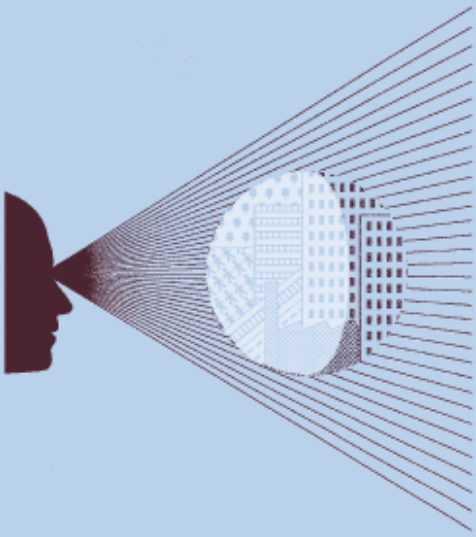
Oxera

Feasibility and implications of a shared fibre access model in UK towns and cities

Economic review of CityFibre's model in comparison with a co-investment model

February 19th 2013



Executive summary

The Digital Agenda for Europe identifies goals for EU Member States to provide all Europeans with access to 30Mbps or faster broadband by 2020, and for 50% of households to subscribe to ultra-fast services of above 100Mbps.[1] At the same time, the UK government has placed significant emphasis on its aims to have 'not just the best, but specifically the fastest broadband of any major European country by 2015'.[2] Notwithstanding the significant public funding programme (implemented through Broadband Delivery UK, BDUK), BT's ongoing roll-out of fibre-to-the-cabinet (FTTC) networks in many parts of the country, and Virgin Media's upgraded cable network, the UK seems to be lagging behind many of its international counterparts in terms of fibre-to-the-premises (FTTP) roll-out, and may not meet the Digital Agenda targets set by the European Commission.[3] Concerns about UK broadband deployment have also been highlighted in a report by the House of Lords Communications Committee.[4]

As there are concerns that the status quo regime may not be delivering the desired outcomes in the UK (at least, not quickly enough), there are good reasons to examine whether alternative business models and industry structures could provide a more sustainable basis for maximising private investment in ultra-fast—'future-proof'—broadband.

In this context, CityFibre Holdings (CityFibre) asked Oxera to review the business model that it is currently implementing, and to compare it against the co-investment concept previously presented by Oxera (the 'NetCo model') in a report for Vodafone.[5]

The co-investment report articulated the economic features of the market that explain the underinvestment problem in next-generation access (NGA) networks across Europe (ie, demand risk, regulatory uncertainty, sunk costs and a long payback period). The NetCo model is designed to address these challenges through the creation of a structurally separate passive network vehicle owned by both the incumbent and independent service providers. NetCo aligns the incentives of different players through a long-term investment and demand commitment by its owners, coupled with a corresponding long-term regulatory settlement that provides certainty and stability to participants.

Meanwhile, under an approach with anchor tenants, CityFibre builds, owns and operates an open-access fibre network without the need for ownership participation by the incumbent or service providers; rather, long-term commitments are obtained through contractual arrangements between CityFibre and its clients (the anchor tenants), which trigger the release of funds by institutional investors. The figure below provides a stylised illustration of the main features of the two models.

[1] European Commission (2010), 'A Digital Agenda for Europe', Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2010) 245 final/2, August 26th.

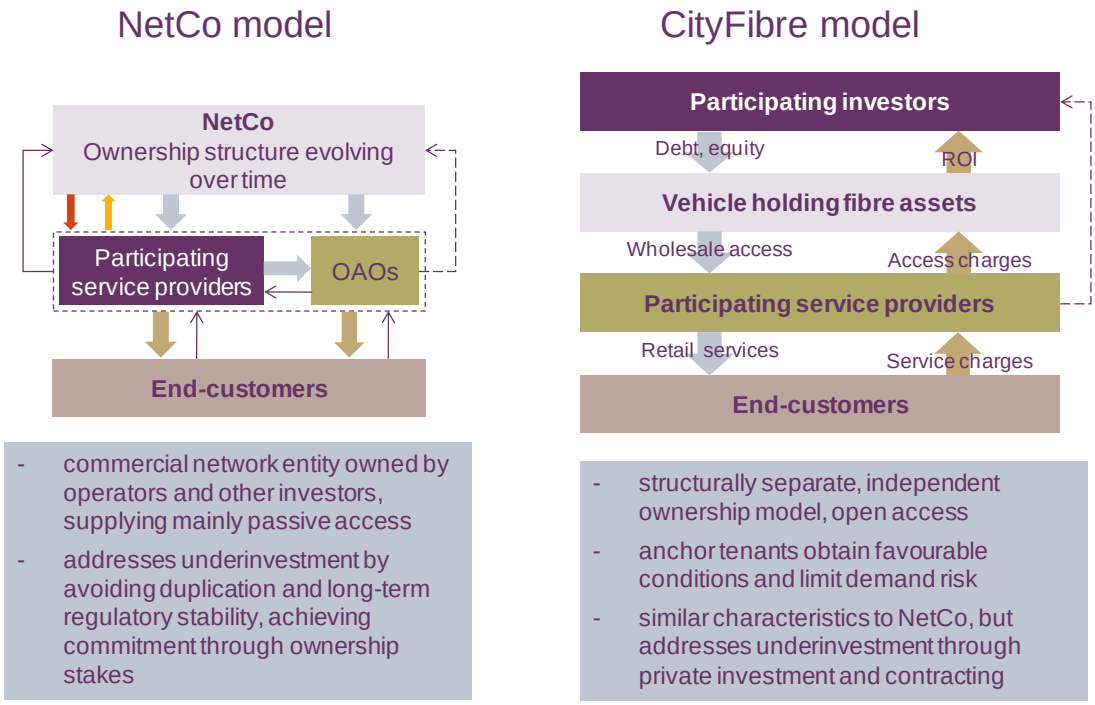
[2] Hunt, J. (2012), 'Broadband in the UK – Faster, higher, stronger', speech by the Secretary of State for Olympics, Culture, Media and Sport, Campus, London, August 20th.

[3] The UK is not listed in the cross-country comparison compiled by the FTTH Council, suggesting that the current penetration is negligible. FTTH Council (2012), 'Canada Joins Global Ranking of FTTH Countries', February 16th, retrieved from http://www.ftthcouncil.org/en/newsroom/2012/02/16/canada-joins-global-ranking-of-ftth-countries.

[4] House of Lords Select Committee on Communications (2012), 'Broadband for all – an alternative vision', July 31st.

[5] Oxera (2011), 'How a co-investment model could boost investments in NGA networks', report for Vodafone, November.

Illustration of NetCo and the CityFibre model



Note: OAOs, other alternative operators.
Source: Oxera.

The two models build on a similar vision: the underinvestment problem faced by the telecoms sector is likely to require novel approaches in order to maximise private investment and to deliver superfast broadband to institutional customers, businesses of different sizes, and consumers.

In this context, the objectives of the present report are twofold:

– to provide a high-level assessment of whether—and, if so, how—the approach being implemented by CityFibre would be able to achieve an outcome similar to that envisaged from the NetCo model—namely, the wider roll-out of FTTP networks across the UK's towns and cities;

– to identify and assess the benefits and risks of CityFibre's plans relative to the status quo for consumers, service providers, investors, local authorities and policy-makers.

How would the CityFibre model trigger investment?

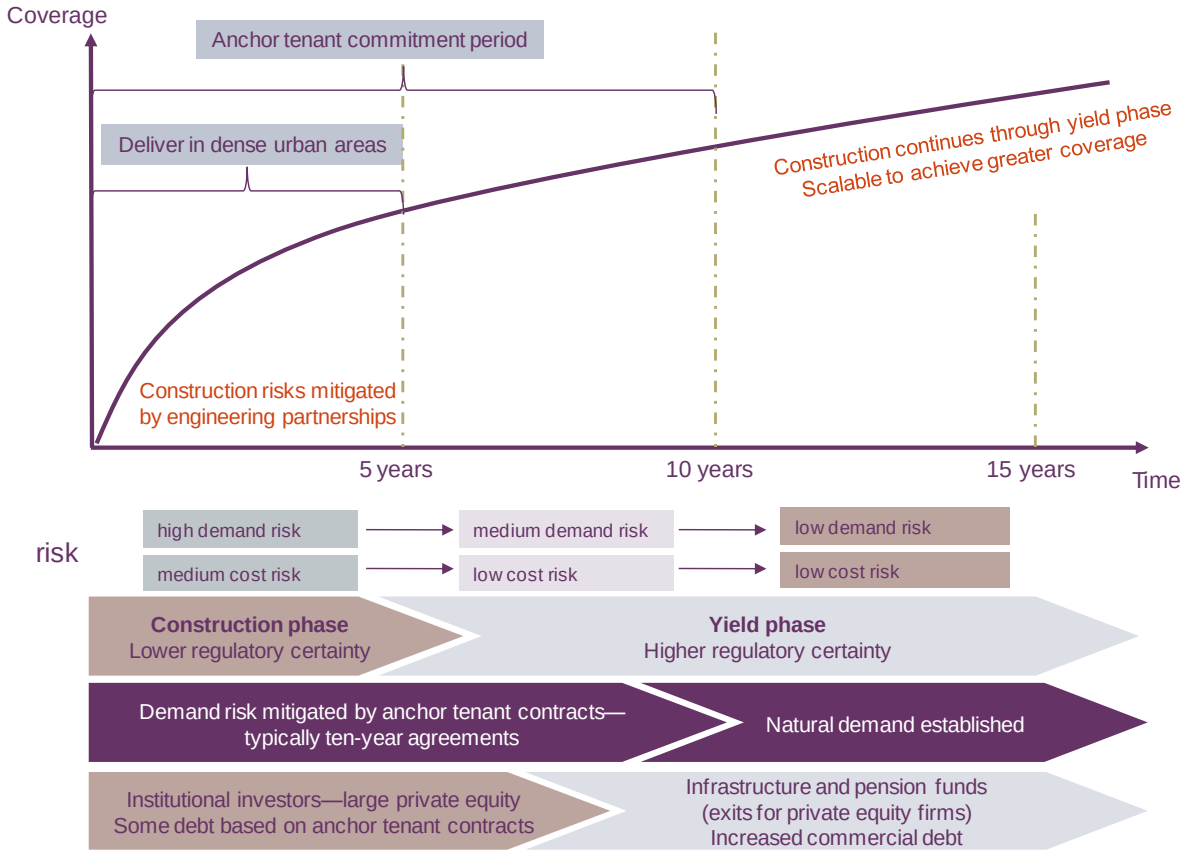
As in the case of NetCo, CityFibre would own the fibre access network and would provide both passive and active FTTP access to service providers in return for wholesale charges. Unlike NetCo, however, which is financed by its participating service provider-owners, the construction of the network in CityFibre's case is initially financed with equity funding from a consortium of private equity and infrastructure fund investors. The mechanism of this funding would be staged to match tranches of capital with network roll-out milestones. Critically, the model assumes that initial anchor tenant(s)[6] would commit to fibre access contracts during the early phase of the network roll-out. CityFibre's open-access approach with anchor

[6] Throughout this report, 'anchor tenant' can refer to a public sector customer (such as a city council or public sector network (PSN) customer (eg, NHS Trust)), a large service provider or a mobile operator. A consortium of anchor tenants envisages a shared network used by all such access seekers.

tenants shares many of the risk-mitigation, access, governance and pricing aspects of the NetCo model.

The objectives of the CityFibre model over time (with a changing risk profile) are illustrated in the following figure, and discussed below.

CityFibre roll-out and risk profile over time—an illustration



Source: Oxera.

The objectives of the CityFibre model are as follows:

– **securing commitment via long-term contracts**—the contracts manage to secure steady cash inflows to fund the investment, and a commitment to a single shared fibre platform. These contractual arrangements are therefore able to replicate what the NetCo model would achieve through equity stakes;

– **mitigating demand risk by staging the network roll-out**—a salient feature of the CityFibre model is the layered structure of investment, starting with investments in the core metro network, and expanded to public services, mobile operator access, and business and residential customers. The model builds on leveraging contractual commitments from service providers and is supported by cash flows from preceding layers. As a result, relatively riskier segments of demand are connected to a core that has already covered a portion of the required capital expenditure (CAPEX), managing to keep the overall demand risk at acceptable levels;

– **achieving non-discrimination**—as CityFibre does not operate as a service provider in the downstream market, it therefore has incentives to maximise the usage, and the number of users, of its network. As is the case for NetCo, CityFibre has an independent board;

– **addressing co-ordination failure between investors**—investors require commitment from service providers, and service providers require credible signs of finance and assurance that the investment vehicle will be funded. The contractual arrangements between the investment vehicle (CityFibre) and anchor tenants, coupled with trigger points in the relationship with institutional investors, are able to achieve this outcome;

– **facilitating private investment**—CityFibre's model aims to secure finance from a range of sources, including private equity investors, infrastructure managers and pension funds. The model is open to equity investments by the service providers.

As can be seen, the CityFibre model represents a variant of co-investment, and builds on principles consistent with the NetCo model. If appropriately implemented, the same risk-reducing, pro-competitive features envisaged in the NetCo model can be present under the CityFibre model. The design of contracts is key to replicating NetCo's equity-led model, while reducing the threshold of participation of service providers with limited resources for large-scale CAPEX commitments.

The CityFibre model does not come without risks, however. Notably, CityFibre would be largely duplicating the infrastructure of the incumbent (albeit through roll-out of FTTP, whereas BT's strategy is to mainly leverage its legacy copper network with incremental VDSL upgrades). Therefore, the response by BT may have implications for CityFibre's access pricing, the returns generated, and the associated payback period of investments. Also, as articulated in the NetCo report, the aggregate level of demand risk surrounding FTTP investments can be mitigated but cannot be fully removed under any investment model.

While regulatory risk would be largely absent (in terms of price regulation), there could be state aid concerns if CityFibre were to benefit from public funding (whether from the Urban Broadband Fund or another form of public funding facility). However, it is unlikely that state aid requirements would have significant implications for CityFibre's business model, given that it would already be providing passive fibre on an open-access basis, with or without state subsidies. Nevertheless, this is a risk that would need to be monitored.

Benefits for stakeholders

The CityFibre model seeks to address many of the issues associated with the UK's current incremental roll-out of NGA, as well as reduce the industry's dependency on the incumbent. Relative to the status quo, recognising that the model is not completely risk-free, the analysis in this report suggests that a successful execution of CityFibre's model could bring benefits to a wide range of industry stakeholders, as follows.

– **Service providers**. Competing investment in passive fibre infrastructure will provide service providers with an alternative to the incumbent. As CityFibre is deploying a competing network that is technically superior to FTTC, it is not duplicating networks that would otherwise exist. Furthermore, an FTTP network allows service providers scope for further innovation and investment in electronics, as well as in services and applications. Further benefits could arise from the opportunity to migrate in an orderly fashion from copper- to fibre-based products, and a pricing structure that allows for flexibility over the migration period.

– **Cities and local authorities**. While Oxera has not assessed the economic benefits of broadband, in light of available evidence it seems reasonable to assume that a city enjoying ubiquitous fibre infrastructure will be likely to attract business growth, job

creation and better services for its citizens (eg, schools and other public facilities).[7] Furthermore, a fibre network will allow better mobility coverage through fibre-enabled WiFi and 4G LTE, and therefore a better platform for social inclusion than the existing legacy network.

– **Policy-makers**. Deploying FTTP to a wider footprint is supportive of the government's aim to have 'the best and fastest broadband network in Europe by 2015', as well as meeting the Digital Agenda targets. Like the NetCo concept, the CityFibre model is an example of an alternative approach that seeks to maximise private investment and minimise the need for public funding. Put another way, by supporting efficient investment models, a larger network footprint could be achieved with the same amount of public expenditure on broadband.

– **Investors**. A shared infrastructure supported by anchor tenancy over a ten-year horizon provides a supportive environment for investment. Investor make-up can change over time, and debt leverage will be attractive to equity shareholders. The CityFibre approach is a (passive-only) model with significant economies of scale and density that can result in high returns in the future, if the demand, and therefore utilisation, increases.

– **Incumbent**. CityFibre will compete against BT as an infrastructure provider. However, the CityFibre model is open to BT's retail (and parts of its wholesale) business. Should BT become a user of CityFibre's FTTP network, its large customer base and financial resources would enable investment in areas that CityFibre's footprint would otherwise not reach. It could therefore be argued that the CityFibre model is a catalyst that could result in a longer-term restructuring of the industry towards a NetCo-like industry engagement.

In conclusion, there seems to be a strong economic case for CityFibre's investment model. If successful, one could envisage the model evolving to a scale similar to that envisaged in Oxera's NetCo model. This could be the case in particular if the approach to enabling investment is flexible and responsive to local economic conditions (ie, one size is unlikely to fit all). A hybrid approach combining the principles of the NetCo model where necessary and the advantages of duplication where viable, may achieve the optimal long-term benefits.

Investment models such as CityFibre's anchor tenant approach could thus significantly contribute towards achieving the UK government's goal of reaching the Digital Agenda targets and having Europe's best superfast broadband network by 2015.

[7] See, for example, Czernich, N., Falck, O., Kretschmer, T. and Woessmann, L. (2009), 'Broadband Infrastructure and Economic Growth', CESifo Working paper no. 2861, December; Crandall, R., Lehr, W. and Litan, R. (2009), 'The Effects of Broadband Deployment on Output and Employment: A Cross-sectional Analysis of U.S. Data', Research paper, The Brookings Institution, February 26th; Qiang, C.Z., Rossotto, C.M. and Kimura, K. (2009), 'Information and Communications for Development 2009: Extending Reach and Increasing Impact, Economic Impacts of Broadband', World Bank Publications, pp. 35–50.

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1 Introduction

CityFibre Holdings (CityFibre) asked Oxera to review the business model that it is currently implementing, and to compare it against the co-investment concept previously presented by Oxera (the 'NetCo model') in a report for Vodafone.[8]

In the context of the European Commission's Digital Agenda targets, and the network investment targets set by the governments of various EU Member States, the co-investment report articulated the economic features of the market (eg, demand risk, regulatory uncertainty, sunk costs and a long payback period) that explain the underinvestment problem in next-generation access (NGA) networks across Europe. The NetCo model is designed to address these challenges through the creation of a structurally separate passive network vehicle owned by both the incumbent and independent service providers. NetCo aligns the incentives of different players through a long-term investment and demand commitment by its owners, coupled with a corresponding long-term regulatory settlement that provides enhanced certainty and stability to participants.

Meanwhile, under an approach with anchor tenants, CityFibre builds, owns and operates an open-access fibre network without the need for any ownership participation by the incumbent or service providers; rather, long-term commitments are obtained through contractual arrangements between CityFibre and its clients (the anchor tenants), which create an environment to attract funding from institutional investors that is used to construct the fibre network infrastructure.

In this context, the objectives of the present report are twofold:

– to provide a high-level assessment of whether—and, if so, how, the approach being implemented by CityFibre would be able to achieve an outcome similar to that envisaged by the NetCo model—namely, the wider roll-out of fibre-to-the-premises (FTTP) networks across the UK's towns and cities;
– to identify and assess the benefits as well as potential risks of CityFibre's plans relative to the status quo for consumers, service providers, investors, local authorities and policy-makers.

1.1 The underinvestment problem

The Digital Agenda for Europe identifies goals for EU Member States to provide Europeans with access to 30Mbps or faster broadband by 2020, and for 50% of households to subscribe to ultra-fast services of above 100Mbps.[9] At the same time, the UK government has placed significant emphasis on its aims to have 'not just the best, but specifically the fastest broadband of any major European country by 2015'.[10] Notwithstanding the somewhat significant public funding programme (implemented through Broadband Delivery UK, BDUK) and BT's ongoing roll-out of fibre-to-the-cabinet (FTTC) networks in many parts of the country, the UK seems to be lagging behind many of its international counterparts in terms of FTTP roll-out, and may not meet the Digital Agenda targets set out by the European

[8] Oxera (2011), 'How a co-investment model could boost investments in NGA networks', report for Vodafone, November.

[9] European Commission (2010), 'A Digital Agenda for Europe', Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2010) 245 final/2, August 26th.

[10] Hunt, J. (2012), 'Broadband in the UK – Faster, higher, stronger', speech by the Secretary of State for Olympics, Culture, Media and Sport, Campus, London, August 20th.

Commission.[11] BT's network investment is predominantly an upgrade of the existing ADSL platform (into VDSL), and, in most areas, access seekers do not have any alternative to BT's infrastructure. As recognised by the European Commission, for example, FTTC roll-out—and the associated virtual access products—implies that alternative operators become more reliant on BT's active wholesale services, and may have less scope to differentiate their services in the retail market.[12] On the other hand, a full fibre-based infrastructure is expected to support higher speeds and symmetrical services that might not simultaneously be possible on FTTC and cable platforms. Indeed, many industry players do not consider FTTC to be a 'future-proof' solution, in terms of either bandwidth or accessibility.[13]

It is not within the scope of this report to assess the economic benefits of fibre network investment; nevertheless, previous studies suggest that high-speed broadband can have a significant and permanent impact on economic growth by providing businesses with efficiency-enhancing inter-office connectivity, by securing a higher quality of service for public institutions such as schools and hospitals, and by providing a platform for new innovative bandwidth-hungry services, both fixed and mobile.[14] The demand for bandwidth has indeed increased at a pace that poses a challenge to access and backhaul networks: for example, in Western Europe, fixed-access IP traffic is forecast to grow at a compound annual rate of 27% over the period 2011 to 2016.[15]

Oxera's report on co-investment highlighted the underinvestment problem that is present across Europe, and the UK is no different in this respect. While there has been a relatively high level of infrastructure funding in other sectors,[16] the telecoms sector has ranked low among all sectors in terms of interest in future investment by infrastructure funds.[17] Unlike traditional utilities, telecoms companies do not operate under long-term licences with effective guarantees of financeability in the event of demand or cost shocks. Investors require long-term confidence in terms of both future cash flows and the underlying regulatory and policy framework. Regulators, in turn, are reluctant to commit for a long period of time, given their objective to promote competition, which, under a vertically integrated market structure, seems justifiable.[18] European regulators, in particular, may also be prevented from making long-term commitments owing to the EU regulatory framework, which requires them to undertake fully fledged market analysis every three years. In summary, the demand uncertainty surrounding individual FTTP investments, coupled with regulation that focuses on market outcomes (prices) rather than investments, is not conducive to large-scale infrastructure investments.

[11] The UK is not listed in the cross-country comparison compiled by the FTTH Council, suggesting that the current penetration is negligible. FTTH Council (2012), 'Canada Joins Global Ranking of FTTH Countries', February 16th, retrieved from http://www.ftthcouncil.org/en/newsroom/2012/02/16/canada-joins-global-ranking-of-ftth-countries.

[12] European Commission (2010), 'Telecoms: Commission accepts UK regulator proposal to mandate virtual unbundling of BT's fibre networks but requests full unbundling as soon as possible', IP/10/654, June 2nd.

[13] For discussion, see, for example InterConnect Communications (2011), 'Fibre to the Cabinet: The Solution to Superfast Broadband or a Convenient Stopgap?', policy paper, March 30th.

[14] See, for example, Czernich, N., Falck, O., Kretschmer, T. and Woessmann, L. (2009), 'Broadband Infrastructure and Economic Growth', CESifo Working paper no. 2861, December; Crandall, R., Lehr, W. and Litan, R. (2009), 'The Effects of Broadband Deployment on Output and Employment: A Cross-sectional Analysis of U.S. Data', Research paper, The Brookings Institution, February 26th; Qiang, C.Z., Rossotto, C.M. and Kimura, K. (2009), 'Information and Communications for Development 2009: Extending Reach and Increasing Impact, Economic Impacts of Broadband', World Bank Publications, pp. 35–50.

[15] Cisco (2012), 'Cisco Visual Networking Index: Forecast and Methodology, 2011–2016', White Paper, May 30th.

[16] There is more funding being raised and focused on Europe (some $51 billion between 2004 and 2011, and a further $33 billion actively being raised as at 2011) than in any other region of the world. Source: Preqin Infrastructure Spotlight, **3**:4, May 2011.

[17] Deloitte (2011), 'The fork in the road ahead: An in-depth analysis of the current infrastructure funds market', March. The only sector ranking lower than telecoms was 'Infrastructure Services', which, according to the report (similarly to telecoms) is not considered a typical infrastructure-type investment.

[18] There is often no evidence to suggest that the vertically integrated incumbent operators would have incentives to provide third-party access on fair and reasonable terms. See, for example, Oxera (2012), 'eircom's next generation access products – Pricing principles and methodologies', April. The report is available at www.comreg.ie and www.oxera.com.

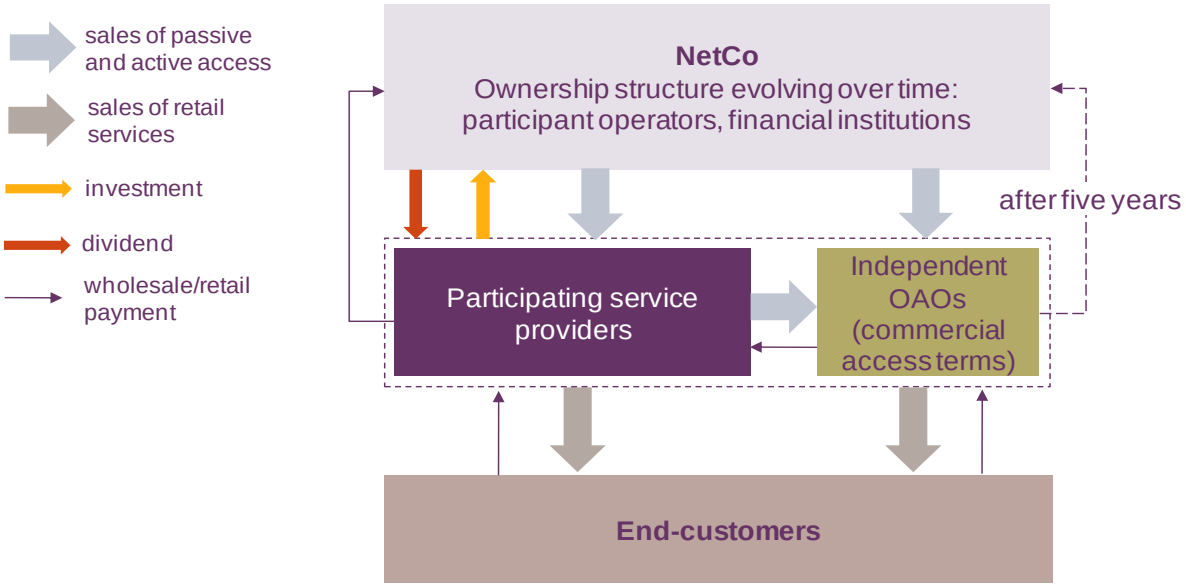
It is perhaps therefore no surprise that currently planned investments are limited in geographic scope, incremental in nature, and may not be enough to meet stated national and European Commission objectives. Against this background, there seems to be a case for alternative approaches to address the underinvestment problem. The NetCo model articulated by Oxera addresses many of the market features that currently hinder FTTP investments in Europe. Furthermore, a model that harnesses some of the features of the NetCo model that maximise deployment while enhancing effective competition might also seem desirable.

In many ways, the business model put forward by CityFibre is a variant of the NetCo model seeking to deal with many, but not all, of the factors that have resulted in a sub-optimal level of investment in superfast broadband. This report considers how CityFibre's business model compares with the NetCo model in achieving the delivery of fibre infrastructure. The main features of the two models are summarised below, followed by an assessment of their economic characteristics, and, in particular, whether there is an economic case for an investment vehicle such as CityFibre. The report considers the model's feasibility in addressing the under-investment problem and enabling the deployment of infrastructure that can support the objectives of the UK government as well as those of the Commission's Digital Agenda.

1.2 How the co-investment model addresses the market features hindering investments

In summary, NetCo would be a structurally separate network entity owned by its participant operators (service providers), including independent access seekers ('unbundlers') as well as the incumbent. Other independent operators could also enter the market on commercial terms. The ownership structure of NetCo would evolve over time, with external investors (including pension and infrastructure funds) becoming more significant investors once the demand and construction risk reduce. Figure 1.1 gives a high-level overview of the NetCo model in the fixed-line telecoms value chain.

Figure 1.1 Stylised illustration of the NetCo model



Note: OAOs, other alternative operators.
Source: Oxera.

NetCo would own and operate the fibre access assets and provide predominantly passive 'dark fibre' access to its service provider-owners and, later, to other service providers. Hence, it would control the fibre network elements, but would leave the investment in active

electronics and innovation in content and applications layers to the service providers. Participants—ie, NetCo's owners—are envisaged to provide wholesale active access to third-party 'other alternative operators' (OAOs) on commercial terms.[19] As explained in greater detail in the co-investment report, NetCo would be expected to address the market features that currently hinder investment in fibre access network by:

– lessening the prospect of duplication of networks, and hence the firm-level demand risk faced by investing operators. Firm-level risk would be reduced via the equity commitment to NetCo. Service providers would have reduced incentives to support alternative networks if they have a stake in the success of NetCo. Additional commitments would include agreements to dismantle competing legacy networks. This would mitigate some of the overall demand uncertainty by spreading fixed and sunk costs across a wide customer base;

– achieving long-term commitment from all stakeholders, including the regulator, which would be more likely to make such commitments where there is an industry structure with several downstream operators. The NetCo model would need the regulator to commit ex ante to an appropriate long-term framework (10–15 years in advance), and to ensure that this is maintained ex post so that investment incentives are not distorted. In addition to securing downstream competition, the NetCo model would allow a lighter or no significant market power (SMP) regulation, consistent with the European Commission's NGA Recommendation;[20]

– achieving greater alignment of incentives and coordination among market participants in order to maximise network coverage. Fixed costs could be mitigated by allowing all co-investors to benefit from the scale economies of a widely deployed network. The sunk cost problem would be addressed by reducing demand and regulatory uncertainty, which should mitigate the risk of asset stranding for potential investors. More generally, the NetCo industry structure would be conducive to establishing welfare-enhancing price discrimination, at either the wholesale or retail level.

In the context of the UK, the NetCo model would be created by BT and other major operators (potentially including Virgin Media, BSkyB, TalkTalk, Vodafone, Telefónica and others) coming together with equity investments into a new entity that would roll out an almost nationwide FTTP network. Where appropriate, current fibre assets or assets that would be used in a new fibre network (eg, ducts) would be transferred into the NetCo, with all parties agreeing to further dismantle their current fixed access networks over time. Following consultation, Ofcom, the telecoms and media regulator, would implement and commit to a new long-term regulatory framework within which NetCo would operate.

In order for the NetCo concept to make a positive contribution towards the EU's 2020 Digital Agenda targets, the participating operators would need to embark on this venture quickly. This may require government intervention supported by proactive engagement by Ofcom. Given current broadband policies and a focus on 2015 goals, the creation of the fully fledged NetCo concept in the UK could be challenging in the short term.

[19] The possibility that one or more of the participants possesses significant market power (SMP) in the provision of bitstream or virtual unbundling, or any other wholesale product that uses NetCo's services as inputs, is included.

[20] European Commission (2010), 'Commission Recommendation of 20 September 2010 on regulated access to Next Generation Access Networks (NGA)', September 20th, paras 27 and 28. In its 2009 consultation document, the Commission included even more explicit guidance on the circumstances under which a co-investment model does not warrant cost orientation. European Commission (2009), 'Draft Commission Recommendation of […] on regulated access to Next Generation Access Networks (NGA)', June 12th, Annex III.

1.3 Report structure

The remainder of this report examines the economic characteristics of the CityFibre model, comparing its specific features against those of the NetCo model. The report is structured as follows:

– section 2 presents a comparison of the NetCo model and the CityFibre model;

– section 3 analyses the economic case for the CityFibre model; and

– section 4 concludes.

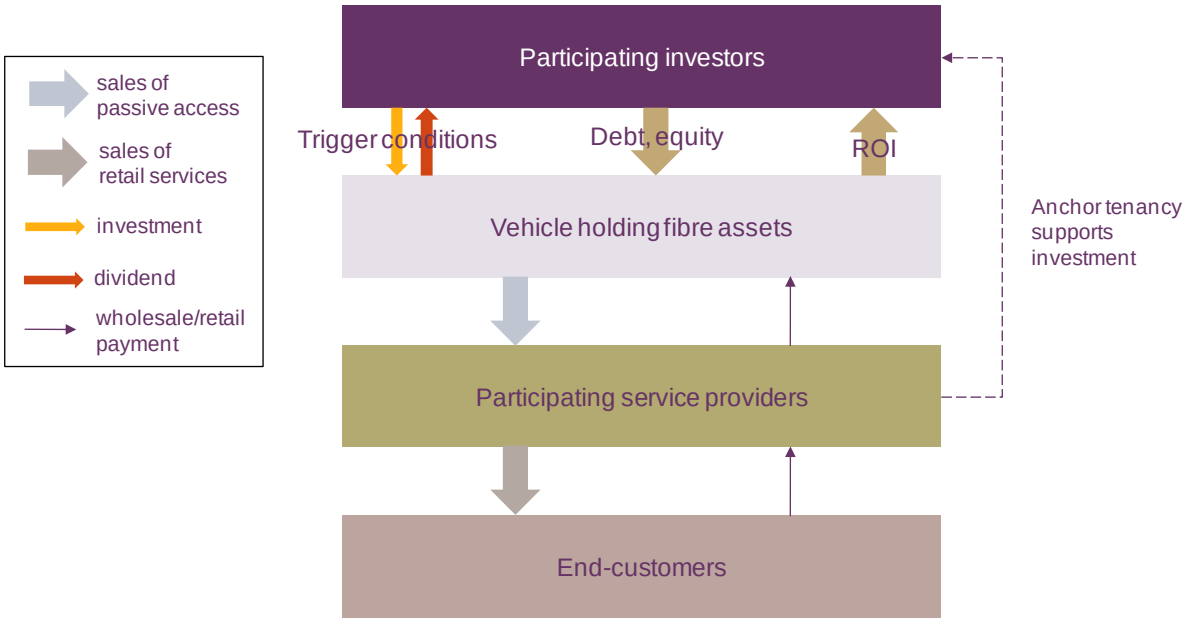
2 Comparison of features the CityFibre model and NetCo

This section explains how the key economic features of the NetCo model can be replicated in the CityFibre model. The review focuses on the main features and principles, not the specific details of the contracts.

2.1 Overview of the CityFibre model

The CityFibre model for FTTP network deployment is a private investment-oriented approach with an ownership structure independent of the incumbent and access-seeker operators.[21] Figure 2.1 depicts the vertical supply chain in the CityFibre model.

Figure 2.1 Stylised illustration of the CityFibre model



Source: Oxera.

As in the case of NetCo, CityFibre would own the fibre access network and would provide both passive and active FTTP access to service providers in return for wholesale charges. Unlike NetCo, however, which is financed by its participating service provider-owners, the construction of the network in CityFibre's case is initially financed with equity funding from a consortium of private, institutional and infrastructure fund investors. The mechanism of this funding would be staged to match tranches of capital with network roll-out milestones. Critically, the model assumes that initial anchor tenant(s)[22] would commit to fibre access contracts during the early phase of the network roll-out. Over time, the model would incorporate other types of finance (debt or pension fund participation) and subsequent tiers of participating service provider. As will become clear below, CityFibre's open-access approach with a consortium of anchor tenants shares many of the risk-mitigation, access, governance and pricing aspects of the NetCo model.

[21] The anchor tenant approach does not, in principle, preclude other participants from taking ownership stakes. The model described here is based on the approach adopted by CityFibre, which, in its initial phases, does not envisage such ownership.
[22] Throughout this report, 'anchor tenant' can refer to a public sector customer (such as a city council or public sector network (PSN) customer (eg, an NHS Trust)), a large service provider or a mobile operator. A consortium of anchor tenants envisages a shared network used by all such access seekers.

The outcomes of the CityFibre model—ie, the hypotheses assessed in the remainder of this report—are the following:

– **securing commitment via long-term contracts**—the contracts manage to secure steady cash inflows to fund the investment, and a commitment by multiple service providers to a single shared fibre platform. These contractual arrangements are therefore able to replicate what the NetCo model would achieve through equity stakes;

– **mitigating demand risk by staging the network roll-out**—a salient feature of the CityFibre model is the layered structure of investment, starting with investments in the core metro network, and expanded to public services, mobile operator access, and business and residential customers. The model builds on leveraging contractual commitments from service providers and is supported by cash flows from preceding layers. As a result, relatively riskier segments of demand are connected to a core that has already covered a portion of the required CAPEX, managing to keep the overall level of demand risk at acceptable levels;

– **achieving non-discrimination**—the investment vehicle in CityFibre's approach does not operate as a service provider in the downstream market. It therefore has incentives to maximise the usage, and the number of users, of its network. As with NetCo, CityFibre has an independent board;

– **addressing co-ordination failure between investors**—investors require commitment from service providers, and service providers require credible signs of finance and assurance that the investment vehicle will be funded. The contractual arrangements between the investment vehicle (CityFibre) and anchor tenants, coupled with institutional investor willingness to finance in the knowledge of committed demand, are able to achieve this outcome;

– **facilitating private investment**—CityFibre's model aims to secure finance from a range of sources including private equity investors, infrastructure funds and pension funds. The model is also open for equity investments by the service providers.

2.2 Comparison of specific features

The CityFibre model exhibits similarities with the NetCo model in many respects. Both models are alternatives to the incumbent-led industry structures: NetCo structurally separates the incumbent, while the CityFibre model bypasses the incumbent by providing an alternative independently owned, shared access infrastructure for service providers.

Both models are expected to result in an open-access industry structure where the network operator (NetCo or CityFibre) has no incentives to discriminate unduly between its customers in the downstream markets. In terms of how the factors hindering investment in FTTP are addressed, NetCo removes virtually all of the risk of duplication through pre-commitment in the form of equity stakes. While the CityFibre model leaves more potential for duplication, particularly from the incumbent, this risk is managed through contracting, resulting in steady cash flows.

The main difference between the two models stems from their objectives. The NetCo model is designed to maximise private investment in fibre access networks, with an aim to achieve the Digital Agenda objectives at the lowest possible cost. The CityFibre model, on the other hand, builds on a different rationale. As explained in greater detail below, the CityFibre business model seeks to fill the demand for fibre access and better broadband services in areas where the incumbent is unlikely to deploy FTTP owing to its committed programme of VDSL roll-out. In this aspect, the CityFibre model is less reliant on the incumbent's existing assets (eg, existing ducts) to deliver broadband infrastructure. Considering the required co-ordination between incumbent and service providers to initiate the NetCo model, the

CityFibre model has the potential to develop a credible strategic business plan and deliver benefits to the industry in less time.

As a general observation, the CityFibre model does not imply a significant revision of the current industry structure; nor does it aim to deploy FTTP throughout the country. The model implemented by CityFibre proposes that deployments are at the metropolitan level, with potentially differing industry players in participating cities. Therefore, the investment through the CityFibre model can materialise quickly and could bring more immediate benefits for the industry than the NetCo model would imply.

Furthermore, as CityFibre's model promotes infrastructure competition, it may lead to a greater level of innovation in the industry and, in part, accelerate the incumbent's plans for FTTP deployment.

Table 2.1 summarises the economic characteristics of the two models, elaborated in further detail below.

Table 2.1 Summary of NetCo and CityFibre models

Characteristic	NetCo	CityFibre model
Stakeholder commitment	Joint ownership	Financeable anchor tenant contracts, and commitments by investors to release funds
Fibre assets controlled by separate legal entity with independent board	Separate board, industry code of conduct	CityFibre board. No downstream operations
Minimal network duplication	Incumbent and service providers commit to a single FTTP platform	Service providers commit to fibre within footprint; incumbent not required. Migration from copper to fibre is supported
Flexible pricing	Yes	Yes
Mechanisms to address demand uncertainty	Industry-wide participant commitment to decommission copper/not invest in alternative platforms	Position as an alternative infrastructure provider where no FTTP is planned. Anchor tenant contracts, layered demand
Open access (products offered)	Predominantly passive (owners) or active (third parties via owners)	Predominantly passive (anchor tenants) or active (third parties via anchor tenants or CityFibre)

Source: Oxera.

2.2.1 Financing

Investors will require a return that reflects the cost of capital and a suitable risk premium associated with NGA roll-out and operation. The CityFibre model seeks to ensure steady cash flows and commitment through a contracting model that establishes long-term commitment from anchor tenants (the design of which is discussed below). From an external investor's perspective, guaranteed cash flow mitigates (and may possibly fully remove) the demand risk, which in turn triggers investment.

The CityFibre model would be financed by private investment consisting of private equity, institutional investors and infrastructure funds. Even though the finance partners might not fully understand the longer-term level of demand, they are able to commit to an initial level of capital outlay linked to the assured purchasing from service providers in the anchor tenancy. Thus, any uncertainty is mitigated by commitments (anchor tenant contracts), and sequentially progressed as demand grows in line with the network roll-out. Over time, and as the risks diminish, the private equity partners would exit, and debt instruments and traditional forms of long-term capital would be utilised.

In contrast, Oxera envisages that the NetCo model would be (primarily if not exclusively) funded by service provider-owners, with investment from financial investors expected once the construction phase is completed (and the demand uncertainty is lower). As construction and demand risk evolve, different forms of financing and corporate governance could emerge (eg, the acquisition of a substantial stake in NetCo by infrastructure or pension funds). The NetCo model would thus not be reliant on funding from financial institutions in the first few years.

Some key differences in the funding of the models are as follows.

– **Private investment**. The CityFibre model could tap wider sources of capital, but is likely to appeal to investors that understand the implications of exposure to critical long-term infrastructure assets. Reliance on the balance sheets of incumbents and service providers is reduced relative to the NetCo model.

– **Risk emphasis**. Layering of demand in the CityFibre model is likely to lower demand risk relative to NetCo, although network duplication and the response of the incumbent could increase demand risks faced by the CityFibre model. The NetCo model reduces the (static) risk of inefficient network duplication. However, compared with the status quo, the CityFibre model would not represent a complete duplication of fibre NGA networks, as the FTTP network (where deployed) would provide a potentially superior service compared with FTTC. Furthermore, under both models the construction risk can be allocated to the civil engineering contractor, and in the case of CityFibre the construction risks are mitigated through its partnership with Fujitsu.[23]

– **Ability of investors to influence demand**. Financial investors in the CityFibre model do not operate downstream, and may be constrained in their ability in control demand ex post. In the NetCo model, incumbents and operators as investors can influence demand, whereas the CityFibre model relies on contracting as the risk-sharing mechanism. Investors would need to be comfortable with the demand and market risks associated with long-term infrastructure assets.

– **Regulatory environment**. The CityFibre model does not rely on any revisions to the regulatory environment or government policies. NetCo, on the other hand, builds on long-term regulatory commitment (no intervention midway through a 15-year period), which is a change relative to the status quo environment (albeit not inconsistent with the European Commission's NGA guidelines). As CityFibre is not expected to be found to have SMP—at least in the short to medium term (see section 3.1.3 below)—it would be free to operate without pricing controls being imposed by Ofcom.[24]

The implications of these factors are likely to affect CityFibre's cost of capital. However, the CityFibre model is flexible enough to structure its financing in a way that will reduce its cost of capital over time. In comparison, while the NetCo model could also be expected to achieve a lower cost of capital over time, its financing costs in the short to medium term could possibly be (negatively) affected by the relatively high gearing and/or pension liabilities of its owners.

The CityFibre model could therefore have greater financing flexibility than NetCo. However, the balance of cash flows and investor horizons may be more complex than an arrangement where all players have long-term objectives in the downstream market.

[23] Such contractor partnership arrangements are not excluded from the NetCo model.

[24] Even in the absence of a formal finding of SMP by the national regulatory authority, CityFibre would be subject to competition law, which could be instigated by anyone with an economic interest in CityFibre's activities.

Possibility of state funding

Both a co-investment model, as well as the approach pursued by CityFibre, could complement network coverage through state funding. Indeed, from a policy perspective, the rationale for such models would be to encourage and maximise private investment, and minimise the need for state funding (or achieve an even wider FTTP footprint).

In the UK, the majority of state funding available for broadband access network roll-out consists of BDUK's £530m fund to promote investment in rural areas. This is not available for metropolitan-oriented deployments. However, as part the Department for Culture, Media and Sport's (DCMS) objectives to stimulate private investment in superfast broadband, BDUK will facilitate up to £150m in funds in its urban scheme for 'Super Connected Cities'.[25] Furthermore, recent announcements by DCMS indicate that a further £600m will be made available for broadband projects (around £300m is 'available during this spending round'[26]), for which further investment in urban projects is likely.

From a state funding perspective, the CityFibre model appears to be suitable to receive an allocation of aid funds for the proposed 'Super Connected Cities', since its passive open-access network is aligned with EU state aid requirements and deployment of shared FTTP networks is recognised as the preferred technology to deliver the EU's Digital Agenda targets. Participation in such schemes is subject to fair procurement and would make state aid considerations relevant for the CityFibre model. This would require that state funding does not distort competition or alter investment incentives. The state aid rules and implications for the CityFibre model are discussed in greater detail in section 3.2 below.

Additionally, there may be EU funding available that is aimed specifically at private investment models such as NetCo or the CityFibre model. The 'Connecting Europe Facility', detailed in Box 2.1, could fit into the CityFibre model evolution as debt instruments become more feasible.

Box 2.1 The European Commission's 'Connecting Europe Facility'

In seeking to achieve the targets set out in the Digital Agenda, one of the European Commission's objectives is to enact measures that can help to 'de-risk investment' and create an environment that is more conducive to private infrastructure investments.[1] To this end, it has announced its intention to set up a 'Connecting Europe Facility', in the form of a financing scheme that may help to optimise the risk/return profile of investments in digital networks. While the precise details of the scheme have not yet been released, it is likely that this facility will be modelled on the European Investment Bank's Risk Sharing Finance Facility (RSFF), given the success of that scheme.

The Connecting Europe Facility is intended to address the current need for 'reasonably priced risk-enhancing instruments at project level which in turn could be a catalyst for attracting additional private financing'. Under the RSFF model, the Connecting Europe Facility would provide funds to investors by issuing two tranches of notes: low-risk senior notes (offered to the general public) and subordinated notes (retained by the European Commission/EIB).

Sources: [1] European Information Society (2011), 'How to Achieve the 2020 European Digital Targets', July, p. 2. [2] European Commission (2011), 'A Budget for Europe 2020 – Part II: Policy fiches', June 29th, p. 55. [3] European Information Society (2011), 'NGA Working Group 3: 6 Common Measures', July 13th, p. 8. [4] Ibid. [5] EIB, 'How RSFF Works', available at <http://www.eib.org/products/loans/special/rsff/how-rsff-works/index.htm>.

2.2.2 Corporate governance

Where the NetCo model aligns incentives with the ownership structure and a well-designed governance structure, the CityFibre model aims to achieve alignment through efficient contracting and a shared infrastructure approach that is conducive to non-discriminatory treatment of wholesale customers. As with NetCo, a salient feature of the CityFibre model is

[25] This is separate from the £530m in the rural fund, and projects cannot claim from both funds.

[26] Hunt, J. (2012), 'Broadband in the UK – Faster, higher, stronger', speech by the Secretary of State for Olympics, Culture, Media and Sport, Campus, London, August 20th.

its governance structure, which spans stakeholder engagement, deployment plans and industry oversight. Its main features are the following:

– the creation of CityFibre as a separate legal entity;
– a participation structure with anchor tenants to ensure alignment of strategic objectives;
– the establishment of development and deployment plans in consultation with anchor tenants and service providers;
– robust service-level agreements (SLAs) to underpin efficient operations.

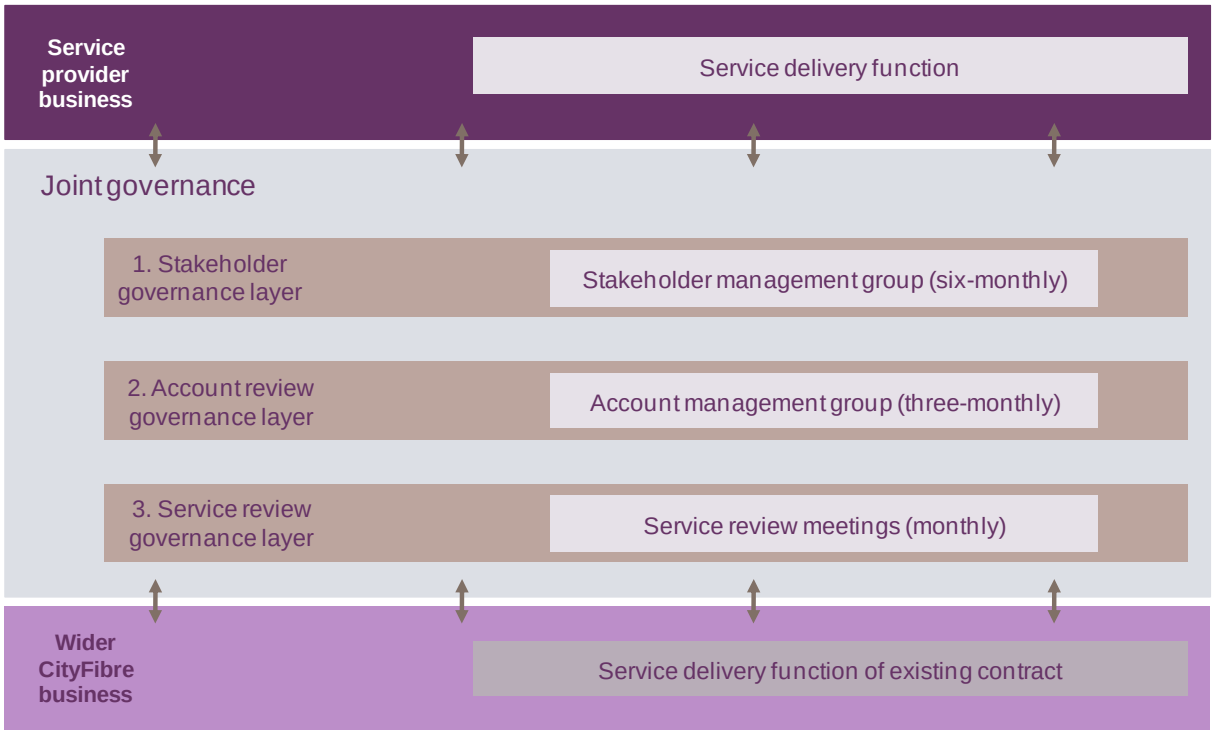
The CityFibre model would have an independent board that governs its investment and strategic business decisions. Its operational governance will encompass a level of stakeholder involvement to ensure that the deployment of the shared fibre networks is optimised for the evolving needs of the industry.

It is possible that the CityFibre model will have certain advantages compared with the governance of NetCo. Where the NetCo model requires robust governance with regulatory oversight to balance the incumbent's large financial stake and incentives to discriminate, such conditions are not similarly required in the CityFibre model. Therefore, compared with NetCo, CityFibre's governance structure could be easier to implement and operate.

Furthermore, as CityFibre has no plans for downstream operations, its incentives to discriminate are reduced relative to NetCo. Notwithstanding this, there is still a potential for preferential treatment of anchor tenants.

The CityFibre model would integrate decision-making processes between itself and participating service providers. Under this model, the executive, commercial and operational layers of the stakeholders would interface horizontally. The process would be formalised with regular meetings at specified intervals. This is represented in Figure 2.2.

Figure 2.2 Joint governance system



Source: CityFibre.

The principles envisaged above would be broadly consistent with those presented in the NetCo model:

– at the stakeholder level, long-term decisions involving strategy, direction and network expansion programmes would be reviewed;
– at the account level, the governance group would cut across all sectors of the organisations covering commercial and financial decisions;
– at the service layer, the focus would be on operational matters covering contracts, connections, migrations and upgrades;
– specific SLAs and key performance indicators (KPIs) would be implemented.

2.2.3 Topology

As far as is economically feasible, the NetCo model is envisaged to involve point-to-point passive fibre networks. Where alternative topologies already exist, or are otherwise necessary, NetCo would provide active access.

The CityFibre model is based solely on passive fibre, and aims to provide flexibility to offer point-to-point or passive optical network (PON) solutions depending on the service provider's needs.

– **Point-to-point topologies** would be deployed ubiquitously to provide connectivity to public sector customers, large enterprises and mobile base stations. The network architecture should enable point-to-point dark fibre between these types of points in the network, ensuring that the passive fibre network is suited to both access and metropolitan backhaul applications.

– **Dedicated PON topologies** would be deployed ubiquitously, and each anchor tenant service provider would be allocated a separate splitter in the optical distribution network. In practice, this means that service providers could control the dimensioning parameters of the network, which would have cost and network performance benefits. Allowing maximum control over the underlying technology is consistent with promoting service innovation in downstream markets.

– **Wholesale active access** would be provided to all service providers via CityFibre or a service provider. Active services can be provided via both point-to-point and PON fibre networks.

– **New services** requiring high bandwidth (for example, mobility services harnessing ubiquitous WiFi networks) could also be catered for within the proposed CityFibre topology, since total installed point-to-point or PON passive fibre capacity will be much higher than current demand.

A potential implication of providing separate PON splitters for each service provider is that a number of dedicated fibres for each service provider would be needed from the distribution point back to the point of presence. As the number of service providers increases, more fibre capacity in the core of the network is needed. This could limit the potential number of service providers, as the CAPEX of this topology significantly increases with the number of service providers.[27] More service providers could be accommodated by increasing backhaul capacity. However, it is Oxera's understanding that, in CityFibre's topology, sufficient fibre is deployed in the core to ensure that no such limitations are encountered.

Box 2.2 below explains how the transition from copper to fibre would be achieved in the CityFibre model.

[27] Analysys Mason (2009), 'Competitive models in GPON', Report for Ofcom, December 1st.

Box 2.2 Copper to fibre migration

An important consideration in the transition to new FTTP networks is the retirement over time of the legacy copper network. Oxera has established this principle as part of the NetCo model, allowing for a two-tier pricing model for fibre access such that customers who retain basic broadband services can be migrated to fibre connections without the service provider incurring the higher access charges normally associated with fibre connectivity.

Oxera understands that the CityFibre model also promotes the concept of migration. Sufficient fibre is deployed in the access networks to enable a migration of all connections from copper to fibre. This would mean that service providers currently using BT's copper LLU connections could migrate all customers, while fibre access prices for basic broadband could be set at a level comparable to regulated copper LLU prices. As the legacy active technologies for LLU reach the end of their useful life, all connections can be served via direct fibre connections.

Once connected to fibre, it is Oxera's understanding that, in CityFibre's model, service providers will be able to up-sell from basic broadband to gigabit FTTP on a 'try before you buy' model. Oxera understands that such an offering is supported, as changes to a customer's access speed are controlled through software with limited manual intervention required.

Oxera has been informed that CityFibre's topology and approach to migration would apply to all customer segments, including public sector connectivity. For example, all schools that are currently connected via copper connections can be migrated to fibre irrespective of the bandwidth required. As data growth dictates higher capacity, the fibre can be 'opened up' to gigabit speeds. This model for migration and rapid upgrade applies to all connectivity for both fixed and mobility solutions.

2.2.4 Pricing

NetCo's pricing is designed to provide sufficient lifetime remuneration on investment, given the risk at the time of investment. To ensure maximum output in an uncertain environment, Oxera reasoned that NetCo would be free to set its own prices and be allowed to price-discriminate in order to reflect end-users' willingness to pay and geographical differences in costs.

As CityFibre is unregulated, it would be free to introduce tiered pricing and to price-discriminate efficiently, which is not necessarily the case with BT, whose pricing is subject to regulatory scrutiny. The anchor tenants who can access passive products are likely to receive beneficial pricing compared with active access-seekers. CityFibre's initial pricing will need to balance service providers' willingness to pay with the cash flows required to meet the return objectives of private equity investors. Price discrimination can be utilised to encourage efficient migration of all connections to fibre, thus allowing for earlier retirement of legacy copper networks.

However, insofar as the aforementioned risk-mitigating factors and evolving financing structure result in lower cost of capital, coupled with increased utilisation, CityFibre could reduce the prices of fibre access over time.

2.2.5 Entry and exit

In the CityFibre model, participating service providers enter via a multiple-year contract that binds the service provider to the infrastructure within the planned footprint. Exit is possible for service providers, but penalties may apply. Once the CAPEX and footprint have been confirmed, entry is possible, but on less favourable terms.

In Oxera's NetCo model, participants commit to finance NetCo's CAPEX and operating expenditure (OPEX). There would be a commercial market for ownership stakes. Later entry and exit would be achieved through commercial agreements, subject to pre-defined criteria for participation. In the CityFibre model, equity participation of service providers is not a prerequisite for passive access, which may encourage early entry by small-scale providers.

3 Economic case for the CityFibre model

This section discusses the implications of the CityFibre model for different stakeholders, and hence its prospects for achieving buy-in from the relevant parties—ie, investors, customers and policy-makers (section 3.1). The economic case for the CityFibre model is further examined in terms of its risk characteristics (section 3.2) and regulatory/policy considerations, including the possibility of state aid (section 3.3).

3.1 Alignment of incentives between stakeholders

To understand whether there is an alignment of incentives between stakeholders, it is essential to articulate the mechanisms through which investors and service providers would gain (or lose) from participation in the CityFibre model relative to the status quo. The appetite that different parties have to commit to the model depends on the perceived risk at the time of commitment (or investment), and the evolution of risk over time. The incentives of the main stakeholders to participate by investing or by pre-committing to a certain share of connections are elaborated on below.

3.1.1 Investors

Like the NetCo concept, the CityFibre topology will result in the deployment of passive fibre infrastructure that will require significant CAPEX to deploy, but is expected to operate with low OPEX when constructed. These economic characteristics are likely to appeal to investors that are attracted to the long-term, reasonably stable, yield potential that is common with utility infrastructures.

The EU's Digital Agenda provides a clear political motive for investment in fibre infrastructure in all Member States. However, the current economic climate could restrict speculative investment, resulting in projects requiring a level of quantifiable demand to secure funding. In the CityFibre model, this is achieved through contracting with anchor tenants to ensure steady cash flows.

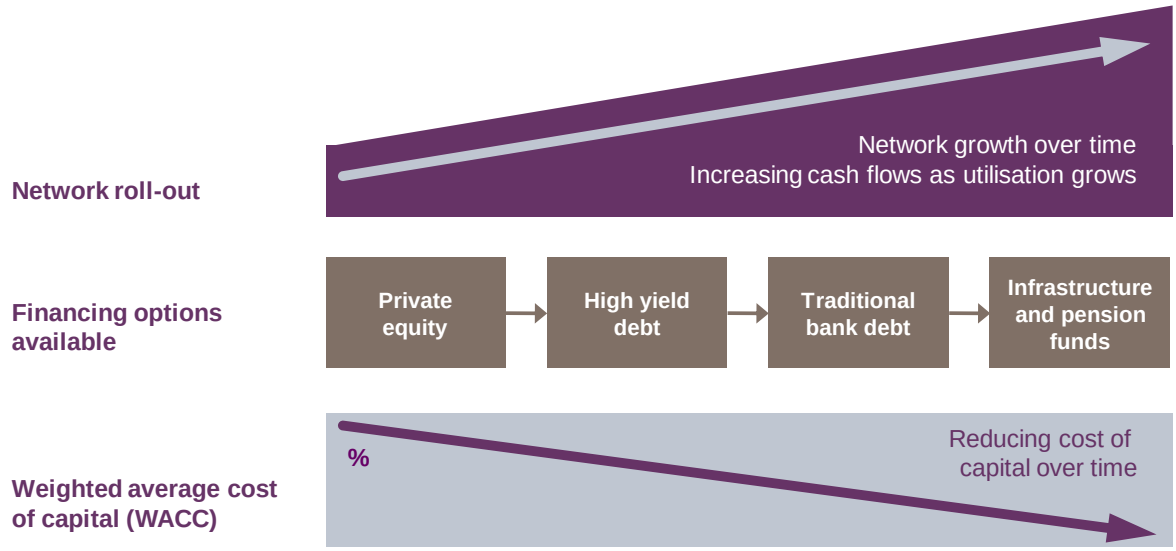
CityFibre would be financed by private investment consisting of private equity, institutional investors and infrastructure funds. The CityFibre model does not exclude the option of investment by service providers, but such investment by its users is not a prerequisite. Rather, as described earlier, most of the financing is expected to come from financial institutions, with the make-up of investors expected to change over time. Compared with the status quo, this could be advantageous for two reasons:

– **there would be access to a wider pool of capital** than would be possible via the incumbent and service provider balance sheets; and

– **there would be the potential to scale up more quickly**, as investment (and therefore fibre roll-out) is not subject to discussion or agreement with the incumbent.

In the early stages of CityFibre's model, a lack of an established long-term credit rating could raise the cost of capital for CityFibre. As deployment progresses and risks diminish, the cost of capital would be expected to decrease, and credit ratings would largely reflect the quality of revenue streams derived from the anchor tenants. As CityFibre is not dependent on equity investment from the incumbent and service providers, it is possible for it to structure financing suited to its stages of roll-out. This is represented in Figure 3.1 below.

Figure 3.1 Financing structure of the CityFibre model



Source: Oxera, CityFibre.

Insofar as the mechanisms described above would indeed result in a lower cost of capital over time, CityFibre's model would exhibit benefits to the service providers using its shared fibre network, as follows.

– **Extended coverage**. CityFibre would have the ability over time to extend the network into less dense sub-urban areas where the lower cost of capital can compensate for higher deployment costs. Service providers would therefore benefit from the extended footprint of the deployed networks.

– **Reducing fibre access pricing over time**. CityFibre would have the ability over time to reduce the costs of fibre access for the benefit of its anchor tenants. A lower cost of capital, coupled with increased utilisation and efficient operating costs (since a pure FTTP network has no electronics to maintain), could result in fibre access reducing towards comparable LLU pricing.

Since the CityFibre model assumes that investor make-up will change over time, private equity investors may wish to exit once a significant portion of the network is built, and incoming investors, such as infrastructure funds, will seek out the stable returns to buy in. The layered approach (explained in detail in section 3.2) potentially allows a degree of smoothing of the cash-flow requirements, as the phased nature of build generates early cash flows. To the extent that demand elasticity and willingness to pay are comparable across the layers of demand, investors could gauge the demand risk of subsequent stages.

Investment in projects with large upfront costs and demand risks may be contingent on partnerships with a consortium of investors. The CityFibre model therefore envisages more than one private equity partner.

Steady cash flows from the anchor tenant contracts may create an environment for debt leverage. Therefore, similarly to the NetCo concept, the CityFibre model is open to debt structures from high yield bonds and to the prospect of evolving to a lower cost of capital available from traditional bank debt.

3.1.2 Customers

Service providers and institutional anchor customers will require the CityFibre model to compare favourably (in terms of prices and quality of service) with status quo access network options. Notably, service providers using CityFibre's services engage in long-term contracts

and effectively share part of the investment risk. This is in contrast to the prevailing regime, where the ISPs can purchase local access network services without having to pre-commit to a certain amount of purchases. Major ISPs will face the costs of migrating their customers to a new infrastructure. Institutional customers may have the option to purchase services such as leased lines from the incumbent. For the residential market, the scale and coverage of the network is likely to be important in order to offer a consistent product in downstream markets.

However, service providers have incentives to seek viable alternatives for wholesale access, as most providers (with the exception of Virgin Media) are dependent on the incumbent for access and connectivity. If BT were found to have SMP in the critical wholesale access markets, it would have incentives to discriminate against access seekers. However, this is not the case currently, as ex ante regulation of BT addresses such concerns, using wholesale remedies for NGA, such as virtual unbundled local access (VULA, an active product that aims to replicate the economics of LLU), and physical infrastructure access (PIA, which provides entrants with access to ducts and poles). However, active access products, and possibly VULA, might be considered not to leave as much scope for product differentiation or sufficiently high, symmetrical bandwidth as an unbundled fibre network would do. PIA, on the other hand, as well as having significant restrictions on its uses, is an untested product that relies on the availability of duct space in the specific area where ISPs would like to roll out.

CityFibre's topology, providing an FTTP network that is open at the dark fibre level, could bring advantages to service providers compared with the status quo. Potential advantages of this topology include the following.

– **Quality of service**. Fibre-based services have superior bandwidth potential compared with other fixed-access platforms, as well as offering the ability to deliver 'headline' performance with lower latency.

– **Product differentiation**. The ability to use dark fibre means that all service providers have control over technical parameters such as PON dimensioning and the choice of active components that are best suited to their applications and services.

– **More pricing freedom for the service provider**. As the dark fibre access cost is largely independent from the service delivered over the fibre (see Box 2.2 above), the service provider retains all higher revenues that may be derived by upgrading customers to higher bandwidth services. For example, a customer upgrading over time from 20 Mbps to 100 Mbps and even to 1 Gbps may be willing to pay incrementally higher revenue for each step increase in bandwidth, whereas the fibre access cost to the service provider will remain static.

– **A more 'future-proof' network**. As fibre is capable of delivering virtually unlimited bandwidth, service providers can provide their customers (including consumers, enterprises, public facilities and mobile operators) with a network that will cope with the data growth demand of future applications and services.

These are all factors that service providers are likely to value highly, and that would compare favourably when benchmarked against the wholesale products offered by the incumbent. A strategy of approaching areas not served by other platforms (eg, cable, FTTC) may also serve to differentiate the CityFibre model, enhancing its appeal.

The details of the contracts will also influence the incentives of service providers. The long-term duration of contracts is similar in terms of the commitment that co-investors agree to in the NetCo model. With regard to the consumption of dark fibre, contracts between CityFibre and service providers can be structured along lines similar to indefeasible rights of use (IRUs) that may allow service providers to capitalise access infrastructure costs. There are incentives to commit early, and penalties could be included in the contracts for breaching capacity agreements.

The incentives of service providers considering participation in the CityFibre model would be contingent on commitment from investors. Service providers would need to incur CAPEX in order to switch to fibre. A lack of finance could expose service providers, particularly if this occurred midway through the roll-out. Given that financiers and service providers have a shared interest in the project being successful, the fact that they have entered into a contractual arrangement with the investment vehicle may imply that, beyond initial agreements, such dependencies positively reinforce the commitment to the programme.

3.1.3 Regulator

To the extent that CityFibre's approach attracts new investors to the telecoms sector, it would be particularly attractive to policy-makers, including those outlined by the DCMS (as discussed above).[28] The anchor tenant approach is thereby consistent with the objective to maximise private investment in fibre access networks, aiding the achievement of the government's 2015 targets, as well as driving towards the more challenging aspirations of the EU's 2020 Digital Agenda.

The CityFibre model envisages that roll-out areas are likely to benefit from FTTP deployments that would not otherwise materialise in the short term owing to BT's strategy to deploy VDSL over copper. There may also be synergies in the target customers if, for instance, city councils that become anchor tenants also have high-speed broadband agendas to pursue.

Furthermore, by providing an alternative access network for service providers, the CityFibre model is consistent with Ofcom's objective to promote competition 'at the deepest level of the network'.[29] While Oxera's co-investment report made it clear that duplication of passive unlit fibre connections is sub-optimal in terms of total industry costs, and incumbent participation was considered necessary, CityFibre's approach building on anchor tenancy agreements to fund investments does not, strictly speaking, represent duplication, insofar as BT is not rolling out FTTP networks in the short to medium term. Furthermore, as the CityFibre model provides open access to passive inputs, BT might be encouraged to use this network, rather than duplicate it ex post.

3.2 Risk characteristics of the CityFibre model

The market characteristics surrounding NGA investments are, to some extent, present regardless of the investment model pursued (incumbent-led, NetCo or CityFibre's model). The aggregate-level demand uncertainty—whether the demand for fibre-based services materialises or not—cannot be fully removed. Similarly, there are unlikely to be significant differences in construction risk, as all models face some uncertainty about the deployment costs, and some of the risk can be allocated to contractors. There are, however, differences in how the cash-flow profile can be adjusted to mitigate risks in order to attract investment. The risk-mitigating features of the CityFibre model are discussed below, followed by an analysis of the potential risk of duplication (by the incumbent).

3.2.1 Risk-mitigating features of the CityFibre model

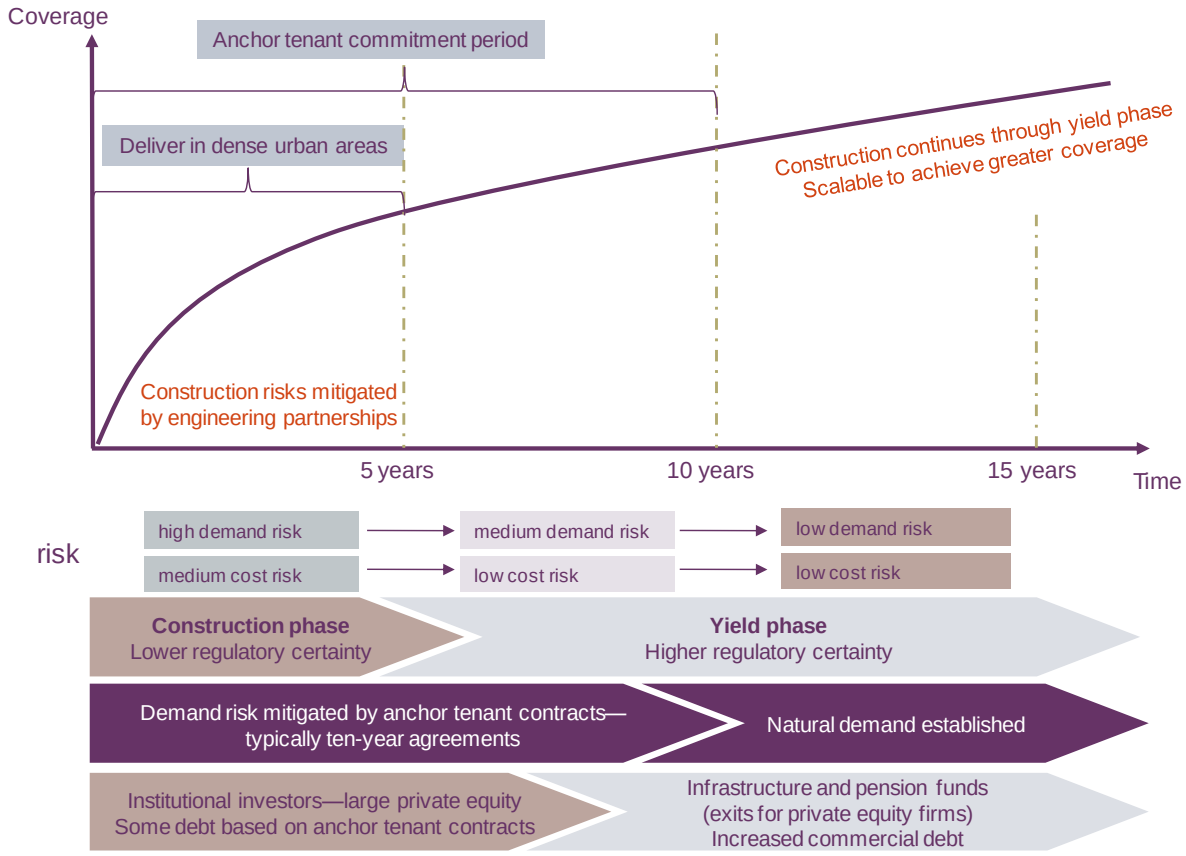
The CityFibre model exhibits many of the risk-sharing characteristics of the co-investment model. Anchor tenant contracts provide network utilisation commitments, which effectively replicate pre-commitment through equity stakes, as envisaged in the NetCo concept. The pre-commitments and consequent steady cash flows, together with the layered structure of investments (explained further below), provide conditions to trigger investment and mitigate financial risks. Furthermore, partnerships with civil engineering firms (for example, Fujitsu) are expected to mitigate CityFibre's delivery risks and provide an ability to scale construction.

[28] Department for Culture, Media and Sport (2010), 'Britain's Superfast Broadband Future', policy document, December 6th.
[29] Ofcom (2007), 'Future broadband: Policy approach to next generation access', consultation document, September 26th.

Relative to the incumbent, or even NetCo (which would be subject to some, albeit limited, regulatory monitoring), CityFibre is unlikely to face any significant regulatory risk.

As explained above, investors' incentives to fund the 'anchor tenant' vehicle depend on the risk they face over the lifetime of the investment. Figure 3.2 provides an overview of the evolution of network coverage, commitments, risks and investor types over time. This profile resembles the roll-out envisaged for the NetCo model.

Figure 3.2 CityFibre roll-out and risk profile over time—an illustration



Source: Oxera, CityFibre.

As illustrated in the figure, in the CityFibre model a large portion of the target coverage could be delivered within a ten-year period. During an early phase, the operators and investors are likely to gain a greater understanding of the market demand for fibre services and deployment costs. As applications that take advantage of high-speed broadband tend to emerge once the network capabilities have been built, the demand risks are expected to stabilise. Moreover, matching the anchor tenant contract to this period mitigates the demand risks for the investors in the infrastructure.

Private equity investors may choose to exit within the anchor tenant commitment period, and this could match their return objectives and timeframes. As the roll-out extends and demand reaches equilibrium, the cash-flow stability is likely to attract other forms of finance, such as infrastructure and pension funds. The participation of large-scale financial institution funds may coincide with (or require) greater clarity on the regulatory regime, which will evolve over time as the impact of the CityFibre model on wholesale markets is understood.

While the CityFibre model shares many economic characteristics with the NetCo model, it differs in several ways.

– **The ownership of the underlying assets is independent of the incumbent and operators**. The service providers could invest in CityFibre, but equity participation is not a critical prerequisite for the CityFibre model.

– **Participation of the incumbent is not a necessary condition in facilitating network roll-out**. The CityFibre model envisages a new network deployment based solely on passive fibre and using recent developments in civil construction. This independent approach may avoid some of the difficulties in aligning the incentives of the incumbent, and give advantages to service providers participating in CityFibre's model, as outlined above.

– **Duplication of assets is possible**. Since the model is viable with a lower level of industry commitment, it is possible that rival networks could be deployed. In particular, the incumbent could have an incentive to roll out a competing infrastructure, although it is less likely to do so if a sufficient number of service providers are committed to the CityFibre model. Indeed, there could be a case for the incumbent itself to use CityFibre's access network in some areas.

As Figure 3.2 illustrates, there are further specific features of the CityFibre model that are designed to mitigate the demand and construction risks over the period of the network roll-out. The layering of demand allows the model initially to target market segments that have high bandwidth requirements and have willingness to pay. This generates cash flows that begin to recover the capital of network components that will be used in the residential layer. The profiles of these cash flows are aimed at meeting the horizons of private equity partners. Furthermore, the anchor tenant contracts extend through the roll-out until the majority of demand and cost uncertainties have been resolved.

3.2.2 Layered risk profile of CityFibre's shared network

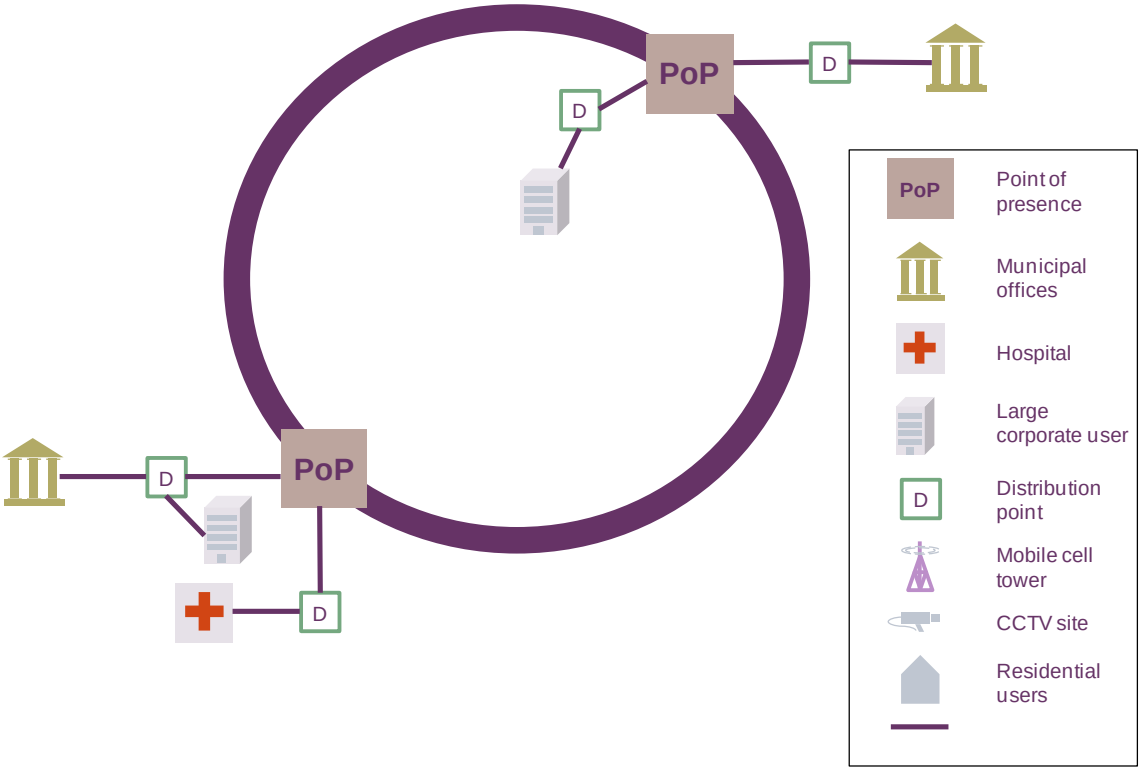
Put simply, the economic case for the CityFibre model is predicated on the intention for the fibre network to be shared by multiple service providers. A salient feature of the model is the sequential 'layered' structure of investment, whereby the company provides connectivity to different 'layers' of customers, and leverages the cash flows generated by the earlier anchor tenants. The layers include metropolitan fibre backhaul to mobile base station and municipal WiFi applications, and connectivity to public sector network (PSN) providers and business (including SMEs) and residential customers. This is explained in greater detail below.

The shared nature of CityFibre's proposed deployment, based on a succession of different types of anchor tenants, relies on layering demand on an initial 'high-value contract' deployment in a city. Subsequent deployments increase the penetration of the network closer to the home. In addition to its layered structure, CityFibre's investment is targeted to urban areas of higher demand where competitive networks are more likely to be beneficial and sustainable. In that sense, CityFibre is expected to face lower demand risk. The specific investment 'layers' and their principal risk characteristics (and cash-flow implications) are explained below.

Layer 1: institutional customers

The CityFibre model targets high-value connections (for example, to public sector, institutional and large enterprise customers), which allow the deployment of a metropolitan ring. This is illustrated in Figure 3.3.

Figure 3.3 Institutional layer of demand



Source: Oxera.

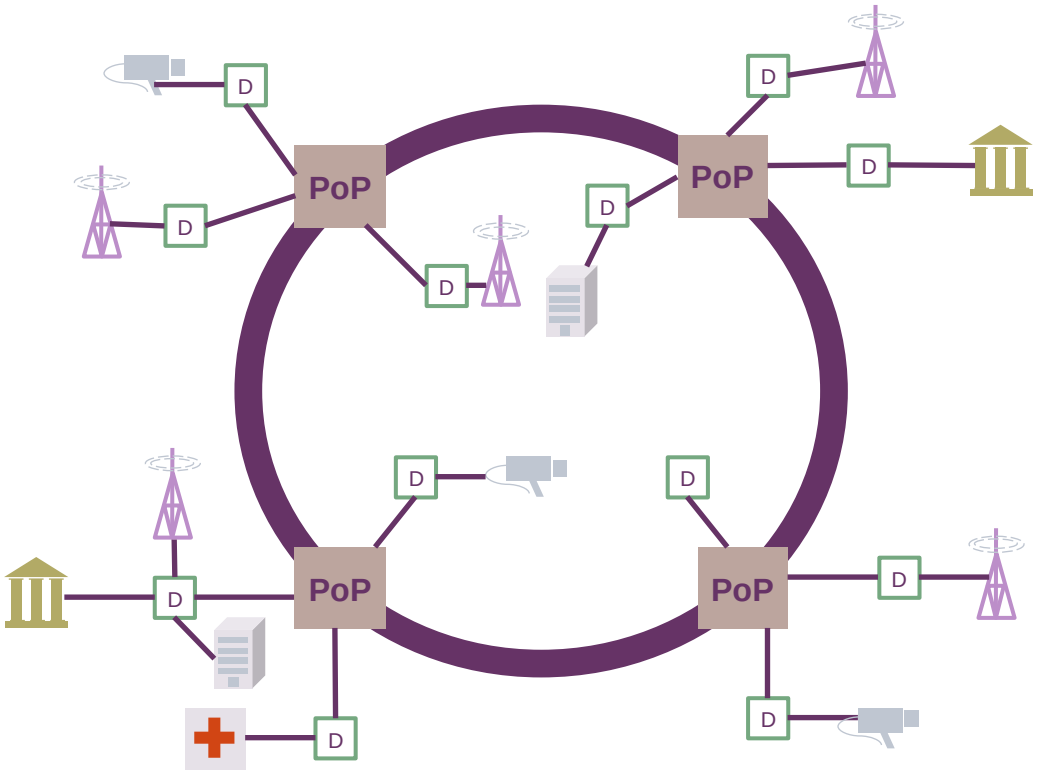
Typically, these connections will be to end-users that have large and complex connectivity requirements, and therefore exhibit a high willingness to pay. They may also have operational horizons that are compatible with longer-term contracts. While these connections may require a build-out to only a small number of sites, they form a strategic 'core network' within a city.

As access connectivity in the CityFibre model is based on dark fibre, providers can deploy services of substantially high bandwidth with more of their costs under their own control. This may be attractive to most enterprise and PSN providers that currently have to source connectivity from the incumbent that is also a competitor in the downstream market.

Layer 2: mobile carrier-to-carrier connectivity

The second layer of deployment targets demand at an intermediate level of geographical density within a chosen city, such as the carrier-to-carrier connectivity requirements of mobile network operators. Figure 3.4 illustrates this.

Figure 3.4 Carrier-to-carrier layer of demand



Source: Oxera.

Connecting existing mobile base stations and WiFi points with fibre backhaul would increase the density (in terms of routes/connected areas) of the deployment, and meet the demand from wireless operators that are experiencing rapid data traffic growth.[30] As demand on wireless networks grows, the number of sites required may increase with the deployment of smaller cells, as operators substitute limited spectrum for greater investment in cell sites in order to deliver high-bandwidth services.

As illustrated above, the CityFibre model envisages that the metropolitan network can be leveraged further with radial connections to other applications such as CCTV and urban traffic control. Each new connection layers additional cash flow to the core network, with minimal additional CAPEX needed to connect.

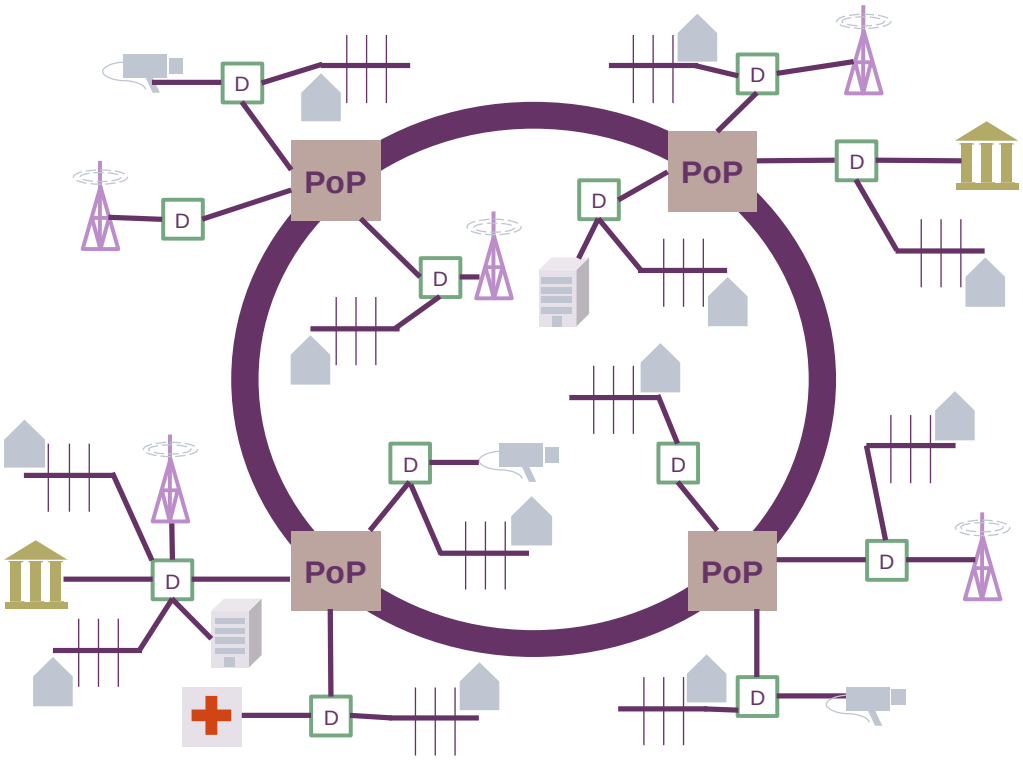
It is worth noting that in an urban environment, as connectivity needs are dictated by the density and location of the population, the needs of layer 1 and layer 2 above result in network being deployed in the same geographic areas. For example, an area of residential population will have schools and traffic control systems, and will need good coverage of mobile services. Therefore, in the CityFibre model there is no dependency on the order of deployment of layer 1 and layer 2, as each has the ability to anchor the build of the core network.

[30] Cisco forecasts that mobile traffic in Western Europe will increase at a compound annual rate of 68% from 2011 to 2016. See Cisco (2012), 'Cisco Visual Networking Index: Forecast and Methodology, 2011–2016', White Paper, May 30th.

Layer 3: SME and residential

The final increment of deployment extends the access network to residential and SME customers, as shown in Figure 3.5.

Figure 3.5 Residential layer of demand



Source: Oxera.

As demonstrated in layer 1 and layer 2, the metropolitan ring network will be built to pass through all residential areas of a town or city. This provides an ability to extend the fibre deployment to all homes, SMEs and wireless small cells.

While the metropolitan core network will be completed with a significant portion of its cost recovered, the remaining roll-out to reach houses will require more CAPEX than the previous layers. Residential customers could be more sparsely distributed, requiring more civil works and fibre cabling to reach. At the same time, the residential demand for high-speed access is more uncertain (at least at present) than for the public sector and carrier segments. The CityFibre model must mitigate demand and delivery risks, which it could do in three ways:

– **contracting with consumer ISPs**, which will benefit from the superior qualities of FTTP compared with status quo option provided by the incumbent;

– **leveraging layer 1 and layer 2 cash flows associated with the 'core'**, which should recover a significant proportion of the shared asset costs;

– **utilising advances in civil engineering technology**, together with construction partnerships to deploy such technology, to enable FTTH to be deployed efficiently and at predictable costs.[31]

[31] It is Oxera's understanding that CityFibre would deploy its network using microtrenching between the distribution point and customer premises, which is generally considered to be less costly than traditional duct deployment. See, for example, Department for Culture, Media and Sport (2011), 'Microtrenching and Street Works: An advice note for Local Authorities and Communications Providers', November.

In addition to broadband and traditional communications revenue, CityFibre may be able to attract cash flows from other applications such as smart grid and smart metering, which can operate over a shared FTTP network.

How would the layered investment work commercially?

With the layered approach, the overall payback period is targeted to be within a seven- to ten-year period. Participating service providers benefit from having a route to market FTTP services in areas where none was envisaged, and from having an alternative to the incumbent for high-speed wholesale access. Contracts are typically structured as a network leasing agreement to purchase a specified number of connections or subscriber lines, and span a 10–20-year period—consistent with the commitment periods envisaged for the NetCo model. Within this period, service providers would also commit to using CityFibre fibre access products within the roll-out footprint. Anchor tenants obtain exclusive access to dark fibre within the roll-out period.

Contracts are intended to match cash-flow requirements and achieve a high level of CAPEX recovery, which reduces the demand risk to the investors, and the commitment by anchor tenants reduces overall firm-level risks. This is illustrated in a stylised example in Table 3.1.

Table 3.1 CityFibre model stylised commercials

Anchor tenant category	Contracted value as a percentage of total CAPEX	Expected value as a percentage of total CAPEX	Rationale for expected cash flows to be above minimum contracted level (over a ten-year period)
Institutional sector	15%	25%	Not all public sector sites included in initial contract. Expected value includes growth from additional sites, CCTV and municipal WiFi
Mobile sector	15%	25%	Contracted value assumes only around 25% of mobile sites connected. Growth in small cells not included
Residential/SME	50%	80%	Penetration in contracted value is around 15% of residential connections. However, penetration is expected to be closer to around 25% or above
Total	**80%**	**130%**	Illustrating that total cash flows could deliver a payback nearer to seven years at expected values

Source: Oxera, CityFibre.

This example assumes a network deployment covering 90% of households, businesses and mobile base stations. As Table 3.1 shows, around one-third of the total CAPEX (being the cost of constructing both the core metropolitan fibre ring and the FTTP access network) is covered by anchor contracts with institutional and mobile anchor tenants. Cash flows from these segments are expected to achieve closer to 50% of total CAPEX over a ten-year period. Likewise, cash flows from the residential and SME segments are expected to cover up to 80% of total CAPEX in the same period. This provides an illustration of how the CityFibre model could achieve a payback within a ten-year horizon.

Forecasts of cost recovery based on contracted values would not include additional site connectivity requirements that might materialise subsequent to signed agreements. Insofar as the analysis of the scale is in the right order of magnitude, the CityFibre model would be sustainable in the context of other competitive networks. Organic growth in additional services and new commercial relationships could leave room for upside opportunities.

As stated earlier, the financing options and cost of capital would evolve over time. Once the construction risk is trending downwards, the shareholders of the CityFibre model would have an opportunity to gear up, if necessary, bringing the leverage associated with the project to

that associated with comparable investments.[32] With most of the construction work done and with a clearer view of future retail demand for fibre connectivity, investors would be looking at a more stable cash flow going forward, and may therefore be able to increase their debt level.

Thus the design of contracts would be of significant importance for CityFibre's model. While the details of the contracts are commercially sensitive, there are certain elements that would seem essential, as summarised in Box 3.1.

Box 3.1 Design of contracts

The CityFibre model seeks to reduce firm-level risk via contracting to service providers. Key to this is to ensure that the contracting model would give this mechanism benefits when compared with alternatives. While outside the scope of this report, there are several aspects of contracts between the investment vehicle and the service providers that provide sufficient incentives to pre-commit and thus trigger investment. These aspects could be designed to replicate the outcomes of the NetCo model in terms of securing steady cash flows while providing rewards for early commitment.

The contracts could be tailored to the needs of different consortium members, but would broadly contain the following:

- the minimum term of the network lease agreements, and mechanisms to extend their term;
- the capacity commitments and mechanisms to share risk and reward in the event of upside demand (ie, higher than expected) or downside demand (ie, lower than expected);
- the commercial terms linked to the capacity commitment, and the associated cash-flow characteristics;
- the service levels to be agreed between the parties;
- the structure of contract governance throughout its term.

3.2.3 Risk of duplication and incumbent reaction

Unlike NetCo, the CityFibre model does not involve incumbent participation, although longer-term participation is not ruled out. Perhaps the most significant risk facing CityFibre is therefore the incumbent reaction. Put simply, BT could react either by rolling out FTTP itself, or by reducing prices of active NGA (VULA). The question is how feasible it is for BT to deviate from its current plans and invest widely in FTTP in the cities and towns that the CityFibre model is targeting. This depends on the relative profitability of legacy-level broadband and the new network—in other words, BT has an established retail customer base, and an NPV-positive investment requires that the relative returns from fibre be sufficiently above those derived from its legacy network.[33]

BT's pricing strategy depends on the extent to which CityFibre provides a service that is of better quality, and the strength of the pricing constraint from fibre access. BT may also prefer not to reduce prices in certain niche areas insofar that this would imply reductions in other areas as well.

It is not possible to provide accurate projections of BT's future plans, but the following scenarios could be considered.

- It could be costly for BT to react (especially if it involves rolling out its own FTTP network where one already exists).

[32] In the context of pipeline development projects, a 70–30 debt–equity split appears to be quite common. See, for example, Nabucco Gas Pipeline, 'Facts & Figures', available at http://www.nabucco-pipeline.com/portal/page/portal/en/press/Facts%20_Figures; and Nord Stream (2011), 'Nord Stream Secures Phase II Funding', March 4th, available at https://e-facts.nord-stream.com/app/article/index.cfm?fuseaction=OpenArticle&aoid=2914&lang=EN.

[33] This theme has been developed by WIK. See Wik-Consult (2011), 'Wholesale pricing, NGA take-up and competition', study for ECTA, April 7th.

– BT's reaction might not be effective enough to impose a serious risk on CityFibre's model (because, for example, in many areas it has an inferior product—active FTTC—compared with CityFibre's passive dark fibre offer).

– Even if BT were to deploy FTTP in those areas, CityFibre would be insulated by the fact that it has signed long-term contracts with anchor tenants that may be seeking an alternative to an incumbent monopoly.

Nevertheless, BT's reaction might have knock-on effects on other aspects of CityFibre's model—for example, if BT lowers prices, this could put pressure on CityFibre's prices (which, as noted earlier, is mitigated to some extent by a reducing cost of capital over time). Therefore, a price reaction from BT would have an impact on the payback period, but not necessarily the overall viability of the investment. Analysis of different scenarios is a complex exercise in itself, and it is outside the scope of this report.

If the presence of CityFibre were to prompt BT into earlier deployment of FTTP, this could be beneficial to the industry overall, especially considering the 2020 targets set in the European Commission's Digital Agenda. BT would have the commercial and regulatory freedom to duplicate FTTP where CityFibre deploys its network. However, such an overbuild of *passive* infrastructure would be inefficient and increase the total industry costs, which, in turn, could be translated into higher prices and lower take-up.

Therefore, in the longer term, BT may choose to participate in the CityFibre model. This could be attractive if it becomes difficult to meet bandwidth demands with its FTTC platform or to serve customers that FTTC does not reach.

3.3 Regulatory and policy implications

In the UK regulatory context, Ofcom could impose certain access remedies if (and only if) CityFibre were found to possess SMP within the meaning of the Communications Act 2003. An operator deemed to have SMP can have 'remedies' imposed on it, ranging from transparency requirements to access obligations and price controls. Long-term regulatory commitment—while a critical prerequisite for NetCo—is not similarly relevant in the context of the open-access CityFibre model, as it would be unlikely that an alternative, non-incumbent, fibre-access provider (whether implemented through the CityFibre model or otherwise) would be price-regulated. Certain other regulatory considerations are, however, relevant, as explained below.

In areas where CityFibre's footprint overlaps with that of BT, the company would be unlikely to be found to possess SMP. Even if CityFibre were to become the largest *wholesale* provider in certain areas, it would represent a tough regulatory stance if Ofcom considered it to have SMP at any stage. This is because Openreach would still be likely to constrain CityFibre's wholesale pricing and, furthermore, BT Retail, together with Virgin in some areas, would still be likely to impose a constraint at the retail level, which would have a knock-on effect on service providers' requirements for competitive price and non-price terms and conditions from CityFibre's passive inputs. Oxera is not aware of any precedents where, under the EU regulatory framework, a national regulator has concluded that a new entrant investing in its own independent infrastructure needs to be regulated.[34]

Regulatory commitment not to change the rules of the game after the investment has been sunk is a critical prerequisite for NetCo, but it does not seem similarly relevant for CityFibre. However, regulatory commitment may, at some point, be needed in terms of:

[34] However, where fibre is connected to new-build housing, there may be requirements to provide access. See Ofcom (2008), 'Next Generation New Build: Delivering super-fast broadband in new build housing developments', statement, September 23rd.

– **clarity on the circumstances under which SMP remedies may be imposed**. Should the CityFibre model gain significant market share, the position of Ofcom could change. For example, the relevant products in the market definition could be altered to reflect differences between FTTC-based broadband and 'ultra-fast' FTTP. High market shares in specific geographical zones could also result in the definition of highly localised markets. Also, there is a realistic prospect of access regulation with respect to new build (Ofcom's approach is to ensure access to new build on 'fair and reasonable' terms);

– **treatment of BT where CityFibre rolls out**. In its latest wholesale local access market review, Ofcom found that BT (still) had SMP status in the non-Hull area of the UK.[35] Clarity would be required in respect of whether BT would still possess SMP, and whether access to BT's ducts and/or dark fibre would continue to be mandated (assuming it has been mandated), once CityFibre had an alternative network in place. (In addition to existing remedies, such as LLU and sub-loop unbundling (SLU), Ofcom is in the process of consulting about whether the scope of the remedy for PIA should be extended to cover the leased lines market in addition to the wholesale local access market.[36] Such a passive remedy would allow competitors to use BT's poles and ducts in the access network for the specific purpose of deploying NGA networks including mobile backhaul.[37] Ofcom has previously rejected arguments in favour of mandating reciprocal access to competitor ducts, on the basis that SMP-oriented remedies are, by their nature, asymmetric.)

Furthermore, were CityFibre to consider financial support from the public sector (eg, participation in the government aid initiative for 'Super Connected Cities'), this could trigger state aid concerns—namely, publicly funded networks could crowd out investments that could be commercially viable. To address these potential concerns, the European Commission has issued guidelines on state aid issues in relation to NGAs (see Box 3.2).

Box 3.2 State aid

State aid is defined as any use of state resources that cumulatively: confers an economic advantage to undertakings; is selective; distorts or threatens to distort competition; and affects trade between Member States.[1] For broadband networks, state aid may be allowed to address market failures and outcomes that are undesirable in terms of cohesion policy, such as a preponderance of a 'digital divide'. Where state aid is received, it must meet compatibility requirements.

The European Commission applies a two-stage assessment in state aid cases. First it assesses whether state aid is present and, if so, it examines whether the support is compatible with the rules. Participation by the state is not automatically deemed to be state aid. The Commission uses the *Altmark* principle in deciding whether compensation for services of general economic interest (SGEI), such as broadband, constitutes state aid. Under these principles, compensation is not state aid if: the beneficiary is entrusted with a clearly defined SGEI; the compensation is calculated ex ante in a clear, transparent manner; the compensation does not exceed net costs, taking account of revenue and a reasonable profit; and the beneficiary is chosen in a public tender, or compensation is determined on analysis of the costs of an efficient undertaking. Where private investment does not deliver adequate broadband coverage, the Commission acknowledges an SGEI. A competitive tender process might satisfy the remaining criteria.

To assess compatibility, the guidelines define three areas, depending on the extent of competition:

– **white areas**—where there are no commercially viable NGA networks (now and in the next three years), the Commission acknowledges that state intervention is likely to be in the common interest;

[35] Ofcom (2010), 'Fixed access market reviews: wholesale local access, wholesale fixed analogue exchange lines, ISDN2 and ISDN30', consultation document, November 9th.
[36] Ofcom (2012), 'Business Connectivity Market Review', consultation document, June 18th. Ofcom (2012), 'Business Connectivity Market Review – Further consultation', consultation document, November 15th.
[37] This remedy would be applicable to the residential consumers, and does not currently apply to the leased-line or backhaul markets.

– **grey areas**—where there is only one NGA network and there are no plans by any operator to deploy NGA networks within three years, the Commission says a detailed assessment is required demonstrating market failure;

– **black areas**—where at least two providers are (or will be in the near future) engaged in NGA facilities-based competition, the Commission says no market failure exists and will take a negative view on state measures to fund further roll-out.

In accepting state aid under these conditions, NGA networks must provide open access to wholesale products and non-discriminatory pricing (see Table 3.2 below).

Note: [1] European Commission (2010), Article 107 (1) TFEU.
Source: European Commission (2013), 'EU Guidelines for the application of state aid rules in relation to the rapid deployment of broadband networks', Official Journal of the European Union, January 26th.

Recent guidelines for the application of state aid rules for broadband networks indicate that an NGA network should provide enhanced connectivity; have the ability to offer substantially higher (download and upload) speeds; comprise a permanent step change by delivering optical backhaul sufficiently close to user premises ('supersede' and 'not just upgrade' existing basic broadband networks); and enable infrastructure-based competition.[38]

The UK government has recently received clearance from the European Commission for a state aid umbrella scheme whereby local bodies confirm directly with the BDUK that their local broadband projects are in line with the terms set out in the umbrella scheme (ie, the projects comply with state aid rules).[39] However, the Commission's clearance decision makes clear that 'any urban broadband development projects are subject to a separate state aid notification and not covered under the current Commission decision.'[40] Insofar as CityFibre could receive funding for urban areas through the Urban Broadband Fund (UBF), these cities are likely to fall into the category of 'grey areas', and hence an economic analysis to establish the competitive implications of state aid would be necessary. Where public funding is accepted, the regulatory regime designed for private investment would be revisited in the context of state-funded networks.

More specifically, the EU guidelines set out concrete 'compatibility conditions' that would apply to the regulation of access to state-subsidised networks. It is apparent that 'all possible forms of network access' should be provided to third parties. Table 3.2 sets out the specific requirements for partly or entirely state-funded networks, as set out in the EU guidelines.

[38] European Commission (2013), 'EU Guidelines for the application of state aid rules in relation to the rapid deployment of broadband networks', Official Journal of the European Union, January 26th.
[39] Further information is available at the BDUK website:
http://www.culture.gov.uk/what_we_do/telecommunications_and_online/8874.aspx
[40] European Commission (2012), 'State aid SA.33671 (2012/N) – United Kingdom National Broadband scheme for the UK - Broadband Delivery UK', November 20th, paragraph 21.

Table 3.2 Assessment of the burden of state aid regulation

Requirement—'compatibility conditions'	Oxera's high-level assessment of the incremental burden to CityFibre relative to 'no state funding'
Detailed mapping exercise and analysis of coverage	Unlikely to cause significant burden to CityFibre, given that the company would be responsible to provide information only on its planned footprint
Public consultation; competitive selection process; most economically advantageous offer	Not relevant for CityFibre (rather, the local authority issuing the tender)
Technological neutrality	Not a burden to CityFibre as such, although there may be a risk of the tendering party preferring an alternative (wireless technologies). This may be unlikely in the context of urban areas
Use of existing infrastructure	CityFibre would not use existing infrastructure. However, it is not clear whether its approach can be considered 'wasteful duplication of resources', given the relatively low costs of micro-ducting, and ambiguity over access and usage restrictions to BT's ducts and trenches
Wholesale access/fair and non-discriminatory treatment	The provision of 'effective wholesale access' is not a burden to CityFibre, given that the business model is based on providing access to third parties by a structurally separated entity Moreover, CityFibre aims to provide predominantly passive access in line with the compatibility conditions
Wholesale access pricing (benchmarking)	In order to compete, CityFibre is likely to set its prices to a competitive level with BT's access products in any case
Monitoring and claw-back mechanism	Claw-back of 'over-compensation' could be a concern depending on how it is defined. Even the NetCo model (as defined by Oxera) would be subject to a pre-defined 'safety cap' if its profits were to exceed, significantly and persistently, its cost of capital
Transparency and reporting	Any transparency requirements come with some, albeit relatively minor, administrative burden

Source: European Commission (2013), 'EU Guidelines for the application of state aid rules in relation to the rapid deployment of broadband networks', Official Journal of the European Union, January 26th.

In sum, the message of the high-level analysis presented in Table 3.2 is that, even if CityFibre were to apply for public funding, the requirements imposed would not represent significant distortions to its business model. Put another way, the investment vehicle under the CityFibre model is a structurally separated network operator aiming to maximise its output. There are limited incentives to engage in discriminatory practices, or indeed charge excessive prices, given the constraints from BT's pricing (VULA, bitstream, LLU). CityFibre would seem to comply with most of the requirements in any case.

4 Conclusions

This report has examined how CityFibre's investment model—a core element of which are contracts with 'anchor tenants'—compares with the co-investment model previously articulated by Oxera. The two models build on a similar vision: the underinvestment problem faced by the telecoms sector is likely to require novel approaches in order to maximise private investment in the sector, and to deliver superfast broadband to institutional customers, businesses of different sizes and consumers.

The NetCo model is designed to address market characteristics that seem to hinder FTTP investment at present. By creating a pro-competitive market structure downstream, and by removing the incentives to discriminate, the co-investment approach is envisaged to achieve greater long-term regulatory commitment with respect to a future (and potentially monopoly) provision of a core part of next-generation networks—ie, the access network. This could make it more viable to invest in networks with a relatively long payback period. Demand uncertainty would be mitigated through limiting the risk of duplicate networks and by establishing an entrant–incumbent partnership at the passive access layer.

The CityFibre model is a smaller-scale variant of a risk-sharing model. It builds on long-term contracts with service providers, which in turn trigger funding from external investors. Given the current circumstances in the UK, the key factors that facilitate the implementation of the CityFibre model relative to fully fledged NetCo in the short term are that:

– it does not require the incumbent's participation, which means that the FTTP roll-out can be initiated earlier than under the full NetCo model;

– it can source financing from a wider range of financial institutions. As investment is not tied to the balance sheets of the incumbent or other providers, it may be possible to scale up investment and aid a faster network roll-out;

– it does not require long-term regulatory commitment, so it can be implemented within the existing framework. Again, the effect of this is a quicker time to market and more immediate benefits;

– it does not require the setting up of a new company involving the incumbent and other service providers, as would be the case with NetCo.

In summary, the CityFibre model is able to reduce the demand, financing and cost risk without a substantial reform of the industry, which allows it to be implemented at a considerably faster pace. The model has the added feature that it creates infrastructure-based competition in a market where often only one open infrastructure is present.

The CityFibre model seeks to address many of the issues associated with the UK's current incremental roll-out of NGA, as well as reduce the industry's dependency on the incumbent. As made clear in this report, CityFibre resembles the NetCo concept in many respects, although there are some differences in terms of, for example, incumbent participation. Relative to the status quo, however, both the CityFibre model and the complete NetCo concept can result in benefits to a range of industry stakeholders, as further summarised below.

– **Service providers**. Competing investment in passive fibre infrastructure will provide service providers with an alternative to the incumbent. As CityFibre is deploying a competing network that is technically superior to FTTC, it is not duplicating networks that would otherwise exist. Furthermore, an FTTP network allows service providers scope for

further innovation and investment in electronics as well as in services and applications. Further benefits could arise from the opportunity to migrate in an orderly manner from copper- to fibre-based products, and a pricing structure that allows for flexibility over the migration period.

– **Cities and local authorities**. While Oxera has not assessed the economic benefits of broadband, there is evidence to suggest that a city enjoying ubiquitous fibre infrastructure will be likely to attract business growth, job creation and better services for its citizens (eg, schools and other public facilities). Furthermore, the fibre network will allow better mobility coverage through fibre-enabled WiFi and 4G LTE, and therefore a better platform for social inclusion.

– **Policy-makers**. Deploying FTTP to a wider footprint is supportive of the UK government's aim to have the best and fastest broadband of any major European country by 2015, as well as meeting the Digital Agenda targets. Like the NetCo concept, the CityFibre model is an example of an alternative business model that seeks to maximise private investment and minimise the need for public funding. Put another way, by supporting such efficient investment models, a larger network footprint could be achieved with the same amount of public expenditure on broadband.

– **Investors**. A shared infrastructure supported by anchor tenancy over a ten-year horizon provides a supportive environment for investment. Investor make-up can change over time, and debt leverage will be attractive to equity shareholders. The CityFibre approach is a (passive-only) model with significant economies of scale and density that can result in high returns in the future, if the demand, and therefore utilisation, increases.

– **Incumbent**. CityFibre will compete against BT as an infrastructure provider. However, the CityFibre model is open to BT's retail business (and parts of its wholesale business). Should BT become a user of CityFibre's FTTP network, its large customer base and financial resources would enable investment in areas that CityFibre's footprint would not otherwise reach. It could therefore be argued that the CityFibre model could provide a catalyst that could result in a longer-term restructuring of the industry towards a NetCo-like industry engagement.

The CityFibre model does not come without risks, however. Notably, CityFibre would be largely duplicating the infrastructure of the incumbent (albeit through roll-out of FTTP, whereas BT's strategy is mainly to leverage its legacy copper network with incremental VDSL upgrades). Therefore, the response by BT may have implications for CityFibre's access pricing, the returns generated, and the associated payback period of investments. Also, as articulated in the NetCo report, the aggregate level of demand risk surrounding FTTP investments can be mitigated but cannot be fully removed under any investment model.

While regulatory risk would be largely absent (in terms of price regulation), there could be state aid concerns if CityFibre were to benefit from public funding (whether from the Urban Broadband Fund or another form of public funding facility). However, it is unlikely that state aid requirements would have significant implications for CityFibre's business model, given that it would already be providing passive fibre on an open-access basis, with or without state subsidies. Nevertheless, this is a risk that would need to be monitored.

The CityFibre model represents a variant of co-investment, and builds on principles consistent with the NetCo model. If appropriately implemented, the same risk-reducing, pro-competitive features envisaged in the NetCo model could be present under the CityFibre model. The design of contracts is key to replicating an equity-led model, yet reducing the threshold of participation of service providers with limited resources for large-scale CAPEX commitments.

Furthermore, in building on the CityFibre model, but recognising some of its potential geographic limitations, there could be a variant (or longer-term evolution) of the model that might be able to address the areas that CityFibre is unlikely to build into. Were the incumbent to become an anchor tenant in those areas, the problems of duplication would be reduced while maintaining much of the simplicity of the CityFibre approach, and retaining the ability to attract outside capital from the beginning.

In conclusion, there seems to be a strong economic case for CityFibre's investment model. If successful, one could envisage the model evolving to a scale similar to that envisaged in Oxera's NetCo model, particularly if the approach to enabling investment is flexible and responsive to local economic conditions (ie, one size is unlikely to fit all). A hybrid approach combining the principles of the NetCo model where necessary, and the advantages of duplication where viable, may achieve the optimal long-term benefits.

Investment models such as NetCo and CityFibre's anchor tenant approach discussed in this report could thus significantly contribute towards achieving the UK government's goal of reaching the Digital Agenda targets and having the best superfast broadband network of any major European country by 2015.

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