

aggreko

The inside view: Hyperscale data centres

A collection of insights from those
working in hyperscale data centres



Hyperscale: Why the inside view matters

Hyperscale facilities typify society's need for digital infrastructure. This class of data centre now underpins much of today's economy, with more than 100 being built in 2020 and the total figure of almost 600 having doubled since the end of 2015.¹ This rate of growth looks set to continue with CBRE predicting supply to reach roughly 400MW in FLAP markets alone by 2022. Other key regions, like the US, Nordics and APAC, also paint a similar picture, with deferred builds now underway alongside new projects.²

Given their importance, it's unsurprising to find hyperscale facilities facing challenges on many fronts. Not only do they need to meet demand for capacity but they must also ensure they remain online with virtually no downtime once built. These operational pressures are only made harder by other key issues such as power security, temperature and humidity control, and the need to deploy green energy solutions, where possible.

This highlights the need for capable, forward-thinking suppliers. Rapid innovation is key because data centres of this scale often act in advance of industry standards, as is efficiency and the ability to provide cost-effective solutions against tight deadlines. As one industry blog

points out, hyperscale data centres "require consistent products, reliable performance, and a partner that understands their business and challenges".³

Aggreko wanted to delve further into this market to get an 'inside view'. The company interviewed key figures – including consultants, managers and engineers – to better understand the priorities of those working on the ground. Highlights of those conversations are written up in this report and supplemented with insight from our own data centre specialists. By conducting this kind of qualitative research, Aggreko is able to provide more effective solutions for the hyperscale market, as it faces a period of accelerated growth.

Who Aggreko interviewed in the **Hyperscale market**



Data Centre
Consultant



Operations
Manager



Senior
Engineer

¹ <https://www.srgresearch.com/articles/microsoft-amazon-and-google-account-for-over-half-of-todays-600-hyperscale-data-centers>

² <https://blog.se.com/datacenter/2021/02/04/overcoming-the-next-set-of-challenges-for-data-centre-construction/>

³ <https://www.aflhyperscale.com/articles/now-thats-interesting/challenges-for-hyperscale/>

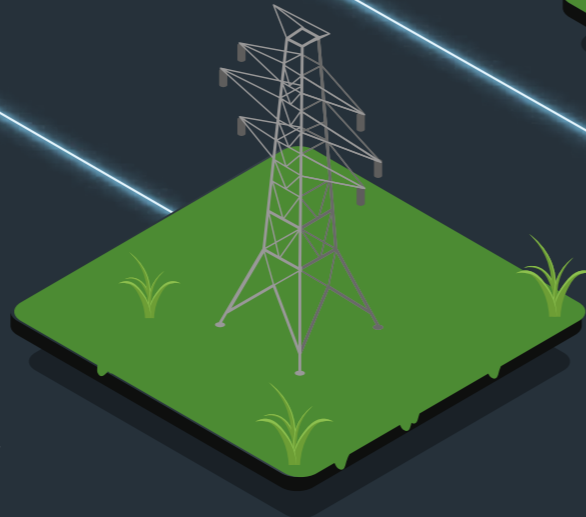
Executive Summary



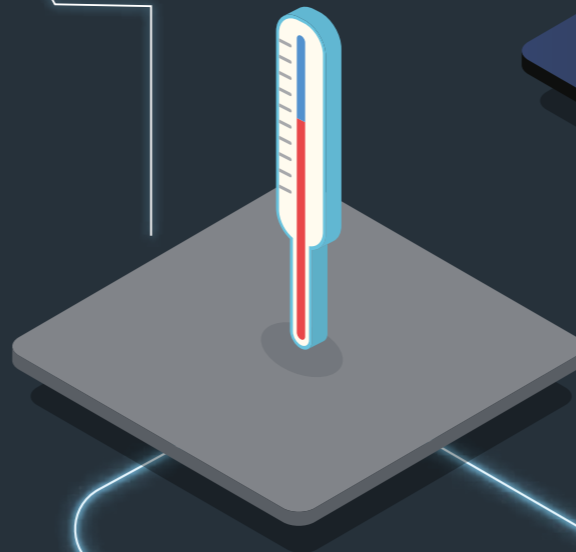
Sustainability partners could become key for the data centre market moving forward.



Hyperscale data centres still mainly rely on **national grids** for power, but **power availability** is a growing problem.



Temperature and humidity control are high on the agenda for hyperscale facilities.



Renewable energy sources are desirable but there are concerns around regulation and the ability to scale-up quickly enough.



Solutions include **relocating to cooler climates** and investment in **adiabatic cooling equipment**, although respondents acknowledge that temperature and humidity would need to be correct for this approach to be effective.



Climate change is forcing operators to reconsider where hyperscale facilities are built, with Scandinavia now growing in popularity.



I. POWER

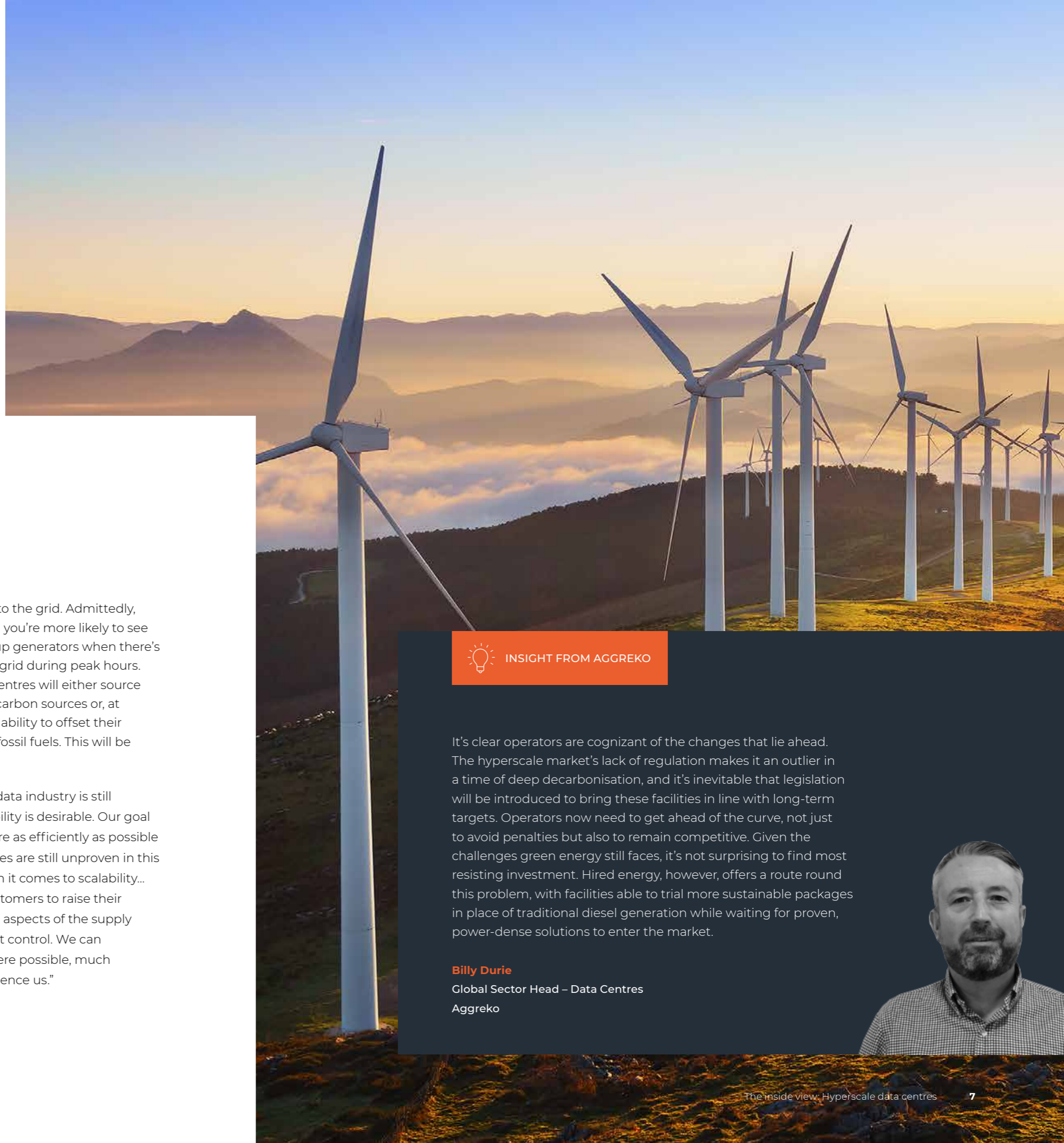
Green energy

Data Consultant: “There’s a definite push towards greener sources of energy in the hyperscale market. Energy certificates and process audits for both operators and clients are now being introduced, which demonstrate halls are running on renewable sources of energy. There is also funding available in some locations for power purchase agreements that assure grid energy is derived from geothermal, solar or wind. However, in my experience, energy consumption in the data centre market is still mostly unregulated and the next 10 years will see stricter legislation introduced to meet targets set out in the 2015 Paris Agreement. Currently the cheapest, most reliable solutions are preferred, but regulation will force sustainability to the top of the list.”

Operations Manager: “Recently I have seen higher demand for power derived from green wholesale providers so data centres can achieve carbon neutrality. Most facilities now also have solar farms on the roof that use what’s available and, where

possible, also sell back to the grid. Admittedly, this rarely happens and you’re more likely to see hyperscale sites firing up generators when there’s excess demand on the grid during peak hours. Moving forward, data centres will either source their power from zero-carbon sources or, at the very least, have the ability to offset their emissions when using fossil fuels. This will be driven by customers.”

Senior Engineer: “The data industry is still relatively young so stability is desirable. Our goal is to create infrastructure as efficiently as possible but greener technologies are still unproven in this market, especially when it comes to scalability... We’re working with customers to raise their sustainability but some aspects of the supply are not within our direct control. We can influence providers where possible, much like our customers influence us.”



INSIGHT FROM AGGREKO

It’s clear operators are cognizant of the changes that lie ahead. The hyperscale market’s lack of regulation makes it an outlier in a time of deep decarbonisation, and it’s inevitable that legislation will be introduced to bring these facilities in line with long-term targets. Operators now need to get ahead of the curve, not just to avoid penalties but also to remain competitive. Given the challenges green energy still faces, it’s not surprising to find most resisting investment. Hired energy, however, offers a route round this problem, with facilities able to trial more sustainable packages in place of traditional diesel generation while waiting for proven, power-dense solutions to enter the market.

Billy Durie

Global Sector Head – Data Centres
Aggreko



Grid limitations

Data Consultant: “The speed of development around semiconductors is significant and this is placing pressure on power requirements in hyperscale facilities. One year ago, for example, one server rack would have gone up to roughly 100 watts of processing capacity, whereas now it’s around 400 watts. This four-fold increase has been passed onto the operator, which is very difficult to resolve.”

Operations Manager: “Power availability is the top priority when searching for new sites. The UK’s grid doesn’t have enough overhead to deal with a new 25-50MW data centre opening without planning ahead, yet the most affordable land is typically found without a sufficient supply. This cuts down our options, mostly leaving vacant industrial sites that can be redeveloped.”

Senior Engineer: “Big-name customers are keener to pursue green technologies, or ask for documentation to prove that energy has come from sustainable sources. But fuel cells, solar and other alternatives are not able to scale up and meet the demands found in most of today’s data centres, particularly at hyperscale, so the grid still remains the number one source with diesel generation the preferred back-up solution. At the moment, most businesses are concerned with meeting load requirements and that means a continued reliance on the grid.”



INSIGHT FROM AGGREKO

Securing power has always been important in this market but current demand on digital infrastructure has forced it to the top. EirGrid, for example, insists certain parts around the greater Dublin area have capacity to export back using gas generation if they want to guarantee availability of grid power. Aggreko is currently in discussion with several operators looking at peaking plants from 20-150MW. In this case, there is potential for local data centres to work together and invest in a shared package, offering sufficient supply without fronting all the of expense for plant.

Ben Vincent

Global Account Manager
Aggreko



Upgrading facilities

Data Consultant: "It's far too expensive to open up a new data centre, so most operators will be looking to retrofit their existing facilities. There's no legislation to stop hyperscale facilities from choosing a fossil fuel generator when there is insufficient power from the grid and green sources. Without legislation, these loopholes will continue to be used and it will be difficult to force through more sustainable energy sources."

Operations Manager: "Efficiency is key. Our current efforts are geared towards achieving a PUE (power usage effectiveness) ratio of 1:1. Most of the obvious changes have already taken place, like installing LED lights to lower power and heat output, but we are also shifting to adiabatic cooling rather than using equipment running on DX gas. If the external conditions are right, we can pump fresh air through a number of filters into the building, regulate humidity between 20% and 80% and essentially have free cooling. This approach costs next to nothing as it only requires fans."

Securing power

Operations Manager: "We're typically forecasting 18-24 months ahead of time – thinking about how much power we need and how it can be secured. Green energy is preferred when going to market but recent events have placed huge strain on facilities, especially with everyone switching to online working. This forced us to scale-up with short notice, forcing us to use what was available. If our customers demand it, we have to find the solution."

Senior Engineer "Recent supply chain problems have highlighted the need for easily accessible equipment that bypasses the threat of shortages. The winter power outages in Texas really drove home that idea because the grid was unable to cope."

 INSIGHT FROM AGGREKO

Generators are indispensable for most facilities, yet relying on them too much could lead to OEMs to void warranties for excessive running hours. Aggreko's solutions are designed to operate optimally at all times, unlike stand-by units bought by data centres that may only be expected to run around 100 hours per year. The business is also structured so its engineers can carry out regular maintenance on operational plant, or be stationed on a customer's site to ensure everything is running to specification. This strategy is difficult for OEMs to replicate, particularly in remote regions where hyperscale facilities are usually found.

Billy Durie
Global Sector Head – Data Centres
Aggreko



 INSIGHT FROM AGGREKO

Aggreko has worked with several hyperscale facilities to provide bridging and commissioning power, allowing customers to build when and where they want.

One provider in Dublin, for example, encountered power issues and found that they would be unable to connect to the grid until several months after the agreed schedule. Rather than delay construction, the customer approached Aggreko and a package was developed that not only met the data centre's power requirements, but also used greener technologies so that EU standards on noise and emissions could be met. Once installed, the customer could also ramp up its power load once the facility was brought online.

Nick Osborne
Data Centre Specialist
Aggreko



II. RISK

Uptime

Data Consultant: "Downtime costs roughly \$10,000 per minute in a hyperscale and is categorised as the highest risk. Individual downtime or failure in these data centres has a direct impact on contract agreements signed with tenants. Redundancy plans usually involve doubling or tripling up on equipment – while an expensive approach this is still more economical than having downtime and paying the associated penalties."

Operations Manager: "It's the most important part of what we do. Any sort of interruption or disturbance – including maintenance – is treated as a SEV (severity) 1 change in our organisation. Some work will require live load switching that shifts the feed over to generators. A plan will be elevated to the VP and then to an external team for technical clearance. Each stage is relayed back to avoid errors."



Downtime costs roughly \$10,000 per minute in a hyperscale and is categorised as the highest risk.



Temperature & humidity control

Data Consultant: "Effective heat removal is a direct cost that has to be managed carefully in hyperscale. If you're moving to a site where the ambient temperature is below 12°C you effectively have free cooling – this cuts the cost of operation by roughly 40% and leaves only fans necessary for ventilation. Over a year that equates to roughly seven million in savings and is precisely why the biggest names in tech are moving to colder, more remote locations. Edge facilities are then introduced to manage latency and provide a seamless experience for the user."

Operations Manager: "If the humidity is correct but the temperature is still too high, we can cool the external air down by using the adiabatic

effect – essentially dragging the air in and using a tower to provide low-power cooling that simply wasn't available 10 years ago. This is far better than gas-based solutions that not only require expensive recharging and specialist engineers, but also certain licences."

Senior Engineer: "Liquid cooling appears to be the latest focus in the hyperscale market, especially due to the density of the servers now found in today's facilities. Older builds weren't designed to operate in this way, so alternative cooling methods are now rising up the agenda as a way to futureproof infrastructure while also lowering costs."



INSIGHT FROM AGGREKO

Aggreko has experience deploying adiabatic cooling solutions across every major data centre market, where they have consistently outperformed traditional methods.

It's encouraging to see adiabatic cooling being used via cooling towers, as this is not only more efficient but also makes sense from an operational point of view. Aggreko has experience deploying these solutions across every major data centre market, where they have consistently outperformed traditional methods. The emergence of liquid cooling is another promising development, especially where more IT is required in a smaller footprint – upgrading data halls in inner city, high-rise buildings, for example. Testing this type of technology has its challenges, especially as most heatload products are designed by heating the ambient air within the data hall, rather than loading up the chilled water system.

Billy Durie

Global Sector Head – Data Centres
Aggreko



Location

Operations Manager: "Flooding potential and climate are key criteria when we're building a new data centre. For existing locations in warmer climates, we're also trying to establish what the average temperature will be over the next 15 years and questioning whether it'll be manageable... Climate change is definitely affecting where we locate some of our newer facilities and we're pushing more towards the Scandinavian regions to take advantage of cheaper power and free cooling. While such moves are good for the planet, these decisions are ultimately driven by savings, efficiencies and risk reduction."

Supplier links

Senior Engineer: "We are thorough with our suppliers and maintenance. By now we have developed long-standing relationships with most of the larger industry providers, whose reputation has been built on managing risk and assuring reliability."

 INSIGHT FROM AGGREKO

Strong, agile supplier relationships are essential for rapid response when the worst hits.

Aggreko has supported several businesses over the summer with mechanical cooling when unexpectedly long spells of hot weather threatened operations. This same principle follows for unsociable hours in remote locations – operators need partners with a range of products that are consistent, reliable and familiar. But most important of all, they need to be readily accessible at a moment's notice.

Greger Ruud
Sector Development Manager - Datacenters Nordic
Aggreko



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Conclusion

The contributors to this discussion have shown that hyperscale facilities are on the precipice of change. Regulation is beginning to catch up with the industry's rapid expansion and rising power consumption, which will force many operators to explore greener approaches for both contingency planning and day-to-day operation. Yet the market realities of today are clear and equipment capable of meeting these challenges is needed now more than ever.

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