DCMS – Future Telecoms Infrastructure Review

Additional Evidence

Annexes

6th April 2018

CityFibre

Contents:

Annex 1 - "The Economic impact of full fibre in 100 UK towns and cities"

Please follow this hyperlink for the document "The Economic impact of full fibre in 100 UK towns and cities" Regeneris, March 2018

Annex 2: "Future benefits of broadband networks", Frontier Economics for National Infrastructure Commission: Commentary from CityFibre, March 2018

Introduction

CityFibre welcomes the National Infrastructure Commission's strong focus on future connectivity requirements a part of the National Infrastructure Assessment.

CityFibre constructs full fibre networks serving business, public sector and residential users and provides backhaul to mobile masts and sites. We have constructed fibre networks in 42 towns and cities across the UK. In November 2017, we announced an agreement with Vodafone to build an initial 1m, rising to 5m full fibre broadband connections. We are therefore extremely interested in the issue of the costs and benefits of full fibre network construction and have some insights on the issues raised.

General commentary on costs and benefits

Whilst we recognise that the NIC has an independent remit from Government and has its own clear focus, we do think it is important to link this analysis of costs and benefits to the public choices available to the Government, particularly given the coincident timing of the Government's Future Telecoms Infrastructure Review. Essentially, these are:

- Maintain the current focus on regulated access to the legacy fixed network, which in practice means that broadband connectivity needs will be largely met via Fibre To The Cabinet (FTTC) technologies for the foreseeable future ('Make Do And Mend') this broadly aligns with **Scenario 5** in the Frontier study;
- Take action to accelerate full fibre (FTTP) rollout and adoption ('Radical Change'): this aligns most closely with **Option 2**;
- Maintain the status quo in fixed whilst promoting 5G technologies with possibility that these will eventually replace FTTC, obviating the need for full fibre rollout ('Wait and See'). This doesn't align directly with a Frontier option though it might lead to an outcome similar to **Option 3**.

CityFibre favours the second of these options. In summary, our reasoning is that:

- Although FTTC may be adequate to meet consumer needs today, a straightforward extrapolation of the existing trend in increasing bandwidth needs suggests that it will be inadequate to meet the needs of a significant consumer cohort within five years and the majority of consumers within ten years. (This assumes that UFBB variants of FTTC deliver their claimed performance for significant numbers of customers.)
- For businesses, particularly SMEs and SoHos, FTTP will deliver a significant improvement over FTTC on quality of service and reliability.
- There is a 'moment in time' opportunity in that the conditions to raise capital for FTTP investments is currently highly favourable: this might change in an uncertain future. Hence it makes sense to secure this investment now and this outweighs the option value approach of waiting until the majority of consumers are clearly dissatisfied with their service or 5G has matured as a commercial technology.
- As regards the latter it is clear to us that today 5G is simply too immature as a technology to take a bet today on it as a future replacement for FTTC. In any event, the costs of a national 5G deployment are if anything even more challenging than for a national full fibre rollout. A substantial proportion of

the costs are in fact common to both, in that 5G will require a dense full fibre network that extends to small cells: the substitutable part of a full fibre deployment that would not be needed in a 5G future is really only the 'final drop' to consumers.

Commentary on Frontier/NIC scenario choices

As can be inferred from the above, we question whether the scenarios outlined closely align to the actual technology evolution paths currently in prospect. We recognise, of course that the timescale for the NIC's work goes out to 2050. There is also an important qualifying component to our comment in that we are not clear whether Frontier is assuming 'greenfield/no regulation' conditions or is making some assumptions about future regulation and (for example) decisions on spectrum allocation.

From a 'real world' rather than theoretical perspective we would say that the plausible scenarios are as we outline above: in particular, we strongly question the assumptions that seem to underpin Scenario 3. We can see no realistic prospect of 5G being rolled out to 63% of the country (at least) whilst FTTP is the preferred technology choice to address the 37% of consumers in rural areas.

In all likelihood, 5G will trail FTTP in terms of market rollout and adoption. We base this assumption on what we know of the current technology development path for the family of technologies termed '5G', the stated plans of the principal MNOs, and the timetables for release of significant spectrum assignments suitable for 5G. Whereas there are concrete plans from various industry players to deploy FTTP in scale by 2021, the earliest prospective scale deployment of 5G by MNOs of which we are aware would not commence until 2022.

As noted above where FTTP and 5G are deployed side by side in urban areas, a large proportion of the costs of deployment are common to both technologies, namely the costs of dense fibre deployment to support FTTP and 5G small cells. On a like for like basis, CityFibre believes from information available to it that the substitutable element of the two technologies – the final drop to the consumer on an FTTP and the cost of the small cell connectivity connection to a 5G consumer at a fixed location – are broadly comparable. Indeed, if anything the latter is currently a more expensive option. Therefore we question the assumption that in urban areas 5G would be the dominant or preferred technology choice based purely on an assessment of the costs of the two network architectures.

Both FTTP networks and 5G networks will show strong economies of density and for this reason both are likely to be equivalently challenging as connectivity solutions in rural areas.

Timescales for rollout of different technologies

Linked to the point above we comment on the assumed rollout timescales for each technology scenario. Frontier assumes that full FTTP rollout cannot be achieved (even on the 'infrastructure reuse' scenario) until 2030. This may be narrowly correct in that a full national rollout of any of the available technologies, even if this commences today, will take at least a decade and possible closer to a decade and a half – *even under optimal political and regulatory conditions.* The reason for this is that there is an upper bound to how much civil infrastructure can be constructed in any given year. In the very short run, the supply of labour and materials is relatively inelastic for this purpose and this is likely to cap the total industry-wide construction of FTTP or 5G small cells. In the medium term supply may be more elastic as large civil construction companies resource up specifically for the purpose of a programme of national communications infrastructure construction. There is still an upper bound on the total construction that can take place though, imposed by the capacity of towns and cities to bear active civil works construction in their streets. Re-use of ducts and poles will not eliminate the need for extensive streetworks, given that much of the existing duct is in the wrong place, much of Openreach's access network is direct buried, and even where usable duct exists it is not always

optimally located to construct a modern fibre ring network, as it is based on the pre-existing BT/OR 'tree and branch' network topology.

If anything, the challenges for rapid rollout of 5G look even more formidable than for FTTP. Bearing in mind that the dense fibre infrastructure required to support 5G small cells will require much the same level of streetwork as an FTTP construction, there is the additional cost and time involved in siting small cells. This is likely to be significantly more complex than FTTP construction.

Therefore we would argue that if anything, and given that in particular 5G rollouts will almost certainly start later than FTTP rollout, achieving rollout of 5G in scale (either to 67% of the country as in Option 3, or even a full national rollout) is likely to take longer than a national rollout of FTTP.

Commentary on the benefits assessment

Our main comment on the Frontier study on benefits is that either by accident or design it does not assess some significant categories of benefit that may flow from a major communications infrastructure upgrade to 'full fibre'. We also question the plausibility of some of the technology scenarios chosen.

The 'use case' methodology adopted to quantify benefits excludes important social benefits and probably more importantly any consideration of spillover benefits in terms of improved productivity and competitiveness, and the impact of a *national* rollout in addressing regional imbalances in productivity and competitiveness. We find this surprising and wonder whether the NIC intends to examine these benefits separately?

Essentially, we see the private benefits to consumers from an improved ability to access and use particular services as capable of being recognised and responded to via the market, provided that some 'hold up' problems, created by faulty regulation, are removed. There is no fundamental market failure in terms of incentives to deploy services that consumers will value.

Conversely, the market is unlikely to be able to reflect and 'price in' important social benefits that would result from a comprehensive national rollout of fit for purpose connectivity services. Because of the strong economies of density, the market will, in all likelihood, fail to deliver a national footprint left to its own devices. Indeed, we believe the most likely outcome of a purely market mechanism under the current regulatory paradigm would be that FTTP would be rolled out to approximately 30-40% of the country with the remainder reliant on some combination of FTTC and fixed wireless access (FWA). If a different regulatory model was adopted (ie one which recognised that passive FTTP is a natural monopoly and regulated accordingly) then the market might deliver, without subsidy, a rollout of perhaps 75-85% of the country. The market on its own, therefore, *even if hold-up problems created by faulty regulation are removed,* will fail to deliver the social/'UK plc' benefits that would arise from a co-ordinated national rollout to (near) 100% of the country.

Frontier recognises that there are social benefits not captured in its analysis but says the *relative* contribution in terms of productivity improvements, positive externalities etc from each of the scenarios can be inferred from the direct, quantifiable benefits in terms of increased economic output. In other words, whilst Frontier has not sought to capture these categories of benefit in monetary terms it expects them to scale pro rata to the quantified benefits.

CityFibre has attempted a more direct quantification of these benefits in a piece of work we have commissioned from the consultancy Regeneris. Their report is attached to this document. The frame of reference for Regeneris's work is the wider economic benefits that accrue to towns and cities that take steps to accelerate FTTP rollout. We would be happy to discuss this report further, but at this stage we simply note that whilst direct quantification of wider social/societal benefits of improved connectivity is not straightforward we think this is where the principle policy questions, including that posed by the Government in the FTIR, lie. In particular, if these benefits are as we believe substantial and will not be fully recouped purely through the

operation of the market this justifies a more active and interventionist strategic approach to the roll-out of connectivity services than has hitherto been the case.

Frontier's assertion that these additional benefits arise proportionately on all scenarios may be true in what is described as the 'moderate evolution' future, but we question whether it is true in the 'ambitious innovation' future. There, the more restricted infrastructure scenarios could lead to 'cliff edge' effects in terms of realised productivity gains: straightforwardly, the ability of specific towns, cities or regions to realise productivity gains from (for example) the adoption of innovative work patterns enabled by the increased capability and reliability of FTTP will be determined by whether they are within the footprint of market-led FTTP rollout. It should also be recognised that innovative delivery of public services will in some cases require ubiquitous or near-ubiquitous coverage if online coverage is to substitute for offline coverage: this would be true, for instance, of remote medicine and social care applications (though we note that some services of this kind might be deliverable on less capable networks than FTTP).

As regards private benefits to business, we believe that the step-change in improvement that arises from the deployment of resilient full fibre architecture should be recognised. This improved resilience arises in two ways: first, fibre is an inherently less faulty infrastructure than one that relies in part on metallic paths. Second, new FTTP networks will be constructed on a ring architecture that is superior to the 'tree and branch' architecture of traditional telecoms networks. Ring architectures by their nature are more resilient to service interruption caused by damage to one section of the network.

Frontier's choice of use cases is open to question. It is biased towards private consumption and indeed primarily consumption by residential customers. As we note above, this ignores factors such as increased productivity gains from home working and more resilient and reliable supply chains (as SMEs migrate from xDSL/FTTC to FTTP). Frontier also largely excludes productivity gains in health and education and we are not convinced by their reasoning on this point, which is in essence that because these have not been major drivers of take-up of existing broadband networks, they are excluded from a future-looking analysis. This can be challenged on two grounds: first, from the point of view of delivery of public services, it was never a feasible option to think about digital-only delivery in the first phase of consumer adoption and acceptance of digital technology. The challenge for government has been that the people who consume the majority of public services are also those least likely to be adopters of digital technology or have the associated skills. It is hard to see this remaining true on a thirty year forward view. Second, whilst it is true that much of what is required to for example manage the flow of information through the NHS could be done through incremental improvements in existing technology, one might question whether some of the more cutting edge innovations in remote healthcare could be supported without a more substantial uplift in technology platform capabilities.

CityFibre - March 2018

Annex 3: “The socio-economic impact of FTTH”

Please follow this hyperlink for the document: “The socio-economic impact of FTTH”, WIK-Consult GmbH for FTTH Council Europe, February 2018

http://www.ftthcouncil.eu/documents/FTTH_Council_report__FINAL_and_proofread-update-20180214.pdf

Annex 4: "Short term investor confidence-raising measures", CityFibre, March 2018

REDACTED

Annex 5: FTTH/B Panorama, iData Digiworld Consulting, February 2018

Please follow this hyperlink for the document: "FTTH/B Panorama", iData Digiworld Consulting, February 2018

Annex 6: "Why local full fibre networks can deliver innovation and competition without the need for infrastructure replication", CityFibre, March 2018

Introduction

DCMS asked CityFibre to explain our reasoning as to why a competition policy based on replication of full fibre local networks delivers little benefit to offset the undoubted static costs of infrastructure replication (both direct and indirect, e.g. street works disruption), as well as the negative impact of replication on the full fibre investment case.

Our argument rests on a key distinction:

- There is merit in promoting competition between legacy and new infrastructures;
- There is merit in promoting competition over full fibre infrastructure (at the active and service layers);
- There is little if any merit in promoting competition between new fibre infrastructures at the passive layer especially when considering the high costs of replication.

In this annex we cover three principal points:

- Where the scope for innovation and competition resides in a full fibre network architecture;
- Questions around the quality and cost of construction of full fibre networks;
- The extent to which regulatory obligations can support good consumer outcomes on a single, passive full fibre local network.

Innovation and competition: Active versus Passive

As a general principle, we believe that competition between technologies will generally be beneficial when different technologies offer differentiated capabilities. These capabilities may not be known at the outset of a competitive process (i.e. the technology is immature), or consumers' preferences between different capabilities may be best revealed through the operation of the competitive process. This is particularly true if the technology has commodity characteristics.

In the first generation of competition in telecommunications, characterised by end-to-end infrastructure competition between vertically integrated providers, the policy to promote such competition reflected the different capabilities of the networks and sought (as outlined above) to allow consumers to express their preference through the competitive process. For instance, first generation digital mobile networks had slightly different characteristics on call quality and coverage that were appreciable to the consumer depending on the standards adopted and the spectrum used. Cable TV systems competed with incumbent copper-based telecoms networks and had different capabilities and transmission characteristics. There has never been a policy (either here or anywhere else in the world) of promoting competition either between copper telecoms networks or between rival cable TV systems deployed in the same territory.

The end-to-end infrastructure competition policy adopted in the 1990s was thus not without theoretical merit albeit severely flawed in its execution. It did, at least, allow some competitive differentiation of services that reflected different underlying technologies.

Ofcom's Telecommunications Strategic Review, adopted in 2006, eschewed end-to-end infrastructure competition in favour of 'unbundling' of local loops: this in part reflected exogenous circumstances (notably the bankruptcy of the two principal cable companies following the 2001 TMT crash) but it also reflected the emergence of a key distinction that is important to understand in the context of the choices available in relation to full fibre networks: the concept of the 'Layer' model as first outlined by the ITU.

At the technical standards level, the adoption of the layer model allows a bright-line distinction to be drawn between the 'passive' infrastructure (essentially, the physical infrastructure whether copper, cable or wireless spectrum and the civil infrastructure in or on which it is deployed) and the 'active' layer (the electronics attached at either end of this infrastructure in which services are created and provisioned). Service providers and equipment vendors can supply and install apparatus that interfaces with the underlying technology based on agreed open industry standards. Local loop unbundling as introduced in the TSR was therefore predicated on an assumption that most of the benefits of full end to end infrastructure competition could be achieved by allowing service providers to obtain access to the passive copper infrastructure of BT and deploy their own active electronics at either end of the local loop, ie in the local exchange and in the consumers' home or business. The limitation of this policy was, of course, the inherent physical limitation of the copper.

Competition on this model is principally through innovation in the services created at the active layer, and through investment in the electronic equipment attached. It is also, inter alia, on the geographic extent of the virtual network thus created. It should be noted that similar distinctions are drawn in the wireless market where extensive network sharing arrangements have been put in place whereby operators jointly build and consume passive infrastructure but compete with each other in active services creation. This does not of course mean that there are no longer incentives to improve or upgrade the underlying physical infrastructure but the balance of the competitive process is in service creation and innovation at the passive layer.

From this, we can see that in the full fibre environment a competition model based on replication of the passive infrastructure rather than through service creation and innovation at the active services level would be unusual and has few, if any, historical precedents. The closest analogue is the 1990s period of end-to-end infrastructure competition, but this was between substantially different technologies (eg cable TV systems and legacy copper networks). (We note here inter alia there will remain competition between technologies going forward between cable TV systems on the one hand and full fibre networks on the other where these are in separate ownership.) With these considerations in mind, we can analyse the merits of a full fibre infrastructure competition policy by considering whether such a policy is likely to lead to 'competition for the market' between substantially different versions of 'full fibre' network.

Design and build considerations in a full fibre network

At the technical level, four considerations need to be made when building a full fibre local network:

- What services are to be delivered, their likely bandwidth requirements;
- The 'future-proofing' of the network for unanticipated demand;
- Quality of service and resilience;
- Minimising cost and disruption in the build phase.

CityFibre believes that on each of these it is already possible to say with considerable certainty what an 'industry best practice' would look like. The UK will in fact benefit from its late deployment of full fibre in that the standards and best practice have now been established through hard-won experience in more developed national markets.

1. **Service requirements:** A full fibre network needs to be constructed so as to address four key business segments: residential broadband consumers; business users; the local public sector estate and anticipated public sector use cases; and backhaul to wireless sites including anticipated 5G small cells. CityFibre adopts a 'well planned city' planning model whereby all of these sources of potential demand are mapped when designing an initial spine network rollout in a given town or city.

Residents
Ultimate potential for gigabit speed fibre to the home deployment

SMEs
Next generation gigabit speed fibre services small and medium sized businesses

Mobile
Pure fibre backhaul connectivity for 4G/LTE mobile networks

Enterprise
World-class pure fibre digital connectivity for large companies

Smart city applications
Enables city-wide Wi-Fi, traffic control and high definition CCTV solutions

Public sector
Ultra-fast connections to council sites, schools, NHS sites, community hubs and sheltered accommodation

This means that a network will be more physically extensive and have more flexibility points than would be the case if it was being built solely to address one of these market segments.

2. **Future proofing for unanticipated demand:** The demand characteristics for all four segments are difficult to predict with total certainty: this is particularly true in relation to future 'smart city' applications and for 5G wireless – the latter problem is evident in the current lack of concrete plans for small cell deployment by the MNOs. CityFibre has adopted a '50 year rule' whereby the fibre count and flexibility points in the network are intended to meet all demands that we can reasonably foresee on that time horizon. Whilst it cannot be ruled out that further fibre deployment (ie additional fibre optic strands) will be required due to a currently unanticipated demand, the network is configured so that these deployments can be made with only incremental cost and importantly without the need for further substantial civil infrastructure construction.

   Typically, our full fibre network infrastructure is designed to include an extensive fibre count capacity available for use well beyond the initial requirements. The fibre spine or ring at the heart of a deployment will typically have an initial 288 (or higher) fibre count, with fibre joint enclosures and chambers placed at strategically advantageous locations to allow further connectivity. The duct conduit has ample space to allow further cables to be installed. Access connectivity to specific locations is addressed using either dual or single fibre cable connections, each cable consisting of a minimum 12 fibre count cable ensuring adequate future capability.

   By careful analysis of potential demand points and areas of aggregation at design stage, we are able to plan our network footprint to best serve current and future demand with a 'Build Once' approach.

3. **Quality and resilience:** Fibre networks designed to an appropriate standard can deliver the kind of resilience and QoS metrics that are currently only available (at a considerable price premium) to businesses purchasing dedicated leased lines. The adoption of a resilient ring architecture, rather than the 'tree and branch' design of a traditional telecoms network, also provides a much greater inherent resilience as it protects users from service disruption when (as is not uncommon) a fibre optic connection is damaged by streetworks undertaken by another utility.

CityFibre recently upgraded the standard specification of all single-mode optical fibre cables used within our metro networks. All new metro installations now use optical fibre cabling conforming to ITU-T recommendation G657.A1. This improves bend tolerance (10mm versus 30mm for the pre-existing industry standard G652) and operates over a wider range of wavelengths. It also allows us to use smaller cables and therefore achieve higher capacity in the same space. This in turn supports use of faster and less intrusive construction techniques (see below).

A further issue for consideration is whether users receive services over a dedicated or shared connection. In theory, a full fibre network could offer a dedicated end-to-end fibre connection to each and every user. In practice, most fibre deployments for the residential and small business market are likely to be based on a shared GPON network architecture. Even so, this will mean that not just on headline speeds but on quality and resilience, consumers see a massive increase in capability over their current service offering. More importantly, if a service provider wished to migrate from a GPON offering to a dedicated fibre offering, this could be provided within the network architecture relatively easily (ie without requiring 'overbuild type' construction).

4. **Minimising costs and disruption in the build phase:** Any full fibre builder is likely to make extensive use of a range of planning tools that now form an industry standard, and to use new techniques adopted in recent years to minimise the actual quantity and impact of civil works. These include narrow trenching techniques and the use of devices that allow additional fibres to be 'blown' from one chamber to the next. As we noted above, Improvements are also being made in our capability to physically bend fibres without degradation of service, which create greater scope for deployment at speed and with minimal additional engineering. We now regularly use directional drilling to limit damage to road surfaces and therefore avoid disrupting traffic at a road crossing. By using this trenchless technology, instead of excavating major carriageways we are now able to always consider a method that minimises disruption to the public.

   There are still significant issues to address in relation to the use of existing civil works particularly for flying overhead fibre connections to premises, but these are likely to be resolved on an industry-wide basis.

   The only unresolved question in relation to costs and impact of deployment is the extent to which wireless deployment may eventually remove the need for overhead or ducted lead-ins to the consumer. CityFibre is agnostic as to the long-term choice of wireless or fibre for this final customer connection but notes that, based on our experience and participation in a trial of '5G type' technology, mass market use of 5G wireless to deliver comparable service quality to an FTTP connection is currently some years away.

Regulation of a full fibre network

The foregoing analysis rests on two assumptions: that innovation and competition at the active layer is secured, and that the design and build characteristics outlined above are guaranteed. CityFibre is an open access, wholesale only provider and hence sees it as axiomatic that our deployment of full fibre networks would lead to the emergence of a healthy ecosystem of competitive providers at the active services layer. We would also expect contractual obligations to service providers to guarantee the kind of service quality and resilience characteristics and adoption of industry best practice on construction outlined above.

Having said this, we recognised in our main FTIR submission that the logical end-point of the full fibre market is likely to involve some regulatory oversight of the full fibre networks deployed. That oversight could be in the form of downstream regulatory obligations imposed in the form of operating conditions following a finding of

Significant Market Power[1] or could be established ex ante were the Government to adopt a franchising model for full fibre.

The foregoing analysis suggests some likely features of a regulatory system. It would be possible to contemplate general obligations to provide open access, non-discrimination obligations to the extent that the full fibre provider was also active in a downstream market (which could include offering wholesale services in the active layer), and Quality of Service guarantees. Particularly in a franchising model it would also be possible for the Government to impose specific standards in relation to the methods of construction adopted.

Moreover, if either through the evolution of the market on its current direction or through franchising the outcome was different FTTP providers operating in different territories, yardstick regulation would be possible so that best practice was identified and rapidly transmitted through the entire industry via regulatory obligations.

In general regulation is a poor substitute for competition as regards the more qualitative features of a well-functioning market such as service creation and innovation: it is difficult to decree via regulation that firms should be creative and innovative and to make this a meaningful and measurable obligation. But as this analysis shows, these are not sacrificed by adopting policies that focus competition at the active wholesale layer. Regulation can be brought to bear, as needed, to supplement this by guaranteeing non-discrimination, open access and (if necessary) fair pricing for access to the passive infrastructure.

CityFibre - March 2018

[1] It should be noted that a finding of Significant Market Power is not a 'given': initially at least FTTP constructed by firms other than the incumbent are likely to compete with products offered over FTTC networks and cable systems: the question of whether products offered over these different neworks constitute sufficiently close substitutes to be a competitive constraint is an empirical one.

Annex 7: "The economics of full fibre in the 'three segments'", CityFibre, March 2018

REDACTED

Annex 8: "Options for accelerated full fibre rollout in the UK", CityFibre, March 2018

Introduction

The Government's vision for the UK's digital infrastructure is to achieve:

- Ubiquitous world-class, future-proof digital infrastructure based on full fibre and 5G;
- At least 10 million premises connected to full fibre by 2025, with a clear path to national coverage by the end of the decade;
- Digital connectivity that is seamless, reliable, long-lasting and also widely available and affordable to UK businesses and consumers.

The Government has also said that to deliver this vision it aims to promote the right competitive structures, a stable market for investment, a move away from "monopolistic markets" and collaboration within the industry.

In this context, we understand that the government's choices to facilitate and incentivise full fibre rollout should result in full fibre reaching as many areas in the UK as possible and, within each area, as many premises as possible.

As CityFibre outlined in our original FTIR submission, the main risks to this vision relate to:

- Actual or potential overbuild of full fibre networks by other full fibre networks (including the strategic announcements of full fibre deployments) chilling or holding up alternative players' investment case for full fibre;
- Consumers being deterred from migrating from legacy networks to new full fibre networks because of tactical rollout of G.fast where full fibre is due to be deployed; aggressive pricing of legacy products; misleading advertising; and inadequate switching processes, with low full fibre take up undermining alternative players' investment case.

In this Annex, we discuss actions that the government and Ofcom could put in place to mitigate these risks, focusing on actions which:

- minimise actual or potential overbuild of full fibre by full fibre, and the threat of overbuild;
- ensure full fibre products are able to compete on a level playing field with legacy products.

Actions that the Government could put in place

In our view, the government and Ofcom both have roles to play in securing the efficient rollout of full fibre networks across the UK, with Government's role being to set a clear policy framework and set of objectives, and Ofcom fulfilling this framework through its own activities. The government could take direct action and/or it could steer Ofcom through its Strategic Statement of Principles (SSP) to implement several short and medium-term measures that could be taken to mitigate the above-mentioned risks. These measures fall into four main categories and are not mutually exclusive:

a) Encourage and enable co-investment models;

b) Increase transparency and accountability in the industry;

c) Decrease the incentive to overbuild at local level; and

d) Improve the regulatory framework.

Alternatively, Government could take more direct action over the longer-term to implement a franchising model, which could take a variety of forms.

We discuss each of these approaches in turn.

a) *Encourage and enable co-investment models*

Co-investment models are a good way to facilitate the efficient rollout of full-fibre, because they allow operators to extend their network deployments much further and faster than if operating individually, by reducing costs and sharing risks. They are at the heart of the Commission's revised European Electronic Communication Code (the EECC) as an attractive model of investment, insofar as they result in increased very high capacity (VHC) network rollout and more effective competition. There are also many examples in Europe and internationally, where telecoms operators (including incumbents and challengers) and other companies have cooperated in building and operating networks.

There are three main types of co-investment models which are currently being implemented in European telecoms markets:

- **Joint venture**: In a joint venture, partners establish a new entity (separate from its owners) which they jointly own and control – they can contribute assets or financing. The new entity is responsible for deploying and operating the network which interested parties can access on a wholesale basis.

  *A good example of this is the (50:50) **joint venture agreement between Vodafone and ESB**, the Irish state-owned electricity company (SIRO). The aim is to rollout to 500,000 homes (across 51 towns) by the end of 2018 and at a cost of €450 million. The first ten locations, dubbed Ireland's first Gigabit towns or "fibrehoods", to be included in SIRO's rollout are Cavan, Dundalk, Westport, Castlebar, Sligo, Carrigaline, Tralee, Navan, Letterkenny and Wexford. While SIRO will build and manage the FTTP network, open access will be offered to all authorised broadband providers in Ireland.*[2]

- **Horizontal co-investment (Reciprocal access)**: This is the simplest model of co-investment where partners are responsible for developing and operating their own network infrastructure, usually in geographically different areas. The parties to such agreements serve customers via each other's network infrastructure through horizontal reciprocal access arrangements.

  *There are already a number of such agreements across Europe. For example, **Vodafone Portugal and NOS agreed a reciprocal access arrangement in 2017.**[3] According to the terms of the commercial agreement the parties will deploy and share an FTTH network that will reach around 2.6 million homes and businesses in Portugal. The agreement also covers mobile infrastructure, including at least 200 mobile towers.*

  According to the terms of the deal each operator will deploy and share (passive) optical fibre to homes, and to deploy but not share active equipment in the central office as well as the link from the central office to the fibre backbone. Customer connections and activations will be carried out independently, with each operator having freedom to decide how to design and sell their respective retail products.

  As a result of this agreement, NOS will increase its fibre-optic network coverage from 3.76 million to more than 4.4 million homes and businesses by the end of 2018, representing more than 80 per cent of all households in the country. Meanwhile, Vodafone Portugal will gain

[2] See https://n.vodafone.ie/aboutus/press/siro-unveiled.html and http://www.vodafone.com/content/index/media/vodafone-group-releases/2014/esb-vodafone-ireland.html
[3] https://www.fibre-systems.com/news/vodafone-portugal-and-nos-strike-network-sharing-deal

access to 1.3 million properties in new areas, increasing its FTTH footprint from 2.7 million homes to 4.0 million.

- **Vertical co-investment (One-way access)**: The key difference between this type of co-investment model and reciprocal access is that only one party builds the network and provides access to the other party, typically a service provider operating in the downstream market. Such arrangements could still be considered to be a co-investment if, for example, the contracts for access are sufficiently large and long-term to have a material impact on the risk of the investment.

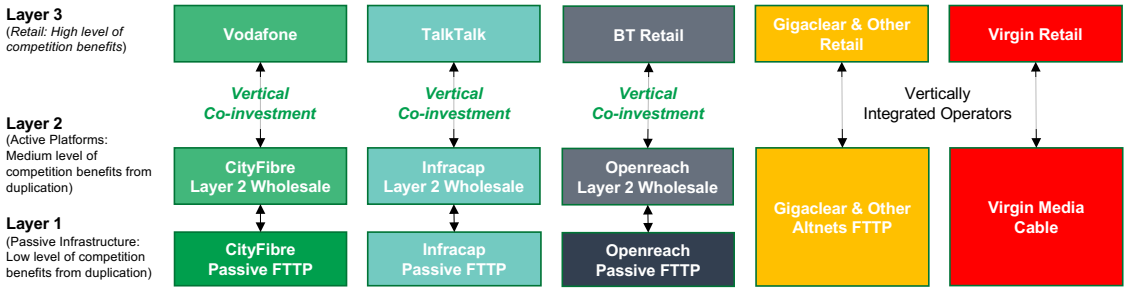
  *A good example of this is the **one-way access model implemented by fixed operators in France since 2010**.[4] Under the rules set by the French NRA (ARCEP) the first operator to connect a building with FTTH is mandated to provide passive access to other interested operators at mutualisation point and offer co-investment. Passive access is offered either through a dedicated fibre line or through a shared fibre line, to the other members of the co-investment agreement, in the form of a 30-year (or 24-year) indefeasible rights of use (hereinafter referred to as "IRU"), renewable two times.*

  *Another pertinent example of **one-way access is the deal between Vodafone Portugal and DST**, a wholesale-only network operator focusing on rural areas which is partially publicly-funded. Vodafone has signed a long-term contract for capacity on DST's network. The terms of this contract in the areas of DST's network that have been supported by public funds are determined by the guidance of DST's bid during the public tender process.[5]*

There are several competition benefits to co-investments. By reducing the costs of network investment and allowing the sharing of risk, such agreements lower the barriers to entry for new players and allows all existing players (incumbents and challengers) to extend their geographic footprint – in both cases, accelerating the pace of new infrastructure deployment in a predetermined geography. In this context, they can be key in facilitating the deployment of full fibre networks. They can have a transformative impact on the telecoms market by shifting the model of competition from one that is based on wholesale access to SMP operators' networks to one of infrastructure competition between different network operators across different geographies. They also allow for increased competition and innovation below the level of the value chain where wholesale access is provided for.

Co-investments in the UK content. Examples of vertical co-investment are starting to appear in the UK. For example CityFibre's strategic agreement with Vodafone is a form of co-investment, whereby Vodafone has committed to a long-term contract with a 'minimum volume commitment' and agreed wholesale access charges, which in turn unlocks CityFibre's investment in the passive full fibre infrastructure. The details that are publicly available about TalkTalk and Infracap's planned full fibre rollout also indicate that this too might operate in this form of risk sharing structure. Under legal separation, it could be said that BT Retail and Openreach operate in a similar vertical co-investment arrangement. This is illustrated in the following diagram:

[4] http://berec.europa.eu/doc/berec/bor/bor11_69_coinvest
https://www.telegeography.com/products/commsupdate/articles/2014/05/15/vodafone-portugal-strikes-fibre-deal-with-dstelecom/mentnga.pdf
[5] https://www.telegeography.com/products/commsupdate/articles/2014/05/15/vodafone-portugal-strikes-fibre-deal-with-dstelecom/

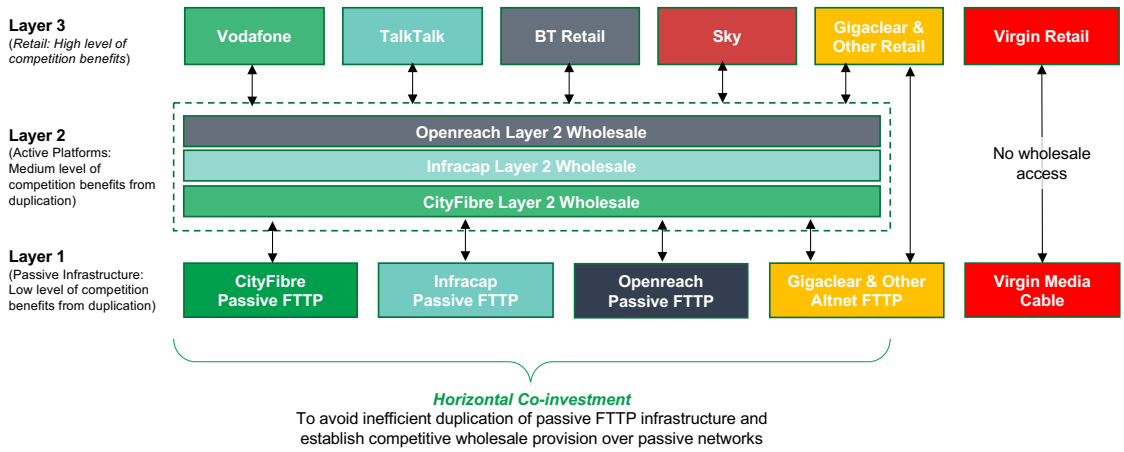


Vertical Co-investment Models Emerging in the UK

While vertical co-investment appears to be playing an important role in stimulating a landrush in Segment 1 in the UK, horizontal co-investment has the potential to extend FTTP into Segment 2 where the economics are more challenging.

Horizontal co-investments recognise the natural monopoly characteristics of full fibre at the passive layer, and that there are no economic or competition benefits that can be derived from its duplication. Rather than 'overbuild', horizontal agreements enable the layer 2 active wholesale capabilities of one party to access the passive infrastructure of another party, and visa-versa. For example, a horizontal agreement between CityFibre (5m premises) and TalkTalk/Infracap (c.3m premises) would result in the active layer wholesale access systems of both CityFibre and Infracap being able to provide wholesale FTTP services to their ISP customers across a combined footprint of c.8 million premises – without the need to duplicate passive full fibre infrastructure to these 8 million premises (an estimated cost saving of circa £4 billion, assuming £500 per premise passed) and resulting in more robust business cases for the passive FTTP investments made by both CityFibre and Infracap due to higher penetration rates. Such horizontal risk sharing models are often referred to as 'reciprocal build' agreements.

The following illustration reflects how these phases might play out in the UK, assuming Openreach also entered into horizontal co-investment agreements with other FTTP infrastructure builders. ISPs not committed to participation in the co-investment model (for example Sky in the illustration below) have a choice of competitive wholesale services operating across a geographically wider FTTP footprint.



The regulatory framework in the UK can be more supportive of such co-investment agreements by setting up a framework with clear rules for industry collaboration that allows co-investment agreements to be designed and negotiated, while ensuring compliance with competition law. At the moment, operators (especially Openreach) are reluctant to engage in co-investment discussions due to the risk of being perceived as breaching competition law, (though horizontal collaboration agreements can be structured so at to avoid breaches of competition law), but as we have noted previously, Openreach also has a unique incentive to prioritise crushing competition over extending the geographic footprint of full fibre.

> *Switzerland provides an example of a regulator (ComCom) playing a key role in facilitating co-investment by setting a clear framework for industry collaboration to take place. ComCom held nine roundtables where it acted as a mediator to help companies coordinate FTTH rollout, so investments took place as efficiently as possible. The outcome from these roundtables was a framework for FTTH co-investment in Switzerland, reaching agreements in areas such as network architecture and standardisation of certain activities. At the same time, the Swiss competition authority scrutinised operators' cooperation agreements to minimise anticompetitive effects (for example, certain exclusivity clauses were prohibited).*

As well as Government and the regulator proactively encouraging horizontal collaboration, the regulatory framework can also **ensure that co-investment agreements are not subject to the same level of regulation as an SMP incumbent's network.** For example, although wholesale access arrangements are at the heart of successful co-investments, they could be spared any price regulation for a pre-determined period of time. According to a report prepared for the FTTH Council fibre access is fundamentally cheaper than copper and this should be reflected in the price full fibre products.[6]

In addition, and as we argued in our response to Ofcom's WLA consultation, Ofcom's position on the rules to be applied to a potential future co-investment involving Openreach are unclear and represent a considerable risk to potential investment. This could for instance involve providing clarity on how, should Openreach participate in a co-investment initiative, the resultant network construction by that body would be subject to obligations such as equivalence of inputs (EoI) and non-discrimination obligations more generally. At present, because Ofcom does not see the value of horizontal collaboration, it has made no effort to proactively describe the resultant regulatory implications.

b) *Increase transparency and accountability in the industry*

Under this policy approach the government would impose a transparency and accountability obligation on all industry players. The main objective of this obligation would be to increase the overall transparency around FTTH build plans and help to guide the market towards the most geographically extensive "landrush'" possible and avoiding the '"hold up" problem resulting from speculative plans deterring others from building in the same areas

Such a transparency obligation could be implemented in different ways, two of which are described below.

- **Option b1**: In parallel to any public announcement of intentions to invest, network providers would be required to immediately set out a detailed annual plan for full fibre investment which they submit to Ofcom (or another third-party) which would then publish a national 'report card' showing which parts of the UK have full fibre in construction, have firm committed plans for construction, or currently fall outside of any firm build plans. This information could be provided down to postcode level. The report card would be reviewed at year end to assess the performance of different operators and highlight

[6] http://www.ftthcouncil.eu/documents/Reports/FTTH_Finance_Report.pdf (page 25)

shortfalls against stated commitments. This mechanism would be not dissimilar to that envisaged in the draft European Electronic Communications Code (Article 23).

The above would create a mechanism to both 'name and shame' operators making spurious PR announcements and also help to direct initial full fibre investment to maximise coverage and limit overbuild. It would not, however, prevent overbuild per se.

- **Option b2**: A more prescriptive alternative to the above approach would be to require operators to submit detailed confidential build plans to Ofcom or another third-party. That third party would then decide which operators invest where according to an assessment of the investment plans in a manner which ensures most of the UK is covered with full fibre as quickly as possible. This approach would ensure overbuild is avoided and network deployment by different operators is spread across the whole of the UK. Thereafter network operators would be required to submit yearly detailed build-plans as per Option b1.

On balance, we believe a proportionate approach would be to adopt Option b1 initially, and only if there is evidence that even with greater transparency of plans, an orderly landrush is not emerging, adopt the more prescriptive Option b2.

c) *Decrease the incentive to overbuild at local level*

In some cases, there may be merit in Government introducing additional measures to limit or avoid overbuild of full fibre networks.

Operators' incentives to overbuild can be mitigated in a number of different ways. For example:

- **Local authorities can provide permits (to dig) on a 'first come first serve' basis**. This means local authorities would have a right to refuse subsequent permits for full fibre deployment once a connection to a premise already exists. This option could be limited to a set time frame, such as up to five years. The objective of this approach would be to mitigate overbuild in a local area (and indirectly encourage the spreading of FTTH network deployment across the UK). Rules and guidance would need to be in place to prevent the incumbent from gaming this approach and locking out alternative players. But in principle, there are powerful benefits from allowing local authorities to directly assess the value of multiple builds (and resultant disruption) to their community.
- **Specific overbuild protection could be given to recipients of a public subsidy:** for example, funds distributed to local authorities via the LFFN programme would receive protection from overbuild for a time-limited period.
- S**pecific provisions could be put in place to prohibit overbuild by** Openreach in a given location until there is a fit-for-purpose DPA remedy, which levels the playing field between alternative operators and Openreach (we describe improvements which are required to the DPA remedy below).

d) *Improve the regulatory framework*

We think it is important for Ofcom and the Government to be fully aligned on providing clear signals to the market.

At a high level, and as per the government's stated objectives, these signals should include a preference for *a)* rolling out full fibre networks (rather than other inferior technologies), *b)* across the whole of the UK (rather than the most economical areas which correspond to 40% of the UK), *c)* supported by a long term healthy competitive market (where altnets continue to provide the key competitive constraint on the

incumbent) d) maximising speed and coverage of full fibre deployment over passive infrastructure duplication [or limiting overbuild] e) level playing field between legacy and full fibre networks and action to facilitate consumers' migration from legacy to full fibre networks.

We hope an SSP on these terms would help address barriers to full fibre rollout that are currently in Ofcom's gift. In particular, we have identified the following priorities for Ofcom:

- **Further improvements to the Duct and Pole Access (DPA) remedy are required**.

  As we have previously argued in our response to Ofcom's DPA consultation there a number of improvements that need to be introduced to the DPA remedy.

  At present, Ofcom's assessment of the utility of DPA – as evidenced by their frequent claims of up to 50% cost reductions on scale full fibre deployments – are hopelessly optimistic. A large part of the existing local access network is directly buried and hence DPA is of no use at all[7]. Of the remainder, a further substantial proportion involves so-called 'overhead deployment' – i.e. customer connections are strung on telegraph poles. The regulatory provisions for overhead lead-ins using Openreach's poles need to be substantially improved to allow this option to be used at scale. CityFibre considers that Ofcom has not yet identified solutions that are scalable and in fact has left this issue for industry to address at working group level. This means that, in reality, a workable solution for overhead lead-ins is probably at least two years away if indeed it emerges at all. The proposals also give altnets insufficient autonomy to undertake overhead lead-in works, creating an undue level of reliance on Openreach. Leaving the current proposals unchanged could seriously affect the user experience when switching to FTTP, and as such could harm the successful deployment of FTTP networks and Ultrafast Broadband (UFBB) services.

  Furthermore, because Ofcom has failed to introduce any overbuild restriction, the incentives on Openreach are straightforwardly to be as tardy as possible in delivering any improvements to DPA. Thus Ofcom has failed to create the appropriate incentives for early action to make DPA properly workable and scalable.

- **Stronger rules on G.fast pricing**. If there is no specific overbuild protection against Opereach's G.Fast, we believe there is merit in the establishment of a price floor for G.fast based on a fair allocation of common costs to that product (a point which we have argued in our response to Ofcom's WLA consultation).

  We recognise the fact that Ofcom can use its ex-post competition powers to intervene should Openreach set too low a price for G.fast. However, history has proven time and time again that competition law investigations can take several years to come to a successful completion (and can also be subject to further appeals). In the interim, while a competition law case against predatory pricing by Openreach is ongoing, many altnets full fibre business case would be undermined beyond repair. Ofcom's reluctance to take action on this is puzzling, given that if it is genuinely interested in promoting end-to-end infrastructure competition the first and most obvious step to take would be to head off the risk of predation by the dominant incumbent.

- **Stronger rules on switching**. As we have argued in our response to Ofcom's WLA consultation, there is currently no process for switches involving UFBB networks. We have already argued that Ofcom should launch a review of arrangements for switching to and between UFBB networks and services as soon as possible - including switching to UFBB networks from standard broadband (SBB) and superfast broadband (SFBB) networks. Again, Ofcom's lack of action on this is puzzling. Remarkably,

[7] Remarkably, Openreach cannot confirm the exact proportions as it claims not to have this information. But our planning work suggests as much a third of the access network in a typical city deployment may be direct buried.

it chose last year to wind up its pre-existing project on cross-platform switching at a time when its own stated strategy purports to be promoting end-to-end infrastructure competition.

- **Advertising**. We also look to Government and Ofcom to work within their powers and influence to work with all stakeholders to ensure that advertising regulation and best practice enables consumers to make informed choices about switching from copper to full fibre products.

Franchising

Should progress towards achieving the government's objectives for full fibre coverage be at risk or there be clear signs of a market failure, a franchising model could be implemented as a complementary option. The advantage of this approach is that it allows the Government to set out the desired parameters in advance, including coverage, rollout times and rules on wholesale access. On the other hand, we recognise that the complexity associated with this type of model may require time to design and implement, as well as careful design to avoid unintended consequences.

A franchising model can be implemented in several ways, depending on how its main components are designed. The key design parameters are:

- Geographic areas (segments) to include in the model.
- How coverage areas are packaged.
- Mechanisms for allocating the coverage areas.
- Design of wholesale access obligations.

The model design would also include mechanisms to ensure competitive incentives are preserved. Separate coverage areas can be allocated on the basis of competitive processes (*competition for the market*), allowing the regulator to compare performance across different areas. Also, a requirement to provide wholesale access can be introduced into the package.

We note that regardless of the specific design of the franchising model, fibre operators allocated to each coverage area will continue to compete with other broadband infrastructure present within that coverage area (e.g. Virgin's network or FTTC already deployed by BT).

In all segments, the franchising model design could also incorporate specific requirements on franchisees to bring full fibre to specific public service providers such as hospitals or schools. For example, the design of the National Broadband Network in New Zealand specified that hospitals, schools and integrated family health centres were prioritised.[8]

- *Segments to include in the model and how to package them into coverage areas*

  A well-designed franchising model can potentially overcome the limitations that deter or delay full fibre investment in all segments. For example, it can remove incentives for strategic announcements and/or overbuild. It can also help maximise coverage and accelerate roll out by including specific rollout obligations and delivery times.

  There are multiple options for packaging the coverage areas. The main principle is that the design of the coverage areas **will need to take into account areas actually covered by full-fibre and firm deployment commitments and contracts already in place.**. The number of coverage areas is an important consideration in the model design. A franchising model can be designed to enable yardstick

[8] http://www.mbie.govt.nz/info-services/sectors-industries/technology-communications/fast-broadband/documents-image-library/rural-broadband-initiative/rural-broadband-initiative-phase-1-august-2016.pdf

competition.[9] Having several areas provides the regulator with a sufficient set of observations to carry out meaningful benchmarking analysis. There are examples in other regulated industries where yardstick competition is used as a regulatory tool, for example:

- Regulation of water and electricity distribution networks – Ofwat and Ofgem use benchmarking analysis as part of their price control methodologies (for example, to compare costs and set regulatory targets). The existence of several companies allow regulators to perform these comparisons in a meaningful way.
- Route-level regulation for Network Rail – The ORR proposed regulatory framework for PR18 establishes greater focus on route-level regulation, with greater use of comparison of route-level data to help explore reasons for differences between routes, such as structural differences, and investigate outliers.[10]

A factor to take into account in the design is to what extent the diversity of franchisees matter: if all coverage areas were allocated to only one or only few companies the benefits of yardstick competition would be greatly reduced.

- *How areas are allocated*

  Allocation should be based on a competitive process. However, the design of the selection criteria is critical to deliver the desired outcomes. There are several examples, not least the design and delivery of the BDUK process, where poor design choices have inadvertently reinforced the incumbent's grip on the market. The selection criteria should therefore consider all the following elements:

  - **The level of subsidy**: if not all coverage areas are expected to be overall profitable (for example, if even where profitable and unprofitable areas are packaged together some areas would remain unprofitable), bids could be positive (bidders business case do not require subsidy, or bidders pay for right to build and operate in an area) or negative (bidders request subsidy).
  - **Competition**: To prevent re-monopolisation and allow the benefits of yardstick competition, there would need to be restrictions on the number of areas that a bidder can win.
  - **Vertical integration**: Franchisees should ideally be restricted from operating in the downstream retail market. The extent to which operations at the 'active' network layer and resultant wholesale market activity would be permitted by the franchisee would also need to be determined.
  - **The design of the auction process**: There are well-understood complexities around auction design itself to avoid 'gaming' behaviour in the auction itself, but equally important will be to ensure that the auction process does not lead to operators submitting unsustainably high bids in the expectation that e.g. coverage obligations could be subsequently renegotiated downwards.
  - **Duration of the contracts**: These could be temporary or permanent. If awarded temporarily, there needs to be a decision on the length of the contract period. An economically meaningful franchise period would need to cover at least the initial payback period on a franchise build which would equate to the likely time required for completing the franchise + a 7-9 year payback period calculated from the end-date of completion.
  - **What elements need to be set in advanced**: The design needs to consider which elements of the agreement will be fixed and which ones will be determined by the bidding process. Elements that can be fixed are: technical characteristics, quality of service, prices etc.

[9] Yardstick competition is used by regulators to compare performance across local monopolies, and set targets according to what is considered to be an efficient benchmark based on these comparisons.
[10] See http://orr.gov.uk/__data/assets/pdf_file/0018/21960/pr18-working-paper-1-implementing-route-level-regulation.pdf

- **EU regulatory compliance, state aid and competition law considerations:** It is difficult to see how franchising – which involves the granting of an exclusive right – can be compatible with our EU regulatory obligations for as long as we remain a Member State or fully compliant with the acquis during a post-Brexit transition period. Even beyond this point, and depending on the eventual form of economic agreement reached with the EU regarding our post-Brexit relationship, there may be ongoing questions of compliance with state aid rules as well as domestic competition law.

  Example: The Ultra-Fast Broadband (UFB) programme in New Zealand

  On October 2009 the New Zealand Government invited potential partners to submit proposals on how they would co-invest with the Government to achieve its Ultra-Fast Broadband objective. The New Zealand Government's intention was to give access to FTTP to around 87% of the population by the end of 2022. The government identified 33 coverage areas. Four companies were finally selected to build and operate these FTTP networks. The terms of the tender specified that UFB partners should be structurally separate from the retail service providers. Having won a significant fraction of the contracts conditional on this separation, Telecom New Zealand underwent a structural separation, creating Chorus Limited.

- *Wholesale access obligations*

  Finally, the model should consider what wholesale access mechanisms to put in place. Questions to consider when assessing the options for wholesale access are:

  - Should access be passive, active or both? Passive access should be a minimum requirement given it would facilitate maximum levels innovation. However, operators should have the option to provide active access too.
  - If active access is allowed, should it be subject to non-discrimination obligations at the passive level? – Our view is that this should be the case.
  - What type of wholesale access obligations should be offered and should these vary by region?- Offering passive access in all areas would be the simplest approach to implement.
  - Should prices be set in advance, or should there be pricing freedom, recognising: i) potential competition from existing products and ii) the need for new fibre networks to attract customers?
  - Should there be a pre-determined period over which franchisees would not be subject to price regulation (but will need to provide wholesale access)? - After this period they could also be subject to price and access regulation.
  - If there is pricing freedom, for how long should it last? At what stage would pricing transition to a RAB model (following fair bet principle)?
  - Is the overarching policy objective to have uniform national pricing? If so, that will dictate the answers to some of these questions.

    Example (continued): The Ultra-Fast Broadband (UFB) programme in New Zealand

    In the UFB example, wholesale access obligations (passive and active products) were part of the contractual terms for granting the regional franchises. Price caps for wholesale products are part of the contract.

- *Risks associated with a franchising model*

  Designing a franchising model is a complex task and requires careful thinking to avoid unintended consequences. For example, we have identified the following risks that government would need to mitigate:

  - In practice, by the time the franchising model can be implemented, some areas in the UK would be covered by full fibre networks. Therefore, the design of franchising model needs to recognise the pre-existence of full fibre in a coverage area. Specifically, there is a risk that setting coverage areas where there is already full fibre investment underway would undermine the economics of the pre-existing infrastructure.

  - The franchise design must avoid an outcome where the conditions for awarding coverage areas result in Openreach as the only credible bidder. Similarly, the franchise design should avoid a situation where Openreach is awarded all or a large number of coverage areas. As discussed above, ensuring different companies are allocated different coverage areas would maximise the benefits of yardstick competition. An option to address this risk is to cap the total numbers of coverage areas any single firm could serve. In that sense, there are lessons to be learned from the BDUK. programme, where outcomes were skewed strongly in favour of Openreach.

  - The design of a franchising model needs to avoid perverse incentives: there needs to be an assessment of the risk that incentives to deploy full fibre in the short term could be reduced if a franchising model is anticipated in the medium or longer term.

CityFibre - March 2018

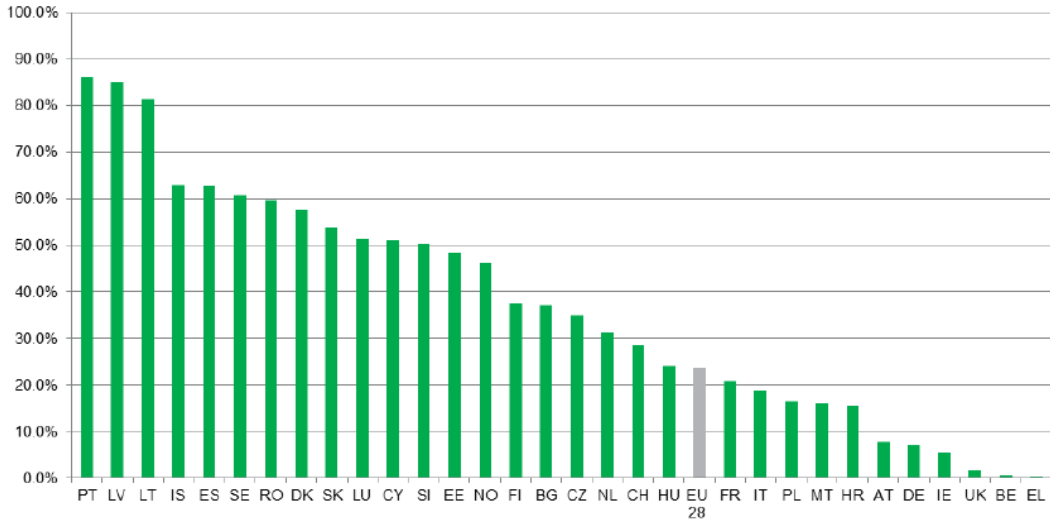
Annex 9: "Full fibre rollout European case studies", CityFibre, March 2018

Introduction

FTTH is becoming increasingly widespread in the EU in order to achieve the common EU broadband targets. The European Commission's broadband targets include: basic broadband for all citizens by 2013 (already met), coverage of Next Generation Networks (NGN – 30Mbps or more) for all citizens by 2020 and the use of NGN (100 Mbps) by 50% of households by 2020. In addition, the Commission has also adopted a strategy[11] which relies on three strategic objectives for 2025: access to 1 Gbps for all schools, transport hubs and main providers of public services and digitally intensive enterprises; access to download speeds of at least 100 Mbps to be upgraded to 1 Gbps for all European households; and uninterrupted 5G wireless broadband coverage for all urban areas and major roads and railways.

Nevertheless, across the EU some countries have deployed FTTH more successfully than others. For example, Portugal, Spain, the Baltic countries and Nordic countries have widespread FTTH networks, while the UK, lags behind the majority of EU countries.[12]

FTTP coverage by country:



Source: IHS Markit & Point Topic, Broadband Coverage in Europe 2016

In this annex, we focus on FTTH deployments in Spain, Portugal and Switzerland. The first three case studies provide interesting EU examples of widespread and/or fast FTTH rollout. Switzerland provides an example of rollout of FTTH outside the EU regulatory framework.

Key observations:

- **The approach adopted to the regulation of legacy telecom assets affects all operators' incentives to invest**. For example, in Spain and Portugal the absence of regulated wholesale active products, combined with duct and pole access (DPA), incentivised roll out. However, active wholesale access remedies were introduced at a later stage to deal with limited infrastructure deployment in less dense areas (see Spain case study).

[11] https://ec.europa.eu/digital-single-market/en/policies/improving-connectivity-and-access
[12] IHS Markit & Point Topic, Broadband Coverage in Europe 2016 – mapping progress towards the coverage objectives of the Digital Agenda, A study prepared for the European Commission DG Communications Networks, Content and Technology, 2017.

- **Co-investments and network sharing agreements can be key in facilitating rollout of FTTH networks**. In all of the case studies discussed in this annex, FTTH network deployment involved co-investment and/or network sharing agreements between operators, including agreements with incumbents operators. Such agreements have helped with risk-sharing and extending network coverage.
- **Government can play a key role in facilitating the deployment of FTTH networks**. For example, in Switzerland, the regulator ComCom facilitated nine roundtable discussions amongst key players which led to the creation of a common framework for the rollout of FTTH in Switzerland (see Switzerland case study).
- **The impact of the DPA remedy depends on how it is implemented in practice** (for example, availability of information on infrastructure location) and the regulatory wholesale access conditions in each specific market.

Below, for each case study, we describe:

- Current levels of FTTH rollout;
- The competitive landscape, including the role alternative operators play in the market;
- The nature of co-investment agreements;
- Supply-side factors which may have facilitated rollout of FTTH networks; and
- The (telecom) regulatory framework. In this context, we only focus on the telecom regulatory framework. However, it is important to note that symmetric obligations requiring access to ducts (not limited to telecom ducts) which are capable of housing high speed broadband infrastructure were also imposed in member states in 2016, in the context of the transposition of the Commission's Cost Reduction Directive into national law.

Spain

Key lessons

Facilitating factors for FTTH rollout
- Incumbent (Telefónica) facing increasing competition from cable, LLU operators, and FTTH investment from non-incumbents
- Co-investment and network sharing agreements
- Extensive and high-quality duct network, with high availability of chambers (manholes, handholes)
- High number of multi-dwelling units (MDUs) in cities
- Vertical access regulation
- Government support for rural fibre rollout

Outcome
- Extensive FTTP coverage

- ***Current fibre rollout***

  In Spain FTTH coverage has reached over 60% of premises, with over 40% growth between 2014 and 2016.

Expansion of FTTH continues. Telefónica expects to cover 25 million building units with FTTH by 2020 and Orange/Jazztel aim to reach 14 million households with FTTH by 2019. Deployment of FTTC (VDSL) is declining.[13]

- ***Competitive landscape***

  In Spain, while Local Loop Unbundling (LLU) was implemented as the key wholesale access remedy, bitstream access remedies were limited (capped at 30Mbps). LLU proved to be effective in promoting infrastructure competition. In addition to increasing competitive pressure from LLU operators and cable companies (mainly Ono), as non-incumbents began to roll out FTTH, Telefónica continued losing market share. In response, Telefonica started to roll out an FTTH network in 2013, reaching 15 million building units by the first quarter of 2016. [14] The main alternative operators, Vodafone and Orange, responded with acquisitions to improve their ability to compete in the broadband market by combining their NGA coverage and improving their ability to offer convergent products. In 2014, Vodafone acquired Ono and Orange acquired Jazztel.[15]

  Currently, Telefónica has 67% of FTTH coverage (building units), followed by Orange/Jazztel (27%) and Vodafone/Ono (5.5%). [16]

- ***Co-investment and network sharing agreements***

  Another facilitating factor for FTTH rollout in Spain has been the use of commercial co-investment and network sharing agreements.

  - In Spain, the first co-investment and network sharing agreement was signed between Jazztel and Telefónica in 2013 allowing mutual access to vertical infrastructures in 3 million buildings (1.5 million existing Telefonica FTTH connections and 1.5 million new connections rolled out by both companies).[17]

  - In 2013, Vodafone and Orange signed a co-investment and network sharing agreement to deploy a FTTH network, reaching 6 million buildings in over 50 cities in 4.5 years. The agreement set out the deployment of two complementary networks, with a reach of 3 million buildings each one. Both companies agreed to ensure mutual access and use of their infrastructure.[18] This agreement was later updated after Vodafone's acquisition of Ono, with Vodafone agreeing to provide Orange with wholesale access to Ono's network, and establishing a mechanism for Vodafone and Orange to provide each other with wholesale access to future FTTH deployments across Spain on a reciprocal basis.[19,20,21]

[13] Europe's Digital Progress Report – 2017, Telecom Chapter, Spain.
[14] BEREC, BoR (19) 96, Challenges and drivers of NGA rollout and infrastructure competition, 2 June 2016
[15] See https://www.vodafone.com/content/dam/vodafone-images/investors/pdfs/acquisition-of-ono-presentation.pdf and https://www.orange.com/en/content/download/25384/573039/version/10/file/orange+acquires+jazztel
[16] CNMC, Análisis geográfico de los servicios de banda ancha y despliegue de NGA en España. June 2016.
[17] See https://cincodias.elpais.com/cincodias/2012/10/08/empresas/1349863145_850215.html and http://www.expansion.com/2012/10/08/empresas/tmt/1349711390.html
[18] https://www.orange.com/en/content/download/11172/242754/version/1/file/CP_OrangeSpain_Voda_FTTH_EN_130313.pdf
[19] http://www.vodafone.com/content/index/about/policy/news/public-policy-news-releases/2014/vodafone-spain-orange-spain-fibre-sharing-agreement.html
[20] https://www.fiercewireless.com/europe/vodafone-completes-ono-buy-amends-ftth-agreement-orange-spain
[21] https://www.reuters.com/article/vodafone-orange-spain/vodafone-curtails-orange-spanish-fibre-network-after-ono-buy-idUSL6N0PY3O820140723

- In 2013, Telefónica, Vodafone and Orange signed a reciprocal network sharing agreement. Access prices were set by the regulator CMT (CNMC's[22] predecessor)[23] [24] as the parties failed to reach an agreement on this.[25]
- In July and October 2016, Orange and MásMóvil signed a co-investment agreement and a wholesale access agreement. The co-investment agreement concerns the joint roll out of FTTH. The wholesale access agreement allows MásMóvil to gain wholesale access to Orange's entire fibre broadband infrastructure.[26]

- ***Regulatory framework***

  The regulator focused on promoting infrastructure competition. Key regulations are:[27]

  - **DPA:** Telefonica was required to provide DPA from 2009. DPA access is subject to the following provisions:
    - Usage is restricted to high-speed broadband (fibre and HFC). Access prices are subject to a general cost-orientation obligation. Symmetric obligations are based on "fair and reasonable terms".
    - Access to be provided on an Equivalence of Output basis (EoO),[28] monitored via KPIs (defined for application process, quality of service, repair time and provisioning).
    - An automated central system provides information on the location and availability of ducts.
    - No specific requirements on the incumbent to reserve capacify for alternative operators, but there are limits to the incumbent's own space reservation.
  - **Vertical access:** vertical access to in-house wiring was introduced in 2009. The remedy requires operators to provide information on houses they connect and leave spare capacity for an additional connection. New buildings (built after 1998) are required to have an internal telecom infrastructure that allows access to at least two fibre networks.
  - **Virtual Unbundled Local Access (VULA):** Telefonica is required to provide VULA in municipalities where there is not sufficient retail and network competition. The prices of VULA in these areas are subject to an economic replicability test. [29]

[22] Comisión Nacional de los Mercados y la Competencia (CNMC).
[23] https://technology.ihs.com/438502/telefonica-vodafone-and-orange-sign-fibre-broadband-agreement-in-spain
[24] https://www.reuters.com/article/us-spain-fibre-optic/telefonica-in-fiber-optic-deal-with-vodafone-orange-in-spain-idUSBRE9610ZW20130702
[25] https://www.cnmc.es/sites/default/files/1530464_9.pdf
[26] See http://www.eleconomista.es/tecnologia/noticias/7721517/07/16/Masmovil-y-Orange-se-alian-para-para-desplegar-conjuntamente-fibra-hasta-un-millon-de-hogares.html, http://www.grupomasmovil.com/wp-content/uploads/2016/05/Barclays_European_Telecom_Services_A_change_in_Spain_-_Masmovil_FTTH.pdf , https://www.bolsasymercados.es/mab/documentos/HechosRelev/2016/07/84696_HRelev_20160722_1.pdf, http://www.grupomasmovil.com/wp-content/uploads/2017/02/8_AgreementOrange_Oct2016.pdf, http://www.grupomasmovil.com/wp-content/uploads/2017/02/8_AgreementOrange_Oct2016.pdf and https://www.telegeography.com/products/commsupdate/articles/2016/10/11/grupo-masmovil-inks-wide-ranging-access-deal-with-orange-espana/
[27] WIK Consult, Best practice for passive infrastructure access, 19 April 2017.

[29] The SMP operator is subject to obligations regarding the copper networks and new fibre networks, with differentiated treatment for the latter depending on the competitive environment.
The CNMC identified a number of administrative units (municipalities) where Telefónica would be obliged to provide access to its FTTH network at the level of civil infrastructure as well as in-house wiring. Telefónica is not required to provide a VULA product over its FTTH network in these areas. The criterion that the CNMC used to identify such municipalities was the presence of sufficient level of retail and infrastructure-based competition on NGA networks (i.e. at least three NGA networks with sufficient coverage). In the remaining municipalities Telefónica is obliged to provide a VULA product over its FTTH network (NEBA local) where the access prices would be subject to the economic replicability test (instead of cost orientation as for the access to the civil infrastructure and LLU). See http://news.itu.int/infrastructure-sharing-and-network-competition-in-spain/ and BEREC, BoR (19) 96, Challenges and drivers of NGA rollout and infrastructure competition, 2 June 2016.

- **Rural areas:** The Spanish government supported network rollout in rural areas through subsidies. Projects considered compatible with EU's State aid rules were subject to several obligations such as technology neutrality, wholesale access to active and passive infrastructure and transparency.[30]

- ***Key supply-side factors***

  The following supply-side factors were key in supporting rollout of FTTH in Spain:

  - An extensive duct network available in most of Spain's municipalities, with high levels of capacity to house additional fibre.
  - Availability of a high number of chambers and manholes.
  - The presence of densely populated urban areas with multi-dwellings.

Portugal

Key lessons

Facilitating factors for FTTH rollout
- Competitive pressure from cable operator (with extensive network coverage) incentivised incumbent and alternative operators to deploy FTTH
- Co-investment and network sharing agreements
- Extensive and high-quality duct network
- High number of multi-dwelling units (MDUs) in cities
- Vertical access regulation
- Government support for rural fibre rollout

Outcome
- Extensive FTTH coverage

- ***Current fibre rollout***

  Portugal is the member state with the most extensive FTTH coverage, reaching over 85% premises in 2016.

- ***Competitive landscape***

  Cable was a key driver for FTTH rollout in Portugal. Widespread cable coverage and high demand for pay-TV services incentivised the incumbent (MEO/Portugal Telecom) to invest in FTTH, starting in 2009. Other non-incumbent operators (Optimus and Vodafone) also rolled out fibre from early on (even before the incumbent).

  The market has experienced some consolidation, with mergers between the main cable operator (ZON) and Optimus (forming NOS Comunicações in 2013)[31], the acquisition of Cabovisão and ONI by

[30] http://ec.europa.eu/competition/sectors/telecommunications/broadband_decisions.pdf
[31] https://www.reuters.com/article/zon-optimus/zon-optimus-agree-to-merge-to-take-on-portugal-telecom-idUSL6N0AQEVJ20130121

the group Apaxin in 2015, the acquisition of Portugal Telecom by Altice in 2015,[32] and the acquisition of Optimus' FFTH network by Vodafone in 2016[33].

FTTH expansion continues: Altice (the parent company of Meo and PT) is aiming to cover 5.3 million premises with fibre by 2020.[34] Vodafone and NOS are currently investing in additional FTTH coverage through a reciprocal access agreement.[35, 36]

- ***Co-investment and network sharing agreements***

  There are also examples of commercial co-investments in Portugal. These agreements include reciprocal access arrangements:

  - In December 2009, Vodafone and Sonaecom signed a (50:50) joint venture agreement, to carry out the construction, management, maintenance and operation of a fibre network. The network could become open to third parties. [37]
  - In 2010, Vodafone and Optimus (now NOS) signed an agreement to provide reciprocal access to their FTTH networks in Lisbon and Oporto.[38]
  - In 2014, PT/MEO and Vodafone signed a 25-year FTTH co-investment and network sharing agreement. The agreement included sharing access to each other's dark fibre in around 900k homes.[39]
  - In 2017, Vodafone and NOS signed an agreement to deploy and share a FTTH network. The two companies will provide reciprocal access to each other's networks on commercially agreed terms[40].

- ***Regulatory framework***

  The regulator has supported FTTH rollout through the following remedies on MEO:

  - **DPA**: the incumbent is subject to a duct and pole access obligation. In 2009, a Decree-Law established guidelines for NGN deployment, including effective and non-discriminatory symmetric access to all ducts and other infrastructures, regardless of the respective owner.[41]
  - Portugal's DPA regulations include the following provisions:[42]
    - There are no usage restrictions.
    - Access prices are subject to a general cost-orientation obligation.

[32] As a condition for clearance of this acquisition, the European Commission required Altice to divest Oni and Cabovisao. See http://europa.eu/rapid/press-release_IP-15-4805_en.pdf
[33] Nos Annual Report 2015. Available at http://www.nos.pt/institucional/Documents/Reportes%20Financeiros/RC_NOS2015_OnENG.pdf
[34] http://altice.net/sites/default/files/pdf/20151109-ALT-Fiber-Event.pdf
[35] http://www.vodafone.com/content/index/media/vodafone-group-releases/2017/vodafone-portugal-and-nos-fibre-network-share-agreement-in-portugal.html#
[36] http://markets.businessinsider.com/news/stocks/portugal-telecoms-mobile-broadband-and-digital-media-statistics-and-analyses-1002259825
[37] See https://press.vodafone.pt/en/2009/12/21/sonaecom-and-vodafone-sign-cooperation-agreement-on-ngn/ and http://other.static.sonae.com/2014/07/31/8a0947488f77189cfb79c2fc3d55eac40ddef334/8a0947488f77189cfb79c2fc3d55eac40ddef334.pdf?download=1
[38] https://press.vodafone.pt/en/2010/12/17/optimus-and-vodafone-sign-partnership-deal-for-next-generation-networks/ and BEREC, BoR (19) 96, Challenges and drivers of NGA rollout and infrastructure competition, 2 June 2016
[39] http://62.48.147.70/NR/rdonlyres/3D25D477-83CD-42DB-8AA0-97D96D359753/1470883/FTTH_Wholesale_E.pdf
[40] http://www.vodafone.com/content/index/media/vodafone-group-releases/2017/vodafone-portugal-and-nos-fibre-network-share-agreement-in-portugal.html
[41] https://www.anacom.pt/render.jsp?contentId=975261
[42] WIK Consult, Best practice for passive infrastructure access, 19 April 2017.

- Access is to be provided on an Equivalence of Input (EOI) basis.[43]
- Information on the location and capacity of ducts is provided through an automated central system.
- The incumbent must reserve 20% usable internal duct capacity for provision of duct access, unless the incumbent requires additional capacity for the USO provision.

- **In-building wiring access**: the building communication infrastructure should be connected to a multioperation chamber, which is usually located outside the building. The first operator to reach the building must install at least two fibres per home and additional infrastructure to be shared with other operators. Prices should be cost-oriented, and Anacom (the regulator) can be asked to intervene ex-post. Access to in-building wiring has to be provided in a non-discriminatory manner.
- **Rural deployment:** rollout of FTTH in rural areas has been facilitated by public tenders that provide state aid to regions considered "white areas". [44] State aid concessions were awarded in 2011[45]. The conditions for granting aid included an obligation on the subsided network's operator to offer other operators wholesale access for the duration of the contract (20 years).
- There is no obligation to provide wholesale active products in Portugal.[46]

- ***Key supply-side factors***

  The following supply-side factors have been key in supporting FTTH rollout in Portugal:

  - The incumbent's duct and poles network is in good condition, and information on the location of ducts and poles is available.
  - Cost of labour in Portugal is relatively low compared to other countries.
  - High penetration of cable TV encouraged operators to build fibre to provide high quality multi-channel television and triple play offers.

[43] EOI - Incumbent provides, in respect of a particular product or service, the same product or service to all operators (including incumbent's downstream arm) on the same timescales, terms and conditions (including price and service levels) by means of the same systems and processes, and includes the provision to all operators (including its downstream arm) of the same commercial information about such products, services, systems and processes.
[44] Areas with no NGA connectivity as defined by the European Commission's Broadband State Aid rules.
[45] See http://ec.europa.eu/competition/state_aid/cases/236635/236635_1199063_71_2.pdf . This required an extension due to delays in FTTH rollout in certain regions, which was granted in 2014 (see http://ec.europa.eu/competition/state_aid/cases/250935/250935_1522860_71_2.pdf)
[46] https://www.ofcom.org.uk/__data/assets/pdf_file/0030/93639/BT-Annex-Analysys-Mason.pdf

France

Key lessons

Facilitating factors for FTTH rollout

- LLU-based competition
- Co-investment and network sharing agreements
- Targeted regulatory framework, identifying regions with more scope for infrastructure competition (very dense areas) and regions where government support would be necessary (less dense areas)
- Government support to rural areas

Outcome

- Fast growth in FTTH coverage, especially in recent years.

- ***Current fibre rollout***

  FTTH coverage in France has grown materially in recent years, but is still below EU average. France's FTTH coverage reached 20% in 2016, representing a 25% growth compared to 2015. The French Government aims to reach 80% FTTH coverage by 2022.[47]

- ***Competitive landscape***

  LLU played a significant role in the promotion of infrastructure-based competition in France and broadband competition has developed mainly in relation to xDSL services.

  In France, the majority of FTTH deployment has been privately funded by operators and focused on areas of high density. The market has four main operators: Orange, Free/Iliad, Numericable/SFR (which merged in 2014), and Bouygues Telecom. Orange has a particularly large share of FTTH homes passed in very dense and areas of medium density.[48]

  Expansion of FTTH continues in France. Orange has set a target of 12 million homes in France by 2018, with this set to rise to 20 million by 2022.[49] SFR[50] and Iliad[51] have also announced their intentions to continue deploying FTTH.

- ***Co-investment and network sharing agreements***

  Co-investment agreements in France are usually based on a one-way access model implemented by fixed operators in France since 2010.[52] Under the rules set by the French regulator (ARCEP) the first operator to connect a building with FTTH is mandated to provide passive access to other interested operators at the mutualisation point and offer co-investment. Passive access is offered to the other members of the co-investment agreement, either through a dedicated fibre line or through a shared fibre line, in the form of a 30-year (or 24-year) indefeasible rights of use, renewable two times.

  There are also examples of co-investment agreements which include reciprocal access arrangements, which are:

[47] République Française, France Très Haut Débit; see http://www.francethd.fr/comprendre-le-plan-france-tres-hautdebit/
[48] http://www2.bryangarnier.com/images/updates/pdf/Fibre_Zones_peu_denses_EN.pdf
[49] https://www.orange.com/en/Press-Room/press-releases/press-releases-2016/Orange-Fiber-already-one-million-customers-strong-in-France
[50] http://www.sfr.com/nous-connaitre/discover-sfr/press-releases/sfr-press-release/07192016-1120-sfrs-fixed-and-mobile-networks-june
[51] http://www.iliad.fr/finances/2018/Slideshow_2017_130318.pdf
[52] http://berec.europa.eu/doc/berec/bor/bor11_69_coinvest, https://www.telegeography.com/products/commsupdate/articles/2014/05/15/vodafone-portugal-strikes-fibre-deal-with-dstelecom/mentnga.pdf

- On 9th November 2010, Bouygues Telecom and SFR signed a co-investment agreement to deploy a horizontal optical fibre network in high-density areas.[53]
- France Telecom and Free signed a co-investment agreement in July 2011, covering 5 million households between 2011 and 2020, in the majority of average-size French cities, representing 60 urban areas.[54]

- ***Regulatory framework***

  ARCEP's objective is to enable operators to invest in ultrafast broadband under equal terms, providing access to existing infrastructure (especially civil engineering which accounts for 50%-80% of rollout costs) and co-investing, especially in the last mile of the network.[55]

  The regulator's focus is on promoting competition based on the ladder of investment principle, where it sees co-investment as one additional step in the ladder.[56] Main aspects of the regulatory framework are:[57]

  - **DPA regulation**: Orange/France Telecom is required to provide DPA. The DPA regime includes the following provisions:
    - Usage is restricted to optical fibre, although it can also be used for leased lines or deployment of fixed or mobile backhaul.
    - Access prices are subject to a cost-orientation obligation.
    - Access to be provided on an EoI basis.
    - There is an online request system and online file exchange system which shows the location and capacity of ducts, however no real time information is provided currently.
    - When rolling out fibre downstream of the mutualisation point, installing operators are required to leave at least as much space unoccupied as they use in areas where infrastructure-based competition is expected to emerge.
  - **Vertical in-building wiring**: regulation is symmetric. Access prices should be cost-oriented and are commercially agreed, but with potential for ARCEP to intervene in case of a dispute. As discussed above, the first operator to connect a building with FTTH is mandated to provide access to other interested operators at mutualisation point and offer co-investment.[58]
  - Orange is not required to provide active wholesale access remedies on its FTTH network (only to VDSL).[59]
  - FTTH roll-out in more rural areas is being undertaken through public initiative networks (PINs). In these areas, the government will sign agreements with private operators for the deployment of FTTH. [60] Private investment is matched by public funds, including direct subsidies and a long-

[53] See https://www.reuters.com/article/bouygues/bouygues-sfr-team-up-to-lay-fibre-optic-network-idUSLDE6B90GH20101210 and http://www.autoritedelaconcurrence.fr/user/standard.php?id_rub=663&id_article=2958&lang=en
[54] https://www.iliad.fr/presse/2011/CP_210711_Eng.pdf
[55] http://www.wik.org/fileadmin/Konferenzbeitraege/2010/National_Strategies/TOLEDANO_ARCEP_WIK_Ultrabroadband_Conference_2010.pdf
[56] https://www.arcep.fr/fileadmin/reprise/dossiers/fibre/intervention-PhDistler-Arcep-Wik_2017_Brussels-070317.pdf
[57] WIK Consult, Best practice for passive infrastructure access, 19 April 2017.
[58] Berkeley research Group - CO-INVESTMENT AND COMMERCIAL OFFERS. Available at https://www.vodafone.com/content/dam/vodafone-images/public-policy/reports/pdf/co-investment-commercial-offers-100417.pdf and WIK Consult, Best practice for passive infrastructure access, 19 April 2017.
[59] Analysys Mason, International case Studies, Final report for Ofcom, July 2015.
[60] https://www.ofcom.org.uk/__data/assets/pdf_file/0016/72025/international_case_studies.pdf

maturity state loan. The networks resulting from these investments will be open to all retail operators. In the case of FTTH services, the same passive remedies apply as for commercial FTTH networks.[61]

- ***Supply-side factors***

  An extended backhaul network , facilitated by LLU[62] has been a factor in the roll-out of FTTH on France.

Switzerland

Key lessons

Facilitating factors for FTTH rollout

- Widespread cable coverage, incentivising incumbent to roll out FTTH.
- Co-investment with utilities and coordinated approach from early stages.
- Regulator (ComCom) played an important role by facilitating a number of round-table discussions where key agreements (coordination of rollout and standards) were reached.

Outcome

- Extensive FTTH coverage

- ***Current fibre rollout***

  Switzerland exhibits above EU-average FTTP coverage, but it lags behind most EU member states, including Spain and Portugal. Switzerland's FTTP coverage reached 28.6% in 2016 from about 2-3% coverage in 2010. [63]

- ***Competitive landscape***

  The Swiss fixed broadband market is dominated by Swisscom, the telecom incumbent, and UPC, the cable incumbent. Swisscom has a broadband market share of about 53% and UPC has a market share of about 20%. Sunrise Communications (Sunrise), an alternative broadband provider, has a share of 10%.[64] In terms of DSL and FTTx, Swisscom has a share of 73% while Sunrise has a share of 15%.[65] Sunrise's internet services are based on LLU and wholesale access to Swisscom's and other utilities' copper and fibre networks.[66]

  By 2008 Swisscom had already invested in FTTC rollout, but increasing competition from cable and initial plans from local utilities to roll out FTTH led it to start investing in FTTH from 2008.[67]

[61] Analysys Mason, International case Studies,
Final report for Ofcom, July 2015.
[62] BEREC, Challenges and drivers of NGA rollout and infrastructure competition, October 2016
[63] IHS Markit & Point Topic, Broadband Coverage in Europe 2016 – mapping progress towards the coverage objectives of the Digital Agenda, A study prepared for the European Commission DG Communications Networks, Content and Technology, 2017.
[64] https://www.bakom.admin.ch/bakom/en/homepage/telecommunication/facts-and-figures/statistical-observatory/structure-of-the-market-and-employment/internet-access-market-shares.html
[65] https://www.comcom.admin.ch/comcom/en/Homepage/Documentation/Facts-and-figures/breitbandmarkt.html
[66] https://www.sunrise.ch/en/annualreport/2015/corporate-report/environment/industry-and-competitive-environment.html
[67] See OECD, Financing of the roll-out of broadband networks – Working Party No. 2 on Competition and Regulation, July 2014. See also http://www.analysysmason.com/Research/Custom/Viewpoints-archive/RDTW0-Swisscom-case-study-Sep2009/Case-study/ and http://www.ftthcouncil.eu/documents/CaseStudies/SWISSCOM.pdf

Swisscom has recently expressed its ambition to "*make fibre-optic technology available to every Swiss municipality by the end of 2021, and thus enable even remote locations to access ultra-fast broadband*". [68] Sunrise also continues to expand its FTTH coverage through additional partnerships with local utilities (see below).

- ***Co-investment and network sharing agreements***

  Co-investment started from early stages of FTHH rollout, when Swisscom began deploying FTTH in partnership with local utilities. Swisscom considered that co-investment agreements would bring advantages such as lower deployment costs, risk-sharing and the ability to choose the most suitable duct system for the network build out.[69] The regulator (ComCom) played a key role in facilitating the set-up of co-investment agreements (see regulatory framework section), while the Swiss competition authority (ComCo) scrutinised operators' cooperation agreements to minimise anticompetitive effects.[70] Specifically, ComCo found certain clauses in the cooperation agreements (layer 1 exclusivity- only public utilities were allowed to commercialise dark fibre; and investment protection - one party could notify to the other party a price discrimination in order to maintain a certain price level) to be against Swiss competition law. These clauses were eventually removed from the final con-investment agreements signed between the parties. [71]

  In the co-investment agreements involving Swisscom, it has usually provided 60% of the investment costs and 60% of the maintenance and operating costs, while the local utility has contributed the remaining 40%. Both partners have granted each other long-term indefeasible usage rights (IRUs). The partners offer access to their FTTH network to third parties on commercial terms.[72]

  Some specific examples of co-investment include:

  - In March 2009, Swisscom entered into an agreement (joint venture) with utility Group E (an electricity producer and supplier) and other partners. Group E and Swisscom agreed to construct a multi-fibre FTTH network in the Fribourg area. Swisscom would bear 60% of the investment costs, and the other partners (mainly Group E) 40%. They would deploy an open access network in different areas and swap the fibre capacity to each other. Each operator would lay four fibres in each area of use (flat, house or commercial premises.[73]

  - In March 2018, Sunrise entered into a long term (20 year) access agreement with SFN (Swiss Fibre Net AG - the joint venture between local energy suppliers) and IWB (Basel Industrial Works), and also renewed its partnership with SIG (Geneva Industrial Services). Under the terms of this agreement, Sunrise will make an upfront investment of CHF 56 million in the fibre optics infrastructure (layer 1) and in return will receive a long-term IRU for a certain number of fibre optic lines in the areas covered by SFN, IWB (Basel) and SIG (Geneva).[74]

- ***Regulatory framework***

[68] https://www.swisscom.ch/content/dam/swisscom/en/about/media/press-release/2018/20180207-mm-jahresbericht-2017-en-ir.pdf.res/20180207-mm-jahresbericht-2017-en-ir.pdf
[69] http://www.ftthcouncil.eu/documents/CaseStudies/SWISSCOM.pdf
[70] OECD, Financing of the roll-out of broadband networks – Working Party No. 2 on Competition and Regulation, July 2014 – note by Switzerland.
[71] https://uk.practicallaw.thomsonreuters.com/5-619-1741?transitionType=Default&contextData=(sc.Default)&firstPage=true&bhcp=1
[72] BEREC, Challenges and drivers of NGA rollout and infrastructure competition, October 2016
[73] See https://www.swisscom.ch/en/about/medien/press-releases/2009/03/20090325_MM_Glasfasernetz.html, https://www.econstor.eu/bitstream/10419/169463/1/Godlovitch-Neumann.pdf and https://www.swisscom.ch/en/about/medien/press-releases/2011/01/20110104_MM_Freiburg_Weko.html
[74] https://www.sunrise.ch/en/corporate-communications/medien/press-releases.html

Switzerland is not a member of the EU and therefore has a different legal and regulatory framework. Broadband regulation is limited to LLU and bitstream access is not regulated (although it is offered on a commercial basis). Leased lines are partly regulated.[75]

The incumbent is required to provide duct access at cost-oriented prices and to meet 90% of the demand for ducts. The regulator ComCom played an active role as a mediator between the operators in order to coordinate the construction of FTTH networks. ComCom held several roundtables between 2008 and 2012. These roundtables aimed to coordinate at high level the development of the networks. ComCom's aim was to *"prevent the creation of monopolies which would impede access for other telecommunications providers"* and obstruct competition, while at the same time, ensuring that *"construction of the network was as efficient as possible, in order to allow economically feasible investment"*. A dozen heads of Swiss companies investing in fibre networks took part in a total of nine roundtables.[76]

The outcome from these roundtables was a framework for FTTH co-investment in Switzerland. Key agreements were: [77]

- The network architecture is created in a coordinated manner and without duplication.
- To connect buildings and homes with multiple fibre cables (roll-out four fibres for each household) and to provide open access without discrimination to the FTTH network at both passive and active levels (layers 1 and 2).
- Standardisation of activities in the areas of 1) the in-house installation and 2) active line access.
- Property owners and network operators have at their disposal a model contract, which governs the legal and financial aspects of FTTH installations in residential properties.

- ***Supply-side factors***

  The following supply side factors have facilitated the rollout of fibre in Switzerland:[78]

  - High population density.
  - Excellent duct coverage: most premises are covered by ducts owned by Swisscom and cable operators cover about 95% of the country. Local utilities also have high-quality duct network with spare capacity.
  - ComCom played a key role in facilitating fibre rollout since 2009.
  - Fixed network ARPUs are high which makes rollout more economical.

[75] BEREC, Challenges and drivers of NGA rollout and infrastructure competition, October 2016
[76] See https://www.admin.ch/gov/en/start/documentation/media-releases.msg-id-43030.html and OECD, Financing of the roll-out of broadband networks – Working Party No. 2 on Competition and Regulation, July 2014
[77] See BEREC, Annex to the BEREC Report
Next Generation Access – Implementation Issues
and Wholesale Products, 2010, OECD, Financing of the roll-out of broadband networks – Working Party No. 2 on Competition and Regulation, July 2014
and https://www.admin.ch/gov/en/start/documentation/media-releases.msg-id-43030.html
[78] BEREC, Challenges and drivers of NGA rollout and infrastructure competition, October 2016