



**DCMS – Future Telecoms
Infrastructure Review**

Call for Evidence

2nd February 2018

CityFibre

1. Executive Summary

- CityFibre strongly welcomes the Future Telecoms Infrastructure Review (FTIR) and the opportunity to respond to this Call for Evidence (CfE). It is the right time to identify the correct market structure and supporting policy and regulatory framework required to build the digital infrastructure the UK needs for the future. In an increasingly digital age, the quality of digital infrastructure will be a key determining factor in the economic prosperity not only of the UK as a whole but of every home, business, village, town and city. The race to construct this critical infrastructure is starting now; setting the right structure as that market emerges is essential to ensure no-one is left behind on copper.
- Having established open access full fibre infrastructure networks in 42 towns and cities across the UK under our “Gigabit City” model, serving all key verticals – residential, business, public sector and mobile/5G – CityFibre has already proven itself to be the “spark” required to disrupt the incumbent-dominated copper telecoms market, and ignite the full fibre revolution now underway in the UK. It’s a revolution that is desperately needed if the UK is to maintain its status as a leading digital economy, given the full fibre gap that currently exists between the UK and its international competitors.
- CityFibre aims to continue to disrupt the market, for the benefit of consumers, businesses and the UK’s economic future, and see ourselves playing a pivotal role in delivering Secretary of State Matt Hancock’s vision for a Full Fibre Britain. We are committed to build large scale full fibre, targetting no less than 5m homes and businesses by 2025 – half the Government’s 10m staging-post target – with the ambition to continue expanding our rollout thereafter. In addition to the many business ISPs consuming CityFibre’s infrastructure, we have established a long-term strategic partnership with Vodafone¹ to deploy full fibre to homes, with firm plans in place to build FTTP to 1m premises in 12 UK cities by 2021, expanding to c.50 cities, 5m homes by 2025 under supportive policy and regulatory conditions. This amounts to committed investment to date of c. £1bn, rising to a total planned investment of around c.£3bn by 2025. Given our position in the market, we intend to be a leading participant in this Review.
- Over the past 24 months both Government and Ofcom have outlined the key policy objectives for the UK telecoms infrastructure market:
 - the need to transition from copper (and hybrid copper networks) to full fibre, in order to future proof our digital infrastructure so it can support the UK’s Industrial Strategy and wider economic goals in an increasingly competitive and digitally-focused global marketplace;
 - the need to reduce the UK’s reliance on Openreach – to offer the industry, consumers and businesses better choice, value and quality of service, or as Matt Hancock has said, bring about a “panopoly” of players in the new full fibre market, not another Openreach monopoly.
- Government has also said the UK requires ubiquitous coverage: “Over the next decade, we want to have at least 10 million premises connected to full fibre, with a clear path to national coverage”, which links to the wider objective of spreading economic growth across the whole UK.
- The Government’s Full Fibre and 5G policy to date has succeeded in better enabling the commercial deployment of full fibre and supporting alternative providers (notably CityFibre, Gigaclear and Hyperoptic) to grow rapidly to the point where they present real competition to the incumbent. However, now that large scale deployments are beginning in earnest – with construction of CityFibre’s 1m premises rollout already underway – Government needs to pivot to a different approach if we are to meet these policy objectives:
 - If Government allows the market to follow its current path, which we describe as a “landrush”, it will not deliver nationwide full fibre coverage and will instead create a new digital divide, leaving a substantial portion of the UK (up to 45%) stuck on copper indefinitely, including many of the urban

¹ In exchange for a long-term 20% minimum volume anchor commitment, we have agreed with Vodafone an exclusivity arrangement for residential homes only through the build phase of each city network, which will subsequently open up to other ISPs, thereby maintaining our open access status.

areas outside London where full fibre could have the biggest impact, and where the economic consequences of being left in the digital slow lane will last for generations.

- Another approach, reorienting policy and regulation so as to incentivise Openreach to build full fibre at larger scale, while sacrificing alternative providers in the process, will lead to the same outcome – a digital divide and a return to monopoly. This remains true despite Openreach's recent, but potentially hollow, 10m FTTP announcement, and would remain true regardless of whether Openreach is fully separated or not.
- CityFibre argues that only way to prevent a new divide, without substantial public subsidy, is to maximise the full fibre investment of multiple providers, mobilising multiple sources of capital and avoiding over-reliance on a reluctant monopoly provider of full fibre, Openreach. This can be achieved by setting out a framework that prevents inefficient duplication of infrastructure deployment and actively supports transition away from copper to full fibre. Such a framework would require a fresh look at what is meant by “infrastructure competition” and clear sighted understanding of the pros and cons of each type:
 - A market where there are multiple infrastructure providers building full fibre across the UK, providing strong “competition” to Openreach (which spurs innovation and better value for money services), without inefficient duplication of full-fibre infrastructure in the same locations, is in UK consumers’ and business’ long-term interest, and should be strongly encouraged;
 - As the UK transitions from copper to fibre there will be “competition” between different types of infrastructure in the same locations, sometimes down the same streets: legacy networks (copper, hybrid copper/fibre and cable TV), as well as future proof networks (full fibre and eventually 5G). There will be risks in this transitional phase because so much of that legacy infrastructure is operated by the incumbent monopolist, whose primary motivation is to defend its position against challengers, and careful regulation will be needed to ensure that competition takes place on a level playing field: copper and hybrid copper/fibre must not be rolled out or exploited in a way that undermines the rollout of full fibre;
 - For the mass market, widespread infrastructure “competition” between two or more full fibre networks addressing the same premises is not in the UK’s interest: it does not deliver additional consumer benefits; it leads to the same roads being dug up multiple times; and, crucially, it undermines full fibre’s return on investment. This type of infrastructure competition (overbuild of full fibre by full fibre) harms the full fibre investment case for all providers (altnets and Openreach alike), will prevent nationwide deployment and ultimately result in higher prices and poorer performance for consumers. If the “natural monopoly” character of full fibre is accepted for the mass market, it should be regulated accordingly, with downstream competition safeguarded and unnecessary duplication of passive infrastructure avoided.
- As a consequence, CityFibre argues that moving the market away from a “landrush” model towards a largely “utility-like” model, where the investment potential of multiple full fibre operators is maximised, and inefficient duplication of full fibre infrastructure is minimised, may be the quickest and most cost-effective way to achieve the widest full fibre coverage without constraining the benefits of service provision and competition in downstream retail markets. In this scenario we see private investment, rather than large-scale public subsidy, funding the majority of the build.
- We propose that for Government to realise its Full Fibre and 5G ambitions, it must signal that this market restructure must take place by outlining a National Full Fibre Plan, with Ofcom bringing about the necessary regulatory changes. In forming a National Full Fibre Plan, Government must be mindful that:
 - The shape of the full fibre market will form quickly over the next few years; there is a narrow window of opportunity to influence its structure – the time to act is now;
 - The move from one model to another must take place in an orderly way, carefully managed, so as not to jeopardise or slow existing investment commitment and deployments;
 - The market’s structure must be selected according to its ability to deliver the longer-term goal of national coverage, rather than the 10m staging post;

- Full fibre and 5G are complements rather than substitutes; 5G and other wireless technologies may eventually deliver the final drop to customers in some locations, but this does not preclude the need to start building dense full fibre networks now;
 - G.fast may represent a cul-de-sac rather than a stepping stone to full fibre; action must be taken now to ensure that the way it is launched and priced by Openreach, advertised by ISPs, and regulated by Ofcom, does not undermine full fibre investment and adoption;
 - The consumer must be taken on the full fibre journey to ensure take-up; this includes tackling years of misleading “fibre” advertising and educating consumers on the benefits of full fibre;
 - The UK’s regulatory strategy needs to be recast to support residential and business consumers’ long-term interests, and to be more consistent with industrial strategy objectives.
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- As full fibre investments are underway now, and rollout plans are accelerating, it is critical that the Review itself, and any resulting transition to a new policy and regulatory structure, does not risk or slow full-fibre current and planned commercial rollouts; especially those being made by CityFibre and other full-fibre specialists. Indeed, the aim should be to fully understand, qualify and quantify the scope of such commercial full fibre rollouts (including those of Openreach), and for Government to encourage these investments to be made in a way that maximises coverage (so more consumers can benefit from full fibre sooner) and minimises inefficient duplication of full-fibre. Therefore, the adoption of a National Full Fibre Plan, and a transition to a new market structure must be swift, undertaken in an orderly manner so to avoid “unintended consequences” that could undermine investments.
 - CityFibre intends to publish further evidence shortly to support these arguments, and looks forward to discussing our proposals with Government, industry and wider stakeholders at this critical juncture in the UK’s economic future.

2. CityFibre’s input into the Future Telecoms Infrastructure Review

- We welcome this Review, which comes at a critical point in determining the UK’s digital future. As the leading disruptor in the market, we will be a proactive participant, contributing constructive ideas and feedback. We see this submission as part of conversation with DCMS, rather than our final word, and we are actively working to develop additional evidence to support the arguments we set out here, as well as our thoughts on potential regulatory and commercial approaches that could be adopted (Regulatory Asset Bases, franchise models, reciprocal access and so on). We plan to publish any further thoughts on these issues by the end of March, so they can be considered as part of the FTIR.
- This particular submission therefore focuses on:
 - The underlying economics of full fibre deployment across different geographies, as well as different players’ business models and underlying incentives, and how they will interact to meet policy objectives;
 - The policy objectives against which the future market – and the Government’s record on this critical economic infrastructure – will be judged;
 - Our recommendations for a National Full Fibre Plan.

3. The economics and commercial incentives shaping the market

3.1. Economics of FTTP build divide the UK into three segments

- In previous submissions and conversations with DCMS, CityFibre has argued that economies of density across the UK’s 27m premises divide the country into three segments, as illustrated in Annex 2:
 - The 1st segment (the most densely populated cities and large towns), is economically attractive for commercial FTTP² roll out and is therefore where the majority of commercial rollout will be focused;
 - In the 2nd segment (medium- and small-sized towns), commercial rollout of FTTP is viable under certain conditions, but challenging under intense competition – these are unlikely to be the primary targets for commercial full fibre builders;
 - The 3rd segment (villages and rural areas) is economically challenging unless approached by rural FTTP specialists and/or with targeted public subsidy.
- The exact boundaries between each segment are a topic of discussion, but the fundamental principle is that different geographic areas will be approached differently by commercial builders.

3.2. Players’ underlying incentives dictate how they behave across these segments

- For obvious historical reasons the UK’s copper-based market has an incumbent player, around which the market and regulation is orientated. Regulation has focused on BT’s ‘Significant Market Power’ and has sought to constrain the effects of that market power both in terms of outcomes for consumers and the competitive process itself.
- But as Matt Hancock said in his “Building a Full Fibre Britain” speech in November 2016, “the market for full fibre will look very different to the market for copper connections”, with “a panoply of potential players.” As with any other market subject to disruptive technology change, a significant “changing of the guard” in terms of market participation should be seen as an entirely natural and positive outcome, bringing consumers’ and businesses innovation, improved service and competitive prices.

² We use “FTTP” (Fibre to the Premise) and “full fibre” interchangeably in this document

- In considering how to bring about the right structure in this new full fibre market, it would therefore be a mistake to focus unduly on the incentives of the major market participants in the copper market (which includes BT/Openreach, Virgin, and to some extent those who currently consume wholesale FTTC (Fibre to the Cabinet) products from BT Wholesale and/or Openreach) at the expense of understanding the motivations of those looking to enter into or expand their share of full fibre market (this includes CityFibre, Vodafone, and the other altnets, but also potentially those yet to enter the market).
- It is important to understand all potential players' motivations in the round, how they differ from each other and react to each other, in order to predict how the market may evolve in different policy and regulatory circumstances. It is also important to acknowledge that making a few tweaks to existing policy and regulation does not fundamentally alter the incentives of those existing players.

3.2.1. Incumbent operators' motivations

- As the inheritor of the legacy copper network, the fundamental choice for BT/Openreach remains whether to maintain a profitable business that utilises existing network assets or whether to make substantial investment in a new network in anticipation of revenues that will not necessarily be any greater than those generated on the existing legacy network. There is no regulatory scenario that overturns this fundamental strategic dilemma for BT/Openreach. Crucially, even if Openreach existed in a fully separated form, this would still be the case.
- Rapid migration to FTTP means stranding much of its existing investment in FTTC. The benefits, in terms of greater revenues, are uncertain and the response that Openreach has received to its suggestion in its FTTP consultation that ISPs should pay substantially more than current wholesale FTTC rates for FTTP suggests that there is no obvious route through this. It is noteworthy that “incremental revenue per line from Openreach’s wholesale charges to CPs” remains one of Openreach’s key enablers for FTTP build, as per their 1 February announcement – FTTP deployment at scale and at speed for Openreach necessarily means higher wholesale and consumer prices.
- The rational strategy for BT/Openreach to pursue is to do all that it can to forestall competition from new entrants, whilst doing the bare minimum in terms of its own FTTP construction programme. Once new entrants have been cleared from the competitive playing field, and the country’s dependency on BT/Openreach is restored, then of course it becomes possible for BT/Openreach to revert to a model of drip-feeding FTTP investment over a much longer timescale and the Government’s ability to influence that investment programme is limited without resorting to substantial (and unnecessary) public subsidy. It is also in BT/Openreach’s interest to talk up the prospects of its own FTTP build programme whilst actually doing very little: not least as this destabilises altnet plans and investor confidence.
- The existence of access regulation on the legacy Openreach network also skews the business incentives of other retail ISPs. The original intention of the access regulation regime, that it should “hold the fort” until such time as the ISPs could construct their own networks, has been lost over time and certain ISPs now find themselves unhealthily dependent on continued access regulation to BT/Openreach infrastructure, with much of their focus being on trying to eke out improved margins from regulated products. It is also important to recognise that no tweaking of policy or regulation is going to nudge these ISPs onto an alternate path of large scale full fibre construction. Indeed, Ofcom’s decision to introduce strict price regulation of Openreach FTTC products and the resultant short-term improvement in the margins that can be generated by purchasing and selling Openreach’s FTTC makes this even less likely.
- Another significant structural feature of the pre-existing market is vertical integration of wholesale and retail as the dominant market paradigm. This has effects both in terms of how capital is raised (telcos’ cost of capital reflects the shoehorning of inherently more and less risky lines of business into the same corporate entity); and on regulation (much time and effort is expended on policing the scope for discrimination inherent in the monopoly infrastructure owner also being its biggest single consumer).

- Vertical integration may also have strategic and behavioural implications for BT in particular. BT Group considers a range of possible uses for the free cash flow it generates including paying a dividend, plugging its pension deficit and capital expenditure on different parts of its business. Whilst it would of course be theoretically possible for BT Group to decide on a radically different allocative approach (e.g. by not paying a dividend) or borrowing money for specific purposes, in practice the combined effect of its vertical integration and its own financial disciplines is to put capital expenditure on its network in competition with other business objectives such as the acquisition of sports rights (to take one obvious and material example). In deciding how to resolve this, BT Group will doubtless consider the incremental revenues that would be generated by offering premium sports on the one hand and full fibre on the other. This will tend to reinforce the requirement for full fibre to generate substantial additional revenues over and above those generated by FTTC. Openreach's FTTP announcement on 1 February reinforces the fact that these underlying motivations will dictate how it behaves in the emerging full fibre market.

3.2.2. New players' motivations

- Outside of the increasingly static regulated environment of Openreach and the large retail ISPs, a revolution has been gathering momentum with the advent of new alternative infrastructure providers. The altnets have benefited from the increasingly evident market failure in the UK in relation to full fibre construction, and this has made sources of capital interested in finding vehicles to address the resultant gap.
- Altnets such as CityFibre have benefited in other ways from the rate of development of the full fibre market in other countries: new technical methods of construction have been pioneered elsewhere, such as narrow trenching, that significantly reduce network construction costs, and an operating paradigm has emerged in other countries of a full fibre, open access provider that is essentially a constructor of a utility, does not seek to vertically integrate into downstream markets, and does not discriminate between downstream use-cases for full fibre.
- It follows that CityFibre was incorporated with a clear vision to build wholesale only future-proof full fibre infrastructure, availing of modern technologies, in a utility like model serving all key verticals – residential, business, public sector and mobile/5G. Our wholesale full fibre approach provides an unambiguous focus on “infrastructure” that has several benefits:
 - An attraction to utility-orientated investors (such as infrastructure funds and pension funds) due to the long-term yield-generating nature of the infrastructure assets, leading to lower cost of capital;
 - With no direct or indirect ties to “competing” retail services in downstream markets, the full fibre networks provide a genuine “neutral host” infrastructure that is increasingly attractive to ISPs and mobile operators. This neutrality engenders longer-term contractual commitments that underpins both investment and rollout;
 - A sole focus on the efficient build and operation of full fibre networks, without distraction from other potentially conflicting business priorities, enables a quicker and more cost effective rollout, leading to significant better value digital connectivity for the end consumer.
- Furthermore, in contrast to the needs and motivations of incumbent operators, CityFibre does not operate and maintain a legacy copper-based infrastructure, and our business case is not “incremental” to an existing copper-based business.
- As such, CityFibre has unambiguous motivations to maximise take-up on the network it constructs, is agnostic between different wholesale customers and use-cases, and can offer lower access pricing, as it does not have to show a positive incremental business case over those generated on a legacy copper network. The arrival of CityFibre and others therefore, at a stroke, shifts the industry cost-base for full fibre deployment substantially downwards.

- For example, in York where CityFibre launched its full fibre trial deployment, in conjunction with Sky and TalkTalk, consumers are benefitting from full fibre broadband services offered by competing ISPs, with packages priced from as low as £21.70³ per month for a 1Gbp/s connection. Take up has already exceeded 32%, and York now tops the UK's broadband speed league table with average internet speeds of 129 Mbit/s, almost three times higher than the UK average speed of 44 Mbit/s⁴.

3.3. How the market might evolve

- Given the economics of FTTP build and the incentives for different players, we envision four paths the emerging full fibre market could take under four different regulatory and policy frameworks⁵ and the impact that this has on rollout across the three segments (as per Figures 1 and 2 in the Annex):
 - **Landrush:** Open infrastructure competition between multiple full fibre providers, likely leading to overbuild (duplication of the underlying infrastructure) in the 1st segment, where most commercial players will focus. This is the path the market is currently on and the market structure that Ofcom is encouraging, as outlined in the DCR. It is also the market structure that Government has implicitly supported in the last 18 months by encouraging competitors to Openreach. CityFibre predicts that while this model could deliver FTTP to the 1st segment (and with it the Government's 10m target), it would fail to deliver to the 2nd or 3rd segments. The 3rd segment is challenging on all scenarios and may require some degree of public subsidy but the "no man's land" between what the market will deliver in a Landrush and that part of the country where we might reasonably expect a public subsidy to be necessary – the 2nd segment – is substantial. Up to 45% of UK premises (12.5m) would be left behind on copper, and a digital divide would open up. This Landrush model is now beginning to establish itself, with both CityFibre and Openreach announcing scale FTTP rollouts in the last few weeks with high potential for inefficient full fibre overbuild of full fibre in the 1st segment.
 - **Openreach:** A policy and regulatory framework focused on encouraging Openreach to take the primary role in full fibre deployment, at the expense of a multi-player market. The attractions of this, it might be argued, are that Openreach is a known quantity (for good or ill) and has scale and resources for the task. But the weak incentives at the heart of Openreach's FTTP proposition, which mean it will remain a reluctant investor in FTTP on all scenarios, combined with reduced competition from alternatives, would mean Openreach only deploying FTTP to the bare minimum of premises to satisfy political pressure, and deploying G.fast to the remainder. Even if Government and Ofcom accept the policy and the regulatory changes Openreach is calling for, where it does deploy FTTP, it will require high prices to compensate it for the incremental capex. Again, up to 45% of the UK risks being left behind on copper if this path were chosen.
 - **State Subsidy:** a policy and regulatory framework that relies on substantial public subsidy to deliver nationwide coverage. CityFibre believes there is sufficient private capital available to negate the need for this approach, *if* it can be correctly harnessed⁶.
 - **Multi-Player Fibre Utility Market:** a policy and regulatory framework that maximises the investment potential of *multiple* providers, by preventing inefficient duplication of infrastructure deployment and actively supporting a transition away from copper to full fibre. At its heart, this model recognises that full fibre at a passive level is a natural monopoly and is "utility-like", and that it should be regulated accordingly, with downstream competition safeguarded and

³ TalkTalk pricing for a 24-month contract - <https://www.talktalk.co.uk/shop/ufo/broadband>

⁴ Broadband Coverage and Speeds: local statistics 2017 – published 24th January 2018
<http://researchbriefings.parliament.uk/ResearchBriefing/Summary/CBP-8200#fullreport>

⁵ There may well be other paths, and almost certainly there will be variations within each path.

⁶ There may remain certain circumstances where targeted, lower cost interventions may support the development of full fibre and could be considered in the context of a National Full Fibre Plan

unnecessary duplication of passive infrastructure avoided. The standard approach to regulation of utilities (such as water and energy) is the franchising model. In the context of telecoms infrastructure a variety of potential models exist, which could be appropriate in different geographic locations at different times, including “reciprocal build” models and neutral open access models, such as those that have already been used in other countries (such as Spain, Portugal and New Zealand) to enable rapid and widespread full fibre deployment. The path maintains the benefits of competition for consumer in many parts of the value chain by specifying that the underlying full fibre infrastructure is neutral and accessible to multiple wholesalers and retailers.

- We expand on our argument that passive full fibre is a “natural monopoly” below and will be publishing further analysis and evidence regarding these potential market paths in the coming months.

3.4. The FTIR itself and a transition to a new market structure must not paralyse current and planned full-fibre investments

- A critical consideration for Government is the transition from the current landrush approach to a multi-player utility model. In particular, the FTIR review process itself must not undermine the confidence in committed full fibre deployments, such as CityFibre’s rollout with Vodafone, or stall the raising of capital to deliver planned projects. The last thing the UK needs, whilst it languishes at the bottom of the full fibre league table, is spades to be put down just as widespread deployment begins in earnest.
- Having highlighted that it is in BT/Openreach’s DNA to do all that it can to forestall competition from new entrants, whilst doing the bare minimum in terms of its own FTTP construction programme, Government must be vigilant in monitoring the incumbent’s behaviour and intervene where necessary to halt any tactics that have the intended (or unintended) consequence of undermining investor confidence in “competitor” full fibre infrastructure, and/or result in activities that may be misaligned to the future outcomes of this Review. For example, in December, we wrote to the Secretary of State and Ofcom to warn of potential “PR rollouts” by Openreach. Indeed, Openreach’s FTTP press release on 1 February announced an “intention” to build full fibre in locations where CityFibre has firm plans (e.g. Edinburgh and Leeds). This PR alone signals overbuild of new entrant full fibre by incumbent full fibre. We will write to Government specifically on this point in the coming days.
- Therefore, an orderly transition is critical, with clear signals to the market that support the “panopoly” multi-player model, providing a direction of travel and the regulatory conditions that underpin investor confidence rather than undermine it.

4. The Government’s public policy objectives

- In this section we analyse the policy objectives outlined in the FTIR’s Ministerial Foreword in today’s market, political and regulatory context to identify some of the essential components of the “right” market structure.

4.1. The time to build is now; the time to create the right market structure is now

- Timing is a critical part of this Review and a recurrent theme in our response. The question of whether we should build full fibre at scale *at all* seems now to have been resolved, with even BT/Openreach appearing to recognise the eventual requirement for widespread full fibre, and its superiority over copper/fibre hybrids. A key remaining question relates to timing: do we commence full fibre construction at scale now, or at some theoretical future date, adopting a “make do and mend” approach in the meantime? Should Government intervene to speed up the market if it does not make sufficient progress, and if so, when? In other words, how long should the market be given to find its own way?

- There appear to be two camps opening up: those who promote the “option value” of a wait and see approach, given that FTTC can (for at least those customers who can receive its more powerful variants) deliver a service adequate for their current needs. The arrival of BT’s “Ultrafast Fibre” G.fast product pushes further into the future the risk that heavy users will start demanding greater top speeds than existing superfast broadband can deliver. This camp sees G.fast as a useful stop gap while we all work out whether we really need to go the whole hog and deploy full fibre everywhere, and argues for a “steady as you go” approach to policy and regulation. It should be noted, however, that this involves further, significant investment in the existing copper network, potentially at the expense of capital being deployed for speedier FTTP rollout, as well as stranding yet more investment in that network should the market subsequently move decisively to full fibre.
- In the other camp are those, like CityFibre, who argue that the UK needs to aggressively pursue large-scale full fibre deployment now and that Government and the regulator need to do all it can to enable this. We wholeheartedly agree with Matt Hancock’s Ministerial Foreword, that the UK “must [...] get the market structure right now for the next generation of technologies”. This is for the following reasons:
 - We are at a unique moment in the investment cycle – banks and investors have finally accepted that fibre should be treated as a long-term infrastructure asset and see this sector as an opportunity to earn yield in a low interest rate environment. This investment climate did not exist even 2 or 3 years ago (investors did not accept that fibre was genuinely infrastructure) and it may not exist 2 or 3 years hence if market interest rates continue to rise. If we miss this investment window, we may miss the opportunity for the required networks to be built with private capital. Importantly, if the Landrush path leads to near-term outcomes where investors achieve (or are tracking towards) a poor return on investment from deployment in the 1st segment, they will be reluctant to invest again in the more challenging 2nd and 3rd segments, even if a different market model is subsequently adopted.
 - These networks will take time to build. Even in circumstances where sufficient capital is available, there will be constraints on labour, materials and the capacity for our urban areas to sustain the civil works required⁷. Achieving nationwide coverage will take time – as much as 15 years or more. If we are to catch up with peers, and enable our economy to compete in an increasingly digital world, we cannot continue to “wait and see”.
 - Extensive and dense FTTP is necessary if the UK is to achieve its objective of being a leading 5G nation. The UK fell behind its OECD competitors with respect to 4G, and we risk falling behind Asian economies yet again on 5G given their significantly better fibre densification.
 - Most importantly of all we need to look at market structure “now” because the market has already begun to form along the Landrush path and will become increasingly “set” in the next few years. Deployments are being made now that will determine the shape of the market over the long term, perhaps irrevocably. CityFibre, with our ISP partner during the build phase, Vodafone, plan to build to 1m premises by 2021, starting this March. In due course CityFibre and Vodafone will need to make the decision about whether to go beyond 1m to the second phase of the strategic partnership: 5m. Openreach has now announced that its FTTP deployments will rise from 2m to 3m by 2020, as well as the “conditions precedent” that need to be met for it to deploy up to 10m; other altnets are also progressing fast with their own plans.
- For these reasons, we argue that Government needs to be even firmer about what it means by “acting now”. The Foreword says that while some Government programmes, such as the Barrier Busting work, are “focused on driving change in the shorter term, this Review will assess what longer term changes could be made to market structures and policy frameworks to encourage investment”. To the contrary, it is vital that the outcome of this review does not result in a series of actions to be taken in 3-5 years hence, as this will be too late. If the Government wishes to change the course of that market, it needs to start now. Where

⁷ CityFibre’s experience is that any given town or city can sustain only a certain amount of active construction activity at a given time for traffic management reasons

changes cannot be made in the short-term, Government and the regulator should give the market confidence by setting out clearly what major changes will happen, and then sticking to them, even if it takes some time to do associated legislation. As we stressed above, this must happen in an orderly manner that does not undermine existing investment commitments and build programmes.

4.2. The technology focus for fixed networks should be ‘Full Fibre’

- The Foreword says Government is “determined to ensure the country has the telecommunications infrastructure it needs to meet the needs of consumer and businesses now and in the future”. Furthermore, it specifies that the “transition from copper to full fibre networks across the UK is necessary to future proof the speed, capacity and reliability of fixed connections and to create the backbone of 5G mobile networks”. Given that Government has already specified full fibre as the preferred endgoal for fixed networks, the focus of debate therefore shifts to the question of whether other network technologies – both fixed and mobile – assist or detract from that end-goal (G.fast) or represent a variation of that goal (5G).

4.2.1. The stifling impact of G.fast on full-fibre rollout

- G.fast – BT’s planned upgrade to its FTTC network – is often described as an “interim” technology; a logical part of a “wait and see” or “incremental” approach. However, it is crucial to understand that G.fast has the potential to represent a cul-de-sac rather than a stepping stone to full fibre deployment.
- No-one building all-new networks today would contemplate using a hybrid part-fibre solution, such as G.fast. It offers increased speeds and can be rolled out quickly and relatively cheaply, but FTTC’s relatively poor performance, restricted upgrade capabilities and higher maintenance costs compared with full fibre, means G.fast will always represent a “second-class” fixed solution, rather than the “world-class” one that Government says is necessary to support its objectives on productivity.
- Openreach now acknowledges FTTP’s superiority over G.fast and appears to envisage launching the latter only in areas where it does not contemplate deploying FTTP as a “spoiler” of others’ FTTP rollouts. What has yet to be fully acknowledged is G.fast’s stifling impact on full fibre deployment when combined with BT/Openreach’s own market position and incentives, and ISPs’ ability to advertise it as “fibre”:
 - In locations where alternative providers are planning or undertaking full fibre deployment, Openreach has the ability to defensively roll G.fast out quickly, potentially at a lower wholesale prices. Under BT’s recently announced “Ultrafast Fibre” brand (which does not appear to discriminate between an underlying full fibre and a G.fast network), G.fast can be marketed to consumers who, thanks to years of misleading “fibre” broadband advertising, have been rendered unable to differentiate between a part-fibre and full-fibre broadband product, despite them delivering markedly different consumer experiences⁸. A competitively priced “Ultrafast Fibre” G.fast product rolled out to consumers ahead of, or alongside, a real “full fibre” product, which cannot properly differentiate itself, has the ability to significantly undermine the market share and return on investment of full fibre in that specific location. Crucially, this only has to happen a handful of times in the early years of large-scale full fibre deployment for investor confidence to be severely dented, and further investment be undermined.
 - In locations where G.fast is rolled out ahead of any planned alternative full fibre deployment, the investment case for overbuilding a G.fast network (with an established customer base) with full fibre is much tougher than against a superfast broadband product, for the same reasons as outlined in the bullet above. Given the fragility of Openreach’s FTTP business case, the incentives for Openreach to overbuild its own G.fast network with full fibre are also weak, as we argue above.
- While Openreach should be free to offer its customers a better service, it is crucial that G.fast’s status as a non-future proofed technology solution that blunts progress towards full fibre is recognised and is not

⁸ Following a review, the ASA recently determined that the common practice of part-fibre broadband products being advertised as “fibre” is not misleading. CityFibre is challenging this decision.

inadvertently rewarded by inappropriate regulation. Consequently, not only should any National Full Fibre Plan be steadfast in specifying full fibre as the fixed-line technology that is best for the UK in the medium- to long-term (rather than what Openreach can more easily and cheaply deliver today), but firm action should be taken now to prevent Openreach from using G.fast to undermine full fibre deployment. This includes pricing (Ofcom has already proposed restricting G.fast national pricing but further protection against anti-competitive pricing may be required), equivalence of ease of consumer switching, and better clarity of advertising (see below).

4.2.2. Full fibre and 5G are complements, not substitutes

- We support the view in the Ministerial Foreword that the UK must aim to be a world leader in 5G deployment, as well as the 5G Strategy's analysis that 5G is not simply a straight-line development of the existing mobile telecommunications platform, but something potentially both transformative and disruptive. A variant of the "wait and see" approach being advocated by some is that wired networks will be predominantly FTTC for the present but that 5G may (eventually) reduce the extent of full fibre construction required. This view advocates that the Government pursues a FT5G (Fibre to the 5G) strategy, rather than an aggressive FTTP strategy.
- CityFibre's view is that fixed full fibre networks and wireless 5G (and other) networks will eventually work seamlessly together to deliver our digital connectivity needs. However, we urge caution in assuming that 5G is a panacea for all connectivity needs now and in the future. It may be the case that on certain broad assumptions, 5G technology could deliver up to 1 G/bit connectivity to a fixed location, comparable to a typical residential consumer FTTH capability on a GPON network and that this could reduce the need to physically dig up front gardens and driveways in some locations. But it will be some time before it is clear *when* 5G will be able to play a meaningful role in this final connection, and how fixed and wireless networks are likely to be used together: we do not yet know whether sufficient spectrum will be made available and on what licence terms to support such a rollout; whether other substantial practical barriers such as the need to deploy extensive new street furniture to support small cell rollout of sufficient density can be overcome. There are also technical barriers, including weather variability and building penetration, to be overcome.
- Regardless of when these factors are resolved, the substitutable part of a full fibre network in this scenario is essentially the final drop from the kerb, or small cell, to the customers' premises: an equivalently dense fibre infrastructure will need to be deployed up to that point in both a FTTP and FT5G strategy: if you are building fibre down every street, you may as well connect every home as well as street furniture for 5G.
- The first step in achieving the preconditions for mass market 5G rollout therefore is to ensure that full fibre networks are being constructed that can support both FTTP and FT5G (Fibre to the Tower), and this should be reflected a National Full Fibre Plan.

4.3. "National" coverage must take precedence over shorter-term staging posts

- The FTIR's Foreword states that "over the next decade, we want to have at least 10 million premises connected to full fibre, with a clear path national coverage". We strongly welcome this target, but it is important to be clear about the relationship between "10m" and "national", when selecting the right market structure to deliver it.
- Government and Parliament are of course very sensitive to the political implications of inequalities in the provision of current generation broadband between different communities, as is Ofcom given its duty to ensure communications services are available throughout the UK. If the whole of the UK is to benefit from this next phase of digital revolution, and future inequalities are to be avoided, the "national" part of this target must take priority. 10m is a useful staging post, but the National Full Fibre Plan must avoid market structures that make the 10m goal deliverable, but national coverage impossible. As we argued above,

both the current market structure (“Landrush”) and a policy and regulatory framework focused on encouraging Openreach to deploy full fibre at the expense of alternative players, have the potential to deliver 10m, but will fail to deliver national coverage, leaving the UK divided indefinitely between copper and full fibre. Bodies such as the NIC have an important role to play here in keeping Government focused on the longer-term horizon, rather than shorter-term political cycles.

4.4. We need to take the consumer with us on the full fibre journey

- The Foreword states that the market must deliver digital connectivity that is “affordable”. We agree. However, we view “affordability” as one element of a wider set of consumer considerations that must be woven into a National Full Fibre Plan: neither individual consumers nor the UK more generally will benefit from widespread full fibre if they are unable to (or choose not to) access it, as we have learnt from the challenges in driving up SuperFast take up. Creating the right conditions to encourage adoption of full fibre networks must be a priority even in this early stage of the market.
- In terms of pricing, it important to dismiss the presumption that the market conditions for full fibre rollout by definition require consumers to “pay more for more”. This features prominently in Openreach’s FTTP rollout conditions as per their 1 February announcement. It is certainly the case that FTTP, as a superior product to FTTC, may be able to command higher retail prices once its capabilities are fully understood and the benefits it brings to consumers integrated into their purchasing decisions. But CityFibre’s business model is based on a presumption that FTTP networks can be constructed at a wholesale cost per subscriber that is highly competitive to the wholesale costs for Openreach FTTC offerings and substantially lower than the wholesale pricing on which Openreach consulted. This is because, as we noted above, we do not have to prove an incremental business case for FTTP.
- As well as being affordable to businesses and consumers, digital connectivity must be easy to choose and consume. Earlier, we stressed the stifling impact of misleading advertising on full fibre investment and roll out, but it will also have a detrimental impact on take-up. CityFibre continues to fight the ASA’s recent decision that advertising an FTTC or co-axial product as “fibre” is not misleading and to look to Government for support. However, we also need to look ahead – as industry, Government, regulator and other key stakeholders – to determine how we introduce “full fibre” to the mass market. Despite arriving at the wrong conclusion on this issue, the ASA’s work on fibre has at least underlined the deep-seated consumer mistrust of broadband advertising, consumers’ confusion about what terms mean and how different broadband products will impact their digital lives. If we truly want the UK to benefit from full fibre, we need to address *now* how we communicate its benefits, and how it differs from previous generations of broadband. We would welcome the opportunity to begin this discussion with all stakeholders now, as part of a National Full Fibre Plan.
- Another critical part of a National Full Fibre Plan will be the role Government plays in stimulating business and public sector consumer demand. We have strongly welcomed the Gigabit Vouchers and Local Full Fibre Networks programmes, and look forward to potentially working with winners of the Challenge Fund. The next step needs to be understanding how these Government-encouraged roll outs work alongside – or in some cases dictate – commercial roll out plans, so that a more helicopter view is taken about how and when different parts of the UK receive full fibre.
- Finally, there are a number of other important consumer protection issues, such as how eventual ‘copper switch-off’ would be effected, what type of lifeline services would be provided over full fibre, and what the distributional effects would be if a declining number of customers remained on the copper network and were expected to pick up a higher pro rata share of the ongoing maintenance costs of that network. These are important issues, but can be settled once the overall market structure is identified. The market should not be ‘bounced’ into accepting Openreach proposals on switch-off as they fail to consider either consumer or competition aspects, but neither should policy-makers be paralysed by the potential complexities of this.

4.5. Clarity is required about what types of “infrastructure competition” are in the national interest

- The Foreword says the Review will determine how to deliver the “competitive conditions” needed to encourage long-term investment and that Government does “not want to see a monopolistic market in these new technologies”. Competition, in its broadest sense, can certainly deliver consumer benefits and innovation, as well as a positive impact on market conditions and investment: indeed without increased competition to Openreach, from the likes of CityFibre, it is unlikely that the incumbent would even be *considering* a 10m FTTP deployment, as it is today. However, right at the heart of this Review sits the question “what do we mean by the ‘right competitive structures’”?
- There is a tendency for all stakeholders to use the term “competition” freely, without being precise about what type of competition is meant, or acknowledging the different costs and benefits of each type. A critical output of this early stage of the Review is to be crystal clear about which types of competition are in the UK’s long-term interests, and which are not:

4.5.1. A market where there are many infrastructure providers

- Matt Hancock says he wants a “panoply” of different players in the new full fibre market. By this we understand that he means a market where there are multiple infrastructure provider building full fibre across the UK in different areas, as opposed to one national monopoly provider. We believe a “panoply” is in the UK’s long-term interest, because it reduces reliance on one single player for critical infrastructure, provides the industry with strong alternatives to Openreach, as well as innovation, value for money and consumer choice, which in turn puts pressure on Openreach’s performance and pricing. A “panoply” approach encouraging multiple providers to build passive infrastructure in non-overlapping territories will ensure efficient deployment of invested capital from multiple sources and deliver full fibre to more business and consumers quicker. This type of “infrastructure competition” should be a fundamental principle of a National Full Fibre Plan.

4.5.2. Competition between different types of infrastructure in the same locations

- As the UK transitions to full fibre, there is likely to be “infrastructure competition” between different types of infrastructure network: the legacy networks (copper, copper/fibre hybrids and cable) and future proof networks (full fibre/5G). Some premises may have access to copper, cable and full fibre and eventually 5G.
- This type of infrastructure competition will be a significant part of the market in the short to medium-term while the UK is in this transition phase, and remains in the UK’s (and consumers’) long-term interests as long as the legacy networks do not undermine the roll out of full fibre. The key to not undermining full fibre is ensuring a level playing field between legacy and future proof networks – advertising that clearly delineates that these are different products with different consumer benefits (as above); the ability for consumers to easily switch between types of infrastructures with comparable ease and absence of hassle (something that Ofcom was considering but has recently parked in the “too difficult” pile); and pricing of copper and hybrid copper/fibre products that does not undermine full fibre pricing (again, Ofcom has already proposed restricting G.fast national pricing but further protection against anti-competitive pricing may be required). Achieving this level-playing field will be a key part of the National Full Fibre Plan, and work should begin as soon as possible. The detailed implementation is for Ofcom, but Government must encourage it to put the necessary measures in place as soon as possible.
- The presumption must be that over time copper and cable will fall away, given that full fibre is the future proof and superior product, and that, as above, full fibre and 5G will work together to provide ubiquitous coverage, although it is not yet necessary (or possible) to say in what way they will work together.

4.5.3. Infrastructure competition between multiple full fibre networks addressing the same premises

- This type of “infrastructure competition” sees two or more full fibre networks built past the same premises. Absolutely fundamental to this Review is determining at what point and in which geographies – or “segments” of the market – this type of infrastructure network competition ceases to be beneficial and starts to become detrimental to the public policy goal.
- Replicating any infrastructure increases the total cost of building that infrastructure. In economic terms the trade-off that has to be struck is between that increased cost arising from replication on the one hand and the dynamic benefits that arise from competitive provision of the infrastructure on the other. Benefits of replicating infrastructure may arise on two axes:
 - Benefits from competition between infrastructures, whose capabilities and upgrade path may not be known at the outset;
 - Benefits in the downstream market in terms of service creation and product innovation. In a market characterised by vertical integration, these benefits would *only* be available via their being competing infrastructures.
- Where replication is a means to test and reveal what might be the best infrastructure, or it is the only means to achieve viable competition that allows scope for innovation and product differentiation, then an infrastructure competition policy is justified even if it increases total costs.
- With that framework of analysis in mind it can be seen that the UK finds itself in a position where there are huge dynamic benefits to be obtained from constructing a new fibre infrastructure that is superior to the legacy fibre/copper infrastructure currently in place. Even exponents of a “wait and see” policy do not seriously argue that FTTC is a more future proof technology choice but rather that there is an argument for deferring major investment in FTTP. So the Government and Ofcom are correct to be encouraging competitive provision of that infrastructure in a “competition for the market”.
- If, however, there was already a nationwide full fibre infrastructure in place, it is much harder to identify the competitive benefits that would arise from encouraging its replication by further market entrants. There is no fuzzy boundary around the optimal design of FTTP networks that requires a competition between different infrastructure providers to resolve, at least as far as the passive infrastructure component of a full fibre network is concerned. A full fibre network constructed today to a decent standard can be future proofed for all conceivable purposes. As for service creation and innovation, if full fibre networks are constructed on open access principles (where open access is to the underlying dark fibre) then scope for competition in the downstream market, including services creation and innovation, is safeguarded.
- If two basic principles are therefore established – full fibre networks being constructed to a future-proofed standard and their being offered on an open access basis – the benefits of replication of the passive network components falls away – the static costs of replication are being borne for no offsetting benefit, and indeed such competition “in, not for the market” may result in all network operators failing to achieve minimum efficient scale and showing a sufficient return on their investments to justify further investment, particularly in geographic areas where the economics are more challenging.
- If it is accepted that a single, passive open access full fibre infrastructure in all or most geographic locations is desirable, then this would move the regulatory paradigm for that part of the market into more of a “utility” model. This opens the way for passive fibre networks to be regulated using approaches such as RAB and the adoption of longer timescales over which charge controls are applied. This would recognise that the full fibre passive infrastructure is a stable regulatory asset with a long payback period and limited need for continual capital investment, as opposed to water networks, for example.

- If different providers build and operate that single full fibre infrastructure, then that causes some short-term complexities for the regulator, but has long term benefits which are again consistent with a utility-style regulatory model. In the short term the regulator would have to conduct distinct geographic market assessments to determine whether the full fibre provider had Significant Market Power. However, a benefit would be that it would be possible to conduct comparative assessments of the same activities being conducted by different providers and over time, apply regulatory incentives to move the market overall towards the most efficient delivery of service at the lowest sustainable cost. (As we have noted, CityFibre's business model assumes wholesale FTTP charges substantially lower than those on which Openreach consulted). On the other hand, a single national monopoly provider would benefit from the well-known information asymmetry problems that have bedevilled the regulation of incumbent telcos in first generation telephony and broadband services.
- Even if it is not accepted that a single, passive open access full fibre infrastructure in all or most geographic locations is desirable, and a policy of full infrastructure competition is maintained, even exponents of this view, such as Ofcom, recognise that it has practical geographic limits. Cable TV franchises were never fully built out and the economics of that platform appear to have an upper boundary of approximately 60% of the country by population. In its DCR Ofcom estimated this there was scope for a third infrastructure competitor for approximately 40% of the UK. Proponents of full infrastructure competition are therefore arguing for an outcome no better than three operators in 40% of the country, a duopoly for a further 20% and a continued reliance on a single monopolist for the remaining 40%. Even if there is scope for competition in 40% of the country, this clearly does not sum to a credible policy for a full fibre national rollout.
- For these reasons, CityFibre argues that Government should seriously explore whether moving to a largely "utility-like" regulatory framework, in all but niche markets and specific locations, may be the quickest and most cost-effective way to achieve maximum full fibre coverage and deliver strong consumer outcomes, without relying on large-scale public subsidy.

5. Conclusion and recommendations: A National Full Fibre Rollout Plan

- Taking into account the public policy objectives, the market economics and the incentives of existing and new players, CityFibre's conclusion is that only way to create the nationwide full fibre network that the UK requires to thrive in the digital age, with as little public subsidy as possible and without creating a digital divide, is to maximize the investment potential of *multiple* providers, by setting out a framework that prevents inefficient duplication of infrastructure deployment and actively supports transition away from copper to full fibre. The best way to do this is to:
 - Move from a "landrush" model to a largely "utility-like" regulatory model, in all but niche markets;
 - Use regulation to maintain a level-playing field – in terms of advertising, switching and pricing – between legacy and future-proof networks.
- Such a move away from today's market paradigm is not something that could happen organically; Government, working with all relevant stakeholders, would need to actively set out such an objective and put in train the regulatory and legislative changes required. We propose that Government does this by setting out a National Full Fibre Plan to be followed over the next decade, with Ofcom bringing about the necessary regulatory changes.
- It is also vital that this transition is orderly, with care taken not to disrupt existing investment commitments and deployments.

- At the time of writing it seems likely that there will be a Brexit transition period up to 2021 and an indeterminate period of “alignment” with the acquis beyond that point as determined by the forthcoming discussions on the future trading relationship with the EU. The UK cannot afford to wait until we have a clear view of the post-Brexit legal, regulatory and economic situation before taking steps to shape the market, therefore if the Government is minded to move the market away from its current path, it must begin to do so working within today’s political and regulatory conditions. Therefore, as well as mapping out the medium- to long-term policy and regulatory roadmap, as soon as possible Government has to take actions to carefully but decisively move the market in the right direction.
- Government also needs to ensure that the regulatory strategy is fully in line with the UK’s long-term infrastructure goals. Both Ofcom’s recent market reviews (2016 Business Connectivity Market Review, and the current Wholesale Local Access Market review consultation) contain elements which run directly counter to the full fibre vision both Government and Ofcom itself have outlined. Whilst Ofcom claims that it is constrained by the statute under which it operates, it must be recognised that part of its statute derives from the European Common Regulatory Framework, and that other EU regulators – in Spain, Portugal, Italy, France – have been much more successful in promoting full fibre rollout, despite working under that same CRF. The power taken by the Government in the Digital Economy Act to set out a Strategic Priorities Statement is a means to encourage Ofcom onto a different path.
- CityFibre is leading the transition to a Full Fibre Britain and has committed full fibre infrastructure investment to date of c.£1bn, rising to a total planned investment of around c.£3bn by 2025. We are already delivering competition to Openreach, a genuine neutral host infrastructure, innovation and best value. Given our position in the market, we intend to be a leading participant in this Review and will follow with further evidence and analysis. We look forward to discussing our proposals with all stakeholders.

ANNEX 1: The Call for Evidence Questions

1: What is the existing UK telecoms market structure and policy framework able to deliver?

- *When will it deliver, and how certain can we be that it will fulfil the Government's ambitions for full fibre networks and 5G deployment?*
- *What will this mean for roll-out of these technologies and for competitive models in different geographic locations?*

If the current market structure and policy framework are retained, and critically if resolute regulatory action is taken to prevent anti-competitive behaviour by Openreach, some full fibre will be constructed in the most economically favourable parts of the country – Ofcom's 'competitive 40%'. This is likely to take the form of a landrush between altnets and Openreach, with some areas therefore being overbuilt by more than one FTTP network.

Some combination of an evolved USO and BDUK-type funding may also deliver full fibre in rural areas.

But this framework will not deliver full national coverage on anything like the timescales envisioned by the Government, if at all. It will leave a 'missing middle' part of the country that does not receive full fibre rollout.

As full fibre rollout is an essential input to scale deployment of small cell 5G, a similar case can be made for 5G.

2: What barriers exist to *long term* investment in the UK telecoms market (beyond work underway by the Local Full Fibre Networks programme to stimulate demand, and by the Barrier Busting Taskforce to reduce build costs)?

- *What effect do existing revenue streams have on investment plans?*
- *What effect do visibility and predictability of returns have on investment plans?*
- *What is the effect of current infrastructure deployment models?*
- *What impact do current infrastructure sharing arrangements have on investment?*
- *What is the impact of the existing relationship between wholesale and retail markets?*
- *What changes to spectrum licensing and sharing could foster greater innovation and investment in 5G?*

There is a 'hold up' problem with full fibre investment in legacy players. The reasons for this are:

- The incumbent Openreach's profitable legacy network blunts its motivation to construct a new, fit for purpose full fibre network;
- The existence of regulated access to the legacy network also blunts the motivations of the large retail ISPs to construct their own full fibre or purchase it from other sources;
- The dominant market paradigm of vertically integrated companies prevents the emergence of a regulatory model that recognises full fibre as a utility with a stable asset base, relatively low risk profile and long payback periods;
- These problems are exacerbated by Ofcom's excessive focus on short term benefits to consumers in the form of lower prices even at the expense of long-term investment incentives.

It should be noted that the above is typical of most markets where incumbent operators own and operate legacy copper based networks and have a dominant market position. It is new entrants, such as CityFibre, that demonstrate leadership in full fibre delivery in such markets. These arguments are outlined in greater detail in the main part of this response.

On infrastructure sharing specifically, underground ducts and, potentially, overhead telegraph poles can be reused to some extent to support new full fibre infrastructure construction. This is not a panacea: in many cases, existing Openreach ducts, constructed to support a 'tree and branch' telephony network, will not be physically in the right places to support a new full fibre resilient ring architecture. The physical condition of existing ducts is also extremely variable, a problem compounded by Openreach's inability to even state with certainty how much of its feeder network is ducted as opposed to direct-buried. As for overhead telegraph poles, any scale use of these assets is highly dependent on Ofcom introducing regulatory requirements for these (such as the ability of altnets to themselves conduct engineering activities on poles) which it currently appears reluctant to contemplate. We therefore find ourselves in the unusual position of welcoming efforts to improve access to ducts and poles whilst simultaneously urging caution on the extent to which these remove the need for new duct construction. For example, Ofcom quoted potential cost savings from use of DPA at a recent INCA conference which we consider to be wholly unrealistic based on our own experience of using DPA in scale in Southend.

DPA is nonetheless a significant development in one respect at least: by setting an expectation that the industry will share the use of existing passive assets, Ofcom has opened the way for a deeper conversation about the scope for and desirability of shared access to passive infrastructure. In economic terms, if it makes sense to share ducts and poles it must perforce make sense to share the fibre infrastructure deployed in or on those ducts and poles.

As regards radio spectrum for 5G, our observation is that spectrum, in particular in mmWave bands, must be made available in ways that permit some disruptive entry into the market. If spectrum is auctioned on a national licence basis, then this will tend to exacerbate the existing hold-up problem in the mobile market and encourage spectrum hoarding by the existing MNOs.

3: What can the UK learn from the widespread deployment of fibre networks in other countries?

- *What factors have led to higher full fibre investment in other countries and how applicable are these to the UK?*
- *What have been the impacts of fibre roll-out models in other countries on competition dynamics, consumer bills, and risk allocation?*
- *To what extent can the fibre that has been rolled out internationally be used for mobile backhaul, and what lessons can the UK learn?*

There are some obvious headline policy messages to take from the widespread rollout of full fibre in other countries.

- That, as the Government recognises, extensive full fibre rollout is now the clear technology outcome towards which advanced economies are migrating
- That full fibre rollout can be delivered at scale across a range of different geographies and built environments: the myth that 'full fibre' is a policy choice suitable only for countries with unusually high concentrations of consumers in MDUs has been exploded by successful deployments in countries such as New Zealand
- That full fibre is driven best in conditions where there is 'competition for the market' but not necessarily replication of full fibre infrastructure in the same geographic areas. For example, elsewhere in Europe reciprocal build agreements between operators have spurred rapid rollout, as has a 'franchising' model in New Zealand
- That extensive full fibre rollout has been achieved in a number of EU countries operating under the same EU Common Regulatory Framework as the UK. This suggests the problems are not inherent to that regulatory framework and that imaginative policy choices within that Framework can overcome the current market inertia.

Ultimately, which policy and regulatory models require closer investigation is partly determined by the Government's appetite for new legislation and for post-Brexit deviation from the CRF: this would open up the prospect of franchising models such as the New Zealand model. If the intention is to remain closely

aligned with the CRF and retain the Communications Act 2003 in its current form, then closer examination of co-investment and shared risk models such as reciprocal build may be the more profitable line of inquiry.

4: The Government wants to consider all market models that will facilitate the next generation of technologies.

a. What different market models* might work in the UK in the longer term, and what risks and opportunities do they present?

- *What consequences could different market structures, including ones which support longer pay-back periods, have on the investment environment, competition and outcomes for consumers?*
- *How might these vary in different geographic areas of the UK, including urban and rural areas?*
- *Over what timescale could market models be changed, and what policy conditions would be necessary to enable this?*
- *Are the current arrangements for BT legal separation working effectively?*
* *Market models which you may wish to consider in responding could include:*
- *Infrastructure competition between different network providers wherever possible*
- *Collaborative models at an infrastructure level*
- *Regulatory asset bases, franchise models, cap and floor regimes, a diversified model to account for geographic variation, and/or gain share models for infrastructure provision*
- *Risk sharing models between infrastructure providers and retail providers*

Our contention is that the UK needs to switch decisively to a model in which open access full fibre infrastructure is constructed across the whole of the UK by multiple providers in a geographic model that does not encourage overbuild. Full fibre passive infrastructure is a utility and there is little competitive benefit from it being replicated. There are several theoretical options available to the Government to achieve this aim. If options which are not available to the Government until some theoretical point in the future when the CRF no longer applies in the UK (or the UK has to align with) are ruled out, then the most promising options are co-investment and risk sharing models such as reciprocal build agreements in which the available industry capital is mobilised to construct fibre networks across the UK in accordance with a national plan.

Adoption of this model makes it much more likely that the market will deliver close to full national coverage without public subsidy being required than either maintaining the current policy trajectory or handing the market to Openreach. We explore in the main paper the rationale behind this conclusion.

A consequence of the adoption of such a model would be the opening up of a different regulatory toolkit, recognising that a passive full fibre infrastructure would be a utility with a stable cost base, lower risk profile and long payback period.

As regards the specific question on legal separation of Openreach it is worth recalling that the the principal reason for the creation of Openreach and its subsequent legal separation was not to affect its investment incentives or technology choices but rather to prevent Openreach discriminating in favour of BT's downstream business groups at the expense of rival firms.

The core of the 'hold up' problem in relation to full fibre is not the incentive to discriminate offered by BT/Openreach vertical integration but rather that BT's ultimate interest is to sweat its existing legacy network for as long as possible within a market structure in which its main consumers are dependent upon it. It should be noted that even ownership separation would not change this fundamental imperative: a different set of ultimate owners of these assets would still face the same economic incentive to generate revenues from them for as long as possible and defer new investment in full fibre for as long as possible.

Where the ownership status of Openreach is perhaps relevant to the exam question of the FTIR is its indirect impact on ISPs' willingness to purchase full fibre. It is clear that some ISPs would prefer the

infrastructure they consume to be owned by a neutral host rather than one of their competitors, as while BT continues to own Openreach there will always be suspicions that the network is being run primarily in the interests of the BT Group. The adoption of a national plan for full fibre that envisaged or required a single, open access neutral host full fibre network in a given area might address this innate suspicion on the part of some ISPs.

b. What should Government consider when assessing the potential for migration from copper to full fibre networks?

- *Over what time period could migration occur?*
- *What phases might migration be required to go through?*
- *What would be the pros and cons for markets and competition?*
- *What would the implications be for different groups of consumers?*

The decision whether to switch off copper, and the form of transition (e.g. an evolutionary approach or a forced migration similar to the switchover from analogue to digital television) would in the first instance be a commercial choice for the incumbent. There is however a substantial set of subsidiary regulatory questions that would need to be addressed. From a market development perspective copper switch-off might be desirable, but it would be important to ensure that it was undertaken in a way that did not give Openreach an unfair structural advantage (e.g. sole access to revenues generated by sale of surplus copper on commodity markets used to fund FTTP rollout). There are also some downstream regulatory implications such as the transition of lifeline services from copper to fibre. Finally, there are also distributional questions if a declining customer base on copper faces an increased share of the maintenance costs of that network. Openreach should not be permitted to 'bounce' the market or consumers through a hasty switch-off process. Nonetheless, these are not insuperable problems and should not deflect the Government from the adoption of a full fibre policy.

5: The Government wants to achieve its digital infrastructure goals at the least additional cost. How should new digital infrastructure be paid for?

- *Are consumers (residential and business) willing and able to pay for new digital infrastructure, given its expected benefits?*
- *What could incentivise investors and shareholders to make long-term investment decisions in telecoms infrastructure?*
- *What is the potential role of government in stimulating demand or otherwise de-risking new infrastructure investment?*

In answering the question, we first wish to unpack it slightly.

The best way to minimise costs at an industry level is to minimise duplication of infrastructure where there is little competitive benefit in doing so, namely the passive infrastructure (civil works and dark fibre). As these account for a very substantial share of the total cost of full fibre network construction a policy that avoided this duplication would itself reduce the total cost of infrastructure deployment.

In terms of costs to consumers, we question the implicit assumption that full fibre will be, like for like, a more expensive technology than FTTC. The question of 'additional costs' only really arises because Openreach needs additional revenues over and above those generated from its copper business in order to justify new investment. Full fibre networks can be built at a cost which is highly competitive with existing FTTC pricing.

If forced to speculate about the future evolution of full fibre retail pricing we would observe that it will likely be an experience good and for this reason initial pricing will need to be competitive with FTTC. Over time, as consumers experience and learn to value the additional benefits of full fibre it is likely that there will be a greater willingness to pay just as there is today a price premium for FTTC over first generation broadband.

On the supply side, the single most important step to pull through investment would be a clear recognition of the utility nature of full fibre passive infrastructure and the adoption of an appropriate policy and regulatory paradigm for this. This unlocks utility regulation models that provide greater confidence in and predictability of anticipated returns on the investment. Ofcom would need to be encouraged to strike a different balance between short term consumer interest in the form of lower prices and long-term investment signals.

ANNEX 2: FTTP rollout across three market segments

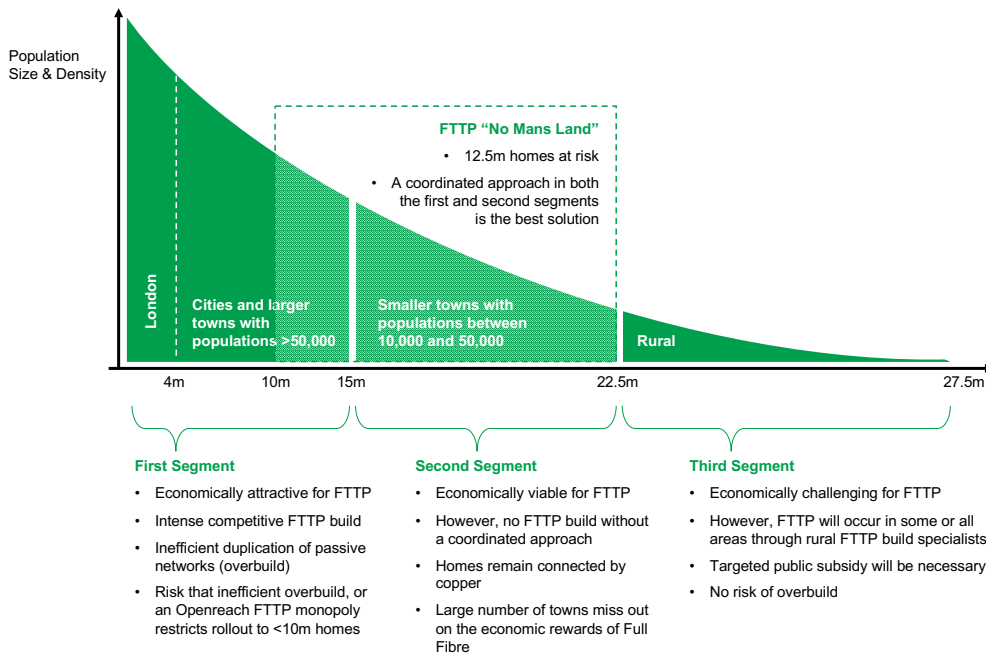


Figure 1 – Rollout under a “landrush” or an “Openreach” market model: a digital divide opens up

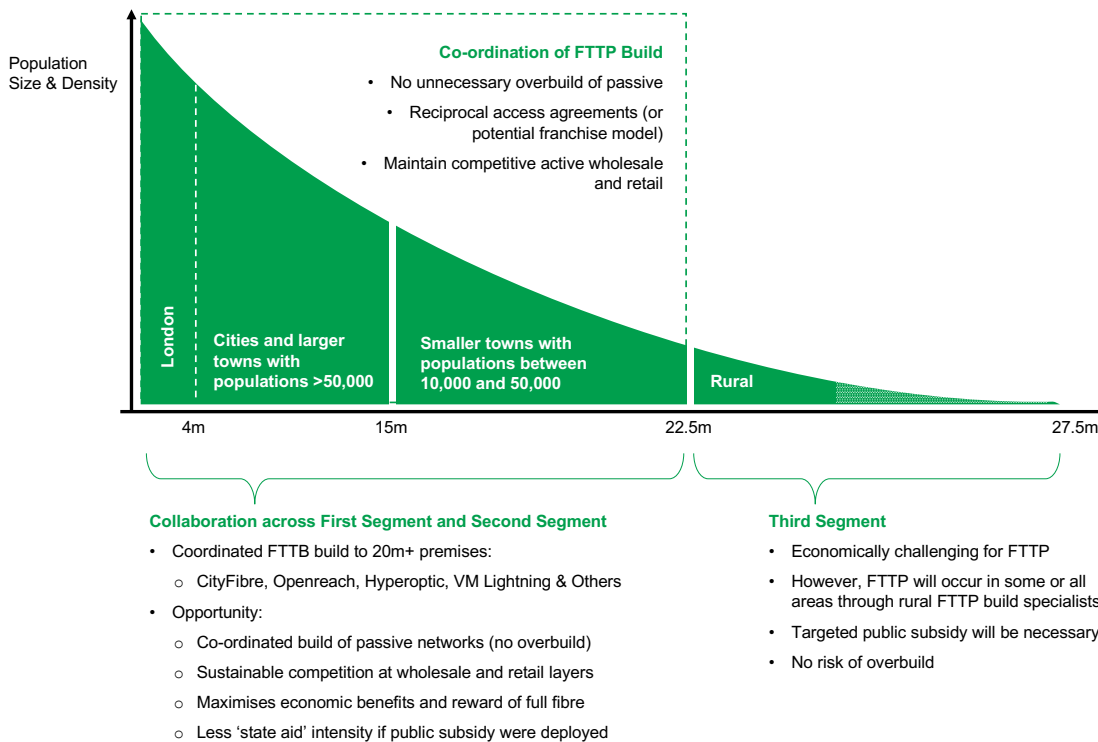


Figure 2: Efficient FTTP Roll Out: utility-like model maximises full fibre coverage