

FIBRE OPTIC MARKET

Upgrading the UK

August 2020



Getting fast, secure and resilient broadband across the UK as soon as possible is a priority for this Government. After a sluggish start, the next-generation of gigabit-capable broadband is now being deployed at pace. No gigabit nation was built in a day but the UK lags behind many of its more digitally evolved competitors.

The importance of connectivity to our lives has never been more apparent than it is right now. The pandemic has laid bare the dependency we place on this critical national infrastructure. Upgrading it will unquestionably drive and enable economic growth, as well as provide substantial productivity benefits. Changes to the regulatory environment have helped the supply-side, supported investment

and incentivised roll-out. These same changes have also helped create a more competitive market by encouraging an ever-increasing number of new providers to build out the network infrastructure. However, where competitive network build does not make commercial sense, the Government has stepped in.



GOVERNMENT POLICY

More than 95% of UK premises now have access to superfast broadband (defined as having download speeds of at least 24 megabits per second (**Mbps**)). This has largely been delivered using ‘Fibre-to-the-Cabinet’ (**FTTC**) technology – part fibre, part copper. But growing data demands are pushing the limits of the copper-based superfast broadband infrastructure.

Boris Johnson’s target is to bring “gigabit-capable broadband” nationwide by 2025. Gigabit-capable broadband would be able to deliver download speeds of 1 gigabit (or 1,000 Mbps) per second, but it will require a mixture of full-fibre technology (ie fibre optic cables that connect the ‘exchange’ –centrally-located buildings housing switching equipment - directly to each premises), cable broadband and future 5G networks. This deviates from Theresa May’s original target to build a UK-wide “full-fibre” network by 2033.

Despite the shorter timeframe, some have argued that the Government’s new target of delivering technology-neutral ‘gigabit-capable’ broadband by 2025 is a watering down of its original “full-fibre” target¹. However, because Boris Johnson’s new target is technology-agnostic, it will arguably make the 2025 timescale more realistic. Still, a number of barriers remain. According to industry stakeholders, policy reform will be required to enable access to properties to install the

infrastructure. Skilled labour shortages could also prove to be a major hurdle as well due to the fact that there is currently no legal obligation on developers to connect new build properties with broadband infrastructure (more on this later).

Although the infrastructure for full-fibre or gigabit-broadband will largely be funded by private investment, the Government has primary responsibility for broadband policy and coverage targets and has therefore allocated £5bn to tackle the hardest to reach 20% of UK premises.

There are several funding programmes for full-fibre, and the Government has also introduced two voucher schemes to subsidise full-fibre connections to rural areas and also to small and medium-sized businesses. According to the Future Telecoms Infrastructure Review (**FTIR**), the Government is following an “outside in” approach, targeting funding towards the hardest to reach areas first that are not typically reached by commercial investment².

Although Government support will be essential in delivering technology-neutral ‘gigabit-capable’ broadband by 2025, both the National Infrastructure Commission and Ofcom – the communications regulator – consider that market competition is the most appropriate way to encourage and deliver full-fibre deployment.

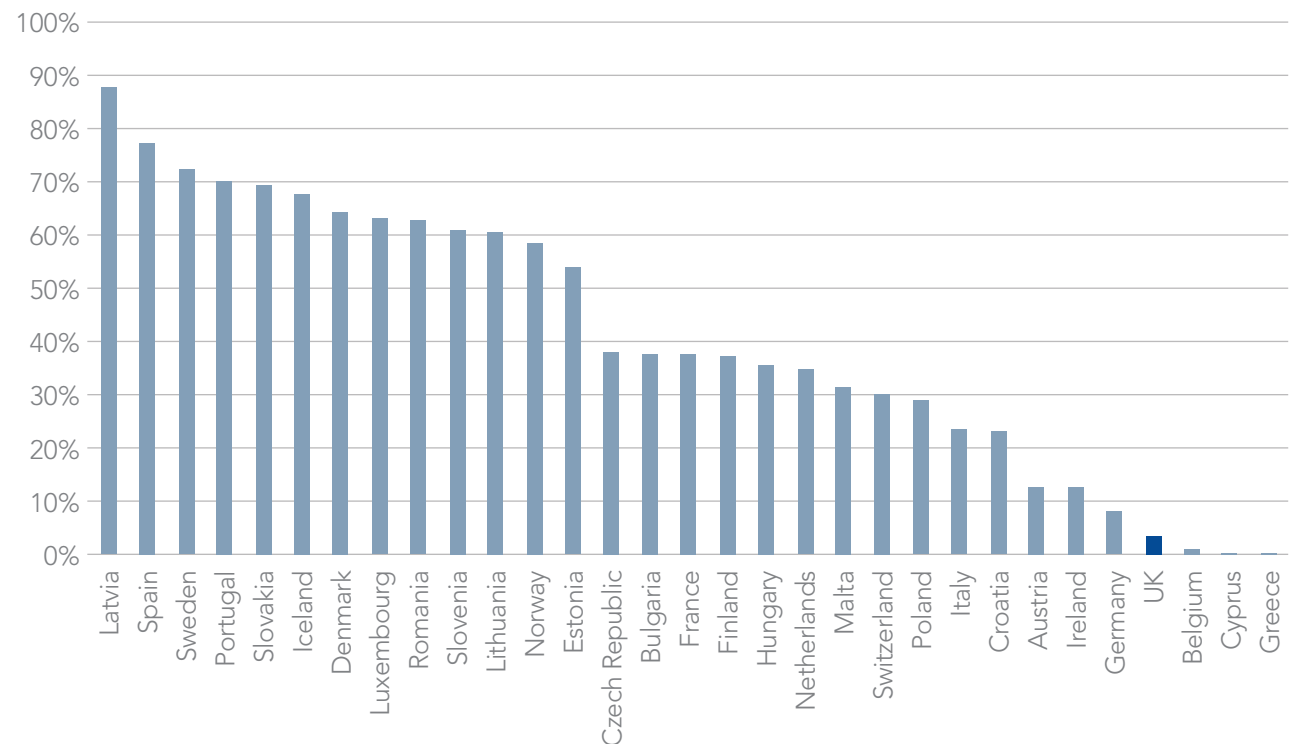
HOW DOES THE UK COMPARE TO OTHER COUNTRIES?

Full-fibre networks – often referred to as either Fibre-to-the-Premises (**FTTP**) or Fibre-to-the-Home (**FTTH**) - provide an end-to-end fibre optic connection the full distance from the telephone exchange to the building and can deliver faster speeds than FTTC as there is no copper leg at all.

According to Ofcom, as of September 2019 approximately 10% of UK premises (around 3 million homes) had access to full-fibre connections capable of delivering 1 Gbps (ie 'gigabit-capable broadband'). Although the latest indicators show that this figure has crept up to 13%, the UK still lags behind many of its European peers³.

A year earlier, in July 2018, the European countries with highest levels of full-fibre coverage were Latvia (**88%**), Spain (**77%**), Sweden (**72%**) and Portugal (**70%**). Of all the EU28 countries (plus Norway, Iceland and Switzerland), the UK had the fourth lowest percentage of households with access to full-fibre (**FTTP**) at 3.8%.

FTTP COVERAGE (% OF HOMES), (MID-2018)





The UK performs relatively poorly against other EU countries when it comes to FTTP coverage. However, this is because in the UK, operators have prioritised VDSL upgrades to existing, copper-based DSL networks as opposed to investing in the typically more expensive FTTP technology. UK operators tend to view the speeds associated with VDSL technologies as sufficient to satisfy demand.

Until recently, the country's largest telecoms network, Openreach (BT), was very much focused on deploying slower hybrid-fibre (FTTC/VDSL2) upgrades with max spreads of 40-80Mbps. Both cost and speed of rollout were major factors in prioritising hybrid-fibre. Whilst FTTP/H is significantly faster (capable of 1Gbps+ speeds) it is far more expensive and takes longer to deploy. However, Openreach recently announced a significant shift from its pre-2018 strategy and

approach and has now become much more focused on FTTP deployments. Openreach aims to cover 4 million UK homes and businesses with the technology by March 2021 and 15 million by 2025. Beyond that, Openreach aspires to reach "the majority of the UK if the right conditions to invest are in place."

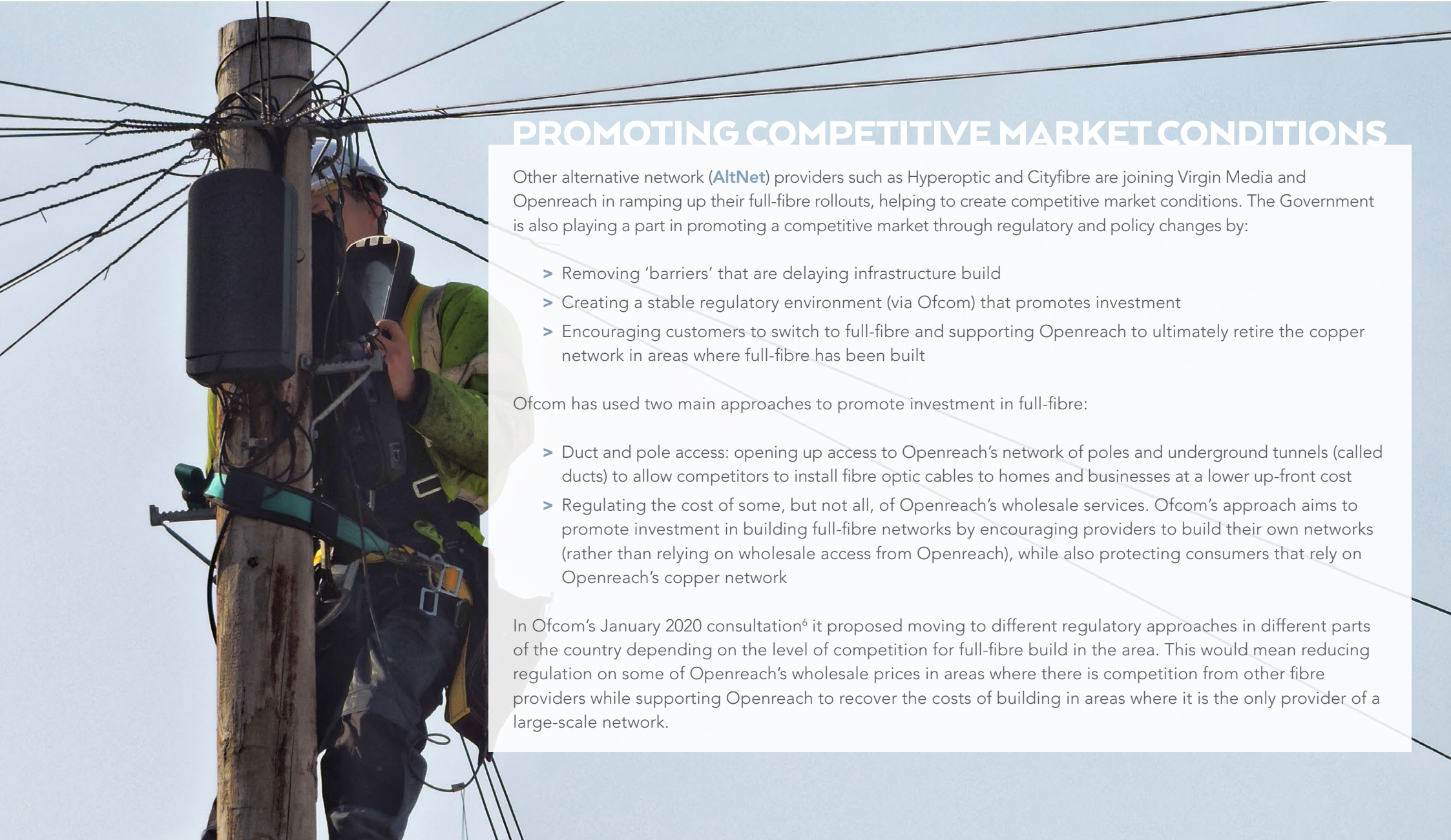
Whilst the UK lags behind many EU countries in terms of FTTP coverage, it actually does quite well when it comes to "superfast" and "ultrafast" coverage. Superfast reaches around 96-97% of UK premises whilst ultrafast coverage is around 59% according to recent analysis⁴. Based on the European Commission's 2020 Digital Economy and Society Index (DESI)⁵, which reveals how the UK's fixed line broadband compared with the rest of the EU in mid-2019, 96% of UK premises achieved what is described as Net Generation Access (NGA) broadband, capable of

30Mbps+. The EU as a whole was only able to achieve an NGA coverage figure of 86%, which puts the UK ahead of other major EU economies like Germany, France, Italy and Spain.

Whilst the UK has been rapidly ramping up full-fibre deployment over the past couple of years, full-fibre is inherently more expensive and slower to build, making it difficult to catch rivals that have been building this type of infrastructure for a lot longer.

VDSL - Very high bit-rate Digital Subscriber Line - a digital subscriber line technology that provides faster data transmission. This is accomplished by more efficient use of phone lines achieved through a configuration that effectively shortens the distance that the signal has to travel. Shorter distances means less degradation and a more reliable connection.

DSL - Digital Subscriber Line - the communications medium used to transfer digital signals over standard telephone lines. DSL has much slower connection speeds than VDSL.



PROMOTING COMPETITIVE MARKET CONDITIONS

Other alternative network (**AltNet**) providers such as Hyperoptic and Cityfibre are joining Virgin Media and Openreach in ramping up their full-fibre rollouts, helping to create competitive market conditions. The Government is also playing a part in promoting a competitive market through regulatory and policy changes by:

- > Removing 'barriers' that are delaying infrastructure build
- > Creating a stable regulatory environment (via Ofcom) that promotes investment
- > Encouraging customers to switch to full-fibre and supporting Openreach to ultimately retire the copper network in areas where full-fibre has been built

Ofcom has used two main approaches to promote investment in full-fibre:

- > Duct and pole access: opening up access to Openreach's network of poles and underground tunnels (called ducts) to allow competitors to install fibre optic cables to homes and businesses at a lower up-front cost
- > Regulating the cost of some, but not all, of Openreach's wholesale services. Ofcom's approach aims to promote investment in building full-fibre networks by encouraging providers to build their own networks (rather than relying on wholesale access from Openreach), while also protecting consumers that rely on Openreach's copper network

In Ofcom's January 2020 consultation⁶ it proposed moving to different regulatory approaches in different parts of the country depending on the level of competition for full-fibre build in the area. This would mean reducing regulation on some of Openreach's wholesale prices in areas where there is competition from other fibre providers while supporting Openreach to recover the costs of building in areas where it is the only provider of a large-scale network.

RETIRING THE COPPER NETWORK

Retiring the UK's copper telephone and broadband network, which is owned by Openreach, will require all premises (and devices) to have a non-copper based telephone and broadband connection (eg a full-fibre connection, a cable connection such as provided by Virgin Media) or a wireless connection.

The National Infrastructure Commission has recommended that the Government develops a plan to allow for copper "switch-off" by 2025⁷. However, this is ultimately a commercial decision for Openreach and so far the Government has not specified a firm date. The Government has only said that a "switchover" will be underway in a "majority of the country by 2030", and that the timescale will depend on how quickly full-fibre can be rolled out⁸.

In order to help speed up full-fibre roll out, Ofcom has told Openreach that where Openreach has built a full-fibre and copper-based network, it intends to help Openreach switch customers to full-fibre by removing regulation on the copper network. This would effectively allow Openreach to increase charges

on the copper network and incentivise retail service providers to move customers to full-fibre networks. Running a fibre and copper network in parallel is a costly exercise so Openreach will be strongly incentivised to retire the copper network as soon as fibre infrastructure is in place.

A copper retirement trial in Salisbury is proceeding on the basis that moving from copper to fibre lines will only begin once 75% of premises in an exchange are able to receive full fibre. This is expected to take 24 months after roll-out starts. The copper switch-off might then happen three years after that. Within that transition period "no move back" and "stop-sell" policies are likely to be implemented before full withdrawal.

The proposals and measures taken by Ofcom, such as loosening the regulation of wholesale line charges, will encourage BT and other telecoms companies to invest heavily in new fibre, helping to propel the UK up the global broadband rankings.





“proposed

£5bn

of extra public funding”

THE RISE OF THE ALTNETS

When Building Digital UK (**BDUK**) first started pushing for full-fibre, there was only BT and Virgin in the market and there was simply a lack of desire from network providers to build. Roll forward ten years and today’s market is chocked full of new AltNets providing full fibre. The rising number of new entrants to the market is a trend that is expected to continue for many years to come as full-fibre deployments are ramped up.

The increased competition from AltNets such as Gigaclear, Call Flow and Airband has led to an acceleration of building plans from the likes of Openreach and Virgin. As things stand, The Independent Networks Co-operative (**INCA**) predicts that AltNet providers will deliver 2.42 million full fibre premises by the end of 2020, before rising to 15.73 million by the end of 2025. By way of comparison, Openreach ended 2019 with 2.16m FTTP premises covered.

Although INCA’s 2025 figure is aspirational, it’s clear that AltNet providers are having an increasingly significant impact across the UK and is one of the reasons why major operators like Openreach have been ramping-up their own deployments. The Government’s recently proposed £5bn of extra public funding to help the final 20% of the hardest to reach premises will only increase competition further.

A key concern of AltNets is that major players will use their weight to overbuild in an anti-competitive way. Once AltNets have announced their intention to build full fibre in a certain area, major players may decide to do the same. Naturally, the more players that venture into a market, the tougher it becomes to gain a return on such significant investments or even attract new funding. Overbuilding frustrates competition and undermines rival AltNets but so far the Government has shown little interest in preventing commercial overbuild by rivals. This could be because having access to so many full fibre networks could hugely benefit consumers who will find themselves with a wider choice of broadband infrastructure.

Despite the current market-driven policy, AltNets appear to be attracting significant investment to help realise their ambitious deployment plans. Many AltNets will shape their business model once a final framework has been agreed in relation to the Government’s £5bn investment. However, the Government’s BDUK team is likely allocate the majority of this for ‘direct supply side intervention’ with suppliers bidding on contracts to deploy gigabit broadband in bundled areas where the market has failed to do so itself. AltNets may decide to adjust their business models and focus their bidding efforts in specific areas.

ALTNET BUSINESS MODELS

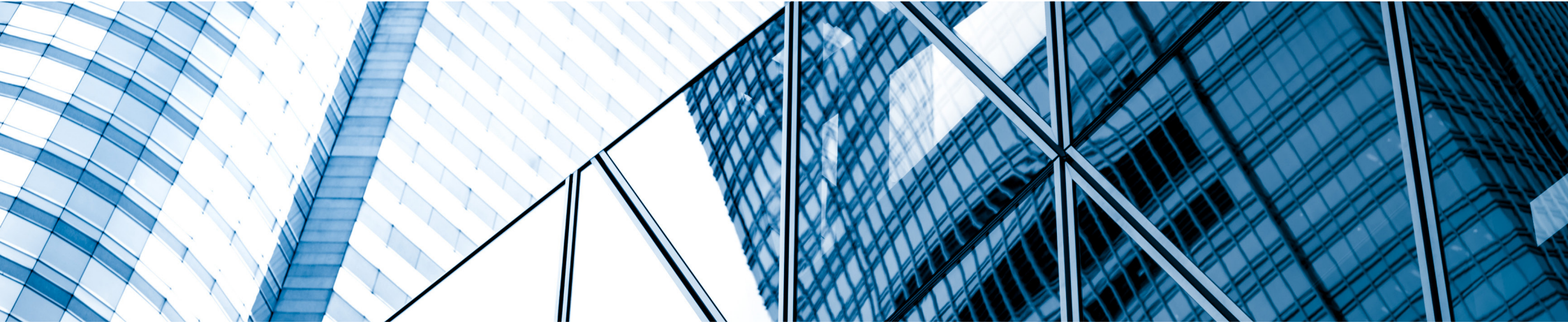
AltNets are competing against incumbents with decades of experience and although many are well funded, a lot of time needs to be spent developing systems, process, products and services to deliver full-fibre.

A substantial number of AltNet providers don't publicly state their build targets or reveal their business model. However, it's clear that most have initially targeted the lower-hanging fruit found in densely populated, urban areas. This is due to the simple fact that there are more premises in urban areas making it more cost effective and lucrative to deliver full-fibre.

A key performance indicator used when considering a new build programme is the forecasted 'cost per property passed' (**CPPP**). Comparing the CPPP to the likely revenue stream for the AltNet (either via new customers or via wholesaling a part of the network to an ISP) informs the potential return on investment and hence the overall viability of a build programme. Last year, Philip Jansen, the CEO of BT Group, said he anticipated that reaching the final 10% of UK premises with 1Gbps capable FTTP broadband ISP technology is likely to require an "outlay of around £4,000 each to

pass" (vs build costs of £300-£400 for the first 50% of premises)⁹. Although some operators may be able to do it for less by using different deployment methods or business models, it's clear to see why the installation of full-fibre in urban areas was targeted initially.

AltNet provider Gigaclear is an exception to this as it has exclusively targeted full-fibre in rural locations. The business case for delivery of FTTP in rural areas is based upon a critical level of expected take-up, in order to secure investment for further delivery. Anti-competitive activity such as 'strategic upgrading' by the national incumbent can undermine planned delivery in rural areas and reduce propensity of customers to join the network. This is, in part, why so few AltNet's adopt a business model that focuses on rural areas. Take-up needs to be exceptionally high to justify the cost of installing full-fibre in rural areas and if the national incumbent acts to undermine competition by commercially funding upgrades in the relevant area shortly after an AltNet announces a planned rollout then the AltNet's take-up rate could be much lower. The net effect is that AltNet's are less incentivised to upgrade rural infrastructure.



83%

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 broadband
 ISP network**

Urban-focused provider Cityfibre, a wholesale only open access AltNet provider, is aiming to build a network connecting up to 8 million premises by 2025. With network projects in over 60 towns and cities, Cityfibre aims to cover 85%+ of premises in each location. However, Cityfibre is in competition with rivals such as Virgin and other AltNet providers such as Hyperoptic and G.Network, who are also building in the same urban areas.

As mentioned above, there is currently no legal obligation on developers to connect new build properties with broadband infrastructure. Despite this, 83% of houses constructed in 2019 were connected to a full-fibre broadband ISP network (up from 73% in 2018). An increasing number of AltNet providers (eg The 4th Utility, Open Fibre Networks Ltd and i4 Technology Group) are focusing their business models specifically on new builds. Most major home builders have entered into partnerships with operators to facilitate full-fibre roll-out. The UK Government has been advising councils to factor in superfast

broadband into local planning approvals for new build developments, but because planning permission tends to be granted long before work begins and the build phase itself can take years, it's taken a while for this advice to have an impact.

Developers say that deploying full-fibre can be prohibitively expensive in remote or rural locations, but it's positive that an increasing number of new homes are being delivered with full-fibre. The proposals outlined in the Future Telecoms Infrastructure Review¹⁰ will help in this respect, which suggest mandating Gigabit-capable broadband connections for new build homes. In fact, the Government recently unveiled new legislation that will overhaul Building Regulations to guarantee gigabit broadband in new homes¹¹. Developers will soon be legally required to install high-quality digital infrastructure from the outset, make it a development priority and ensure that broadband companies are on board before the first brick is laid.



THE EMERGENCE OF SATELLITE BROADBAND

Another trend worth noting is satellite broadband. A satellite dish and transmitter attached to your home can communicate with a satellite in geostationary orbit. Data is transferred between the satellite and the dish and then to and from the providers central hub on earth.

Elon Musk's 'Starlink' and Jeff Bezos's 'Blue Origin' are two well-known backers for this type of broadband. These geostationary satellite fleet operators have seen the huge potential in connecting rural/remote areas that are more difficult to connect by using traditional, ground-based telecommunications networks.

Although not currently widespread, the technology has the potential to solve accessibility issues. Because satellite broadband removes the need for phone lines, mobile cell towers and other terrestrial services, it could prove to be a useful solution for those living in locations where fixed-line and mobile broadband is very slow or not available at all. Providing the dish can be mounted with a clear line of sight to the satellite (south in the UK), it's possible to receive satellite internet absolutely anywhere.

Satellite broadband speeds are generally comparable with standard ADSL broadband, with the majority of top consumer packages offer a speed of 30-36Mbps – on par with entry-level fibre optic broadband. However, because of the distance the signal has to travel, latency (or lag) is high, which can impact activities that rely on rapid, real-time communication. It's also prone to interference from the weather and other wireless signals and at the moment comes with data usage caps or Fair Access Policies which mean that heavy users may have their browsing speeds capped.

The £4,000 CPPP figure quoted by BT Group CEO, Philip Jansen, to reach the final 10% of UK premises with FTTP appears excessive when compared to the set-up and installation cost for satellite broadband, which is typically in the hundreds. Although not yet capable of matching the full-fibre download speeds, satellite technology is constantly advancing and for some, it will be the quickest and most cost effective option for affordable superfast broadband.



CONCLUSION

The full-fibre market is peppered with a steadily increasing number of smaller players and not all will be able to succeed. These competitive conditions increase the likelihood of market consolidation further down the line. For less urban areas, the rise of the AltNets has been a particularly welcome development, deploying fibre infrastructure in regions that have largely been ignored as a result of being less commercially attractive. Arguably,

without the growing levels of competition it would have taken incumbents a long time to connect these sites with full-fibre infrastructure. However, the telecommunications industry thrives on scale – something which AltNets will find hard to achieve.

The Government's objective is to 'fibre-up' the nation and AltNets have certainly helped with this goal by creating healthy competition and driving

infrastructure investment across the market. The digital divide between rural and urban areas is being addressed in some areas but by no means all. The Government's £5bn investment pot to tackle the "hardest to reach" 20% of UK premises will help close the digital infrastructure gap and level-up the country, but a more ambitious 2025 roll-out target may mean this pot will have to swell in size.

APPENDIX

A summary of definitions relating to broadband speeds as defined by the UK Government:

TYPE OF BROADBAND	DOWNLOAD SPEED
Decent Broadband	At least 10 Mbps
Superfast Broadband	Greater than 24 Mbps
Ultrafast Broadband	Greater than 100 Mbps
Gigabit-capable Broadband	Greater than 1Gbps

Note: Ofcom and the European Commission use different download speed definitions.

TYPE OF BROADBAND	DOWNLOAD SPEED
Asymmetric Digital Subscriber Line (ADSL)	Up to 8Mbps
Asymmetric Digital Subscriber Line (ADSL2/2+)	Up to 24Mbps
Fibre-to-the-Cabinet (FTTC)	Speeds of up to around 80 Mbps
'Cable Broadband' or Hybrid Fibre Coaxial (HFC)	Capable of speeds of around 1 Gbps
Full-fibre (i.e. Fibre-to-the-Premises/ Home, FTTP/ FTTH)	Can provide download speeds in excess of 1 Gbps. Potentially speeds in terabits in the future (1 terabit = 1,000 Gbps)

Note:

Mbps = megabits per second

Gbps = gigabits per second

One gigabit per second (Gbps) is equal to 1,000 megabits per second (Mbps).

