

Why enclosure innovation is a key part of the 5G transition

The UK 5G rollout is picking up pace, but building robust, future-proof network infrastructure presents operators with multiple challenges.

May 2023 marks four years since the launch of the first public 5G network in the UK. The beginning of the most significant shift in mobile data technology for decades has happened at a difficult time. Operators have had to contend with a pandemic, global supply chain problems and geopolitical tensions that affected major hardware vendors.

Despite these hurdles, considerable progress has been made. By the end of 2022, around 12,000 5G sites were in operation across the UK, almost double the 2021 figure. Regulator OFCOM estimates that 70 percent of UK premises can now receive a 5G signal.¹

Last year's figures also hint at the size of the challenge involved in universal 5G access, however. Doubling the number of active 5G sites has increased the share of premises within range of a 5G signal by around 20 percentage points. And 5G investments are still concentrated in the areas with the highest density of users. The fraction of the UK landmass

covered by 5G networks is less than 20 percent, compared to the more than 80 percent covered by 4G technology.²

The transformation imperative

There's plenty of pressure to make 5G transition work. Mobile network operators have promised their customers access to 5G anywhere in the UK by as early as 2028.³ They hope that the promise of fast, reliable 5G connections will attract and retain more customers.

Operators also need the shift to 5G to keep up with rising demand. Mobile data traffic has increased by around 40 percent every year in recent years.⁴ If that growth rate continues or accelerates, it will soon exceed the capacity of today's networks. Switching customers to new technologies that make more efficient use of scarce radio spectrum will be a critical part of the industry's response to the growth challenge.



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The big build

The construction of future proof mobile networks will require a lot of new hardware. Beyond the upgrading of existing sites to add 5G capabilities, operators will also need to rethink the design and configuration of their infrastructure. One key strategy for capacity improvement is densification: adding more of today's macro cell towers and supplementing those towers with networks of small cells that serve customers within a much smaller area.

Densification could dramatically increase the quantity and the variety of infrastructure in the UK's mobile networks. South Korea, where the 5G rollout has progressed further and faster than most countries, had more than 160,000 5G base stations in use by the end of 2021. That's roughly one 5G site for every 300 people, and well over ten times the current UK total.⁵

Constructing, connecting, and maintaining new high-complexity, high density infrastructure will present multiple challenges for operators. And the details of those installations

could have a big impact on reliability, installation difficulty and through-life costs.

Enclosure issues

One key detail for distributed telecommunications infrastructure of all types is the design of the enclosures used to protect the sensitive and valuable equipment installed at each site.

Enclosures for telecommunications hardware have several jobs to do. They must prevent the ingress of harmful water, dirt and fine dust that could degrade electronic hardware reliability and performance, affecting user satisfaction and maintenance costs. They must keep equipment within manufacturer's minimum and maximum operating temperature range. They must also resist accidental or deliberate damage by people, insects and animals. And they must be built to last – maintaining consistent performance and a neat appearance for years with minimum maintenance.

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With regard to temperature, the enclosures must manage the heat generated by the equipment itself, with sufficient ventilation or cooling capacity to keep the interior within strict tolerances, regardless of the load on the network, the effect of solar gain, or the temperature of the wider environment. Where enclosures are installed in populated areas, noise generated by equipment or cooling systems must be tightly controlled.

Some of those requirements are getting harder to fulfil, as climate change leads extremes of weather to become more frequent in the UK. That means higher peak summer temperatures, stronger winds, more extreme rainfall and

a greater chance of flooding. In the UK, enclosure cooling systems have traditionally been designed to cope with temperatures of 35°C. After recent heatwaves, infrastructure operators are increasingly specifying enclosures designed for a 40°C peak.

Then there's the issue of location. Finding space for mobile infrastructure has always been challenging, especially in busy urban environments. As networks come to depend on larger numbers of small base stations, operators will be forced to become more creative about how and where they position their infrastructure. In addition to the usual sites on roof tops or the sides of buildings, they may use street furniture such as lamp posts or bus shelters as locations for antenna arrays.

Enclosures for unconventional infrastructure locations may face several extra constraints. They include the need for extra physical security, tight limitations on the available space, or the need to accommodate specific mounting hardware.

These enclosures might also need to meet particular design guidelines, and local authority planning rules, to ensure that they blend into the local visual and architectural environment.

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Future proofing

Enclosures for next generation mobile infrastructure need to be specified with the future in mind. The industry is still building its understanding of how different hardware performs in different environments. Operators are experimenting with different technology approaches, such as the use of OpenRAN platforms that allow the same software to operate on hardware from multiple vendors. Today's 5G rollout is based on the existing 4G core network, but operators expect to transition to standalone 5G systems eventually, to offer their customers the full benefits of the new technology.

And nobody knows exactly how demand for mobile data capacity will evolve in the coming years. In its own forecasts for data traffic in 2035, OFCOM is evaluating scenarios that range from a low of 19 times 2021 levels up to a high of 540 times.⁶

All that uncertainty makes it highly likely that operators will want to adapt and extend infrastructure during its operating life. Ensuring that enclosures have the physical space for extra will simplify that process. So will the ability to increase cooling capacity where new, more energy-intensive hardware is installed.

Over the medium to long term, mobile network sites may become the home for additional infrastructure. 5G use cases such as advanced traffic management systems with vehicle-to-infrastructure communications will depend on reliable, low-latency communications with significant data processing conducted at the edge of the network. It's important to avoid vendor lock-in too. Operators may need to switch supplier or accommodate equipment from different companies inside the same enclosure during its lifetime. Adopting a vendor-agnostic cabinet system helps to ensure that such changes don't invalidate warranties or compromise the availability of spare parts and vendor support.

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The case for a smarter enclosure partner

There won't be a one-size-fits-all answer to the problem of enclosure designs for next generation mobile networks. Operators will need to find a balance between the desire for standardization - to simplify inventory control, site design and staff training - and customised solutions to meet the specific requirements of complex network locations.

Smart design can help. Modular, expandable enclosure systems allow the same basic design, and common parts, to be used in a wide range of different scenarios. And they provide a fast, low-cost upgrade path when a site's needs change.

And when modularisation is not enough, operators need an enclosure design partner that understands the challenges of the telecoms sectors and can collaborate with them to develop cost effective solutions for specific installation types.

Manufacturing and supply chain capabilities will matter too. As operators race to install thousands of pieces of infrastructure over the next five years, tight build schedules depend on the timely, reliable availability of all the components needed for a build.

With more than four decades of experience in the design, manufacture, and support of enclosures for demanding indoor and outdoor applications, Rainford can offer mobile network operators the expertise, scale, and production capabilities they need. Our experience includes extensive work with the largest fixed line telecom companies, and the provision of solutions for demanding applications in the rail, energy, and other sectors. To find out if we could help to solve your toughest infrastructure protection challenges, just pick up the phone.



- 1 <https://insidetelecom.com/2023-the-year-of-uk-5g/>
- 2 https://www.ofcom.org.uk/_data/assets/pdf_file/0034/249289/connected-nations-uk-report.pdf
- 3 <https://newsroom.ee.co.uk/ee-becomes-first-network-to-take-5g-to-50-of-uk-population/>
- 4 https://www.ofcom.org.uk/_data/assets/pdf_file/0017/232082/mobile-spectrum-demand-discussion-paper.pdf
- 5 <https://5gobservatory.eu/observatory-overview/5g-scoreboards/>
- 6 https://www.ofcom.org.uk/_data/assets/pdf_file/0017/232082/mobile-spectrum-demand-discussion-paper.pdf (Figure 14)

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