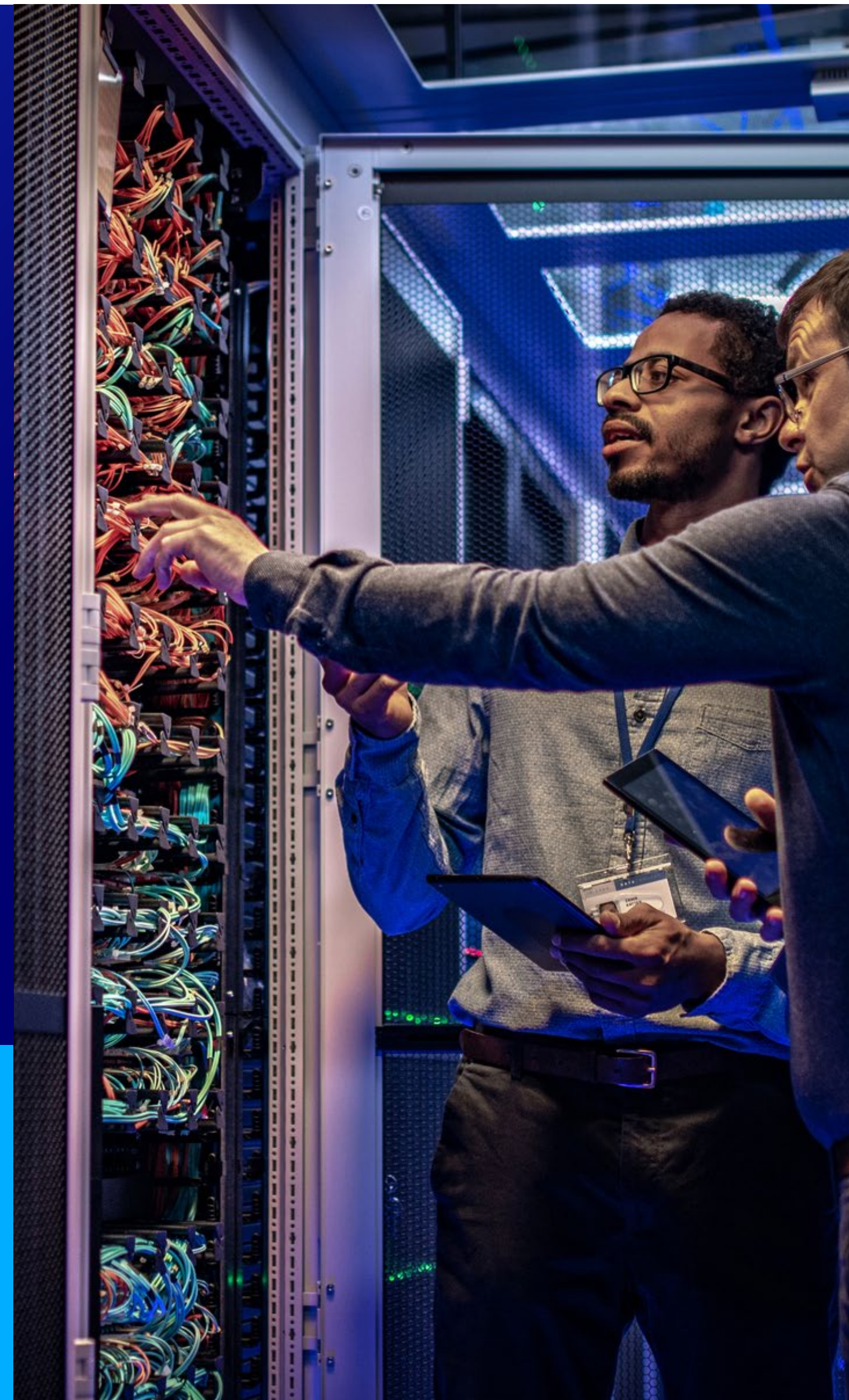


The key challenges facing data centre owners and operators



Paul Wrighton
Regional Director,
Sustainable Infrastructure,
Johnson Controls

43% of data centre owners want to reduce their power bill; **41%** include their infrastructure within the corporate ESG policy; and **38%** have carbon and power usage effectiveness (PUE) targets⁶.



Sustainability

The mounting pressure for data centres to adopt sustainable practices stems from both environmental concerns and business imperatives. [Data centres create 740m tons of CO₂ emissions each year³](#) – and as energy consumption skyrockets, stakeholders are demanding more energy-efficient infrastructure to mitigate carbon footprints and, naturally, lower their energy bills.

There's a growing need to shift to renewable energy sources and increase efficiency. Moreover, aligning with sustainable practices is becoming a competitive edge, attracting eco-conscious customers, investors and employees.

However, the fundamental issue here is trying to be sustainable and energy-efficient in a somewhat non-sustainable environment. Most (81%) data centre businesses in the UK and Ireland say the energy crisis will impact emission reduction plans⁴. And energy efficiency regulations are tightening because of the data centre industry's reputation for high energy consumption and complex cooling needs.

On 1 April 2023, the Minimum Energy Efficiency Standards (MEES) changed, making it unlawful for landlords to continue leasing properties that do not meet the required standards. By 2027, the UK Government aims to have all rented non-domestic buildings achieve an EPC of C before attaining B by 2030. As of the latest assessments, only 12% of all registered commercial properties meet this criteria⁵.

Simply put, energy-efficient and low-carbon solutions are no longer optional. They are a necessity and a key to the industry's future success.



"87% of corporate executives plan to **invest more in sustainability technology** in 2023 and 2024, according to a recent Gartner survey²."



Rising costs

The repercussions of escalating operational costs for data centres are two-fold: they strain profitability and highlight the urgency of efficient resource management. Rising expenses, from energy to maintenance, require optimised infrastructure and streamlined operations to ensure financial viability. The digitalisation of plant systems in data centres using Model-Based Control can significantly improve efficiency compared to standard BMS programming, reducing energy costs and lowering GHG emissions.

Meanwhile, a change in pricing structure (CapEx to OpEx) could help to strike a balance between delivering robust services and maintaining flexibility in the competitive data centre landscape. However, fluctuations in the market make it difficult to secure long-term, cost-effective energy agreements, and only a handful of data centre operators can secure long-term Power Purchase Agreements (PPAs) from renewable sources.

Another way to maintain profitability is to upgrade to sustainable, modern equipment – creating smart data centres where technology integrates seamlessly with the spaces and brings about rich sources of data, providing valuable insights and results. In this way, smart data centres can help you deliver more efficient, cost-effective, and sustainable outcomes with improved operational efficiency and safety – helping to combat the effects of rising costs.

“...smart data centres can help you deliver more efficient, cost-effective, and sustainable outcomes...”



Mark Bouldin
Digital Solutions SME
Johnson Controls



Downtime

Downtime can be extremely costly for data centres with far-reaching implications – disrupting critical services, causing financial losses and eroding customer trust. Beyond immediate financial impact, downtime can tarnish a company's reputation and compromise its ability to meet the demands of an increasingly connected world. Factors such as faulty equipment, cyberattacks and human error can all trigger downtime. But one of the main potential contributors is the risk of fire.

Data centres are enclosed environments where overheating, electrical sparks or simply human errors can result in the outbreak of fire, which means that fire safety measures and fire suppression solutions are vital to prevent downtime – and ensure the safety of your people assets and customer data.



Supply chain delays

Supply chain delays pose significant difficulties for data centres, triggering project disruptions, delayed expansions and compromised service reliability. The intricate interdependence of hardware and components can lead to bottlenecks, affecting deployment timelines and potentially leaving data centres ill-equipped to handle the increasing demand. Mitigating supply chain risks demands proactive contingency planning and flexible procurement strategies to ensure seamless operations and uninterrupted service delivery.



Talent shortage

The data centre sector is struggling with a shortage of talent in key areas, such as cybersecurity, AI and network engineering – amplifying the requirements of maintaining optimal performance and innovation. This is partly due to an ageing workforce and limited entrants to the field. The scarcity of expertise underscores the urgency for industry-wide investments in training, upskilling and educational initiatives to build a robust workforce capable of steering the future of data centres.



“...fire safety measures and fire suppression solutions are vital to prevent downtime – and ensure the safety of your people assets and customer data”



Today's data centre priorities

Where should you focus your attention?

With a multitude of challenges to consider, where then, should you focus your attention? It's a question that many data centre operators are now asking themselves – and one that we're keen to address at Johnson Controls. We believe that there are four key priority areas that you can target to move forward and protect your data centres both today and tomorrow.



1. Flexibility and resilience

Achieving flexibility and resilience should be the most important priority for today's data centre operators. By placing flexibility and resilience at the forefront of your strategy, achieving uninterrupted service delivery, an enhanced reputation, and the ability to confidently navigate the uncertainties of the digital age is possible.

Flexibility can empower operators to swiftly adapt to shifting demands and bounce back from any sudden changes. This could mean opting for large open floor plans to facilitate better space and resource utilisation; making your airflow management fool-proof to let you experiment with the design of the room; or opting for racks with adjustable depths for enhanced scalability.

Meanwhile, achieving resilience can ensure that your data centres withstand and recover from unexpected incidents – including event such as power outages, cyber-attacks and natural disasters. Resiliency helps to minimise downtime and ensures business continuity. But it means everything from server and network to storage system management must contribute to resilience.

Data creation is estimated to hit
175 zettabytes by 2025

2. Operational efficiency

Streamlining processes, enhancing server utilisation and adopting innovative cooling techniques contribute to substantial cost savings and align with sustainable practices.

Maintaining absolute control of the ambient temperature and air flow in the data centre is critical. And since cooling energy costs account for up to 40% of operational expenses⁷, efficiency is key. However, data centres are renowned for having complex cooling needs.

As computing power grows and data processing intensifies, it's increasingly difficult to manage the heat generated by high-performance servers. Balancing the need for efficient cooling with energy conservation requires sophisticated approaches such as hot/cold aisle containment, liquid cooling and precision air distribution. Moreover, the geographic location of data centres adds an additional layer of complexity, with varying climate conditions influencing the choice of cooling systems.

"cooling energy costs account for up to 40% of the operational expenses, efficiency is key"





3. Scalability

Data creation is estimated to hit 175 zettabytes by 2025. That's just two years away, meaning scalability must become a paramount priority. The surging influx of data and ever-evolving technological landscape means that operators need the ability to seamlessly expand infrastructure to meet growing demands.

With the rapid adoption of cloud computing, IoT, ML and AI, data centre operators must ensure that their facilities can accommodate the fluctuating needs of their clients too. Scalability not only future-proofs operations but also enables cost-effective resource allocation by allowing operators to scale up or down as needed.

Data centres therefore need to be designed keeping in mind the continuously increased networking, computing and storage requirements – so you need to make sure you leave room for growth in space, power and cooling.

4. Security and fire safety

Data centres demand advanced security and fire safety measures due to the critical nature of the data they house. But data centres have very complex security and fire safety needs. The convergence of digital assets means there's a need for multi-layered cybersecurity protocols, guarding against cyberattacks that could compromise sensitive information.

Simultaneously, due to the concentration of high-performance hardware, fire safety measures are crucial to prevent potential catastrophic losses and ensure uninterrupted operations.

By making security and fire safety central priorities, you can instil confidence in your clients, shield against devastating breaches, and guarantee the continuity of services within an environment where data protection and operational stability are critical.

“operators need the ability to seamlessly expand infrastructure to meet growing demands”



How Johnson Controls can help

Solutions for data centres

To meet the evolving requirements of today's data centre environment – and overcome the inevitable challenges that will arise – it's important to work with a trusted partner: someone who understands the data centre landscape and can recommend and provide the right solutions.

At Johnson Controls, we don't believe a one size fits all approach exists. Our products and solutions are found in the most demanding data centres in the world – and our approach is tailored to each client and every environment.

With our enterprise delivery, we can reduce risk and improve programme delivery for data centre operators. We use industry-leading digital solutions, building automation, and hyper-efficient heating and cooling systems to save energy and reduce emissions. And we continue to advance safety with world-class fire detection and protection and smart security systems.

We bring everything together as a single provider, which is what sets us apart from the rest. With our tailored advisory, design and financing, and our installation, retrofit and intelligent maintenance services, we can support you in accelerating your journey toward a smart, healthy and sustainable future.

From the hidden danger of loud fire suppression discharges to the sustainable solution of free cooling, we'll learn and understand your needs. Our portfolio of integrated solutions helps minimise costs, maximise efficiency, and optimise timing.

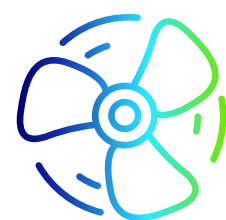
Here are some of our experts to introduce the solution areas we offer:



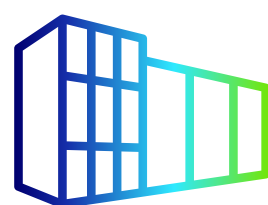
Fire detection and suppression



Security



HVAC



Building management, automation and connected energy performance



Proactive service



Funding solutions





Fire detection and suppression

Electrical failures, overheating lithium-ion batteries, inadequate maintenance, and/or human error in data centres can cause a rapid fire outbreak. That's why we offer the most comprehensive suite of fire detection and suppression systems, designed to protect your employees, customer data, and assets. Our industry-leading solutions detect fire at the earliest stage and prevent it from spreading, ensuring maximum safety.

You can mitigate risk while benefitting from the simplicity of centralised control and our innovative technologies. Our fire detection solutions are designed to be adaptable and flexible to protect against a wide range of potential fire risks. When combined with our innovative fire suppression systems (water and/or gas solutions), we can provide end-to-end fire safety coverage for your facilities so that you can focus on what matters most: your customers.



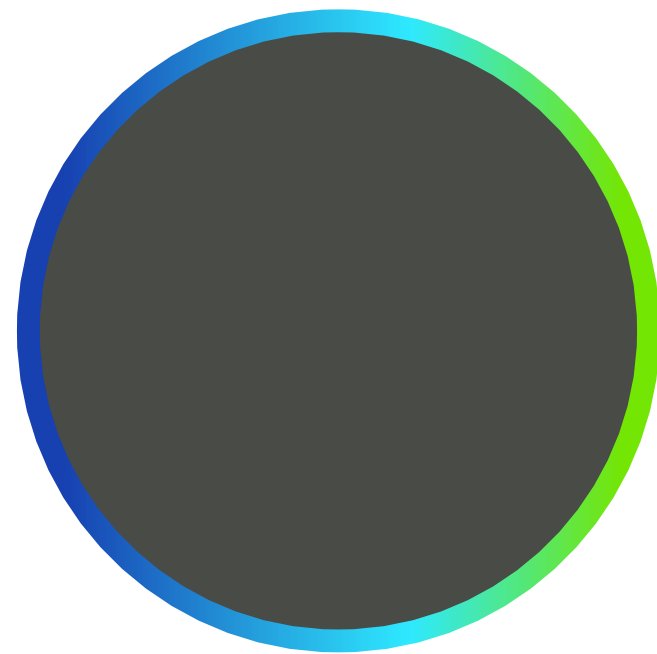
Michael Scragg
Fire Suppression UK&I Lead
Johnson Controls



Security

In the multi-billion dollar data centre industry, it can take years of investment and hard work to build a trusted reputation for security, but only seconds to destroy it. So, to protect your data centre's hardware and the data itself, you need an integrated network of solutions.

At Johnson Controls, our portfolio of world-class security solutions includes access control, video surveillance, cybersecurity, threat detection and more. We can identify threats, assess vulnerabilities and determine potential consequences – enabling you to improve the safety of your data centre around the clock.



Richard Jones
General Manager
Fire & Security UK&I
Johnson Controls





HVAC (Heating, Ventilation and Air Conditioning)

Johnson Controls has extensive experience in providing cooling and airside products, services and turnkey solutions to hyperscalers, colocation and enterprise customers – ensuring their data centres operate efficiently with minimal downtime.

Our extensive chiller product range comes with the fastest restart time in the industry with our 'quick start' feature, ensuring a chiller restarts within just 26 seconds. Our chillers also feature free-cooling options, magnetic bearing compressor technology and variable speed drives, monitored 24/7 by our Open Blue Connect Chiller platform, ensuring optimal performance and reliability.

You can rest assured that our range of air handling and CRAC/ CRAH units with advanced filtration and controls technology will ensure end-to-end reliability and performance for your data centre cooling requirements.



Michael Anderton
HVAC&R General
Manager, UK&I
Johnson Controls



Building management, automation and connected energy performance

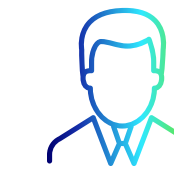
The modern data centre is a complex environment, and each facility is unique from a design point of view. That's why we believe a bespoke approach to enterprise management is vital.

With our support, you can enjoy detailed control, improved efficiency, and enhanced decision-making with data-driven insights. We collect critical data from your building automation system and turn it into powerful intelligence to guide energy and operational strategies. By combining this with our predictive diagnostic services, we can prevent and solve issues in your data centre before they turn into expensive problems.



David Lloyd
Head of Connected
Energy, UK&I
Johnson Controls





Proactive service

Whether running an enterprise data centre or using colocation facilities, a site's reputation depends on its operational availability and uptime. Our goal is to therefore help our customers win everywhere, every day – and it's why we can offer to monitor, analyse and optimise your equipment with our proactive services and support.

Our comprehensive range of data centre services covers everything from fire detection to fire suppression, security and heating, ventilation and air conditioning system maintenance. Our team of technical experts have the tools and know-how to apply advanced remote diagnostics, use real-time data, and produce predictive analytic insights of the operational performance of your equipment. If there is an equipment fault, they can quickly identify and resolve it before it becomes a bigger, more costly issue – such as downtime.



Carl Peter Hogg
Director Service
Excellence, UK&I
Johnson Controls



Funding solutions

We've funded customer projects worldwide and can tailor a solution to your specific needs. With Johnson Controls As a Service (AaS), you can establish targets, make informed capital decisions, and manage the installation, servicing, and connectivity of your building's infrastructure – all at a predictable fixed monthly fee. As part of our comprehensive and advanced lifecycle service, we provide innovative tools, performance dashboards, and regular reporting to guarantee desired outcomes and manage risks effectively.

Johnson Controls is dedicated to providing consistent support month after month, allowing you to concentrate on your primary operations while enjoying the long-term advantages of our partnership. We've designed our payment plans with flexibility to best serve our customers while meeting your organisation's needs and goals.

We offer a simple monthly fee and give you two subscription choices:

1. Purchase

A monthly subscription that allows you to own the equipment at the end of the contract.

2. Rental

This monthly option gives you the flexibility at the term's end to renew the agreement, acquire the equipment outright, or return it. It's an ideal choice for those looking to periodically upgrade their equipment, meeting both immediate needs and future goals.



Sarah Dixon
Enterprise Sales
Director, UK&I
Johnson Controls





Success stories

1. Significant energy savings for a global IT company

We recently helped a global IT company to reduce its data centre energy consumption via its chilled water system – delivering 380,000 kWh of electricity savings per year.

Our client had a 3 MWth chilled water system serving its data centres. It consisted of three chillers, two dry air coolers and associated primary and secondary pumps. A site survey indicated that the system was running without adequate automatic control or effective sequencing and the free cooling loop was not optimised. The main challenge was to implement these recommendations without compromising availability or the day-to-day operations.

We worked closely with the client to optimise the pipework in the free cooling circuit; install two-port shut-off valves within the chiller circuits to enable effective sequencing; add variable speed drives on the primary and secondary pumps to enable sequence control; and replace failing secondary pumps with a new set. Our guaranteed fixed-price solution led to enhanced system efficiency and helped remove 204 tonnes of carbon.

2. Optimal energy-efficient systems at a data centre

We helped one of our customers realise significant energy savings via our custom solutions – including a system capable of 309.9 kWh of free cooling at 5°C outside ambient air temperature.

Two chilled water circuits were already providing cooling to this client's data centre, with each circuit supplied by three 418 kW ammonia chillers. The circuits were supplying cooling to 24 Computer Room Air Handling (CRAH) units, the Uninterrupted Power Supply (UPS) battery rooms and communications rooms. After a full site evaluation, we suggested two main solutions regarding airflow management and temperature control recommendations to maximise the potential savings.

The first solution, a free cooling system, included the installation of two air blast cooling units to the chilled water system. Meanwhile, the second solution involved replacing the CRAH units with Smart Cool units supplied with the latest EC variable speed fans. This helped our client achieve a considerable reduction in annual maintenance and reduce the risk of downtime too.



The future and beyond

The reliance on our data centres will deepen over time – are you prioritising yours?

Data centres play a pivotal role in digital infrastructure. From our viewpoint, it’s clear that their importance will only continue to grow. As data centre specialists, we’re in 90% of the world’s most iconic buildings – and we know better than most that the data centre acts as the beating heart of the business.

It’s obvious that there are challenges to face due to the rapid evolution of the data centre market, but we believe that with the right support, you can overcome them – and the benefits are more than worth it. Since 2000, we’ve helped our customers save 30.6 million tonnes of CO₂ globally and \$6.6 billion through guaranteed operational savings.

While no one ever really knows what the future will look like exactly, our legacy of innovation serves us well in helping our clients prepare for the unknown. With nearly

140 years of innovation behind us, more than 9,200 active patents, and over 4 million clients globally – we’re in the best possible position to provide support.

We’re constantly analysing the market to spot the next big trends and developing ways to adapt to them. But for now, as mentioned earlier in this insight guide, we believe that achieving flexibility and resilience should be your most important priority. These are fundamental attributes that any business can benefit from – not only data centre operators.

In today’s unpredictable world, being flexible can help you operate both proactively and reactively. And demonstrating resilience can help you recover quickly from any unexpected incidents that may happen along the way. Along with operational efficiency, scalability, fire safety and security, these qualities can ensure that your data centre is ready for the future and beyond.

Learn more today

Want to know how Johnson Controls could support you and your data centre?

To ensure we get a complete overview of your requirements, we can run collaborative workshops with your team. Using this information, our experts can then create bespoke, results-driven solutions for your data centre.

Arrange a free no-obligation consultation by contacting us using the details below:

www.johnsoncontrols.co.uk/industries/data-center

Visit johnsoncontrols.com or follow us [@johnsoncontrols](https://twitter.com/johnsoncontrols)

©2023 Johnson Controls. All rights reserved.
EA231003



References:

- <https://datacentremagazine.com/articles/efficiency-to-loom-large-for-data-centre-industry-in-2023/>
- www.cliffordchance.com/insights/thought_leadership/2023-trends/data-centre-trends-2023.html
- <https://www.netapp.tv/player/30086/stream?assetType=episodes&mcid=09339839875346898354556665573636808094>
- <https://www.wiztopic.com/download-pdf/64f88c51ffe7b9f48b093c0c>
- <https://www.techcrati.com/news-hub/uk-energy-regulations-challenges-opportunities-data-centres/>
- <https://www.intelligentdatacentres.com/2023/04/12/the-challenges-and-opportunities-now-and-ahead-for-data-centre-decision-makers/>
- <https://www.hardyracks.com/post/is-your-data-center-designed-for-scalability-flexibility-and-resilience>