Making the 'climate case' for Full Fibre

At the heart of Talk Talk's promise to customers is that simple, affordable, reliable and fair connectivity should be available to everyone. A key part of achieving this is through being at the heart of Britain's Full Fibre future.

This paper summarises a review of the direct environmental benefits arising from a shift to Full Fibre, and in particular that such a move may yield up to an 80% improvement in energy efficiency compared to existing copper-based services.

What is Full Fibre?

At the moment, most home broadband connections are delivered using a mix of fibre-optic cables and old copper cables, which have been in place for decades, originally to deliver telephone services. This system uses a copper connection between premise – a home or business – and the nearest green street cabinet. Full Fibre uses a fibre optic cable to connect to households without using any copper cable at all. Often this is called 'Fibre To The Premises' or FTTP.

Just under seven million homes and businesses (24%) now have access to Full Fibre broadband connections, an increase of over five million compared to 2018 [(i)]. These connections can deliver much higher download speeds, of up to 1 Gbit/s. They are also up to five times more reliable than older, copper-based broadband, and less likely to slow down when lots of people use them at the same time. Compared to the seven minutes taken to upload a 1GB file on the superfast copper network, a Full Fibre connection would take around 42 seconds.

In its Future Telecoms Infrastructure Review (FTIR), the UK Government set an ambitious target of delivering nationwide Full Fibre by 2033 [(ii)] and announced planned funding of £5 bn for rural areas[(iii)]. To support this, Ofcom has set out proposals for new, flexible regulation that will help to build a Full Fibre future for the whole of the UK [(iv)].

Since 2014, TalkTalk has been a pioneer in developing Full Fibre, driven by a belief that it is critical for the UK's digital future. We are determined to remain at the forefront of this drive, as we recognise the benefits to the UK economy, society and the environment.

Understanding the benefits of Full Fibre

The radically increased reliability and speed offered by Full Fibre will underpin new ways of doing business, delivering public services and added flexibility in the workforce. It will deliver significant benefits to consumers at home too.

A report from the Centre for Economics and Business on behalf of Openreach, estimated a £59bn boost to UK productivity by 2025 powered by nationwide rollout of Full Fibre [(v)], while enabling much greater flexibility in terms of how businesses operate and employees work.

This has been exemplified as the coronavirus pandemic has placed unprecedented demand on our networks. For example, it has led to a surge in homeworking to allow businesses to continue operating during trading and travel restrictions. People have also relied on broadband services – including video calling apps – to keep in touch with friends and family, and to continue learning during school closures.

Furthermore, there is evidence that the technology itself offers substantial direct environmental benefits, particularly in terms of the reduction of GHG emissions associated with the delivery of broadband services.

The 'climate case' for Full Fibre

TalkTalk believes that a shift to Full Fibre could yield, GHG emissions reductions and energy efficiency improvements of up to an 80% compared to copper-based infrastructure. This is owing to:

- Rationalisation of infrastructure required to deliver services.
- Utilisation of more energy efficient technology.
- Better reliability of fibre optic networks.

Taking each in turn:

Rationalisation of infrastructure required to deliver services

One of the key differences between fibre optic and copper cable is the inherent properties of the material used to construct them. Primarily, fibre networks use light rather than electricity to transmit signals.

For copper networks, power is required to 'drive' the signal and even when the network is not in use it must be powered to prevent the copper from rusting. Typically, copper cables can only reliably carry signals for seven miles before significant degradation. This infrastructure therefore requires many exchanges and street cabinets to maintain a good quality of broadband to the end-consumer. Currently, Openreach (which runs the UK's digital network) reports that it operates and maintains some 5,600 exchanges (although not all these are capable of offering TalkTalk services) and 109,000 street cabinets [(vi)].

Conversely, light used in Full Fibre networks can travel tens of kilometres without degradation and therefore require far fewer exchanges throughout the network to boost performance.

Currently, TalkTalk operates in some 3,035 exchanges [(vii)] that offer Local Loop Unbundling (LLU) services – enabling other providers to share infrastructure with Openreach. Analysis suggests that these exchanges use over 85,000 kWh of energy each year. This equates to around 20,000 tonnes of CO_2e [(1)].

The advantages of requiring less equipment and being able to use far longer cables than existing copper, mean we expect we will only require the use of some 1,000 exchanges - while being able to service many more customers and meet our commercial ambitions. Furthermore, given the ability to transmit signals over far greater distances, the use of street cabinets will be virtually eliminated in a Full Fibre model.

Utilisation of more energy efficient technology

In addition to the rationalisation of the network, advances in the technology we use to operate a Full Fibre network means it is much more energy efficient – requiring less power to operate and less cooling compared to copper networks.

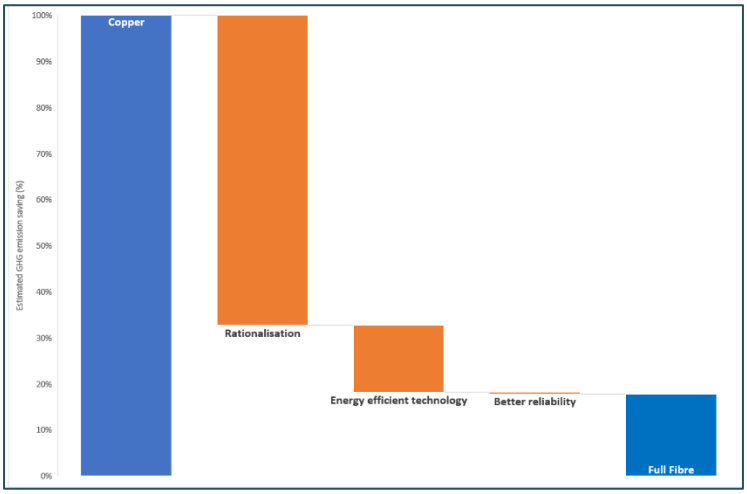
With a move to Full Fibre, TalkTalk will replace existing Multi-Service Access Node technology housed within Openreach exchanges with smaller, more efficient switching technology. Engineers estimate – using on-site measurements of power consumption – that the new technology will be around 10-15% more energy-efficient. Furthermore, the newer fibre optic technology has a much smaller physical footprint and generates far less heat. Again, TalkTalk engineers estimate 10% less energy required for cooling (although this could be a far greater saving if, for example, the entire exchange was converted to Full Fibre).

[1] Based on location-based calculation of emissions using UK government guidance and emissions factors.

Better reliability of fibre optic networks

Copper-based networks are highly vulnerable to water ingress, whereas water has little impact on pure fibre. Fibre connections are also more reliable due to the wires being connected to premise directly, rather than being shared in broadband cabinets where they may be damaged. This creates a strong advantage for Full Fibre, as faults are one of the most important drivers of customer dissatisfaction and churn. Fewer faults also mean fewer field engineer visits.

Typically, TalkTalk field engineers travel some 740,000 miles a year to identify and repair network faults. But with fewer faults, exchanges and street cabinets, the number of visits required by engineers are expected to fall dramatically. Even if this fell by as little as a third, hundreds of tonnes of GHG would be saved as fewer journeys would be made.



The chart summarises the savings contribution of each of the categories described above. Rationalisation of the broadband network is by far the most significant area of saving in terms of GHG emissions, accounting for two thirds saving over existing copper infrastructure.

But that is not the whole story…

The focus of this paper is on the direct climate benefits of Full Fibre over copper networks. However, we also recognise that this technology offers a series of other environmental benefits – and potentially challenges for us to consider.

First and foremost is how we may be able to influence the behaviour of our customers, for example, to adopt more flexible working patterns. In its report, Openreach suggested that over 1 million additional people could work from home, and the associated reduction in commuting trips could be expected to deliver significant environmental benefits. The GHG reduction is estimated to be in the order of 360,000 tonnes each year [(v)].

Potentially opposed to this trend is the increased energy use at home as a result of higher demand for data, use of video calls and access to more and more online services. In turn, that may increase emissions. Certainly, we can see the number of devices in use and the amount of online content being consumed within the UK increasing very quickly [(viii)], which may suggest an increase in associated GHG emissions. To understand and quantify this, TalkTalk has participated part of a pioneering collaboration between computer scientists at the University of Bristol and nine major media companies, including ITV and BBC, that will help digital industries understand and manage the significant carbon impacts of digital content [(ix)].

Certainly, it is important to understand this impact as we grow our network. So, we also have a responsibility to provide energy efficient technology within consumers' homes – such as Wi-Fi routers, extenders etc. We do not

necessarily expect this equipment to be radically different from that used for copper networks, but we can make sure that we incrementally make what we do offer as efficient as possible.

Ultimately, we must also recognise that copper is a rare resource that must either be recycled or mined and extracted from a handful of countries around the world. Extracting the 2kg copper ore needed to produce a 200-foot length of copper wire produces around one tonne of CO_2e. Creating the equivalent length of fibre optic cabling produces just 0.06 kgCO_2e [x]. In other words, in terms of embodied carbon, fibre holds significant advantages over copper.

In summary

We are committed to building a Full Fibre network that creates a broad range of benefits for UK society, in a way that reduces our environmental impact. Our analysis, independently reviewed by Carnstone Partners Limited, has given us confidence that this is the case and that over time, the energy and emissions savings from Full Fibre networks are significant.

We have established a substantial commitment to reduce the impact of our operations and are confident that as we pursue our commercial goals and roll out Full Fibre that these achievements will be enhanced further as our business growth goes hand in hand with a reduction in our environmental impact.

7 October 2021

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