



# Delivering super-fast broadband in the UK

Promoting investment and competition

Statement

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## One page summary

The rollout of super-fast broadband marks one of the most fundamental changes to the UK's telecoms networks. It will bring real benefit to its consumers, business and the economy. Ofcom's overarching aim in super-fast broadband is for consumers and citizens to benefit from timely investment, competition and widespread availability.

Recent announcements of investment and planned investment, including Virgin Media's launch of a 50Mbps service, are very positive for consumers. Consumers will benefit even more from increased choice and wider availability.

The release of spectrum will facilitate the introduction of new technologies and players into the market: it is an important way we can help bring faster broadband to consumers. But fixed networks will play a central role in delivering super-fast broadband for many.

We want to support rapid and widespread investment in superfast broadband and the continued, critical role of competition in meeting consumers' needs. This is important because – just as with current generation broadband - competition in super-fast broadband services and infrastructure will mean more investment, innovation, differentiation and choice as well as competitive prices for consumers.

Ofcom has a central role to play in enabling both investment and competition in super-fast broadband. To do this, we will:

- allow wholesale pricing flexibility to enable returns appropriate to the considerable risks of building new networks, but constrained by the market in the interests of customers;
- ensure that any regulatory pricing allows investors the opportunity to earn a rate of return that genuinely reflects the cost of deployment and the associated level of risk;
- minimise unnecessary inefficiencies in network design and build as a result of regulatory policies, while continuing to protect the consumer interest;
- support the use of new, more flexible wholesale services by BT to offer super-fast services to other service providers and consumers at competitive prices; and
- safeguard the opportunity for further competition based on physical infrastructure, by facilitating fair opportunities for companies to synchronise their investments with BT's deployments, should reasonable demand arise, and encouraging network design that takes future potential competition into account.

To make this approach work, we need to make sure existing regulation is relevant to rapidly changing market circumstances. This is why we are consulting on a related change to the Undertakings agreed by BT with Ofcom in 2005 that will promote efficient investment in superfast broadband networks and services.

This statement focuses largely on plans for private sector led investment. It prepares the ground to ensure the regulatory environment promotes private sector investment and competition to bring millions of UK consumers into a new era of super-fast broadband.

But this will not be the whole story. We need to work closely with all stakeholders to understand the likely scope of private sector investment and consider whether there is a need for further action to bring the benefits of super-fast broadband to a wider group of UK consumers, citizens and businesses.

## Section 1

# Executive summary

- 1.1 Super-fast broadband services, and the networks required to deliver them, continue to grow in importance and interest to consumers, industry and politicians alike. They are of increasing importance to Ofcom too as part of the converged communications sector we regulate. Successful rollout and take-up of super-fast broadband will help to deliver Ofcom's principle duties of furthering citizen and consumer interests by delivering significant benefits to those consumers and citizens. These developments are also relevant to a number of our other duties, such as securing the wide availability of communications services, including high speed data transmission, and encouraging investment and innovation and promoting competition.
- 1.2 They are important as they will build on the growing significance of broadband in delivering a wide range of content from the web, including audiovisual content and access to public services through to delivering public service content as clearly set out in 'Putting Viewers First', our statement on the future of public services broadcasting<sup>1</sup>.
- 1.3 These new services will be delivered as a result of investment in new or upgraded networks, many of which will be led, in the main, by the private sector. To deliver consumer benefits, the regulatory regime needs to support early investment, especially given the current economic environment, but it also needs to ensure that there are options for competition both now and in the future.
- 1.4 The purpose of this statement is to set out the overall regulatory approach we will take to such investments, based on consideration of stakeholders' views. These approaches will be implemented through the normal process of market reviews, in conjunction with other regulatory measures, including the Undertakings that BT has given Ofcom under the Enterprise Act 2002.

## Consumers and citizens are at the heart of our regulatory approach

- 1.5 Super-fast broadband offers the prospect of real consumer benefits, building on those from today's broadband services. The services supported by super-fast broadband will bring individual, social and economic benefits to UK households and businesses.
- 1.6 They are likely to enrich consumers' lives through access to a wide range of video rich and immersive information and entertainment content and communications services. These will help citizens participate in society and democracy and can bind communities together through social networking, shared experiences and effective collective organisation. The benefits will also extend to the wider economy, supporting new ways for consumers and online businesses to trade, developing new applications and services and driving the UK's creative industries.

## To secure these benefits, regulatory approaches need to strike the right balance to secure both investment and competition

- 1.7 Consumers and citizens will benefit from timely investment delivering widespread availability of these services. Just as in today's broadband markets, they will also

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<sup>1</sup> [http://www.ofcom.org.uk/consult/condocs/psb2\\_phase2/statement/](http://www.ofcom.org.uk/consult/condocs/psb2_phase2/statement/)

benefit from effective competition through service innovation and pricing. We must therefore strive to achieve both investment and competition to meet consumers' interests and requirements.

- 1.8 In many circumstances, effective and sustainable competition can help to deliver investment – competitive pressures make further investment and innovation necessary for companies to continue to be successful. However, we recognise that super-fast broadband requires major new investment, carrying with it uncertainty and risk, more so than in the case of first generation broadband. As a result, we need to find the right balance of regulatory policies to deliver investment and foster competition in the interests of consumers.

### **The private sector is moving ahead with investments today, complemented by other players**

- 1.9 Since publishing our consultation document in September, we have seen a number of very positive developments in super-fast broadband investment. In fixed line, Virgin Media has launched a 50Mbps product, currently available to 20% of homes and planned to reach 50% by the mid 2009. BT plans to invest in super-fast broadband to deliver up to 40Mbps to 40% of UK homes, with deployment starting in January 2010.
- 1.10 There are also a wide range of other projects, including H2O's use of sewers to build high performance new access networks in Bournemouth and Dundee and an increasing number of local, community and public sector schemes targeting specific communities and locations. Other technologies also have a role to play, fixed and mobile wireless services and satellite.
- 1.11 However, it was clear from consultation responses that few stakeholders believe individual private sector investments alone will deliver to the whole of the UK. How far private sector investment will meet the UK's needs remains uncertain. This will be a key consideration for subsequent phases of super-fast broadband deployments as we explain later.

### **The focus of this statement is on the investment plans of players with significant market power**

- 1.12 Our overall aim is to ensure that consumers can get timely access to super-fast broadband services from a wide range of players, using whichever access networks are most appropriate. This may be: fibre; cable; copper; mobile; fixed wireless; or satellite. It is therefore important that barriers to entry are minimised. For example, in the case of wireless platforms, this can be achieved through our strategy of spectrum release, liberalisation and trading. For fixed access, a key barrier to entry relates to the replicability of access networks where there is significant market power.
- 1.13 The main focus of the regulatory approach set out in this document is the upgrade to access networks where players currently hold a position of significant market power in relation to the relevant markets at present. Today, for physical access networks, this means BT across the UK. We therefore focus here on the key policy and regulatory issues raised by BT's plans to upgrade to super-fast broadband. Our focus is on providing regulatory clarity for BT, for communications providers who will rely on BT's infrastructure to deliver services and for consumers. Our intent is to provide a sufficiently clear regulatory approach about how regulation may be imposed in the future to secure investment and competition in the delivery of superfast broadband to the ultimate benefit of consumers. For other companies without significant market

power at this time, there is currently no basis for us to regulate. Findings of significant market power will be subject to re-examination in future market reviews.

- 1.14 The bulk of BT's current upgrade plan is based on the deployment of fibre-to-the-cabinet, as opposed to fibre-to-the-home. This statement therefore focuses extensively on the regulatory treatment of BT's fibre-to-the-cabinet deployment.
- 1.15 Our general approach to fibre-to-the-home investment was covered by our new build statement published in September 2008<sup>2</sup>. This outlined the regulatory regime for fibre in new build developments. This document set out clear positions on the delivery of existing regulatory obligations and products, universal service and uninterrupted access to emergency services.

**Given the level of uncertainty today, consistent regulatory principles are required to support investment**

- 1.16 Given the uncertainty surrounding demand for and cost of super-fast broadband, it is important that there is a clear and consistent regulatory regime. The best way to achieve this is to base regulation on relevant core principles. These are:
- contestability: creating conditions that allow any player who sees a case for deploying next generation access infrastructure to invest, as soon as they see a case to do so;
  - maximising potential for innovation: scope for innovation and differentiation is essential for competition in next generation access;
  - equivalence: in order to deliver effective competition, we must ensure all players have equal opportunities to access wholesale services at the levels where competition can be effective and sustainable;
  - reflecting risk in returns: investors in next generation access must have the opportunity to earn returns on investment that reflect the level of risk incurred; and
  - regulatory certainty: the regulatory regime must be clear and in place for a reasonable period of time. This will give investors the clarity that they need to invest with confidence.
- 1.17 These general principles and approaches are based on those that resulted from our Strategic Review of Telecommunications in 2005<sup>3</sup>. They focus on securing investment and competition at the deepest level in the network that is effective and sustainable.
- 1.18 In practice, it is clear that support for investment and competition in super-fast broadband networks means:
- providing a clear, consistent and transparent regulatory regime that reflects the underlying competitive dynamics;
  - ensuring any regulation takes account of the uncertainty and risk in investment, faced by a variety of players;

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<sup>2</sup> <http://www.ofcom.org.uk/consult/condocs/newbuild/statement/>

<sup>3</sup> [http://www.ofcom.org.uk/consult/condocs/statement\\_tsr/](http://www.ofcom.org.uk/consult/condocs/statement_tsr/)

- providing flexibility in trialling and piloting to help develop and test new technologies, commercial relationships and services, while retaining a long term focus on the aims of regulation;
- supporting initiatives by new entrants, the public sector and community broadband projects in the delivery of super-fast broadband services; and
- minimising barriers to entry wherever possible, through spectrum release, liberalisation and trading as well as ensuring future opportunities for competition are not unnecessarily foreclosed as a result of investment decisions made in the short term.

1.19 This statement builds on these principles. However, it also takes into account the magnitude of the changes that will result from the move to super-fast broadband – this is potentially a new era for communications services across the UK.

1.20 The responses we received to our September consultation ‘Delivering super-fast broadband in the UK’<sup>4</sup> support the view that the current framework for regulation remains relevant. However, we should not seek simply to roll-over existing regulation to new situations such as super-fast broadband investment. We must apply regulation in ways that are relevant and proportionate to the prevailing and future circumstances that we face. This has to take into account the need to promote investment and competition.

### **In the future, wholesale electronic products – ‘active access’ – will be key to deliver widespread investment and competition**

1.21 There are two main options for the promotion of competition in super-fast broadband:

- **active products** – wholesale services bought from super-fast broadband network owners that use both the network owners’ physical infrastructure (such as copper cables, fibre or duct) and its electronic equipment; and
- **passive products** - where competitors buy access to the network owner’s physical infrastructure only, and combine these with their own electronics to deliver services.

1.22 Active products will be fundamental to delivering widespread competition in super-fast broadband regardless of what happens with passives. They will form a vital part of the overall competitive environment and delivery of new retail services.

1.23 BT’s plans for its next generation active products have progressed substantially since our consultation, but delivering the right product will require continued work. To support competition effectively these products must be high quality and fit-for-purpose, building on the increasing understanding of industry’s technical requirements for these products. However, operational requirements will be as important as technical characteristics. Effective competition will also require these products to be provided to all wholesale customers on an equivalent basis.

1.24 We expect that active products will develop further in the future and offer scope for competitive differentiation and innovation. To support this objective, we have been working closely with industry to develop a good understanding of the technical

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<sup>4</sup> [http://www.ofcom.org.uk/consult/condocs/nga\\_future\\_broadband/](http://www.ofcom.org.uk/consult/condocs/nga_future_broadband/)



requirements for active products<sup>5</sup>. We believe it is important for active products to reflect many of these requirements. Consultation responses suggested that this can be best delivered through industry's existing approaches to new product development, supported as required by Ofcom and other mechanisms for strengthening industry dialogue.

### **There will continue to be a role for competition deeper in the network based on access to physical infrastructure – 'passive access'**

- 1.25 Regardless of the progress made in active product design, limitations will remain on the level of innovation and differentiation supported by active products compared to passive products. For example, passive access can provide greater scope for customising and differentiating retail services or offering different retail pricing propositions. This would suggest that, while the economics of competition based on active products may be more favourable today, propositions based on passive products may nonetheless have an important role to play in future.
- 1.26 We continue to favour competition at the deepest level possible wherever this is both effective and sustainable. At present there appears to be limited demand from communications providers for passive products. We believe, however, that the option to develop services based on passive inputs should be retained: we are therefore keen to promote passive access wherever this is economic and sustainable as this may ultimately be an important means of meeting consumers needs. We are particularly interested in innovative models of passive competition which may make it more economic than current sub-loop unbundling, including coordinated investment at the point of deployment, for example co-location. We will continue to work with industry to understand demand and approaches to passive competition.
- 1.27 In order to retain the possibility of future passive competition in fibre-to-the-cabinet there may be opportunities to design network upgrades in a manner that avoids unnecessarily foreclosing the possibility of such competition. Simply by taking account of the prospect of later competitive entry, design principles might be adopted which give rise to very little or no additional cost at the time of initial deployment but that lower entry barriers subsequently.
- 1.28 BT proposes, for example, to design its upgraded cabinet solutions with sufficient fibre and power capability to allow other communications providers to deploy their own equipment cost-effectively in future. We are keen to see similar principles extended wherever viable and practical: it will help ensure that future opportunities for competitive entry are maintained wherever feasible and cost effective.

### **There is increasing interest in opportunities to use duct access to support competition**

- 1.29 The results of our recent survey of BT's duct network shows there is significant unoccupied space in individual ducts. How far this may be used to support competition in super-fast broadband remains to be determined: end to end availability is highly variable, and practical and operational challenges would need to be addressed. In addition, use of existing duct may be more appropriate to support competition in fibre-to-the-cabinet deployments as opposed to fibre-to-the-home given general limitations on the amount of usable duct between the cabinet and home.

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<sup>5</sup> <http://www.ofcom.org.uk/telecoms/discussnga/eala/updated/>

- 1.30 As a result of the consultation, some players have indicated, for the first time, that they would be interested in using a duct access product. At the same time, there is significant interest internationally in using ducts to deploy super-fast broadband and support competition. Combined with the results from our survey, this suggests that duct access could play a role in the future, and we will be continuing to investigate this potential. However, at this time, access to BT ducts on its own does not appear to be an effective immediate solution to competition issues in fixed access networks.

### **Pricing will need to reflect the risk and uncertainty associated with investments in super-fast broadband**

- 1.31 Consultation responses were supportive of our approaches to wholesale pricing. There are two main elements to our policy position:
- at this stage of market development, pricing flexibility on wholesale active products is appropriate; and
  - for passive products, cost based pricing that reflects the level of risk incurred is appropriate.
- 1.32 We continue to believe that these approaches to wholesale pricing are appropriate and will support investment and competition. In either case, the pricing of products must allow opportunities to recover costs and earn a reasonable rate of return on investments.
- 1.33 However, while companies may have freedom to set specific price levels, we will continue to monitor pricing for behaviour that suggests anti-competitive motives or effects. This will include the relative levels of prices or other activities that may be undertaken to undermine fair competition.

### **Consultation responses suggested the prospect for early transition from copper to fibre networks is low at this time**

- 1.34 The issue of transition from copper to fibre networks did not feature as heavily in consultation responses as we had originally expected. While transition is likely at some point in the future, it appears too early to plan for it in detail now. Therefore, our position on this issue remains unchanged from the consultation: we should not seek to retain old access networks indefinitely, but any process for migration should be well signalled and managed in ways that minimise the level of disruption to consumers and the industry. This includes companies that have invested in current generation broadband.
- 1.35 In the future, any process for transition will have to be carefully timed and clearly signalled. We will also need to monitor developments in this area very carefully given the potentially large impact that future transition could have on the regulatory positions outlined in this document.

### **Ofcom will take forward a number of initiatives to continue to support the deployment of super-fast broadband**

- 1.36 This statement sets out the regulatory approaches that we intend to apply to super-fast broadband. These policy approaches will be implemented through a number of mechanisms, including market reviews and the Undertakings. Future market reviews will increasingly need to take into account the developments discussed here,

alongside further information and guidance from the European Commission and European Regulators Group.

1.37 Ofcom expects to take forward a number of key actions, including:

- supporting ongoing industry development of active products, including the characteristics, technical requirements and standards for these products;
- undertaking future market reviews, including the wholesale local access market review;
- ensuring the Undertakings continue to be suitable to support super-fast broadband;
- further work to understand the prospects and role of duct access in delivering super-fast broadband investment and competition. This will include understanding levels of industry demand as well as building on the outcomes of the duct survey; and
- monitoring prospects for and implications of any future transition from copper to fibre access networks;
- playing a leading role in working with stakeholders to need and possible scope of actions to further extend the availability of super-fast broadband services beyond where the private sector alone will deliver.

### **We are consulting on a variation to BT's Undertakings to support investment in super-fast broadband**

1.38 BT's Undertakings require BT Openreach to provide passive products on today's copper based access network on the same basis for all communications providers, including BT's own wholesale and retail divisions. This was in response to demand for such passive products from communications providers and a range of competition problems identified within the Strategic Review.

1.39 Today, in super-fast broadband, there appears to be more significant interest so far in active products. In these circumstances, requiring BT to develop passive products for communications providers, and to then use them itself, risks creating inefficiencies such as duplications in engineering labour or overly complex business processes. Such inefficiencies could have the effect of deterring investment in super-fast broadband, contrary to the consumers' interest.

1.40 In parallel to this statement we are therefore consulting on a proposed variation to BT's Undertakings. The proposed Variation would allow Openreach to control and operate the electronic equipment required to deliver fibre-to-the-cabinet wholesale products. Subject to the outcome of the consultation, this variation will require Openreach to provide active wholesale products to all service providers on an Equivalence of Inputs basis. BT also proposes a number of commitments around the provision of fibre-to-the-cabinet passive products which are designed to meet the needs of service providers who may wish to compete at this level.

1.41 The Variation in our view will help promote investment in superfast broadband which will be to the benefits of service providers and consumers. It also maintains a range of options – active and passive – to allow service providers to differentiate and compete in the broadband market.

**As super-fast broadband deployments gather pace, the debate will quickly move to extending the reach and speeds of services**

- 1.42 It is clear that there is significant interest from the private sector to commence delivery of super-fast broadband investment in the immediate future to significant portions of the UK. However, it remains unclear how far these private sector investments will go. This raises obvious wider public policy questions on how the emergence of a super-fast broadband 'digital divide' can be prevented.
- 1.43 This issue is of paramount importance to consumers and citizens given the long term benefits they might otherwise miss out on. As these services start to become part of life within the UK, the case for society to secure more widespread availability will increase quickly. Addressing this issue will be a matter for Government as well as Ofcom. We will have a key role to play in finding the right balance between private sector investment, the wider activities of the public sector and the regulatory framework that underpins both areas.
- 1.44 Once these new networks are deployed and services launched, focus will inevitably move to further improvements in the consumer experience. The UK should not limit its longer term vision for super-fast broadband to today's plans or technologies. This is just the start. In the future, we would hope that companies continue to invest in new technologies including fibre-to-the-home and evolutions of other technologies such as mobile broadband, fixed wireless and satellite, to deliver ever improving qualities of service and new, innovative applications. Without this ongoing development, there is a risk that the potential consumer, citizen and economic benefits will not be fully realised.
- 1.45 We look forward to a period of significant development in super-fast broadband. This will take a number of forms: increasing deployment of new networks and technologies, in product and service innovation and in widespread consumer benefits as the availability of super-fast broadband services is followed by the adoption of these services.

## Section 2

# Consumers and citizens are at the heart of our regulatory approach

- 2.1 On 23 September 2008, we published our consultation document 'Delivering super-fast broadband in the UK' (the September consultation). This set out our proposed strategy to support both investment and competition in super-fast broadband. Since then, we have seen substantial developments in the announcing and building of next generation access networks and the launch of super-fast broadband services. We have also had extensive discussions with stakeholders and received wide ranging representations from them to our consultation.
- 2.2 The acceleration of super-fast broadband development means it is even more important we provide a clear set of regulatory policies on how we will treat these new services. This will help to enable the market to continue investing and innovating with both new services and networks.
- 2.3 Protecting the interests of consumers and citizens is at the heart of our approach to the regulation of super-fast broadband. The services that can be delivered are likely to provide social and economic benefits to residential and business consumers. As such, we need to provide balanced regulatory policies that help deliver the prospective benefits through investment, innovation and competition.
- 2.4 This statement sets out our conclusions on the right overall regulatory strategy and principles for super-fast broadband based on consideration of stakeholders' views. Accompanying this statement are three related documents which raise important issues in their own right:
- A consultation on a request from BT to vary its Undertakings<sup>6</sup> to support the forthcoming deployment of next generation access networks<sup>7</sup>;
  - A report summarising our work with industry to define the technical requirements of active line access (ALA) products<sup>8</sup>; and
  - The results of our recent duct survey<sup>9</sup>.
- 2.5 While the focus of this statement is on super-fast broadband, we are very conscious that there remain groups of consumers who are not benefiting from the current generation of broadband for a range of reasons, including availability, accessibility and desire to connect. We are addressing this within our access and inclusion work, and separately in combination with the Government's Digital Britain project team. Under these projects we are examining the issues and looking to find ways to extend the benefits of broadband connectivity and the services they support to all. Over time, this debate will extend to include super-fast broadband.

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<sup>6</sup> <http://www.ofcom.org.uk/telecoms/btundertakings/btundertakings.pdf>

<sup>7</sup> <http://www.ofcom.org.uk/consult/condocs/fttc/>

<sup>8</sup> <http://www.ofcom.org.uk/telecoms/discussnga/eala/updated/>

<sup>9</sup> <http://www.ofcom.org.uk/telecoms/discussnga/duct/>

## What is super-fast broadband?

- 2.6 As we outlined in the September consultation, there is no single, agreed definition of what super-fast broadband is. It can be used to relate to specific technologies or to certain minimum bandwidths that can be supported. In practice, it is likely to be both, as well as a number of other characteristics such as the balance between bandwidths from and back to the network.
- 2.7 These new super-fast broadband services are often, but not always, delivered by new technologies – so called next generation access technologies. While it is the delivery of better quality, super-fast broadband services that will bring consumer and business benefits, it is the move to new access networks that may pose the greatest challenges for regulation.
- 2.8 In practice, super-fast broadband and next generation access could involve:
- laying fibre to existing telecoms street cabinets. This can offer the prospect of downstream bandwidths of 40Mbps and beyond and 15Mbps upstream. This compares to downstream speeds of 8 and 24Mbps for ADSL and ADSL+ technologies respectively;
  - upgrading current cable networks to deliver speeds up to and beyond 50Mbps downstream or more, against their previous maximum speed of 20Mbps;
  - fixed or mobile wireless services using new technologies which may be able to deliver headline speeds in excess of 50Mbps downstream and 20Mbps upstream; or
  - connecting new build homes and offices with fibre connections offering service speeds of up to 100Mbps or more.

## Super-fast broadband offers the prospect of real consumer benefits, building on those from today's broadband services

- 2.9 Consumers, citizens and businesses are likely to realise private, social and economic benefits following the rollout of super-fast broadband. Many of these will build on the already strong progress made with today's broadband services. The new services supported will provide a range of different characteristics, such as higher downstream and upstream speeds, that will enable innovative new applications.
- 2.10 For residential customers, super-fast broadband may provide a better or more reliable way to do things they already do today – for example, faster and more reliable connections for web-browsing, file sharing and e-commerce. In the longer term though, consumers are likely to benefit from new products and services that can only be delivered over super-fast broadband connections, including bandwidth-hungry content and audio-visual services.
- 2.11 For citizens these new services and applications may offer more intuitive and engaging ways to relate to each other and to physical and virtual communities more broadly. They will enable citizens to participate in new ways with society and democratic processes, and will influence how citizens access and benefit from future public services.
- 2.12 Business customers are more concerned with availability, resilience and quality of service – particularly given that loss of connections can mean loss of business. There

is also scope for businesses to use super-fast broadband services to improve their productivity, for example making greater use of online sales and purchasing systems, or more widely adopting cost-saving strategies such as teleworking. Super-fast broadband may also underpin an online economy where consumers and online businesses can trade, develop new applications and services and drive the UK's creative industries

2.13 The availability of super-fast broadband connections is not enough to deliver this vision; they need to be taken up by consumers. It is the development and take-up of new applications that make best use of the characteristics of super-fast broadband networks that will drive benefits. In addition, new access networks will need to be supported by investment and upgrades in other parts of communications networks so overall demand for much more bandwidth can continue to be met.

2.14 To ensure that super-fast broadband really delivers consumer, citizen and business benefit, it is imperative that there is:

- wide availability of super-fast broadband in the home, in the office, and on the move, at affordable prices and available to many;
- effective choice of super-fast broadband services and the applications offered over the new networks;
- high take-up of super-fast broadband by a broad range of different consumer groups, citizens and businesses;
- service innovation – we want to see a range of new services available that improves the lives of consumers;
- competitive prices - consumers must benefit from competitive prices and efficient delivery of services, but with prices at levels that give incentives to investment; and
- empowered and protected consumers – who understand what these new services offer them compared to today's broadband. They must also be able to easily migrate between services and competing suppliers, while being protected against potential abuse.

2.15 At this stage, we believe that many of these can be best secured through a combination of investment and competition. However, both will need the support of regulation, as will the protection of consumers in the future.

**Today, deployments are being largely led by the private sector, but in the future others will have a role to play**

2.16 Today, much of the wide scale super-fast broadband activity we are seeing is being led by the private sector. However, super-fast broadband in the UK seems likely to develop in three stylised phases:

- early deployments, largely private sector led and focussed on those areas and circumstances that lend themselves most to super-fast broadband and next generation access. These include upgrades to existing cable infrastructure, upgrades to copper access networks, new access network technologies, and new build housing;

- actions to extend the reach of super-fast broadband services beyond what the private sector alone would deliver. Some schemes along these lines are already well developed, for example Digital Region in South Yorkshire and recently announced plans from ActNow to secure next generation access in Cornwall from 2010. However, as the benefits of super-fast broadband become better understood from the first phase of build, and it becomes clearer where the market will and will not invest, there may well be an increasing focus on further actions that may be necessary to extend reach; and
- future upgrades to improve super-fast broadband services. Already, some commentators are calling for bandwidths in excess of those supported by some of the technologies that look likely to be deployed in the first phase. Communications providers and vendors are already working on such technologies, and planning such upgrades. In the longer term, if and when the benefits of super-fast broadband are proven, there will be an increasing desire to deliver more widespread availability of new, faster and better technologies. These could raise new challenges for regulation.

2.17 These three phases are unlikely to follow on from each other neatly – there will be overlaps between all three. New build fibre is one example: investment is being led by the private sector today, but the technologies used may be very similar to those that could form part of the third phase above.

**This statement describes our regulatory policies towards those super-fast broadband deployments led by the private sector**

2.18 It is crucial that the first phase of largely private sector led investment can start as soon as possible and is consistent with industry identifying an investment case. That time is now. The private sector, the public sector, and communities, are all trialling and experimenting with new applications and technologies to understand better what the benefits of super-fast broadband are. We must ensure that regulation supports these developments today.

2.19 Just as with broadband and other communications services today we expect private sector led investment will go a long way to delivering super-fast broadband to much of the UK. It is important that we provide as much regulatory certainty as possible in order to underpin this.

2.20 We have adopted the regulatory policies set out later in this document to give industry the regulatory certainty and regime necessary to invest in delivering super-fast broadband. But these policies have also been developed with competition in mind – securing investment with no competition will not result in a good outcome for consumers in the longer term. We believe that consumers benefit most from competitive markets that offer the potential for product, service and pricing innovation and real choice – something we have clearly seen in current generation broadband.

2.21 This statement provides our considered position on:

- how regulation should respond to the challenges posed by super-fast broadband;
- our approach to promoting competition, including the balance of focus between active and passive wholesale access products;
- our view on the most appropriate pricing of wholesale access products; and



- early views on the approach that could be adopted to any future transition from copper to fibre access networks.
- 2.22 The main focus of this statement is on specific planned deployments where significant market power may be an issue. This mainly relates to FTTC deployments by BT, explained in more detail in Section 3 below.
- 2.23 This statement does not by itself establish any specific regulatory rules. Rather, it will inform future policy implementation. European legislation<sup>10</sup> requires regulators such as Ofcom to carry out periodic reviews of markets: this is the mechanism by which we can introduce new regulation. The relevant markets in this case are likely to be those that cover wholesale local access and wholesale broadband access. Specific regulatory policies will therefore be implemented through market reviews, and where appropriate BT's Undertakings.

### **As the market starts to invest in super-fast broadband deployments, the debate will move to extending the reach and speeds of services**

- 2.24 The wider debate on super-fast broadband has already started to focus on later phases, including questions of increased availability and prospective exclusion resulting from differences in the future availability. Stakeholders have told us that there are reasonable grounds to believe that private sector investment alone will not result in new services for all. This was also the case for today's broadband.
- 2.25 Today, it is clear that the market intends to deliver super-fast broadband to at least 50% of UK consumers. However, it remains unclear just how much further it will go. This will depend on a range of factors including the level of competition, revenue opportunities and the cost building next generation access networks. There are situations where the market could either invest further than current announced plans, or not achieve today's aims.
- 2.26 How to address any potential shortfall in super-fast broadband availability is an issue for Ofcom and all its stakeholders, including government. Questions on availability, and on universal access, are clearly important for government given the possible implications for social and economic welfare. Currently, the Government's Digital Britain project is considering this in depth, both for today's broadband and also for super-fast broadband. However, we also need to make sure that regulation is alive to these issues: questions of access and inclusion for broadband are central to Ofcom's own work programme. We have a key role to play in assessing the need and form of any further action required to secure these new services to the majority.
- 2.27 Similarly, we must give thought to the future developments and upgrades – the third phase described above. Regulation needs to be consistent with the prospect of future upgrade paths for new technologies supporting greater bandwidths and higher qualities of service if demand emerges for these products. Specifically, consideration will need to be given to future prospects and implications for investment and competition of a move to ever high speed technologies, including FTTH.

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<sup>10</sup> Directive 2002/21/EC on a common regulatory framework for electronic communications networks and associated facilities ("the Framework Directive")

## Section 3

# Super-fast broadband services are now available in the UK, with more planned

- 3.1 By the middle of 2009, almost 50% of consumers will be able to access super-fast broadband through services offered by Virgin Media. There are plans from BT to invest in super-fast broadband to deliver up to 40Mbps to 40% of UK homes, by the end of 2012. These developments are in addition to the current broadband connectivity available to the majority of UK consumers through a range of service providers. However, we want to try and secure more choice through competition. We also want to secure wider availability of super-fast broadband: competition can again play a key part with other firms investing in additional deployments.
- 3.2 This movement of the new services, from planned and promised to real, is set to increase in the future. Increasingly high bandwidth services are going to be offered over fixed, cable, mobile, fixed wireless and satellite platforms.
- 3.3 However, the main focus for this statement is on the regulatory treatment of upgrades to those access networks that are enduring economic bottlenecks. In the main, this means the upgrade of BT's network to super-fast broadband, with a focus on FTTC. However, the overall principles and approaches adopted are likely to apply equally to other technology deployments where there is significant market power.

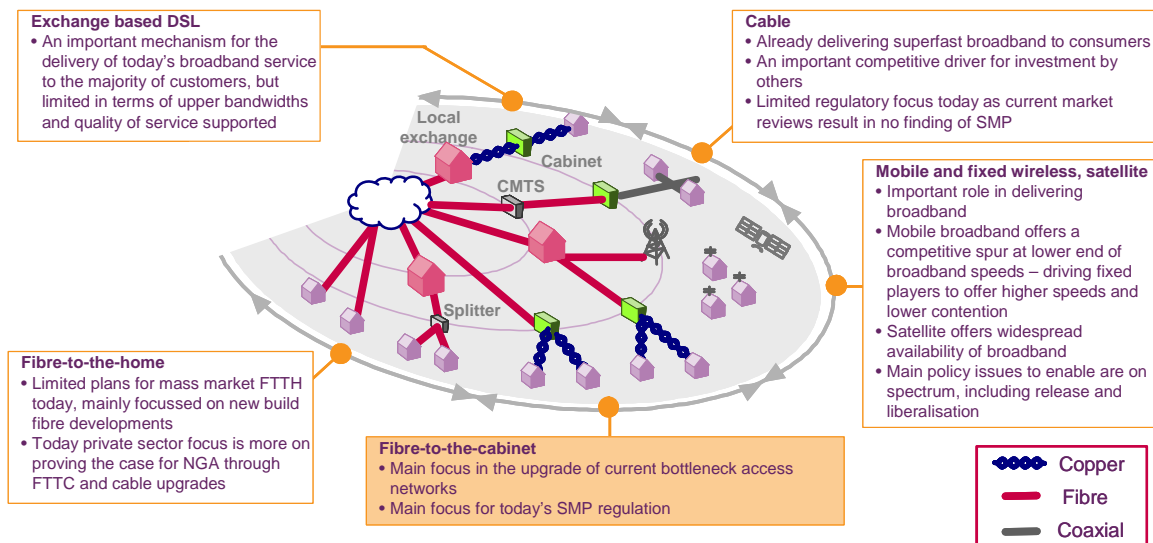
## Super-fast broadband can be delivered by a number of technologies

- 3.4 As we have outlined previously, super-fast broadband services can be delivered by a wide range of technologies and players. It is important that the regulatory regime does not prevent any of these technologies or platforms being used. This is one reason why we are continuing with our policy of spectrum release, liberalisation and trading. Our aim is to ensure that spectrum is released to the market in a timely and efficient manner so it can be used to deliver new services to end users, including but not limited to super-fast broadband.
- 3.5 Such a multi-platform environment, with services available from a range of networks, is important to securing the right outcomes for consumers. It can deliver real choice while also helping drive investment and innovation. Everyone can benefit from this, from residential consumers to small and large businesses.
- 3.6 Figure 1 and Figure 2 summarise the main technologies that might be used to deliver higher speed broadband. While technology continues to develop, the information in Annex 8 or our September consultation continues to provide relevant additional background information to these technologies.

**Figure 1: Technology options to deliver super-fast broadband**

| Technology                           | Description   |
|--------------------------------------|---|
| Fibre to the home or premises (FTTH) | Fibre offers the highest capacity of any access technology. FTTH uses it for the entire access network: this gives the prospect for ever higher speed services in the future. However, FTTH is expensive and disruptive because of the need to lay new cables to every building and the high labour costs this entails. Some existing access networks are being upgraded to FTTH, with existing assets being reused wherever possible. The exception is new build housing where new cables are always required; FTTH costs are therefore lower.   |
| Fibre to the cabinet (FTTC)          | FTTC upgrades reuse more of current copper access networks than FTTH. Fibre is installed into the access network, but only to street cabinets that typically serve a few hundred customers. From there to the end customers, the connection reuses the existing copper links, reducing costs compared with FTTH but still allowing significant speed increases over all-copper networks.  |
| Cable                                | UK cable access networks already use fibre with the final connection provided from street cabinets over coaxial copper cable (hybrid fibre/coax, HFC). This architecture allows them to be upgraded to super-fast broadband without needing new cables in the ground. Having been originally designed to broadcast TV, they are very efficient in delivering the same high bandwidth content to lots of users at the same time. Headline speeds for cable networks can be similar to or higher than other wired networks, but some characteristics differ such as more customers sharing bandwidth than for FTTC or FTTH technologies and more constrained upstream speeds.   |
| Mobile wireless                      | Mobile broadband has grown substantially, with 11% of UK adults now having access to mobile broadband at home. Technology developments have also resulted in increased headline speeds. This is likely to continue with further technology deployments including 3G LTE. Due to the way that mobile network capacity is shared, wired networks are ultimately likely to deliver higher speeds and larger usage caps than mobile. While playing an increasingly important role in delivering broadband generally, its principle characteristic of mobility simply cannot be offered by fixed networks. For some customers, the benefits of this mobility will outweigh any speed differences. For others, mobile may supplement their wired broadband service. Whatever the balance between fixed and mobile services, it is clear mobile will continue to have an important role in the market. |
| Fixed wireless                       | Technology developments, including WiMAX, are making the boundary between fixed and mobile wireless less clear. In general, fixed wireless can offer longer ranges and higher bandwidths than mobile. Whilst it can be used anywhere, fixed wireless access has been most successful in areas where wired infrastructure build is particularly expensive, such as more rural locations.   |
| Satellite                            | Satellite broadband offers close to 100% coverage across the UK. No other technology achieves this - for some, satellite is the only broadband option. In the past, there has been a trade off between this coverage at a relatively high cost and limited capacity shared between many users. Recent developments mean satellite bandwidths have increased, and reuse their capacity more efficiently to reduce this trade off.  |
| Other technologies                   | As well as these technologies, others may play a role in super-fast broadband. One example is powerline communications. This uses existing mains electricity distribution to deliver broadband signals. However, despite early trials there has been no commercial deployment in the UK, and it is not anticipated that these technologies will deliver mass market super-fast broadband in the near term.  |

**Figure 2: There are many ways to deliver super-fast broadband**



**Major next generation access announcements have largely been focussed on fibre based wireline deployments**

3.7 Virgin is in the process of upgrading its hybrid fibre/coax cable network to offer 50Mbps, in addition to its existing services at 20, 10 and 2 Mbps. These services were available to 20% of UK homes at launch in December 2008, with the aim of extending reach to all 50% of UK homes covered by the cable network by mid-2009, making it the largest such deployment currently being planned.

3.8 The new technology, known as DOCSIS 3.0, which Virgin Media are using for the current upgrade should allow them to offer even faster speeds in the future. Indeed, the company has said that 200Mbps should be achievable and that it would like to offer this to customers by 2012. These developments may prove to be an important driver for investment by Virgin Media's competitors in order to match or better the quality of services on offer from cable.

3.9 BT is also progressing with its plans for super-fast broadband. BT's plans focus on rolling-out fibre-based services to the cabinet. BT is about to start large scale pilots in two exchange areas: Muswell Hill in north London; and one in Whitchurch in South Glamorgan. It has announced plans to deliver next generation access to up to 10 million homes by the end of 2012, drawing on a mix of fibre-to-the-cabinet and fibre-to-the home. The exact exchange areas are to be decided in consultation with its wholesale customers. Service providers will be able to offer super-fast broadband services to customers connected to BT's network.

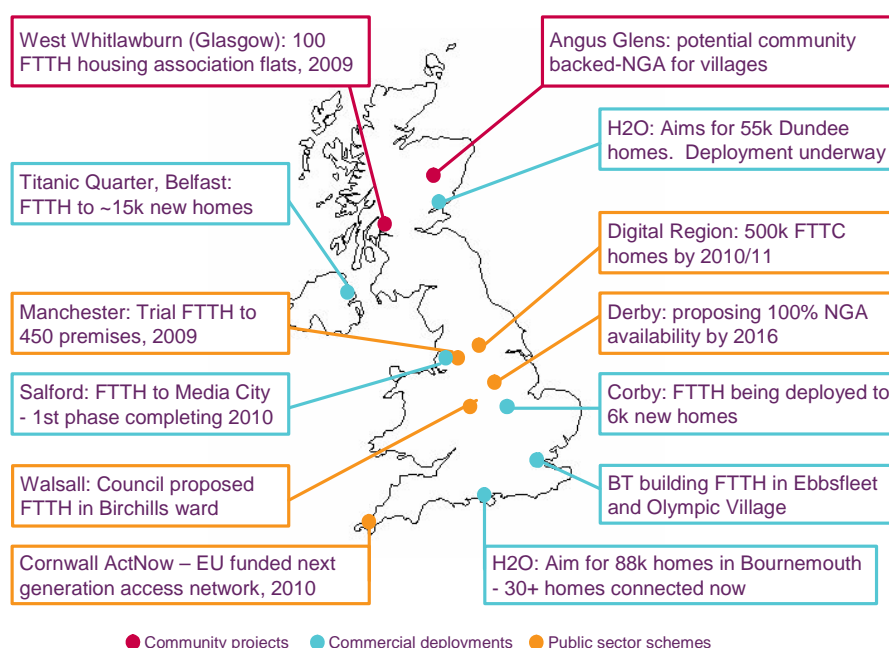
3.10 Openreach has also been consulting its customers on the wholesale products<sup>11</sup> it plans to offer them following BT's investment in next generation access. As a result, a number of service providers have now signed up to offer services over the pilot active products being developed for the Muswell Hill and Whitchurch deployments.

3.11 Smaller scale deployments involving joint public and private sector developments and localised private networks are also continuing:

<sup>11</sup> BT's wholesale access services are based on its Generic Ethernet Access product being supplied out of Openreach. <http://www.openreach.co.uk/orpg/news/productbriefings/nga/nga00108.do>

- H2O has commenced the rollout of a FTTH network in Bournemouth, and will shortly start deployment in Dundee;
- Digital Region is shortly to issue the final contract and commence build of a FTTC network connecting 600,000 premises in South Yorkshire;
- the South West Regional Development Agency is about to commence a tender process for next generation access deployment in Cornwall using European structural funds; and
- new build fibre and community broadband developments continue, with projects announced round the UK, as outlined in Figure 3.

**Figure 3: Sample of announced local super-fast broadband schemes**



### **Our immediate regulatory focus is on fixed network upgrades, notably FTTC**

- 3.12 We need to ensure that investment in super-fast broadband services from all of these platforms is supported by an appropriate and proportionate regulatory regime. We want to encourage and enable the deployment of new technologies and services to bring new services, and therefore benefits, to consumers. Key to this is minimising barriers to entry, for example through our strategy of spectrum release, liberalisation and trading.
- 3.13 However, the main focus of regulation is on those areas where there is significant market power and few prospects for future competition as a result of high barriers to entry. Based on current market reviews, there is no basis to regulate parties other than BT (and KCOM in Hull). However, we cannot presuppose the outcome of future market reviews.
- 3.14 In practice, this means our current focus needs to be on the challenges posed by the upgrades to copper access networks required for delivering super-fast broadband services.
- 3.15 The bulk of BT's proposed upgrade is based on use of fibre-to-the-cabinet (FTTC). This has also been the main focus of industry through Openreach's recent product

consultation and development of its new wholesale product, Generic Ethernet Access (GEA) over FTTC networks. As a result, this statement focuses on the regulatory treatment of BT's upgrades to super-fast broadband using FTTC.

- 3.16 Our general approach to new build FTTH investment was covered by our new build statement published in September 2008<sup>12</sup>.

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<sup>12</sup> <http://www.ofcom.org.uk/consult/condocs/newbuild/statement/>

## Section 4

# Consultation responses supported our overall principles and approaches

- 4.1 It is clear that, at this stage of market development, potential investors require consistent and transparent regulatory principles. This reduces some of the areas of uncertainty related to super-fast broadband, and increases the likelihood of investment. These principles must be balanced to achieve the twin aims of securing investment and competition in the face of the significant complexity inherent in super-fast broadband deployment.
- 4.2 Our overall approach is consistent with European guidance from the European Regulators Group and European Commission on regulatory approaches, and is founded on our current approach to market definition provides the overall context for these policy positions.

### **There were no concerns expressed on the overall regulatory principles or framework in light of super-fast broadband**

- 4.3 Many respondents to our September consultation commented that regulatory certainty was a requirement to enable investment in super-fast broadband and ensure it is not undermined. They stated that Ofcom should ensure that regulation does not result in an inefficient outcome and that flexibility and extended rollout should be accompanied by appropriate rewards. A common theme amongst responses was the continuing appropriateness of Ofcom's overall regulatory framework and principles. This included the continuing need for approaches based on market reviews, identification of competition problems and tailored regulatory remedies to address them.
- 4.4 At the same time, respondents believed that industry had a key role to play in finding solutions to issues posed by these deployments. In some instances, respondents believed that there was also a role for Ofcom in facilitating such discussions. More detail on responses can be found in Annex 1.

### **Consistent regulatory principles are required at times of uncertainty**

- 4.5 The starting point for our regulatory approach to next generation access is our statutory duties: to further the interests of citizens in relation to communications matters; and to further the interests of consumers in relevant markets, where appropriate by promoting competition. In meeting these duties, the Communications Act 2003 ("the Act") also sets out that we should secure the availability of a wide range of electronic communications services throughout the UK; encourage investment and innovation in relevant markets; and, where relevant, encourage the availability and use of high speed data transfer services throughout the UK.
- 4.6 Initially, current generation consumer broadband services had limited geographic coverage and lacked sufficiently strong competition between providers. However, changes brought about by the application of the regulatory principles we established in our Strategic Review of Telecommunications<sup>13</sup>, and BT's Undertakings that followed, laid the framework for a competitive market. It was this competitive market

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<sup>13</sup> [http://www.ofcom.org.uk/consult/condocs/statement\\_tsr/](http://www.ofcom.org.uk/consult/condocs/statement_tsr/)

that helped to support significant industry investment in broadband, resulting in a vibrant and competitive market.

- 4.7 As we set out in previous consultation documents, we consider that the regulatory principles from the Strategic Review of Telecommunications are also relevant to the regulatory challenges posed by super-fast broadband. In particular, we consider it is still appropriate to promote efficient, competitive private sector investment and competition at the deepest level that is effective and sustainable. However, we must also take into account the fact that we are moving into a new era for telecoms networks and that the challenges will differ to those faced by today's access networks.
- 4.8 Recognising this, the September consultation set out five principles we have adopted in relation to super-fast broadband and next generation access. These are:
- contestability: creating conditions that allow any player who sees a case for deploying next generation access infrastructure to invest, as soon as they wish;
  - maximising potential for innovation: scope for innovation and differentiation is essential for competition in next generation access;
  - equivalence: in order to deliver effective competition, we must ensure all players have equal opportunities to access wholesale services at the levels where competition can be effective and sustainable;
  - reflecting risk in returns: investors in next generation access must have the opportunity to earn returns on investment that reflect the level of risk incurred; and
  - regulatory certainty: the regulatory regime must be clear and in place for a reasonable period of time. This will give investors the clarity that they need to invest with confidence.
- 4.9 On the final principle, ensuring a clear and consistent regulatory environment and rules is vital to securing investment. We will aim to deliver regulatory certainty by committing to ensuring our decisions are clear, timely and consistent over the longer term wherever underlying competitive conditions remain unchanged. We will also seek ways to ensure such certainty and consistency is reflected within the European Framework wherever possible.
- 4.10 Regulators are unable to commit legally to specific regulatory approaches beyond the period of market reviews, risking increased investor uncertainty on future policies. In this situation, the only way to provide certainty to investors is through transparent and timely commitment to a clear regulatory framework based on the prevailing competitive conditions. Changes to these regulatory positions would need to be justified by the underlying competitive environment.
- 4.11 Following the September consultation, it is clear that supporting investment and competition in super-fast broadband requires:
- providing a clear, consistent and transparent regime that reflects the underlying competitive dynamics;
  - ensuring that it takes account of the uncertainty and risk in investment, faced by a variety of players;



- providing flexibility in trialling and piloting super-fast broadband services to help develop and test new technologies, commercial relationships and services, while retaining a long term focus on the aims of regulation;
- supporting experimentation by new entrants, the public sector and community broadband projects in the delivery of super-fast broadband services; and
- minimising barriers to entry wherever possible, through spectrum release, liberalisation and trading as well as maintain options for future fixed network investment by all parties.

### **Regulation must find the right balance to secure both investment and competition**

4.12 We believe that our duties with respect to consumers and citizens can be best met by both:

- promoting investment to support early deployment and widespread availability of super-fast broadband ; and
- securing competition at the deepest level that is effective and sustainable, particularly in the longer term.

4.13 Our regulatory approach needs to find the right balance of policies to allow both aims to be achieved.

4.14 In many instances a competitive market will in itself promote investment: competitive pressure leads companies to invest and innovate to maintain market share. However in markets characterised by significant uncertainty, such as super-fast broadband today, prospective competition may be considered a significant risk and could actually limit rather than promote investment. We need to be aware that measures intended to promote competition in advance of new, risky network deployments could stifle actual investment from regulated companies.

4.15 However, at the same time, allowing investment with no consideration for future competition could limit the prospective benefits for consumers and future investment. We do not want to miss the opportunity to place competition at the heart of next generation access networks. We would like to see consumers and citizens benefit from timely investment and widespread availability as well as choice and competitive prices achieved through competition. In working towards our aims we will also remain aware of the potential impact of our regulatory approach and policies on industry and their incentives and ability to invest.

### **Super-fast broadband and next generation access pose a number of complex challenges for investment and competition**

4.16 Delivery of super-fast broadband services is unlike many previous developments in the communications sectors. In many cases it requires substantial new investment in networks to deliver retail services that are still not well understood. Since we published our first discussion document on next generation access, the level of debate and understanding of next generation access has grown substantially. What is clear from this is that next generation access poses a number of complex, and often inter-related, challenges for both investment and competition.

## Investment challenges

- 4.17 Uncertainty surrounding investment can be categorised into three main headings:
- the business case for investment;
  - designing and building networks that support super-fast broadband services; and
  - the how the regulatory environment affects investment.
- 4.18 The business case for investment continues to be uncertain. There is still little evidence on how many customers will be prepared to pay for access to super-fast broadband services and how much they will pay. As a result, the potential rate of return for investors may need to be higher to encourage efficient investment. This uncertainty is compounded by questions on how far existing business models may be able to support the case for substantial investment in new networks.
- 4.19 Actually designing and building the new networks to support super-fast broadband pose a number of challenges for investment. For example:
- What is the most efficient time and phasing for investment? This is closely linked to the issue of demand uncertainty.
  - What is the most appropriate technology to use, balancing near term costs with long term functionality? Next generation access technologies are developing rapidly, with evidence from international case studies becoming available.
  - How far can network build support the business case for investment through potential cost savings? These challenges are common to today's broadband services and relate to how network investors can monetise broadband in ways that still allow application and service innovation and consumer benefit.
- 4.20 Thirdly, a clear framework allowing a range of stakeholders to progress with super-fast broadband investment is critical to addressing both investment and competition challenges. Such stakeholders include existing communications providers, new entrants and the public sector. The regulatory regime is a major element in the overall market. It sets out the rules that will apply to new next generation access networks, and will influence decisions and plans to invest in these new networks by all parties, whether they are regulated or not. Regulation can directly or indirectly influence investment levels, technology choice, reach, timing of rollout, commercial strategies, products and prices. In the tables below we outline the headline policy proposals to address both investment and competition issues that result from next generation access.
- 4.21 There are a number of regulatory policy areas that may influence investment :
- rates of return - both potential network investors and future wholesale customers will be concerned about ensuring cost recovery on investments and having opportunities to make an appropriate rate of return;
  - competitive intensity - more competition can result in increased investment incentives and a bigger market. At the same time, the risk of significant and unsustainable future competition can reduce investment incentives;

- economics of different wholesale services - uncertainty on the actual economics of different wholesale access products compared to their scope for innovation and differentiation; and
- level and type of regulation - the risk that prospective investments may be jeopardised if investors face disproportionate regulation in other activities.

4.22 Figure 4 outlines the regulatory policy positions we think are appropriate to address each challenge of these challenges.

**Figure 4: Policy responses to investment challenges**

| Investment challenge |  | Regulatory policy position  |
|----------------------|--|---|
| Business case        | Demand uncertainty                               | <ul style="list-style-type: none"> <li>• Enabling a <b>flexible environment for experimentation and trialling</b> of new technologies, products and services</li> <li>• Enabling suitable pricing approaches to account of risk levels</li> </ul>   |
|                      | Ability of business models to support investment | <ul style="list-style-type: none"> <li>• This is not an area for Ofcom to become directly involved in. However, we support the development of new business models that balance incentives to invest and consumer interest. Regulation should not prevent innovation and experimentation in new business models where this does not result in substantial consumer harm</li> </ul>   |
| Build                | Technology uncertainty                           | <ul style="list-style-type: none"> <li>• Continued belief in the principle of <b>technology neutrality</b></li> <li>• Spectrum release and other means of market entry</li> <li>• <b>Importance of standardisation</b> to allow interoperability and reduced inefficiencies</li> <li>• <b>Design principles</b> and early engagement on ‘how’ these networks can be built most cost efficiently but still with scope to support passive based competition</li> </ul>  |
|                      | Most efficient time for investment               | We favour enabling industry, through a <b>clear regulatory framework</b> , to make earlier investment wherever this is efficient  |
|                      | Opportunities for cost savings                   | <b>Managed transition</b> at the most efficient time  |
| Regulation           | Cost recovery and rate of return                 | <ul style="list-style-type: none"> <li>• <b>Pricing flexibility</b> on active products</li> <li>• <b>Returns on passives products that reflect</b> risks</li> <li>• <b>Cost recovery principles</b> applied to active and passive wholesale products</li> <li>• Ensuring downstream providers can earn suitable returns – monitoring for <b>margin squeeze</b></li> </ul>   |
|                      | Competitive intensity                            | <ul style="list-style-type: none"> <li>• Clear expression of regulatory interest in maintaining both <b>active and passive competition</b></li> <li>• Continued requirement to meet reasonable demand for access, either at the same time or at a later stage, as well as a requirement to conduct appropriate <b>industry consultation</b></li> <li>• Options for effective and sustainable passive competition based on –<b>coordinated investment, design principles</b> that make later market entry possible and through the provision of passive inputs on the same basis where reasonably practicable or otherwise to the same specifications, functionality and outcomes as the inputs Openreach uses itself</li> </ul> |
|                      | Wholesale competition                            | <ul style="list-style-type: none"> <li>• Support for <b>high quality fit-for-purpose active products</b></li> <li>• Support for effective and sustainable passive competition through <b>the obligation to meet reasonable demand</b>, and the adoption of design principles that enable future market entry on the most cost-effective basis possible</li> </ul>   |
|                      | Existing regulation                              | Ongoing commitment to ensure the appropriateness of regulatory policy and the burdens they impose against the benefits they bring   |

4.23 However, regulation is not the only factor influencing investment – or even necessarily the most important. For example, consumers’ willingness to pay for higher bandwidth services, the development of new applications and services that require these higher bandwidths and greater quality of service, and the level and

nature of inter platform competition will all have an impact on next generation access investment. Many of these additional factors are partly or entirely outside the direct control of regulation. This statement focuses on areas where regulatory policy can have a direct influence.

### **We have not considered in this document questions raised on business models that may support investment**

- 4.24 In addition to these factors, investment in super-fast broadband may require the emergence of new business models. Within the September consultation we asked the question of the role of regulation in supporting such business models. Consultation responses and debate on this issue agreed that new business models are important, but that it should not be for the regulator, but the market, to lead in the development of new business models. Overall response from stakeholders on this question was that regulation has a relatively limited role in developing new business models or supporting specific business models
- 4.25 We agree with this position in part. Our view is that the market is best placed to develop new business models. However, it is important that these do not result in significant consumer detriment or anti-competitive outcomes. Our role includes protecting against both of these outcomes. Additionally, we can provide support for the development of sensible self-regulatory frameworks, where appropriate.
- 4.26 A sensible regulatory framework, whether based upon self-regulation or involving a more formal role for Ofcom, can raise levels of consumer confidence in new products and services, and encourage investment in complementary products and services. More broadly, we would like to ensure regulation does not get in the way of such developments. The exact role played by regulation in supporting the development of new business models is a debate that will continue.

### **Competition challenges**

- 4.27 In addition to investment related issues, the move to next generation access networks presents a number of competition challenges outlined in Figure 5 including:
- the most appropriate approach to secure effective and sustainable competition for consumers in the face of prospective economic bottlenecks. There remains a risk that fixed network upgrades to deliver super-fast broadband will result in enduring economic bottlenecks. In such circumstances, we need to promote competition at the deepest level that is effective and sustainable in order to maximise consumer benefits;
  - implications of next generation access for existing models of competition - super-fast broadband may result in challenges to existing regulatory approaches and products; and
  - how these new networks may affect consumers' experience of future communications services - consumers must continue to have a high quality experience from services delivered over new next generation access networks.

**Figure 5: Policy responses to competition challenges**

| Issue  | Regulatory policy position   |
|--|--|
| Securing effective and sustainable competition for consumers in the future | <ul style="list-style-type: none"> <li>• Promoting and helping develop <b>high quality active wholesale products</b>, enabling differentiation of active products</li> <li>• <b>Equivalence of inputs</b> on active products provided by BT out of Openreach</li> <li>• Continued requirement to meet reasonable demand for passive access, where practicable and an obligation to conduct specific <b>industry consultation</b> on passive inputs once there is more experience of FTTC deployments in the market.</li> <li>• Securing contestability – <b>requirement to meet reasonable demand for deployment at the same time as Openreach</b></li> <li>• Retaining options for future competition – that make future market entry possible on the most cost-effective basis possible</li> <li>• Provision of passive inputs using the same components, processes and systems it uses itself where reasonably practicable, or otherwise to the same specifications, functionality and performance</li> <li>• Promoting inter platform competition e.g. through spectrum release</li> <li>• Exploring the appropriateness of options for new regulatory remedies, including <b>duct access</b></li> </ul> |
| Implications for current regulation  | <ul style="list-style-type: none"> <li>• No simplistic roll-over of existing regulatory products, but instead a <b>managed transition</b> to minimise impact on competition and promote investment</li> </ul>  |
| Consumer experiences and outcomes  | <ul style="list-style-type: none"> <li>• <b>Migrations processes</b> and <b>ongoing consumer protection</b> remains key – need to be embedded in active and passive products</li> </ul>  |

**We have developed our policy positions to address these challenges and to deliver on our aims for investment and competition**

4.28 The policy positions summarised above have been adopted based on the responses received to the September consultation. They have been developed to address those areas of challenge and complexity that regulation can influence in order to deliver on our dual aims of securing investment and promoting competition.

4.29 The main policy areas outlined in Figure 4 and Figure 5 are explained in more detail in the remainder of this statement. Our regulatory approaches aim to deliver consumer benefit from timely deployment, competition and innovation.

4.30 Section 5 sets out our approaches to wholesale active products, including the importance of:

- high quality, fit-for-purpose active wholesale products, supported by the robust and scalable systems and processes, to deliver investment in widespread super-fast broadband and competition;
- ongoing development of active products to meet industry needs;
- standardisation of active products and adoption of standards across industry is vital; and
- active products provided by BT on an equivalence of inputs basis out of Openreach (subject to the outcome of the variation consultation).

4.31 Section 6 covers our overall approach to passives, including:

- obligations to meet reasonable demand for access to physical infrastructure as a result of findings of significant market power;
  - opportunities for coordinated investment at the time of network rollout, for example for competitors wishing to house their own equipment at or close to Openreach's cabinet sites in the most cost-effective manner possible, offering a potentially a more favourable economic basis for passive competition; and
  - options for protecting potential future competition through design principles that make future market entry feasible on the most cost-effective basis possible.
- 4.32 Section 7 summarises the outcomes of our recent duct survey and the possibility of options for duct access to form a prospective future regulatory remedy
- 4.33 Section 8 sets out our positions on the pricing of wholesale access services, including:
- pricing flexibility for active wholesale products;
  - rates of return and pricing for passive products that reflect the level of risk at the time of deployment;
  - managing potential risks arising from margin squeeze; and
  - Ofcom's approach on cost recovery in relation to super-fast broadband wholesale products.
- 4.34 Section 9 covers our headline approaches to future transition from copper to fibre access networks

### **These overall approaches are consistent with European guidance on regulatory approaches**

- 4.35 The European Commission closed its consultation on a proposed Recommendation on Next Generation Access networks on 14 November 2008<sup>14</sup>. The aim of the proposed Recommendation was to provide guidance to national regulators on the treatment of regulated access to next generation access networks, to prevent fragmentation of the internal market, incentivise investment in next generation access networks, and foster competition in the new super-fast broadband environment. Whilst not bound to follow a Commission Recommendation, we are required to take utmost account of its contents.
- 4.36 The Commission noted that in terms of achieving effective competition, passive remedies provide the greatest theoretical scope for product differentiation and innovation. However, it also recognised that passive remedies will not be available in every circumstance. There is therefore a need for a range of active and passive remedies to be available to ensure effective competition in all market circumstances. The Commission also noted the importance of taking investment risk into account in setting regulated prices. Finally, it noted that transitional arrangements must be in place to ensure that wholesale customers were able to migrate from copper to fibre based products in an orderly and timely fashion.

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[http://ec.europa.eu/information\\_society/policy/ecom/comm/doc/library/public\\_consult/nga/dr\\_recomm\\_nga.pdf](http://ec.europa.eu/information_society/policy/ecom/comm/doc/library/public_consult/nga/dr_recomm_nga.pdf)

- 4.37 At this time, the exact timetable for the final publication of the Commission Recommendation is unclear. However, our policy positions have been formed taking into account the general direction and contents of the draft Recommendation.
- 4.38 In addition to the European Commission's draft Recommendation, the European Regulators' Group (ERG) published its Opinion on the Regulatory Principles for Next Generation Access in October 2007<sup>15</sup>. This Opinion explicitly focused on implementation issues and regulatory principles for fixed next generation, based on the 2002 EU electronic communications framework. The Opinion recognised that next generation access may impact on the definition of relevant markets at both the retail and wholesale level, but that today's market definitions may be appropriate for super-fast broadband. It also recognised that for an effective transition, it would be important that national regulators ensure that there is transparency surrounding any planned deployment of super-fast broadband. The Opinion also recommended that regulators need to develop their regulatory approach early in the deployment process to provide the necessary predictability to all market players.
- 4.39 From the outset Ofcom has taken utmost account of the direction and contents of the Opinion. The key principles that it sets out closely match those outlined by Ofcom both in terms of overall regulatory strategy for telecommunications networks and in relation to the specific issues arising in relation to super-fast broadband.

### **Our current approach to market definition provides the overall context for these policy positions**

- 4.40 The focus for regulation is on areas where effective and sustainable competition is unlikely to emerge - specifically where companies have market power or risk causing consumer detriment from other sources. Regulation of current generation broadband was necessary as the physical access network represented an enduring economic bottleneck, giving the owner of the access network market power. There remains a substantial risk that upgrades to these existing networks to offer super-fast broadband services will also result in a bottleneck given the costs involved in fixed deployments and the limitations of other technologies. The focus of ex ante regulation is on addressing positions of significant market power.
- 4.41 The process for identifying market power and implementing regulatory remedies to tackle this is undertaking a market review. Under the European Framework and UK legislation, we are required to undertake market reviews at frequent intervals, and each must be conducted on its merits according to a strictly-defined legal process.
- 4.42 Respondents to the September consultation pointed to the importance of market reviews and that regulation should be applied flexibly according to prevailing conditions, but consistently where there are no material changes between review periods. We agree with this position, especially in the current situation of significant uncertainty surrounding super-fast broadband.
- 4.43 One of the key steps of these reviews is establishing a market definition within the scope of a market review. Defining the market involves identifying relevant competitive constraints that may apply to products and services. It is necessary to consider how far each constraint may apply to the new products and services. In each case, it is necessary to consider the constraints on the product first, and then to consider the way in which constraints may vary by geography.

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<sup>15</sup> [http://www.erg.eu.int/doc/publications/erg07\\_16rev2\\_opinion\\_on\\_nga.pdf](http://www.erg.eu.int/doc/publications/erg07_16rev2_opinion_on_nga.pdf)



- 4.44 In our previous consultations we discussed our overall position on market definitions for next generation access and super-fast broadband services. Although the determination of the relevant market will be conducted within the scope of a market review, generally, we expect that many of the applications and services delivered by super-fast broadband initially will be able to be supported by current higher speed broadband services. Therefore, in the absence of evidence suggesting otherwise, super-fast broadband services and today's broadband services are likely to fall into a single broad market definition.
- 4.45 In practice, this means that, at the wholesale level, next generation access services are likely to fall within the definitions of market 4 (wholesale local access) and market 5 (wholesale broadband access) as set out in the European Commission Recommendation and supported by the ERG Common Position.
- 4.46 Our wholesale broadband access (WBA) market review, completed in May 2008<sup>16</sup>, drew similar conclusions: we concluded that there was insufficient evidence that services with speeds higher than were available would fall into a separate economic market. We will look at next generation access services in the context of the wholesale local access (WLA) market review when this review commences later in 2009.
- 4.47 It is important to note that market definition is only the initial step in the market review process. When considering whether ex ante regulation is required to promote competition, we will need to consider whether deployment and take-up of super-fast broadband services has altered the competitive conditions in the relevant market. We will also need to establish whether it is appropriate to regulate next generation access wholesale products alongside current generation products.
- 4.48 Our overall approach to regulation is to remain consistent between market reviews where the competitive environment has not changed materially. We will revisit the conclusions from any market review and overall policy positions in future market reviews as and when market and competitive conditions change significantly. Two specific examples include:
- where evidence suggests consumers are beginning to place sufficient additional value on higher speed services such that there is a break in the chain of substitution between current and higher speed services then it may be appropriate to define separate economic markets for these services; and
  - where transition from copper to fibre networks results in the removal of copper connections to the exchange, the overall competitive position in the market may change. This may require the policy positions outlined in this statement to be revisited.

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<sup>16</sup> <http://www.ofcom.org.uk/consult/condocs/wbamp/wholesalebroadbandreview/>



## Section 5

# Active wholesale access is fundamental to delivering widespread competition

- 5.1 Active wholesale products have a number of advantages over passive access, particularly in relation to the cost of market entry. Following the September consultation it is clear that active wholesale products will have a central role in delivering competition in super-fast broadband. The economics of these products mean that they are the most likely access product to be viable across the full footprint of next generation access deployment.
- 5.2 In order to support effective competition it is essential that active products are of high quality and deliver significant scope for innovation and differentiation. Industry has made good progress on this so far, but this development will need to continue into the future. Ofcom has been engaging with industry to capture their detailed requirements for future active products and we are publishing the resulting document on Ethernet Active Line Access technical requirements alongside this statement<sup>17</sup>. We have also been facilitating the international standardisation of active line access and this work will continue.
- 5.3 There may be circumstances in which active products do not deliver on their promise, or communications providers demand greater levels of control and configurability than active products can deliver. It is for these reasons that we must also retain opportunities to compete through passive access products; these are explored in more detail in the next section.

## Consultation responses were supportive of active product development

- 5.4 Respondents were generally of the view that there was a need for high quality, fit for purpose active wholesale products and that these needed to be flexible and support differentiation. Active products need to replicate as far as possible access to passive infrastructure and they should provide similar scope for innovation and control.
- 5.5 Some respondents provided more specific examples of the type of control required and service offerings that active access products should support (for example installing consumer premises equipment or multicast capabilities) that broadly agreed with the active line access technical requirements.
- 5.6 A number of respondents stated that active products were more likely to support competition than passive products and that they would, in any case, be needed in areas in which passive products would not be economic.
- 5.7 Overall, respondents agreed that current industry discussions and ongoing engagement on the design of Openreach's active products were the right way forward.

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<sup>17</sup> <http://www.ofcom.org.uk/telecoms/discussnga/eala/updated/>

## Active wholesale products will have a role to play in next generation access regardless of the future of passives

- 5.8 Active wholesale products rely on a combination of the network owners' physical infrastructure (such as copper cables, fibre or duct) and their electronic equipment. The electronic data signals which are produced form the input that competing operators use to deliver services to their end customers.
- 5.9 These products have played a very important role in the development of competition in today's broadband services; the facilitation of many players entering the market and gaining scale allowed some of them to make the additional investment required to migrate to passives. In areas where passives are not economically viable, actives continue to bring the benefits of competition to all broadband consumers; they provide choice for the approximately 20% of areas where local loop unbundling has not been used. There are several features of active products that also make them an attractive basis for super-fast broadband competition, including:
- less investment is required than when using passive products;
  - services can be established rapidly as local infrastructure build is not required;
  - all customers on a network can be addressed at once. Relatively little additional investment is needed to maintain this as the coverage of the network grows; and
  - with standardised active products, there is the potential for a single retail product to be readily offered to customers served by many different access networks.
- 5.10 The economic and practical advantages of active products and the uncertainty about the economic viability of passive alternatives, led respondents to the September consultation to express strong interest in using active access. All respondents agreed that a high quality product is essential to the future development of the market. There was also strong interest in the development process for the active wholesale products (known as GEA – Generic Ethernet Access) that Openreach plans to offer to retail service providers.
- 5.11 It seems clear that active products will be the inputs of choice for many potential competitors. This will certainly be true in the early stages of deployment, and at least in some situations this will continue as the new services develop to maturity. We therefore believe active products will be a more significant feature of the future competitive broadband market than they are today.

## Given the importance of active products, they must be high quality and fit-for-purpose

- 5.12 We agree with respondents to the September consultation that active products need to be fit for the purpose of enabling truly effective competition. While similar in concept to today's active wholesale products, future products have the potential to avoid many of their limitations. The ideal for any wholesale input is that it affords those using it sufficient flexibility to build innovative and distinctive retail products. To date, passive products have met this need very effectively, but active products less so. This is partly because current active products are complex and have lots of features hardwired into them. This reduces the freedom of communications providers to make their own choices in designing retail products, and can stifle innovation.

- 5.13 A more desirable vision for future active access is simple products with the minimum of predetermined features. Such an approach will maximise the scope for innovation and differentiation. Inevitably active products will remove some choices from the communications providers purchasing them due to the infrastructure owner's design, but this should be minimised as far as technical and cost considerations allow.
- 5.14 There are several important technical developments, explored in more detail in the Ethernet Active Line Access Technical Requirements document, that promise to make this possible for super-fast broadband. Such wholesale products would be closer to passive products in their ability to support truly innovative and differentiated retail offers. The majority of respondents to the September consultation agreed that this was a desirable aim, although there was some disagreement about whether it could be realised in practice. We believe it can be achieved and indeed that it must be if active-based competition is to really bring benefits to consumers in the future.

**Industry's technical requirements for future active products are now well understood, and the important task of standardising them is getting underway**

- 5.15 Working closely with industry over the past few years, we have captured a set of technical requirements for the new generation of bitstream products, a concept we call Ethernet Active Line Access. We published a detailed draft of these requirements alongside the September consultation, and are publishing a revised version alongside this statement, updated in response to the many helpful comments we have received. We agree with respondents that the development of wholesale products should be industry-led, and believe that active line access provides a very useful benchmark in assessing whether the commercial products that emerge from this are fit-for-purpose.
- 5.16 The next stage of development for the Ethernet active line access requirements is for them to form the basis of an industry standardisation process. This will allow different network owners to develop wholesale active products against an agreed common standard. Such standards bring important benefits, such as helping to overcome the challenges faced by downstream providers wishing to offer common services across the many different new networks that may emerge. This in turn increases the opportunity for the widespread availability of service and a choice of service providers. Also, with standardisation in place, equipment vendors will be able to produce common equipment for multiple markets, increasing scale and reducing cost. Furthermore, the standardisation of product interfaces make ordering and management operations more effective and potentially less expensive.
- 5.17 Respondents to the September consultation generally agreed with the importance of standardisation for Ethernet active line access, and that Ofcom should have a role in facilitating this. There is strong evidence that most of the relevant standardisation bodies – namely the Broadband Forum, the Metro Ethernet Forum (MEF), and the Network Interoperability Consultative Committee (NICC) – are committed to undertaking the development work required which is a very positive step. Ofcom remains concerned however that industry may deliver standards too late, potentially foreclosing opportunities for competition, or that standards may be too heavily influenced by the requirements of vertically integrated operators which may limit downstream competition. We will therefore continue to engage actively with industry and standardisation bodies to facilitate their standards development efforts and address issues that arise.

**Openreach’s plans for GEA have progressed substantially, but delivering them will require continued work**

5.18 Another area which received considerable comment from respondents was BT’s GEA products and the associated development process. The general response was that the plans for the new products represent very positive progress as a result of Openreach’s engagement with its industry customers, but that more work is still required.

**Figure 6: Comparison of GEA with active line access technical requirements**

| Characteristic   | Needed because   | GEA (FTTC) status  |
|--|--|--|
| Security enablement                                    | Secure service delivery<br>User authentication   | GEA partially meets these requirements. A VLAN-based traffic separation scheme will be in place for the FTTC pilot, although some functionality such as configurable and stackable VLANs are planned for future improvements. GEA will support security protocols defined by communications providers.   |
| Quality of service (QoS) enablement                    | Satisfactory delivery of voice and video   | GEA partially meets these requirements. GEA includes a range of upstream and downstream capacities, with standardised priority labelling. Line rate reporting will be in place for the Pilot, with improvements planned for the future. Service level agreements will be in place for the Pilot.<br><br>However, GEA FTTC only supports multiple communication providers at individual end-user premises via the installation of additional copper pairs. This is not considered to be a mass market solution.   |
| Multicast support                                      | Bandwidth savings in backhaul of one to many services (IPTV)                               | GEA does not currently meet this requirement. Openreach are actively consulting on multicast and the required functionality is covered in detail in the Openreach network equipment invitation to tender. However, BT is awaiting confirmed demand from communication providers before inclusion.<br><br>Active Line Access specifies that multicast should be implemented where there is demand; we have already received some evidence of demand, and this is expected to grow in the future. A published roadmap is needed to demonstrate how demand will be assessed and when the functionality will be included.                |
| Support for flexible customer premises equipment (CPE) | To allow communications providers to innovate in consumer premises equipment functionality | GEA partially meets these requirements. The network termination equipment provided on GEA provides a standard interface, and supports the installation, connectivity and management requirements of Active Line Access. A wires-only interface on FTTC is being considered, including approved chipsets for communication providers’ customer premises equipment. However, the ports on the GEA FTTC customer premises equipment are limited to providing data from only one communication provider. Also, further development is required to ensure multi-vendor interoperability between exchange and customer premises equipment. |
| Support for flexible interconnection                   | There is no universally economical interconnection point                                   | GEA compares well against these requirements. GEA offers a local interconnect and compatible with a range of backhaul products. No cabinet interconnection is planned, but stakeholders have suggested this requirement may be impractical and unnecessary. The interface is an industry standard 1Gbps, which is considered to be the most cost effective interconnect size.  |

5.19 It is clear that significant progress has been made since the first GEA consultations in March 2007 (FTTP) and August 2008 (FTTC). Our own analysis of GEA against the technical benchmark of Ethernet active line access suggests though that while the gaps have closed significantly, some important ones remain. In particular, gaps remain around: traffic separation functionality; support for more than one communication provider to supply a home or premises; a process for responding to

demand for multicast functionality; and multi-vendor interoperability between exchange and customer premises equipment. We recognise that the GEA products are still in development, and it is reasonable to expect that some improvements are still to be made. However, were these gaps to remain in the longer term, they would have a material impact on the ability of operators to compete effectively using GEA, which would be of concern. We believe they could be addressed given the right product development process. The following table compares the current plans for GEA against the five key technical characteristics identified in active line access.

## **Operational considerations are also of vital importance**

5.20 In addition to the technical characteristics, a number of systems and processes will be needed to best ensure active products are effective inputs for communications providers. Many respondents to the September consultation commented on these in the context of GEA, emphasising that they are fundamental to a successful product. We agree with this analysis, and consider particularly important systems and processes to include:

- **migrations** – industry-wide processes for migrations between different product types and customer situations are required to help ensure a positive consumer experience. Migrations may include the initial move onto next generation services, migrations between communications providers, and communications providers altering their interconnect point;
- **consistent interface with today's products** – the communications providers' interface with GEA should be as consistent as possible with existing wholesale products. Communications providers have invested heavily to create interfaces with current products and the need for unnecessary additional investment should be minimised;
- **common ordering mechanism** – there should be a common industry-wide ordering mechanism which will allow communications providers to order active products across a variety of infrastructures. This will require collaboration between the various infrastructure providers; and
- **service activation** and quality assurance – service fulfilment, assurance and billing processes will need to be developed. In particular, it should be ensured that communications providers are able to activate and configure services quickly. Communications providers will need real time access to line rate information and control of bandwidth. A service management platform is needed so that communications providers can manage their traffic, and conduct testing and diagnostics.

## **It is imperative for industry to have a roadmap of active product development**

5.21 The GEA product has moved closer to meeting industry requirements and Ofcom recognises that Openreach's engagement with its customers has been the main vehicle for achieving this. However, there is still a gap between the projected GEA specification and active line access and, more importantly, in some ways, much of the required functionality is still only planned for inclusion at dates yet to be specified.

5.22 To maintain credibility, BT's expressed intentions to improve GEA, for its initial trials and beyond, need to be accompanied by a published roadmap. This needs to demonstrate how and when the product will come into compliance with the technical requirements of Ethernet active line access. Because of the importance of processes

and systems, the roadmap would need to cover the inclusion of GEA on BT's operational systems such as its equivalence management platform system. The roadmap should also reflect Ethernet active line access's standardisation to enable service partners to properly assess the case for upgrading their interfaces and processes to meet the requirements of GEA. The need for a roadmap is included in our consultation on a variation to BT's Undertakings, which is published today and discussed in more detail below.

- 5.23 Ofcom recognises the difficulties of agreeing a roadmap with diverse stakeholders and agrees with Openreach that some features of GEA should be included subject to customer demand, which is currently uncertain. The roadmap should therefore include suitable 'gates' to ensure the functionality offered is commercially viable. None the less, a published roadmap, developed by Openreach in consultation with its customers, will be a key measure to assess how far active products are indeed fit-for-purpose.

### **If active products fail to deliver on their promise, our focus may ultimately need to shift to towards passive access**

- 5.24 The likelihood that broadband competition in the future will rely more heavily on active products than today creates a risk: if the active products offered are not fit-for-purpose, this may severely damage the prospects for effective competition. There was consensus among respondents to our consultation that allowing the industry's existing product development processes to manage this risk is the preferable approach. We agree, and will look to established mechanisms, such as the OTA, for strengthening industry dialogue if required. Where we find significant market power in a relevant market review, we can introduce remedies to promote competition, and in the past these have included publishing a functional specification for an active product which BT was required to meet.
- 5.25 There remains a risk that active products will not satisfy competitors' requirements and this is a major driver of our efforts to ensure that those wishing to use passive products are given every reasonable opportunity to do so. Passive products are discussed in more detail in the following section, but because their economics currently look challenging, demand for them is currently very limited. The next section outlines ways in which the costs of using passives could be reduced, but we have balanced the impact of this carefully against the limited demand. If active products on which competition can be based are not delivered in a timely way, this balance may shift and we will need to consider other ways in which passive inputs can be used to fill the gap and deliver competition.

### **BT is proposing that Openreach will deliver active products, on an equivalence of inputs basis to all its customers**

- 5.26 BT is proposing to deploy FTTC on the basis that Openreach will control and operate the active electronics in order to avoid potential inefficiency. The provision of the active product by Openreach will be required to be on an equivalence of inputs basis. To enable this would require a variation to BT's Undertakings.
- 5.27 We published today a consultation on a variation to BT's Undertakings<sup>18</sup>. Subject to consultation, we are inclined to agree to the variation.

<sup>18</sup> <http://www.ofcom.org.uk/consult/condocs/fttc/>



## **Active products will form a vital part of the overall competitive environment for super-fast broadband, but will need a strong focus to deliver good products**

5.28 The opportunities that active products offer for investment, competition and service delivery to end customers are significant. However, it is imperative that these products are high quality and fit for purpose. This will require considerable activity and focus from both industry and Ofcom. Specifically, it will be important to ensure that:

- **Active products are fit-for-purpose** – the availability of fit-for-purpose active products is essential for the development of competition in super-fast broadband, particularly in light of the uncertainty around the demand and viability of passive products. Ethernet active line access captures the technical requirements of such a product and will be used as a benchmark for commercial offerings.
- **These products are supported by robust and scalable systems and processes** – alongside the technical requirements for active products, the supporting systems and processes form an essential element in achieving successful active products.
- **Standardisation and the adoption of common standards for active products is important** – we will continue to work with industry to standardise Ethernet active line access requirements due to the benefits for competition, cost and widespread service availability.
- **There is an agreed roadmap for the ongoing development of GEA** – BT's plans for its GEA active product are an increasingly close match to industry requirements. A published roadmap is required to give clarity about future developments and allow progress to be tracked
- **Active products are delivered on an equivalence of inputs basis** – as discussed in our Undertakings variation consultation, it is proposed that Openreach will provide current and future active super-fast broadband products on an equivalence of inputs basis to BT's own downstream businesses and other external wholesale customers.
- **Where active products fail to meet communications provider requirements, passive products will remain** - the next generation of active wholesale products have the potential to deliver more effective competition than is the case for current products. If this potential is not fully realised, the balance of access remedies may need to shift to passive products.

## Section 6

# Opportunities for competition based on passive access need to be retained

- 6.1 The previous section discussed the use of active wholesale products as the basis for competition in super-fast broadband delivery, and considered the requirements for such products. This section focuses on the alternative approach of using passive wholesale products to offer unbundled access to an operator's network. Access to more basic passive infrastructure, such as duct and poles, is discussed in the next section.
- 6.2 While there was significant consensus in the consultation responses on the role and importance of active products, this was not the case for passive products. There was no expressed interest in using passive access products in the near term. Despite this, many respondents felt that it was important to maintain options for passive-based competition, although there were differing views on the form this might take. We believe that, as with local loop unbundling, the economics of next generation passive access are likely to change over time and as a result the willingness to invest may increase. It is therefore important not to preclude these opportunities, but at the same time we must avoid imposing additional costs which may undermine the investments announced by network owners.
- 6.3 Today, local loop unbundling provides the basis of much of the current competition in broadband. This has led to genuinely innovative and differentiated retail products being offered by many more communications providers than there are physical access networks. However, because of the physical make-up of networks, similar passive-based delivery of next generation services is likely to be relatively more expensive, limiting the number and coverage of the competitors we might expect to use this option.

## Respondents' views on the role and prospects for passive access were mixed

- 6.4 Respondents' views on the prospects for competition based on passive access were wide ranging. A number of respondents, including BT, stated that passive access was unlikely to be economic and therefore Ofcom should focus its regulatory attention on active access. BT's position on this point was that passive access would undermine the case for investment, and consuming passive inputs as an input into downstream active products would be inefficient.
- 6.5 On the other hand, a number of respondents expressed the view that passives were important. These respondents suggested that passive access would provide the greatest opportunity for control and service differentiation. There was more consensus on the view that, even where it was viable, passive access was unlikely to work in all areas
- 6.6 There was, however, some support for innovative new forms of passive access that could improve the economics. One example was cabinet co-location to enable operators to install their own electronics and offer greater retail product differentiation than active access products would support. There was recognition, however, that support for co-location would come at a cost and that operators choosing to co-locate should pay a proportion of the upfront costs of the investment. More detail on the responses to these questions can be found on Annex 1.

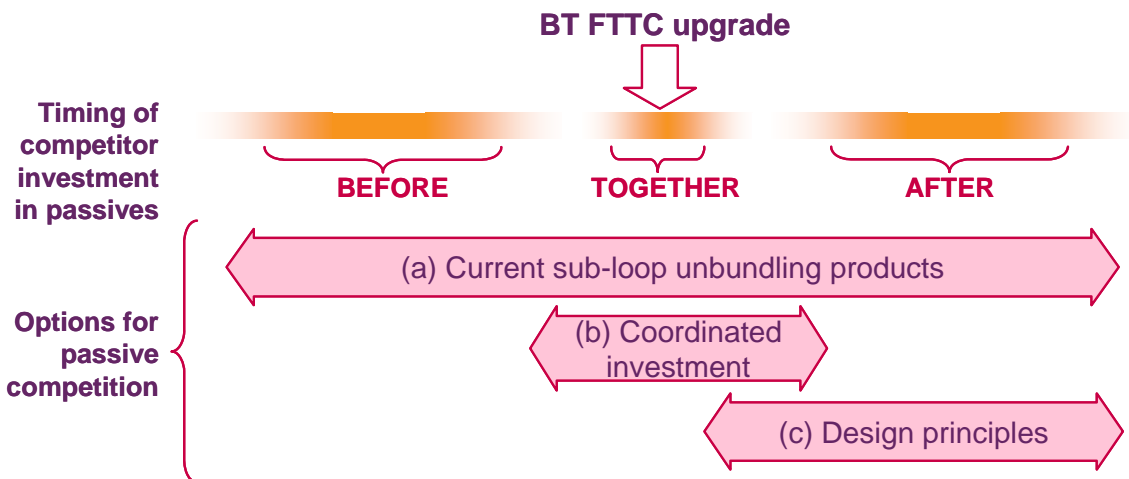


## **We believe there are benefits in keeping options open for competition based on passive wholesale products in the future**

- 6.7 We use the term passive to refer to the range of wholesale products which give competitors direct access to the physical infrastructure making up an access network, such as the cables which connect to end customers and the ducts in which they run. These are the inputs which constitute the “deepest” possible level for communications providers wishing to enter the market; short of digging their own trenches in the streets, they come closest to providing competitors the benefits that would derive from building their own access networks.
- 6.8 The flip side of passive products’ flexibility, and the innovation and differentiation they allow, is the need for competitors to replicate many of the other elements required to build and run a network, such as the access electronics, backhaul links and a network field force. Scale, in terms of numbers of customers, is required to justify such investments and this limits the potential viability of market entry based on passive inputs. In the context of current generation broadband, approximately 20% of the population are not served by any communications provider using passive products (local loop unbundling), in part because of the underlying economics of passive based competition.
- 6.9 Given the uncertainty about the economic viability of future passive products, the lack of current interest among communications providers, and the potential cost implications of designing networks to provide them, it could be argued that passive wholesale products should be ruled out in relation to next generation access. However, this would be a significant and premature shift in regulatory policy. Passive products form the main basis for competition in current broadband and their presence has arguably been an essential ingredient in the success not just of competition but of the market as a whole.
- 6.10 One of our core principles in regulating telecoms is to establish competition at the deepest level that is effective and sustainable. It is clear that passive products represent the deepest level but less clear currently that they will be effective and sustainable. At this stage it is impossible to be sure they will pass these economic tests, but it is equally impossible to be certain that they will not. Similar concerns on both sides were expressed in the early days of local loop unbundling. Ultimately, the market proved to be very successful at solving the economic and operational challenges associated with passive products which have, in time, proved to be more viable in more circumstances than initially anticipated. Although the challenges for next generation passive access are in some ways new and larger, market mechanisms may again deliver solutions.
- 6.11 Because of this, it is important to retain passive options and work to improve their economic viability. However, in doing so we must be careful to avoid the risk of loading additional cost or delay on the network owners as this may discourage the very investment on which this form of competition would rely. It is important that the costs of introducing competition are proportionate, and are exceeded by the benefits it brings. Where cost is incurred, the appropriate cost recovery mechanisms will be needed, and our approach to these is given in Section 10.
- 6.12 This has led us to consider passive wholesale products in several contexts based on the prospects for passive access at different times:
- i) current sub-loop unbundling products;

- ii) coordinated investment in the upgrade of networks to offer super-fast broadband; and
- iii) market entry based on design principles and passive inputs after the initial network upgrade.

**Figure 7: Possible timing of competitive investment in FTTC using passive input products from BT**



**Sub-loop unbundling (SLU)**

Investment through BT’s current sub-loop unbundling product, based on separate cabinets for new entrant communications providers. In this situation, communications providers could choose to invest before, at the same time or after BT undertakes its own investment plans.

**Coordinated investment**

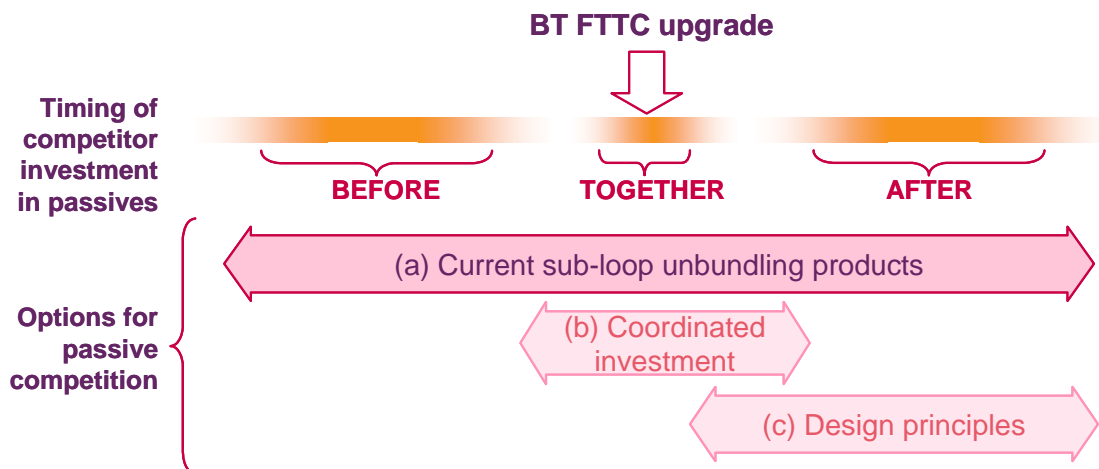
Investment in upgrading a network to offer super-fast broadband services, by more than one communication provider at the same time. In the case of an FTTC upgrade, all communications providers would install their own VDSL equipment, at the same time, and elements, such as cabinets, power, backhaul fibre, could be shared.

**Design principles**

When upgrading a network, adopting design principles that make it possible for other communications providers to enter the market in the future in an efficient manner.

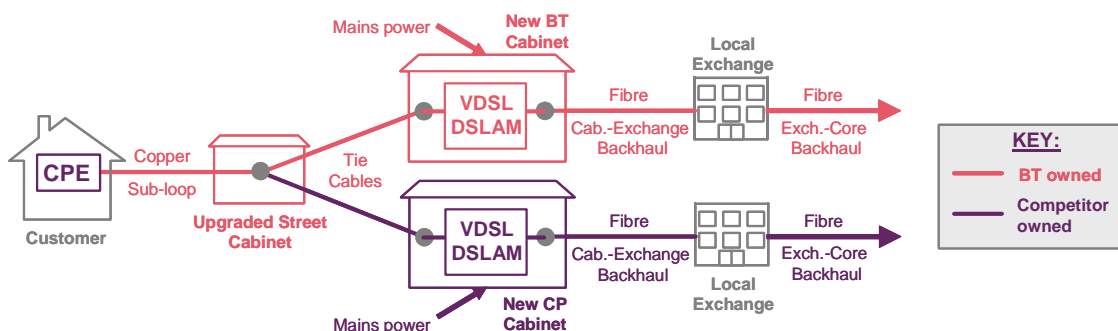
6.13 In addition, we have also considered the potential for market entry and competition based on duct and pole access. This is discussed in Section 7.

**i) Consultation responses suggested today’s sub-loop unbundling products are unlikely to support large scale effective or sustainable competition**



6.14 BT already offers a series of passive wholesale products that should allow competitors to deliver super-fast broadband services using FTTC technology. These products were originally introduced in January 2001 to fulfil a requirement placed on BT by a European Regulation<sup>19</sup>. These products offer access to “sub-loops” – the segment of BT’s local access network running between end customers and its street cabinets. In December 2004 Ofcom reaffirmed BT’s requirement to provide ‘sub-loop unbundling’ as a result of our findings in the wholesale local access market review<sup>20</sup>.

**Figure 8: Architecture for BT’s current sub-loop unbundling products, showing the infrastructure build required by each operator**



6.15 The sub-loop unbundling (SLU) products currently offered by BT are similar in concept to the local loop unbundling products used extensively by BT’s competitors today. However, although they have been available, since January 2001, there has been only very limited interest in them and most of this has been in the last year or so. This lack of interest in sub-loop unbundling has resulted in very limited development of the products.

6.16 One difference between BT’s sub-loop unbundling and local loop unbundling products is the amount of physical infrastructure that needs to be built by each competitor using them. The duplication of some network assets is a desirable outcome of passive wholesale products: the use of different equipment by different communications providers delivers much of the benefit that this form of competition has over active-input alternatives. For example, the need for those using local loop

<sup>19</sup> Regulation (EC) 2887/2000

<sup>20</sup> [www.ofcom.org.uk/consult/condocs/rwlam/statement/rwlam161204.pdf](http://www.ofcom.org.uk/consult/condocs/rwlam/statement/rwlam161204.pdf)

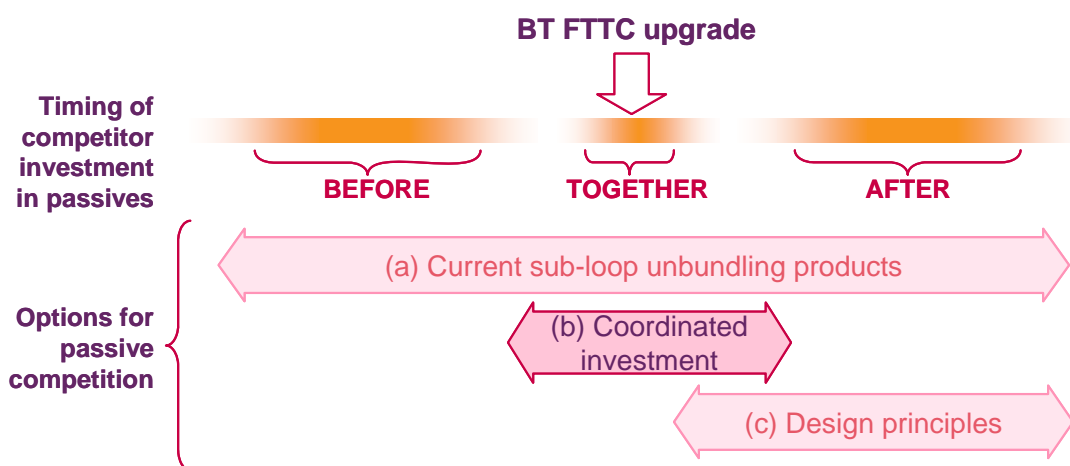
unbundling inputs to install their own DSLAMs has allowed some competitive providers to install more sophisticated equipment than BT and offer higher speed services. However, these dynamic benefits of competition need to be weighed against the increase in the overall cost due to asset duplication. In the case of BT's current sub-loop unbundling product, much of the duplication does not appear to offer any meaningful scope for innovation, instead simply increasing cost and reducing efficiency. These costs, and the uncertain demand for FTTC-based end products, may be why the current sub-loop unbundling products remain largely unused.

**While economically challenging, sub-loop unbundling in its current form may still have a role to play**

6.17 Despite their limitations, we believe the current sub-loop unbundling products may play a potentially important role, particularly in areas where BT chooses not to upgrade its network and no other next generation access networks exist. In these areas, sub-loop unbundling remains the only option for other communications providers wishing to offer super-fast broadband services without having to build a completely new network from scratch. While today, the costs are high and the revenues uncertain, this may not always be the case. The cost side of the equation may be improved for communications providers who have access to public funding, such as the Digital Region project planning to use sub-loop unbundling in South Yorkshire<sup>21</sup>. Moreover, future cost reductions and a developing market for super-fast broadband services with new revenue streams may further improve the economic case for entry using these products.

6.18 We therefore believe it is important to retain the current sub-loop unbundling remedy, and the products that deliver it should continue. Some respondents to the consultation agreed with this position, although some suggested that unless the high costs and duplication were addressed, the current sub-loop unbundling products were unlikely to be commercially viable. Options for achieving this are explained below.

**ii) Coordinated investment offers a potentially a more economic basis for passive competition**



6.19 Our September consultation considered options for passive products which may offer improved economics compared to current sub-loop unbundling. One suggestion which received some support from respondents is based on other communications

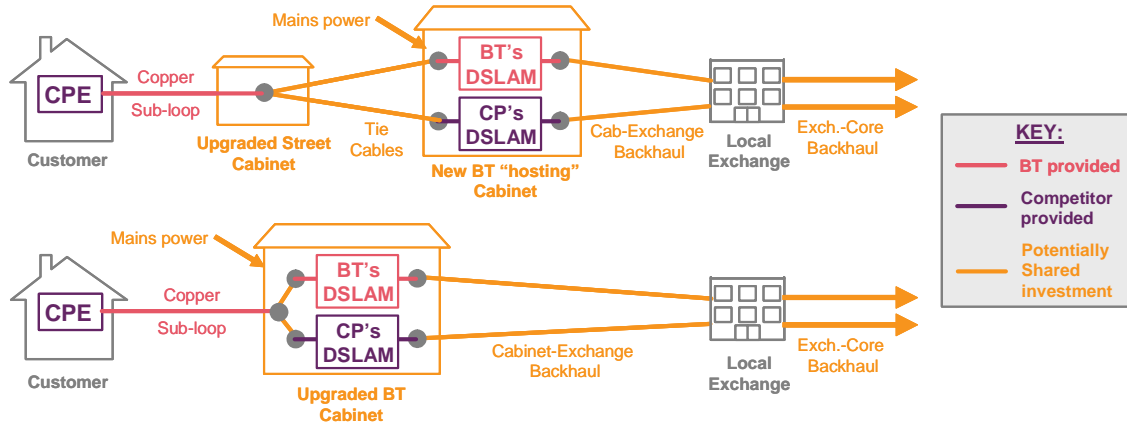
<sup>21</sup> <http://www.digitalregion.co.uk/>

providers being given the opportunity to enter the market at the same time that a network owner upgrades to FTTC and in return committing to pay an appropriate share of the upgrade costs. This is potentially relevant in the case of BT as it has announced its intention to upgrade its network to FTTC for around 10 million customers over the next four years.

- 6.20 If multiple operators wishing to use passive inputs enter the market at the same time, there is the opportunity to minimise much of the unnecessary duplication of investment which would occur with current sub-loop unbundling products.
- 6.21 One example of this is the possibility to enable collocation, which is an important ingredient in today's successful local loop unbundling products. In the case of BT's current sub-loop unbundling product, there is no collocation option, so any and all communications providers wishing to use the product must establish their own facility for housing their active electronics, most likely by building a new street cabinet as close as possible to existing one in which the sub-loops are "unbundled". When BT upgrades to FTTC, they are likely to reuse, extend or replace their existing cabinet or build another nearby, depending on a number of factors such as the condition of the original cabinet, the spare space it offers and physical/environmental considerations. The requirement for communications providers using BT's current sub-loop unbundling product to always build a new cabinet and connect it to the sub-loops in BT's cabinet will increase the overall deployment cost and may put them at an economic disadvantage to BT.
- 6.22 With coordinated investment this problem may be overcome by allowing all participating operators to house their equipment in a common facility constructed during the upgrade of the existing cabinet. This would obviously be subject to factors such as cabinet design, physical practicality and the need to ensure that all parties are able to manage their network components effectively and securely. However, examples such as the piloting of a shared-cabinet VDSL deployment by Deutsche Telekom and Vodafone in Germany, and the subsequent deployment announcement by Deutsche Telekom and Ewe Tel, suggest that these issues can be overcome in practice. As the market matures both in the UK and overseas and new equipment is developed by vendors, we may expect current economic and practical concerns to be further eased.
- 6.23 Besides the construction of the cabinets themselves, many other elements can be cost optimised using this approach. For example:
- a single engineer, or engineering team, could make one visit to the cabinet site and undertake the preparation and installation work required for all sharing communications providers, removing the need for multiple visits;
  - the design may allow for one, rather than several, instances of facilities like mains power feeds, power distribution, backup batteries, signal distribution cabling and equipment cooling; and
  - only one site survey and planning application would be required.
- 6.24 There are also potential operational cost savings beyond the initial build. For example, by using a common engineering team, such as Openreach's, for the repair and maintenance of all operators' equipment there may be scale efficiencies that can be realised. Even if each operator uses their own engineers, there may still be opportunities for operational cost reductions such as shared line testing facilities.

- 6.25 In practise, it would be for individual communications providers to decide whether any reduction in their ability to innovate and differentiate their end products was a worthwhile trade off for the potential cost saving of the options discussed above.

**Figure 9: Potential architecture for coordinated investment, showing potential for collocation and asset sharing**



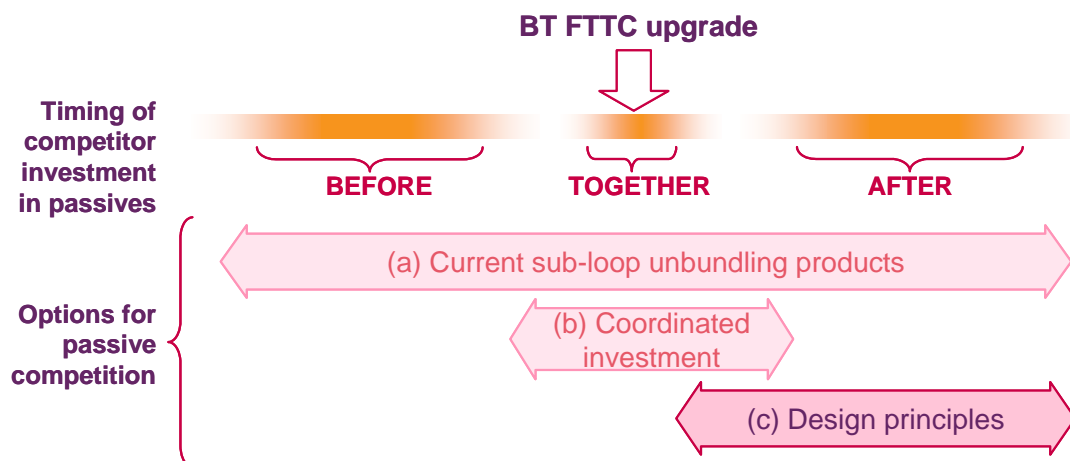
- 6.26 Coordinated investment may be particularly beneficial: by offering reasonable certainty about the number of market entrants upfront, it may simultaneously ease concerns over how the initial upgrade investments are paid for and the magnitude of the costs of market entry.
- 6.27 A disadvantage of coordinated investment is that competitors are required to coordinate their investment decision with that of the network owner. Given the uncertainty around the development of the market for super-fast broadband services this may explain why, while the benefits of cabinet collocation were mentioned by many respondents, the option of joint investment timing was only discussed by one.

**Coordinated investment approaches are potentially beneficial for competition: we encourage industry to explore them further**

- 6.28 We support the view expressed by several respondents that arrangements such as joint investment are best secured through commercial negotiation. Such arrangements should be open to all communications providers on non-discriminatory terms. They are most likely to be successful if all parties agree on an upgrade design that allows the potential savings to be realised; design principles would be needed which did not foreclose the option. It would also be important to ensure that the costs for the upgrade are fairly recovered across all parties involved.
- 6.29 We believe that these objectives may be best achieved through open dialogue between Openreach and relevant communications providers, where the latter can express their interest in investing in particular upgrade areas at the same time. Openreach is also proposing a specific Undertakings commitment to conduct an industry consultation on the design of FTTC passive inputs and fibre backhaul products which would take place no later than during the course of 2011. This would provide industry with further opportunity to explore the potential for further improvements in cabinet and solution design once the market has developed more experience of FTTC deployments.
- 6.30 As coordinated investment is likely to be the most cost efficient way of introducing passive access, we would encourage the industry to explore these options fully. This includes potential market entrants having every opportunity to express their interest

in this model and network owners with significant market power meeting any reasonable demand.

### iii) Network upgrades could be designed to support the possibility of future competition based on passive access



6.31 Market entry using passive inputs can happen before, at the same time as, or after a network owner upgrades to FTTC. The first of these options is already supported by sub-loop unbundling and in the preceding paragraphs we have explored the ways in which coordinated investment can make the second more cost effective. This section will consider ways in which the cost of later entry can be minimised.

6.32 It is possible for market entry after the initial FTTC upgrade to happen using the current sub-loop unbundling products. However, as discussed earlier, the amount of asset duplication involved may limit its economic viability. Sub-loop unbundling keeps all operators using sub-loops largely separate, leading to a need to duplicate elements such as cabinets, mains power feeds, battery back-up, cooling and backhaul. As in the case of coordinated investment, we believe that sharing as many elements as possible would be more efficient, and the reduced costs would encourage passive-based market entry.

6.33 Absent consideration of asset sharing, it would be efficient for an FTTC upgrade to be designed to minimise costs while still providing whatever flexibility is expected to be required for future expansion and so on. However, there is a range of design modifications that could be undertaken which may reduce the costs of subsequent entry. These modifications may increase costs initially but in return would reduce the risk of foreclosing future competition due to high entry costs subsequently. Some examples of the approaches that could be considered are:

- **the adoption of design principles** which anticipate and provide for future entry, particularly where this can be done at little or no cost;
- **pre-provisioning facilities for multiple communications providers.** For example a much larger cabinet could be installed and fully equipped at the time of the initial upgrade. This would include spare space for electronics and all other required facilities, such as power, cooling, battery backup and backhaul, to support a certain number of future communications providers;

6.34 Between these two extremes there are a number of options which trade off the level of additional upfront cost and the cost savings for future entrants. For example, a

modular cabinet might be used which, while initially not offering sufficient facilities for other communications providers, would allow them to be added to the existing cabinet without requiring a complete rebuild. Alternatively, the network owner could simply specify a larger cabinet than they require for their own upgrade, leaving spare space for other communications providers but without pre-installing additional facilities.

- 6.35 In this context, it is worth considering the role that third party providers of shared infrastructure have played elsewhere in the telecoms sector. For example, much wireless network deployment makes use of a network of radio towers owned and operated by a specialist “tower company” who are not generally themselves a network operator. A similar model could potentially emerge in the context of street cabinets for next generation access; cabinets used by multiple operators could be established by a third party. Alternatively, a number of operators using passives inputs may decide to jointly construct a shared cabinet themselves. It is desirable that, whatever approach is taken to cabinet upgrade by the network owner, these possible options are not fore-closed.

### **We encourage the adoption of design principles that support future competition**

- 6.36 Due to the lack of current demand for passive products, we do not believe it is proportionate to require BT to incur significant additional costs when upgrading their network in order to reduce the costs of potential future market entry. However, we believe there may be design principles that could be adopted which, while imposing minimal additional cost, would help to avoid the foreclosure of future market entry. These design principles would cover both the physical aspects of the deployment, such as cabinet design, and the design of the systems and process used by the new network.
- 6.37 For the physical design, examples might include installing sufficient backhaul fibre and mains power capacity to accommodate other operators’ equipment in the future. In terms of systems, it would be desirable for Openreach to build supporting systems and processes that could support passive based competition where appropriate. This can be achieved either by using the same systems components for active and passive products, or different components that result in the same outcomes for passive based competitors.
- 6.38 Because the process of designing and trialling FTTC upgrades is still at an early stage, it is not yet clear which design issues which might be relevant. We will therefore proceed taking into account the following principles:
- 6.39 The level of interest in passives and views on upgrade design should be determined through dialogue between interested parties and Openreach and, in due course through formal industry consultation;
- following such dialogue or formal consultation, any reasonable requirements emerging from this process that can be incorporated at zero or near zero cost should be adopted as design principles for the upgrade;
  - ultimately, the design of the network upgrade and control of its timing and cost is a matter for the network owner. Requirements which are shown to impose significant delay or additional cost need not be included;



6.40 Ensuring that the passive inputs offered to competitors are the same as those used by BT also helps to avoid foreclosure. Today, this is achieved through equivalence of inputs: most respondents were keen that this approach continues. Indeed, some suggested that the principle of equivalence alone was enough to secure future competition. The strongest form of equivalence is equivalence of inputs – the same products offered at the same prices and using the same systems for all purchasers. While this should be the starting point for passive products, it may not always be possible. In these cases we would expect BT to offer to its competitors products of the same specification and functionality, and delivered to the same performance, as it provides to itself.

### **Regardless of these other options for passive competition, regulation as a result of significant market power continues to require passive access**

6.41 This section has considered the passive products which we believe will be most appropriate in the future and what our regulatory stance towards them should be. We continue to believe that competition based on passive inputs is attractive as it offers the greatest scope for innovation and consumer benefits. However, such competition is only desirable where it is effective and sustainable.

6.42 It is important to note that the regulatory requirement to offer such passive wholesale products would stem from access remedies, which are designed to address a finding of significant market power in a relevant review.

6.43 At this point in time, BT is required to provide passive access products due to a significant market power finding in the Wholesale Local Access market. Under this significant market power finding BT is required to provide a number of specific services, including sub-loop unbundling and ancillary services, in addition to the requirement to provide network access on reasonable request.

### **Policy conclusions**

6.44 Our main policy position relating to wholesale passive products to support competition in delivering super-fast broadband services can be summarised as follows:

- **Coordinated investment in FTTC upgrades** – of the various options for passive access, models based on coordinated investment and sharing of cabinet facilities offer the greatest potential. We support open commercial negotiations to secure such arrangements.
- **Non-foreclosure of future competitive entry based on passive products** – we expect BT to take account of the prospect of future passive-based market entry when upgrading its network. As such, it should adopt design principles which take into account reasonable industry requirements while not incurring any significant additional upfront cost or delay.
- **General obligation to meet reasonable demand for passive access** – there may be other models for passive access identified by market reviews in the future. For the duration of the current reviews, we would expect communications providers with significant market power to continue to meet all reasonable requests for such access.
- **Equivalence for passive products** – wherever possible, we would expect Openreach to provide such inputs using the same components, processes and

systems it uses itself for providing its wholesale FTTC product. Where this is not possible or is unduly inefficient, we would expect Openreach to provide such inputs to the same specification, functionality and performance as those inputs used by Openreach.

### **BT Undertakings variation request and the implications for passive options**

6.45 The previous section of this document discussed the variation consultation on BT's Undertakings to allow the active electronics for FTTC to be owned and operated by Openreach. As we noted, this has potential implications for passive access, in particular Openreach would not be required to deliver passive products to its customers on a strict equivalence of inputs basis. In requesting a variation to the Undertakings, BT has therefore volunteered additional commitments to address issues associated with the delivery of passive products. These are set out more fully in the Variation consultation but can be summarised as follows.

- Openreach will meet reasonable demand from Communications Providers wishing to house their equipment, where practicable, in facilities attached to or otherwise integrated with or in the vicinity of BT's FTTC cabinets, whether at the same time as Openreach or in future.
- Openreach will adopt design principles for BT's FTTC cabinet solutions that, through provision of power and fibre, enable other Communications Providers to locate their own equipment at or in the vicinity of BT's FTTC cabinets, where practicable.
- Openreach will consult with industry to assess demand for passive inputs and Communications Providers' views on the design of FTTC and its associated passive inputs and backhaul products. The consultation will be completed within three months of the time 1 million end-user premises are taking services using BT's active products, or at the latest during the course of 2011. The consultation process will address the needs of Communications Providers wishing to invest at the time of BT's upgrade programme as well as the reasonably foreseeable needs of those considering investing at some future time.
- Based on its consultation on passive inputs, Openreach will review and modify the design principles for its cabinet solutions, where practicable, to facilitate meeting reasonable future demand for passive inputs and backhaul products cost-effectively.
- Openreach will design FTTC systems, where practicable, to enable future provision of passive inputs to Communications Providers using the same components, processes and systems which it uses to provide those inputs to itself.
- Should demand for passive inputs arise, Openreach would provide them using the same components, processes and systems which it uses to provide those inputs to itself where this is reasonably practicable. Otherwise it would provide them with the same specifications, functionality and performance as the passive inputs it provides to itself for its active products.

## Section 7

# Duct and pole access may present further opportunities for passive competition

- 7.1 In the previous section, we focussed on passive products which unbundle existing access connections. We discussed an even “deeper” level for passive competition in our consultation, which involves communications providers installing their own cables using existing underground duct or overhead pole infrastructure.
- 7.2 In the context of a communications provider looking to build an entirely new network, the recent report from the Broadband Stakeholders Group<sup>22</sup> showed that the civil works to deploy duct infrastructure represents a significant portion of the cost for both FTTC and FTTH architectures. Access to the existing duct may avoid much of this cost, and avoid significant disruption to society in the process. Duct access is also strongly recommended by the European Commission in its recent Draft Recommendation on Next Generation Access and is a work area in the recent Digital Britain interim report. Another technique that can be used to reduce duct costs is to install cables overhead, and again, reusing existing infrastructure such as poles where available can further reduce costs.
- 7.3 When considering the options for communications providers which wish to base their services on passive wholesale inputs from other network operators, duct and pole access are likely to be more expensive options than those considered so far, due to the need to install duplicate cables as well as electronics. However, they allow more radical differentiation than unbundling of cables, such as using FTTH when a duct owner is using FTTC.

## Our consultation saw the first expressions of interest in duct and pole access in the UK

- 7.4 The response to our September consultation resulted in the first public interest in duct access from UK communications providers, albeit from only two respondents. Other respondents suggested that, in addition to telecoms duct access, there was potentially a role for access to other utility infrastructure in the delivery of super-fast broadband services. It was also suggested that access to ducts and poles could provide a cost effective way to build new backhaul networks and reduce barriers to entry. In contrast, even some of the respondents who expressed an interest in duct access, together with those who were generally more negative about its prospects, indicated concern about the practical viability of these options.

## The results from our duct survey shows there is significant amounts of unoccupied space in existing ducts

- 7.5 In order to better understand the technical feasibility of duct access, Ofcom commissioned Analysys Mason to conduct a sample survey of BT’s telecoms duct. Following full cooperation from BT, this survey was completed in December 2008 and Analysys Mason’s report is being published on the Ofcom website alongside this statement.<sup>23</sup> The survey focused on those areas where Ofcom has a direct remit, but

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<sup>22</sup> [http://www.broadbanduk.org/component/option,com\\_docman/task,doc\\_view/gid,1036/Itemid,63/](http://www.broadbanduk.org/component/option,com_docman/task,doc_view/gid,1036/Itemid,63/)

<sup>23</sup> <http://www.ofcom.org.uk/telecoms/discussnga/duct/>

the survey results should be read in the context that BT's telecoms ducts are just one element of UK infrastructure potentially relevant to super-fast broadband deployment, with others including Virgin Media and other 'utility' duct networks.

- 7.6 The survey covered 817 chambers and 18,000 duct ends, which is of equivalent scope to the sample survey of duct in France, commissioned by ARCEP. As this was the first survey of this type to be conducted in Europe, we felt it was important for our survey to be comparable. The survey involved opening up BT's chambers and inspecting the occupation of ducts running from the chamber wall.
- 7.7 We envisaged that the duct infrastructure of most interest to communications providers would be urban and suburban routes between the metro node, the exchange and the street cabinet. These routes were considered to be most relevant to FTTC as it is these parts of the network that need upgrading for such a deployment. Routes between the final cabinet and end customer premises may also be of interest, particularly for FTTH deployment, however these were not surveyed. This is because we understand from BT that less than two thirds of this part of the network is ducted, compared with almost 100% for the parts surveyed. In addition, any ducting in this portion of the network is more likely to have been sized without allowing for any spare capacity.
- 7.8 The survey therefore observed duct availability along contiguous routes between a BT 'metro node' and a 'last cabinet' before the customer premises. In total 31 routes were surveyed, spread across 11 UK towns/cities<sup>24</sup> and totalling 143km in length. They were chosen to give a good spread of customer premises across residential, commercial and light industrial properties.
- 7.9 The raw results from our observations shows that a significant amount of existing space is currently unoccupied in the surveyed duct ends:
- 78% of ducts have sufficient unoccupied space to allow at least 1 additional 25mm diameter sub-duct to be inserted;
  - 51% of ducts have space that would allow 3 additional sub-ducts;
  - 22% of ducts are full; and
  - 27% of ducts are empty.
- 7.10 It is important to note that the availability of space underlying these average figures varied significantly across the duct survey sample. The results showed considerable variation across the different cities and towns that were studied. The availability figure also tended to be lower closer to the customer, with the average of space for three or more sub-ducts being 52% on surveyed routes between metro nodes and exchanges but reducing to 39% between the exchange and cabinet.

### **Practical challenges need to be overcome if the unoccupied duct space is to support future competition**

- 7.11 The raw survey data needs to be interpreted carefully. Although all efforts were made to ensure the sample was as representative as possible, it only accounts for around 0.02% of BT's total duct assets and is therefore not large enough to be statistically

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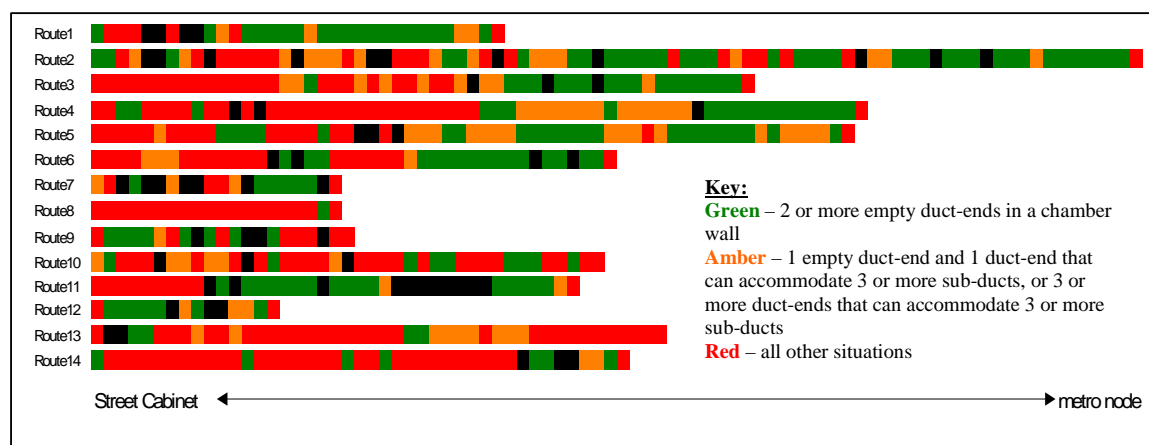
<sup>24</sup> Surveys were conducted in Birmingham, Cardiff, Crawley, Croydon, Glasgow, Leeds, Manchester, Milton Keynes, Peterborough, Southampton and London

reflective of the whole network. We believe the results are indicative, but no firm conclusions can be drawn about the unoccupied space in the majority of ducts that were not surveyed.

7.12 Even in the areas that were surveyed, using the observed space to deploy end to end networks may be difficult:

- the results are based on the space observed at the duct ends only, not all of it will be usable for installing new cables, for example due to blockages deeper into the duct or cable access problems in the chamber;
- some of the spare space is required by BT for operational maintenance and planned capacity growth; and
- there may not be contiguous unoccupied duct space on any end to end route. A given route, for example between a telephone exchange and a street cabinet, consists of many segments – individual duct runs between pairs of chambers. Among the surveyed routes, although average duct space may be high, some segments have very little unoccupied space and therefore may not be useable for the installation of new cables. This is illustrated below for 14 of the routes surveyed. The red segments have the least unoccupied space, and therefore the highest risk of being unsuitable for reuse.

**Figure 10: Segment by segment illustration of unoccupied from duct survey**



7.13 In addition to providing an insight into the availability of duct, the survey sought to better understand some of the operational challenges involved in a deployment using it. The survey team encountered a number of operational issues that would affect a deployment such as:

- chambers containing water and/or sewage that were inaccessible until pumped out;
- BT drawings that are complex and not kept up to date resulting in difficulties locating some chambers. Also Ordnance Survey maps to relate duct drawings to the surroundings were unavailable on some routes;
- overgrown chambers that needed to be cleared;
- chamber depths that required scaffolding and harnesses to access;

- chamber access problems, for example due to location in busy pavements at pedestrian crossings and vehicles and building sites on top of chambers; and
- other restrictions such as lead time to get a work permit for chambers in a carriageway.

### **Making duct access a significant part of the overall regulatory approach would require a number of key activities**

7.14 We asked Analysys Mason to use their experience from the survey to consider the critical success factors in any future duct access product. As a result, they have proposed a set of recommended next steps which would be required to develop duct access into a workable product. There is more detail on this in their survey report, but in summary:

- audit of the extent and format of the current records of the Openreach infrastructure network;
- definition of a common standards-based record;
- feasibility assessment of digitising the Openreach records to create a coherent and referenced planning resource;
- set of duct plans that would be of value to the planning process of a communication provider;
- feasibility assessment of linking engineering rules to digitised drawings; and
- defining the survey and drawing information that would be required from communication providers after initial survey, and at the as-built stage.

### **Pole access may present another opportunity for the ‘final drop’ of network deployment, though we have not yet examined this in detail**

7.15 We have not undertaken a survey of BT’s pole infrastructure. Based on the information provided by BT, we understand that the use of poles becomes more common as the network gets closer to the customer. From the exchange to the cabinet, less than 1% of their network is carried overhead. This suggests that for FTTC deployments where it is this section of the network that needs to be upgraded, poles will be of little or no relevance.

7.16 However, between the cabinet and final distribution point, this figure increases to around 12% and for the “final drop” – the last few metres of the access network which connects to individual houses – it is around 50%. These sections of the network require an upgrade from copper to fibre in the case of FTTH deployment and therefore pole access may be particularly interesting to operators considering this.

### **Ducts and poles present interesting opportunities for future competition which require ongoing work**

7.17 In conclusion, our indicative survey of BT’s duct shows that there are significant amounts of unoccupied space, an important finding in the context of their potential for supporting competition in the future. This leads naturally to questions about the extent to which this could, or would, be used by potential competitors to deploy

alternative access network infrastructures. In terms of viability, the survey report emphasises that care is required in interpreting the raw results and that there proved to be practical and operational issues to be overcome before duct access could be an effective input product. In terms of demand, some communications providers have expressed interest in its use, or at least further exploration of the possibilities.

7.18 The experience of other EU countries is instructive. Two examples where duct access obligations have been placed on the incumbent operator are shown in the table below, which indicates key elements of the resulting reference products.

**Figure 11: Examples of overseas duct reference offers**

| Country  | Measures to overcome practical challenges  |
|----------|--|
| France   | <ul style="list-style-type: none"> <li>• Information on available space available to all</li> <li>• Sharing costs such as the undertaking of detailed surveys</li> <li>• Transparent non-discriminatory pricing</li> <li>• Engineering rules to ensure efficient duct usage</li> </ul> |
| Portugal | <ul style="list-style-type: none"> <li>• Electronic availability of duct location information</li> <li>• Web interface to duct information</li> <li>• Engineering rules to ensure efficient duct usage</li> <li>• Accreditation of engineers</li> </ul>                                |

7.19 It is too early to conclude how successful a basis for competition the current duct access products will become in these and the other countries where they are offered. It will remain difficult to draw direct conclusions on how other deployments will be reflected in the UK, given that we know from the duct survey that there are significant differences between the infrastructure deployed here and overseas. However, as well as the indication from our survey that there may be significant amounts of unoccupied space available, the ability to take advantage of this may increase over time.

7.20 As demand for access fibre deployment grows, the incentives to reduce the high cost of this new infrastructure build may spur further technology developments (such as smaller diameter fibre cables, inserting fibre into existing copper cables, micro and flexible ducting and cable installation methods) to optimise the use of space in existing ducts. Furthermore, the incentives to recover valuable unused copper cables, may increase the space available in existing ducts, while new duct built in the future is likely to be designed and sized to enable shared use for fibre cables. These considerations all suggest that shared duct use may become increasingly viable in the future.

7.21 Our next steps in investigating this opportunity will be drawn from the practical international experience of introducing duct remedies and the recommendations from the UK duct survey outlined above. In the short term, we will be working closely with the Digital Britain team to investigate further the role which access to ducts, whether belonging to BT, or other communications and non-communications companies, can play in next generation access.

## Policy conclusions

- **Access to existing duct infrastructure** – the increase in interest in duct access and indications of unoccupied capacity found in our survey of BT’s ducts

suggests that this option is worthy of further investigation. Duct access has the potential to form an important input for those considering new access infrastructure build. Experience from our duct survey and international duct access product offers will inform the next phase of our work to consider how the practical and operational issues can be overcome.

- **Access to existing overhead pole infrastructure** – the relevance of this type of access is limited mainly to FTTH/FTTP deployments and therefore demand is likely to be low in the short term. Where it is relevant, we encourage commercial discussion in the first instance. Where such discussions fail in face of clear demand, we will consider the appropriate intervention. In the meantime, we will be continuing to investigate the usability of BT and other pole infrastructures.



## Section 8

# Our approach to wholesale pricing will support investment and competition

- 8.1 We outlined in our consultation our view that pricing of wholesale next generation access-based services will be crucial to the success of these networks and the services they support. Pricing will affect the incentives to invest, the success of competition, and consumer demand for the services.
- 8.2 Any decision to impose a price control will be taken at the time of a market review on the basis of the conditions in the particular relevant market. However, following the consultation, we continue to believe that the general approach proposed in the consultation – specifically flexible pricing for active wholesale products - is appropriate at this stage of the market development. This gives industry the ability to reflect the level of risk in investment through prices. However, we also need to provide more guidance on how these approaches could play out. In practice some of the more innovative and new approaches will need to be considered on a case by case basis to ensure they do not undermine either investment or competition, resulting in significant consumer harm.
- 8.3 The policy positions with respect to pricing are based on the current view of what the broadband market will look like in the coming years. Specifically, it is based on the presumptions that: there will be a broad market for all broadband speeds, including super-fast broadband; and that broadband services and competition based on access to copper networks will continue to be available. Changes to either of these positions may necessitate a change to the overall regulatory position.
- 8.4 In this section we confirm our position in respect of the following:
- that in the near term there should be pricing flexibility on active products. This may be in terms of the absolute level of prices, geographic variations, changes over time and may possibly allow for volume discounts and also tiered pricing; and
  - prices of passive products should reflect the level of risk at the time the investment was made, allowing opportunities to recover costs and earn a reasonable rate of return.
- 8.5 We will also ensure that while we need to strike a balance between the need for longer term regulatory certainty and the inherent demand and supply side uncertainty that we revisit these principles and approaches as and when necessary.

## Consultation responses were supportive of the proposed approach, although with some risks identified

- 8.6 Respondents to the September consultation broadly supported our approach to pricing. However, some respondents expressed concerns about whether it would be appropriate to have flexible pricing in the absence of effective upstream inputs, particularly where there is uncertainty about the effectiveness of constraints on pricing at the retail level. These respondents stressed the importance of Ofcom

continuing to monitor changes in market conditions and being ready to change our approach if necessary. Other respondents suggested alternative pricing approaches.

- 8.7 Some respondents raised some useful points on how particular pricing approaches should be implemented in practice. Stakeholders generally agreed with our proposed triggers for reviewing our pricing approach, adding further suggestions including lack of take-up of services and changes in market share.
- 8.8 Respondents also generally agreed that risk should be reflected in the prices of passive products, where appropriate, although responses varied on the level of risk associated with super-fast broadband investment. More detail can be found in Annex 1.

### **Our principles on pricing remain appropriate**

- 8.9 In light of these responses and developments we believe our principles set out in the September consultation are appropriate to guide us in setting prices for wholesale next generation access products. We will continue to regulate at the wholesale level where necessary to address competition concerns, either for active or passive products. Our aim is to promote downstream competition in retail services. Only where wholesale regulation was likely to be ineffective or remedies in place insufficient may retail price regulation be considered. This is the same approach we have adopted for current generation broadband services.
- 8.10 In the September consultation, we outlined some general principles that we believe are appropriate in considering how to set prices for next generation access related products. These are:
- prices and rates of return must reflect the level of risk when investments are made;
  - pricing approaches should take into account the level of demand uncertainty;
  - flexibility in pricing is desirable, allowing experimentation, increased investment and greater take-up;
  - pricing approaches need to reflect the underlying characteristics of products;
  - regulation should consider the impact on investment incentives from the relative prices of different products;
  - the costs of new investments should be recovered from the services that they support; and
  - investment risk can be addressed by more than just pricing approaches.
- 8.11 These principles provide the basis for the following more detailed positions on pricing. Over time, we must continue to ensure that both our principles and the detailed policy positions reflect the developing nature of super-fast broadband, supporting early and widespread investment in these networks as well as competition in order to maximise consumer and citizen benefits.
- 8.12 Our principles of reflecting the level of risk and underlying characteristics of the products in our pricing approach is consistent with the Commission's draft recommendation on next generation access. In particular, the recommendation

states that where regulators set price controls, these “price controls should reflect the characteristics of different assets (existing or new ducts for example) such as asset lifetimes and levels of risk in terms of uncertainty of demand and technological obsolescence”.

8.13 While these are the principles by which we will seek to set prices for wholesale regulated products, in light of the responses to our consultation, we believe that it would be useful to provide additional clarity on our proposals. In particular, we have provided additional detail on our approach to:

- pricing flexibility for active products;
- what pricing freedom means in practice;
- addressing key concerns on pricing flexibility;
- cost orientation for passive products;
- how will we approach the issue of appropriate rates of return and cost recovery; and
- what could trigger a review of this approach.

### **Pricing flexibility on active products is appropriate at this stage of the market's development**

8.14 In the September consultation, we proposed that in the near-term pricing flexibility should be allowed for active products. As noted above, responses were generally supportive of this position, but some respondents expressed some concerns, which we address below.

8.15 We continue to believe that price regulation of new active products is likely to be disproportionate at this stage. Where demand is uncertain, forecasting costs and revenues is likely to be very difficult. It also carries the risk of stifling investment if prices are set too low or alternatively reducing consumer benefit if prices are set too high. Pricing flexibility allows the investor to trial different prices, which is likely to be particularly beneficial where demand is uncertain. Such flexibility also allows operators to manage the risks of their investments and make pricing judgements in the face of various market uncertainties and their requirements to earn a sufficient rate of return.

8.16 We recognise the concerns of some respondents that allowing pricing flexibility carries the risk of higher prices and anti-competitive price structures compared to if prices were regulated. However, it is important to note that this approach would not afford operators offering next generation access services complete pricing freedom; the risks above are likely to be mitigated by the presence of constraints from current generation broadband and from competition from other operators. A further constraint might be the availability of upstream passive products. The availability of such products could mitigate the risk of anti-competitive outcomes by encouraging innovation in design and construction as well as product offers and pricing structures.

8.17 If it transpires that taking into account all these factors, active product prices were not to be sufficiently constrained, these approaches would need to be reviewed.

## What could pricing freedom on actives mean in practice?

- 8.18 We are generally supportive of pricing flexibility, where competition is not damaged. In this section we clarify our view on flexible pricing and explain how we would address concerns raised by respondents to the September consultation over the potential for flexible pricing to damage competition.
- 8.19 There are a number of pricing structures that could be implemented if next generation access operators offering active wholesale inputs have flexibility in setting their prices. Below are some possibilities, but there are potentially a number of others. The competitive implications of these pricing structures would be considered on a case by case basis if we were to receive complaints.
- 8.20 In allowing pricing flexibility, we will continue to closely monitor the outcome of any specific pricing approaches adopted to assess potentially anti-competitive outcomes. Any pricing approaches adopted by communications providers with market power would only be appropriate if contracts are tendered on a fair and non-discriminatory basis – for example, available to all and not designed to specifically favour the downstream arm of any network operator with significant market power.
- 8.21 For other providers, such commercial models would need to have regard to general competition law and in particular to the provisions on agreements between competitors. These positions apply to all potential pricing approaches, including those explored in more detail below.
- 8.22 The examples of pricing flexibility explored in more detail in this section are:
- freedom to change prices as the market develops;
  - volume discounts; and
  - tiered wholesale pricing.

### Freedom to change prices as the market develops

- 8.23 As noted above, today there is considerable uncertainty on how demand for next generation access based services will develop. As a result, there is merit in allowing a network operator providing such services flexibility in how it sets its prices. This can include allowing it to trial different prices, perhaps over time or in different geographic areas in order to assess how purchasers of active inputs and end consumers change their behaviour in response to different price levels.
- 8.24 In addition, pricing flexibility could include allowing the operator freedom to set whatever price it deems appropriate and relying on the constraints present in the market to protect the interests of consumers. Such an approach will allow a market led outcome rather than a regulation led outcome. It can help avoid the distortions to competition and investment incentives that the latter may entail.

### Volume discounts

- 8.25 Volume discounts are where a purchaser is offered a lower unit price when it purchases a certain volume of a wholesale input. This might involve pre-commitments to purchase or up-front financial contributions, but does not necessarily have to. We recognise that volume discounts can reduce unit costs and thereby be beneficial in encouraging take-up of next generation access products. Encouraging

take-up is likely to be particularly valuable where the value of next generation access services increases as more consumers are connected to them.

- 8.26 However, we also are aware that volume discounts can act as a barrier to entry for smaller providers. It is important that volume discounts do not result in anti-competitive outcomes. We would therefore be concerned, for example, by situations where the downstream business of any network operator with significant market power was to be the main beneficiary from any volume discount being offered.
- 8.27 Any evidence that volume discounts were damaging competition could require us to review our overall approach to pricing flexibility.

### **Tiered wholesale pricing**

- 8.28 Tiered pricing refers to pricing structures whereby the network operator offers wholesale access at different prices based on different quality measures such as speeds. This can be particularly relevant where an investment involves high fixed costs but the incremental cost of serving an extra customer is relatively low. Such pricing flexibility could conflict with our views, outlined in Section 7, that it may be more desirable for active access products to have the minimum of predetermined features. This will maximise the scope for innovation and differentiation.
- 8.29 However, allowing tiered pricing where the network operator is able to charge different prices for different quality services could have the beneficial effect of resulting in higher consumer take-up of services. In particular, a network operator, could for example, in the context of next generation services, price the highest quality next generation access products above average cost and price lower quality next generation access products below average cost. In addition to the potential to increase consumer take-up, allowing different prices to be set and higher returns to be made on the highest quality products may also create efficient incentives to invest in next generation access.
- 8.30 However, the impact on service providers competing downstream is ambiguous. There may be benefits from the availability of additional, lower quality products at lower prices but the innovation potential for service providers competing downstream may be reduced. As we note the provision of simple products with the minimum of predetermined features by the network operator is likely to be conducive to downstream innovation.
- 8.31 Where the active access product has a minimum set of predetermined features sold at a single price it may nevertheless be the case that market expansion can be achieved. This will be the case where the purchaser of the wholesale input faces high fixed costs of its own in providing the retail service. In such a scenario it might be able to offer higher quality retail products at prices above its marginal cost (the average costs of the network operator where it has a single price) to those customers with a higher willingness to pay and not necessarily be undercut by competitors. Similar to the discussion above, this could allow a retailer to provide services below its average cost (but above its marginal cost) to those customers with a lower willingness to pay. The ability to price in this way at the retail level could be further enhanced where the retailer is able to bundle its retail next generation access based products with other retail services. The impact of this is that market expansion could be achieved even where the network operator has a single price at the wholesale level.

- 8.32 As with flexible pricing more generally, we are aware that a risk of allowing tiered pricing by a network operator is that it could allow it to generate excessive profits and potentially limit the ability for retailers to offer innovative retail prices. These factors would feed into any decision that we would have to make with regard to pricing. It is important that any model of tiered pricing would result in profits being balanced between wholesale and retail providers and would result in the best mix of incentives to invest and effective competitive outcomes.

### **Some respondents were concerned about the risk of potential margin squeeze**

- 8.33 A further risk emanating from our proposed approach to pricing flexibility for active products raised by several respondents to the September consultation was the risk of margin squeeze. Whilst we believe that setting prices for new active products in the near term would currently be disproportionate, we will remain vigilant to the risk of specific pricing practices distorting competition.
- 8.34 Wherever we were to see evidence of or the risk of margin squeeze, we would expect to take action to prevent it. This may include to exercising our competition law powers and moreover reviewing our overall approach to pricing.

### **For passive products cost based pricing that reflects the level of risk incurred is appropriate**

- 8.35 As outlined in Section 6, our preference is to promote competition at the deepest level of infrastructure where it will be effective and sustainable. In the past we have required access on regulated terms to network elements that we believe are enduring economic bottlenecks. For example, sub-loop unbundling is currently an explicit requirement on BT in the wholesale local access market and needs to be provided on a cost-orientated basis.
- 8.36 At this stage of next generation access development, we continue to believe that cost-orientation is likely to be the most appropriate option for passive products. This approach should allow for the market to become contestable, thereby encouraging innovation in design, construction and the product offer.
- 8.37 In general, the presence of uncertain demand for super-fast broadband services is less of an issue in the context of passive products as they tend to require less upfront investment, meaning they tend to be less risky than active products for the bottleneck asset owners. In addition, it is likely that the constraining effects on pricing at the retail level which we have identified for active products will be less effective at mitigating the risk of excessive prices further up the value chain. These factors together mean that where pricing flexibility is likely to be appropriate for active products, it is likely to be less appropriate for passive products. We therefore believe that setting prices based on costs is appropriate for passive products.
- 8.38 However, as stated in the September consultation, we do recognise that some passive elements of next generation access upgrades are also likely to be risky to some extent. These are assets that require new investment up-front to support unknown demand. We therefore believe that cost-orientation will continue to be appropriate for many passive products, with considerations for next generation access specific risk where necessary.
- 8.39 This position is supported by the European Commission's draft recommendation which set out the importance of reflecting risk in regulated prices. It is also consistent with emerging approaches of other European regulators, in particular OPTA's

approach for the Netherlands of adjusting regulated prices to ensure that they reflect risk. OPTA's approach was raised by a respondent as an option for Ofcom. We intend to fully consider all possible pricing options if and when we set prices after we conduct a market review.

### Ofcom's approach on cost recovery

- 8.40 In order to provide clarity to BT and to other Communications Providers we also set out in this Statement our approach to cost recovery and factors to be taken into consideration in assessing the eventual costs that BT could recover in meeting the commitments it has offered relating to passive inputs. We will have to consider any conditions involving cost recovery in light of all the relevant evidence and considerations in the context of any market review conducted in accordance with the significant market power statutory framework provided by the Communications Act 2003.
- 8.41 We consider that the prices for passive products should be designed to cover the efficiently incurred long-run incremental costs of providing passive products<sup>25</sup>, including a return which reflects the associated risks, plus an appropriate contribution to common costs, including the common capital and operating costs, incurred as part of the FTTC programme.
- 8.42 In addition, in order to retain the option for future competition based on BT's passive inputs, we recognise that BT may, in making its FTTC investment, incur additional costs specifically in anticipation of future demand for passive products. Should this occur, we consider that BT should have the opportunity to recover these additional costs in full, through appropriate mechanisms<sup>26</sup>:
- incremental costs efficiently incurred at the time of the investment before the demand for its passive products or known or can be reliably determined, where those costs are incurred specifically to support potential future demand for passive products; and
  - incremental systems development costs efficiently incurred at the time of investment before the demand for its passive products or known or can be reliably determined, where those costs are incurred specifically to support potential future provision of passive products.
- 8.43 Not allowing an appropriate level of common costs to be recovered on passive products is likely to result in a distortion of the relative prices between active and passive products, which could give rise to arbitrage opportunities.
- 8.44 In practice, this means that we would expect Communications Providers using passive wholesale products to make an appropriate contribution to the total fixed cost of those elements of any FTTC network upgrades that they use. This would include both network and system elements.
- 8.45 Consider the example of a Communications Provider deciding to compete by investing in FTTC infrastructure using BT's passive inputs after BT has incurred costs

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<sup>25</sup> Efficiently incurred incremental costs in this context include the costs associated with design, development, provision and operation of passive products.

<sup>26</sup> The mechanisms would need to be agreed with Ofcom, taking into account uncertainty of demand for passive products at the time, the need not to foreclose markets to BT's competitors and the materiality of the costs.



to upgrade its network to offer super-fast broadband services using FTTC. In this example it is quite likely that some of the costs originally incurred by BT for its own FTTC services could help support the delivery of the passive inputs. If, however, the price for passive inputs was set only on the basis of the long-run incremental costs of providing them then competition on these terms could leave BT unable to recover the costs of its investment. We consider that, if BT faced this situation, it is likely to be deterred from its original investment; in these circumstances BT might also be deterred from making future investment in super-fast broadband if its expected revenues (from both active and passive products) were less than its expected costs.

- 8.46 The detailed implementation of this approach on cost recovery will obviously depend on the circumstances and we would expect this to be determined on the basis of specific proposals including network and system build plans and designs.

### **Future developments may mean we must check if these approaches are still appropriate**

- 8.47 The pricing principles and approaches outlined here are based on the current forward view of how next generation access will develop. Any regulated prices will be set as a result of market reviews and as part of a market review we would consider all possible pricing options.
- 8.48 Our approach needs to strike a balance between the need for longer term regulatory certainty and the inherent demand and supply side uncertainty in super-fast broadband and next generation access. We envisage that any pricing approach would remain in place for the period between market reviews. This would likely be extended beyond such a period in the event that the circumstances merited such an extension.
- 8.49 However, where the underlying competitive conditions were to change from the current forward view, we may need to revisit these principles and approaches. Such changes could be driven by a number of developments. In some cases, inter-platform competition could increase in certain locations, resulting in more focus on lighter touch or de-regulatory policies. Alternatively, the development of next generation access networks and the communications sector more generally could result in changes to the existing models of competition, for example through the removal of copper links between homes and exchanges as part of a transition from copper to fibre. Or we may see customer expectations and experiences of next generation access result in the emergence of a new super-fast broadband market, distinct from today's broadband services.
- 8.50 Although such changes in competitive conditions may require us to revisit our pricing approaches in the future, we believe that it is appropriate that any prices set by the regulator in the future, including potentially for active products, should reflect the risks present at the time of a particular investment. Such an approach is necessary to create efficient incentives to invest and to provide clarity for potential investors. This principle would be taken into account, alongside our other principles on cost recovery in any review of our pricing approach in the future.



## Section 9

# Copper to fibre transition seems unlikely in the short term

- 9.1 A key factor influencing investment decisions around next generation access networks is the potential for operational cost savings and other efficiencies that may be achieved by a move from current generation to next generation access networks.
- 9.2 However, planning for this now may be premature given the state of market development. When this issue does arise, we need to ensure that any transition is well managed, efficient and does not result in significant consumer detriment or anti-competitive outcomes.
- 9.3 This is an issue we will need to monitor closely as super-fast broadband networks are rolled out to understand the potential timing and impact of any future transition.

### **Few respondents to the consultation suggested that transition was an issue that needed to be addressed soon**

- 9.4 Respondents were generally of the view that the generic model for transition outlined was suitable and it was unlikely to deter investment. Overall though, most suggested that it is not possible to give an accurate view on when transition would or should occur given the current state of market development.
- 9.5 Overall, BT welcomed the view that parallel running of the new networks and the legacy network would not be economic and stated that migration would not occur without consultation with its customers and notification of changes to the network. However, other communications providers expressed concerns about the implications of transition for current investments in infrastructure, especially local loop unbundling. They were most concerned about the risk of forced migration and potentially stranded assets. More detail on responses to this issue can be found in Annex 1.

### **While transition is likely at some point in the future, it appears too early to plan for it in detail now**

- 9.6 Until the current generation networks are fully replaced by new networks and switched off, two networks would have to be operated and maintained simultaneously. This, however, is not likely to be economic over the long term and may impede development and innovation. As we outlined in our consultation document there are a number of considerations supporting transition from current copper networks to next generation fibre networks:
  - As technology in the original networks becomes older and obsolete it will become more expensive to maintain. Also, as customers move from the old to the new network, the fixed costs of maintaining the old networks are spread across fewer customers. These effects are likely to mean that it will eventually be uneconomical to maintain the old network.

- Depending on the technology being used, parts of the existing networks and its infrastructure can be reused to save at least part of capital costs associated with the deployment of new networks
  - Infrastructure from the existing network may interfere with or limit the technical potential of the new networks.
- 9.7 These factors together highlight the likely importance of a transition from copper to fibre for an operator considering an upgrade for current generation to next generation networks. We are keen to do all we can to support a transition process in order to ensure unnecessary barriers to investment in next generation access are removed.
- 9.8 However, following the consultation, no respondents suggested that transition from copper to fibre was imminent. As a result, many of the policy positions outlined in this statement are based on the assumption that copper access networks and the products they support will continue to be available for the foreseeable future.
- 9.9 We agree with stakeholders that the transition from copper to fibre is still some time away. There is still considerable uncertainty surrounding investment in next generation access networks, specifically around what shape the networks will take, where they will be deployed and what consumer demand will be. As greater clarity around these elements emerges, the triggers, timescales and geographic phasing of transition are also likely to become clearer.

**When the issue of transition does arise, we should support it, but ensure that it is efficient and not anti-competitive**

- 9.10 Where transition does occur, we believe the model for transition outlined in the consultation document forms a good starting point, based on some key principles that we consider important:
- affected stakeholders should have an opportunity to comment on the networks owner's transition plans before they are finalised;
  - the transition process in any given area should not start until certain pre-conditions, or triggers are met; and
  - when the transition process is triggered, there will be a set minimum notice period to ensure affected stakeholders have time to act as required.
- 9.11 Any transition to new access networks needs to be carefully managed, with clear consultation, notification and migration periods.
- 9.12 Respondents to our consultation generally agreed with and welcomed our proposed model for transition from copper to fibre. A number of respondents suggested that it was too early to consider the details of what triggers would be appropriate for the commencement of transition, although end-user take-up was widely outlined as the key factor to consider.
- 9.13 Respondents also voiced caution about the time frame over which transition should occur, emphasising a need for sufficient time to be available, and stated their concerns about the risk of stranded assets.
- 9.14 We acknowledge the concerns some respondents have about future stranded assets but do not consider this to be a factor that should impede transition. We are not going

to protect existing business models at the expense of future developments and new services for consumers.

- 9.15 As we outlined above, depending on the technology used, parts of the existing networks and infrastructure may be reused in next generation access networks. This means that assets may continue to be utilised, rather than become stranded following any transition to fibre access networks. In addition to this, investment in local loop unbundling (LLU), where operators placed assets into the exchange, has occurred in waves, with investment growing to peak over a period and then gradually falling back off. Over time, investments in local loop unbundling will be paying back on the original investment as they come to the end of the anticipated payback periods. At the same time, future investment may be less significant in terms of new exchanges unbundled or significant upgrades to those that are already unbundled. This may limit the overall magnitude of stranded assets but this will need to be managed with care.

### **Any process for transition will have to be carefully timed and clearly signalled**

- 9.16 Moving from copper to fibre will pose challenges to existing competitors, regulation and the consumer. Any transition may result in fundamental changes to the wholesale products and potentially the features they support. It is not our role to protect communications providers from these changes. Instead, we will focus on ensuring that transition does not negatively affect the competitiveness of the market or result in a poor consumer experience during transition and beyond.
- 9.17 The timing of transition will have to be carefully balanced. The timing is likely to vary by geographic area. In each case, a situation should be avoided in which transition is premature or occurs in ways that do not take due account of existing infrastructure deployments. At the same time, the period over which two networks are run in parallel and uneconomically, should be minimised.
- 9.18 We will continue to be vigilant and actively monitor the development of the market and consider a range of potential triggers that could signal an appropriate time for transition. These triggers may include the level of take-up, the availability of good quality wholesale products, a clear transition plan and process discussed with industry and a suitable customer migration process. When these triggers are met and transition does occur it should be clearly signalled and allow sufficient time for operators to adapt to change.
- 9.19 Our central focus in a transition process will lie on the protection of consumers. The removal of a network with a large user base will carry the risk of consumer harm. As we outlined in our consultation there are a variety of different ways consumers may potentially face detriment including forced migration, the removal of existing retail products and negative impact on competition. We will keep these issues central to our considerations and ensure consumers are protected where necessary.

### **Upgrade plans need to be monitored very carefully as changes could make transition a more pressing issue for industry and regulation**

- 9.20 Although the current expectation is that the design of FTTC upgrade will leave the old copper network in place, these designs could change quite quickly and leave transition needing to be addressed sooner than expected. Moreover, with a fibre deployment in place, whether it is FTTC or FTTH, a decision to switch off the old network could be made and implemented very quickly.

- 9.21 We must therefore be alive to the possibility that although nobody is talking about transition as a short term prospect at the moment, this position could rapidly change. We therefore need to monitor operator plans for signs our current stance on transition is no longer appropriate. We will need to define and help manage the process of transition once it becomes clear that this is impending. This will require us to revisit our principles and the high level model for transition again in the future on the basis of actual plans.
- 9.22 When transition does occur this could provide an opportunity for a network operator to increase its charges for its services, including those services that could be provided over the copper network. This could be because the constraints imposed by alternative operators using copper-based inputs would no longer exist. The network operator could seek to recover its investment costs by allowing costs to be spread across all products, including services which can be provided over existing networks.
- 9.23 However, in general, we believe that such an approach to cost recovery is likely to be inefficient. If investment were to be secured on such a basis it would negatively affect those consumers who do not value the new services by forcing them to pay higher prices. In effect, those consumers who do not value next generation access investment would be subsidising those consumers who do. This would be an underlying principle in considering our pricing approach if and when transition occurs.
- 9.24 However, we recognise that the presence of externalities may mean that a strict interpretation of this principle may not be appropriate in all cases. For example, some aspects of investment may confer social and economic benefits on a broader range of consumers than only those who consume next generation services. In such a scenario it may therefore be appropriate to allow the prices to rise on products which do not rely on the investment in next generation access networks.

## Section 10

# Next steps

- 10.1 This statement outlines the regulatory principles, approaches and positions that have been arrived at following our consultation and engagement with a broad range of stakeholders.
- 10.2 Going forwards, an increasing range of regulatory decisions and activities will need to take into account super-fast broadband and next generation access developments. Many of these will either build on, or complement, the policy positions outlined in this statement.
- 10.3 It is vital that we maintain the momentum towards the deployment of super-fast broadband. We intend to play a full part with activity including:
- the forthcoming wholesale local access market review, as well as other future market reviews, including but not limited to the wholesale broadband access market review;
  - ongoing engagement with industry on the technical requirements and characteristics of active line access;
  - promoting standardisation in wholesale active products, in conjunction with the work commenced by Community Broadband Networks following the Digital Britain interim report;
  - engaging with industry to understand the level of demand and usefulness of duct access in light of next generation access deployments and our survey results;
  - extensions to the duct survey to provide further information and to understand what actions would be required if this were to form the basis for future investment and competition;
  - monitoring the outcomes of industry led developments and discussions, including potential transition from copper to fibre and wholesale active product development, to understand implications on these policy positions; and
  - playing a leading role and working with stakeholders to the debate on the need and actions that could lead to increased the availability of super-fast broadband services for more consumers, citizens and businesses beyond what the private sector alone can deliver.
- 10.4 These actions and activities will link to further information and guidance from the both the European Commission and the European Regulators Group on regulatory approaches and implications of super-fast broadband.
- 10.5 We believe that the overall regulatory approaches outlined in this statement should provide the certainty and ability for the private sector to continue with super-fast broadband plans. We look forward to continuing to work closely with all our stakeholders throughout the life of this exciting and fundamental development for the communications sector, considering its implications for consumers, the market and regulation.

**The first stage in ensuring an appropriate regulatory regime for super-fast broadband is to consult on a variation to BT's Undertakings**

- 10.6 We have indicated above our intention to consult on a proposal to vary BT's Undertakings which is designed to provide BT with the regulatory certainty it requires in order to proceed with its proposed investment in fibre to the cabinet.
- 10.7 We are publishing today a Consultation on this proposal here <http://www.ofcom.org.uk/consult/condocs/fttc/>.
- 10.8 We encourage all interested stakeholders to provide constructive comment on the proposals in this consultation, and alternative approaches where appropriate.

## Annex 1

# Respondents' views on the super-fast broadband consultation

## Potential consumer benefits from super-fast broadband

- A1.1 Ofcom received 30 responses to the September consultation 4 of which were confidential. The public responses are available on Ofcom's website at [http://www.ofcom.org.uk/consult/condocs/nga\\_future\\_broadband/responses/](http://www.ofcom.org.uk/consult/condocs/nga_future_broadband/responses/). This section summarises respondents' views to each of the questions raised in the September consultation and responds to them.

*Question 1: Is there further evidence available on the applications and services or consumer benefits that may be supported by next generation access?*

- A1.2 Many respondents considered that it was too early to predict the likely pace of change or the services that could potentially be delivered via super-fast broadband networks. The general view was that demand was unknown and the willingness of consumers to pay more for as yet unspecified services and enhanced speeds was unclear. The 'killer' application that will drive consumer- and business- demand is not known at this point in time. Respondents commonly stated, however, that there were likely to be economic and social benefits that are derived from super-fast broadband networks.
- A1.3 Most of those that did mention specific applications or services suggested that IPTV and HDTV were likely to drive consumer-demand in the same way that these had driven-demand for services delivered via super-fast broadband networks in Europe. Access to premium content was therefore important. A number of respondents also suggested that concurrent access to multiple applications was also likely to be a driver of demand.
- A1.4 A number of respondents also pointed to other potential socio-economic benefits such as enhancements to and increased potential for home-working. Two-way video could also become more common. Other respondents also suggested that there could be increasing possibilities for local health authorities to provide specialised care and home support for patients in the home.

### Ofcom's view

- A1.5 We acknowledge that the 'killer' application likely to drive demand for super-fast broadband services in the UK is not known as yet. We also recognise that HDTV and IPTV services have helped to drive demand in Europe and consider that the possibilities in relation to home care will be beneficial.
- A1.6 In terms of access to premium content, on 30 September 2008 we published the consultation document entitled *Pay TV second consultation: Access to premium content*<sup>27</sup> and this included our initial proposals to require access to particular premium TV channels (focused on live Premier League matches and first-run Hollywood blockbuster films). The consultation closed on 9 December and we are currently reviewing responses and considering next steps.

<sup>27</sup> [http://www.ofcom.org.uk/consult/condocs/second\\_paytv/condoc.pdf](http://www.ofcom.org.uk/consult/condocs/second_paytv/condoc.pdf)

## Migrations processes will be key to ensuring the success of next generation access

*Question 2 - Who should lead on defining and implementing a process for migrations to and from next generation access networks? What roles should industry, Ofcom and other bodies play?*

- A1.7 Respondents agreed that fair and efficient migration processes were fundamental to ensure that consumers were protected. General principles such as consumer consent, visibility of charges and cancellation rights would be needed. Migration processes should also be defined and implemented at the outset. Respondents' views on who should define and lead on migrations processes were, however, mixed.
- A1.8 A number of respondents suggested that Ofcom would need to lead on migrations processes to ensure that such processes protected consumers and did not hinder competition. Revisions to the General Conditions of Entitlement could be needed.
- A1.9 Other respondents suggested that the industry should lead and define migration processes and that they should be able to ask the Office of the Telecoms Adjudicator to intervene should agreement not be reached.

### Ofcom's view

- A1.10 We agree that, as with all migration processes, the consumer's consent is fundamental and that charges for switching need to be fair. We do not, however, consider that it is presently appropriate to revise the General Conditions of Entitlement. We will, nonetheless, act should our intervention be required because industry has not been able to deliver reasonable migration processes.
- A1.11 In terms of who should lead on migration processes, we consider that, as long as industry ensures that migration processes remain high on the agenda, in the first instance, they can lead on the development of such processes. Ofcom and the OTA could intervene as required.

### Ofcom's role

*Question 3- What role is there for Ofcom in the ongoing debate on next generation access versus industry's role in progressing this debate through multi-lateral and bi-lateral discussion?*

- A1.12 Respondents' views on the appropriate level of regulatory involvement at this stage were mixed. Many respondents considered that industry discussions through the various relevant consultative groups were needed and that these could deliver a suitable wholesale product. Other respondents, however, considered that regulatory intervention would be needed prior to large-scale deployment of super-fast broadband networks to ensure that competition opportunities were not missed. Ofcom needed to assess the extent of competition and impose appropriate regulatory requirements.
- A1.13 A number of respondents suggested that Ofcom should have a coordinating/facilitating role at this stage to ensure progress does not stall and they welcomed Ofcom's involvement in the development of standardised technical standards.



- A1.14 A number of respondents added that Ofcom must ensure that the debate on super-fast broadband networks considers the extent to which business consumers could also stand to benefit.

### **Ofcom's view**

- A1.15 We are presently of the view that industry discussions including via the Broadband Forum and the GEA Trialists Working Group be the main place for discussions on BT's GEA product. We will consider, in any case, the need for regulatory intervention in the relevant market reviews.
- A1.16 We will continue to have ongoing dialogue with BT and any other parties as appropriate and will continue to facilitate discussions on standardisation and discussions on the requirements of active line access in conjunction with industry and standardisation bodies.

*Question 4 - How far does current regulation, including market definitions, equivalence and the BT's Undertakings, need to evolve as result of next generation access deployment?*

- A1.17 Many respondents stated that the underlying rationale of the Undertakings should not be diminished and the principle of equivalence should be maintained. Enduring 'bottlenecks' need to be regulated. A number of respondents suggested, however, that it was not clear that there would be viable opportunities to invest deep in the network and therefore they welcomed the recognition in the September consultation that active products would be important to promote competition in the provision of services over super-fast broadband networks. A number of respondents suggested that the Undertakings may need to be varied to ensure that Openreach could control cabinet electronics.
- A1.18 Many respondents also stated that regulatory certainty was required and that investment should not be undermined. They stated that Ofcom should ensure that regulation does not result in an inefficient outcome and that flexibility and extended rollout should be accompanied by appropriate rewards. On the other hand, another respondent stated that it was not clear that investment in super-fast broadband networks needed to be incentivised or warranted a new regulatory approach.
- A1.19 A common theme amongst responses was the need for the appropriate market reviews to define the relevant market(s), assess competition within them, assess whether anyone has significant market power in the relevant market(s), and tailor regulatory remedies accordingly. Cost-orientation requirements for active products may be warranted.
- A1.20 Some respondents also suggested that there were likely to be geographic variations in the level of competition and that regulation should be applied accordingly and flexibly.

### **Ofcom's view**

- A1.21 We agree that the underlying rationale of the Undertakings and the principle of equivalence of inputs need to be maintained. It is clear, however, that the costs involved in rolling out fibre-based networks are likely to be high and that inappropriate and heavy-handed regulation at this stage of development could discourage investment and, absent certainty, future regulation could undermine investments. We consider that we need to provide a clear, consistent and

transparent regulatory regime that reflects the underlying competitive dynamics of rollout.

- A1.22 We also recognise that we will need to conduct the necessary market reviews and define relevant markets, assess significant market power, and implement regulation accordingly. The market reviews are the mechanism through which we would regulate anyone found to have significant market power. We agree that regulation may differ geographically should geographic regions not have homogeneous market conditions.

### Sub-loop unbundling and duct access

*Question 5 - How important are passive products such as forms of sub-loop unbundling and duct access? Can the economics of these products support the promotion of effective and sustainable competition at this level? Which passive products should Ofcom pursue?*

- A1.23 Respondents' views on this were wide ranging. A number of respondents stated that passive access was unlikely to be economic on the one hand and therefore Ofcom should focus its regulatory attention on active access. On the other hand, a number of respondents stated the opposite. These respondents suggested that passive access would provide the greatest opportunity for control and service differentiation.
- A1.24 A number of respondents stated that multiple access networks were unlikely to be economically viable – certainly not in rural areas – and therefore those that invest in super-fast broadband networks should not have their investments undermined by economic models of competition which may not be sustainable. Ofcom should avoid promotion of inefficient outcomes. Active products would support competition and the efficiencies and economies of scale that BT benefits from underpin its deployment. BT stated that successful deployment of super-fast broadband networks elsewhere had relied on state-aid or vertically integrated operators. One respondent suggested there was little economic case in support of duplication of alternative access networks via duct.
- A1.25 On sub-loop unbundling, a number of respondents stated that BT's obligation to provide the product should remain and that it should be supplied on an equivalence of inputs basis. BT stated that it would continue to support the present product. Some respondents also stated that demand for sub-loop unbundling was unlikely and needed to be proven. Another respondent stated that the present product was uneconomic as, amongst other things, it would require duplication of cabinet investment.
- A1.26 There was, however, some support for cabinet co-location and that operators needed to be provided with incentives to invest in the deepest level of infrastructure. Cabinet co-location would enable operators to install their own electronics and this would enable them to offer greater retail product differentiation than active access products would support. There was recognition, however, that support for co-location would come at a cost and that operators choosing to co-locate should pay proportion of the upfront costs of the investment. One respondent stated that BT should be required to consult operators annually on its intended rollout plan and this would provide operators with an opportunity to consider whether to invest or not.
- A1.27 On other potential passive remedies, a number of respondents stated that the case for duct and pole access was not strong and could potentially undermine original

investments. BT, in particular, stated that requiring access to passive infrastructure may compromise its investment in super-fast broadband. Additionally, duct access would be accompanied by operational and practicable difficulties and these included the variability of space within ducts.

- A1.28 Other respondents took the opposite view. They suggested that the result of the duct survey would be of interest and that, potentially, access to other utility infrastructure could be considered for the delivery of super-fast broadband services. It was suggested that access to ducts and poles could provide a cost effective way for backhaul networks to support access to the premises and reduce barriers to entry. One respondent also suggested that a duct access obligation offered the greatest simplicity and least impairment of BT's investment and was therefore warranted.
- A1.29 A number of other respondents suggested that Ofcom should consider access to unbundled dark fibre as this could support cabinet access.

### **Ofcom's view**

- A1.30 We do not believe that it is straightforward to state that active access is likely to be the only economic model that would support competition in super-fast broadband services. We consider that a mixture of active and passive access could potentially support competition in the provision of retail services in areas in which passive access is not economically viable and enable competition at the deepest level where the economics are sustainable.
- A1.31 We agree that it is unlikely that multiple access networks will be sustainable in many areas and therefore fit for purpose active products will be required to ensure that there is consumer choice. We also recognise that BT benefits from economies of scale and note that it considers that it is these scale benefits that underpin its deployment of its next generation network.
- A1.32 We welcome BT's support for sub-loop unbundling. BT is required to provide Local Loop Unbundling Services including sub-loop unbundling under significant market power services condition FA9 "on fair and reasonable terms, conditions and charges and on such terms, conditions and charges as Ofcom may make from time to time" and therefore BT is subject to a specific requirement.
- A1.33 On joint investment (or coordinated investment) at the cabinet, we believe that there is potential for this to be viable. We consider, however, that such discussions should be commercially driven and that bi-lateral and multi-lateral discussions are the appropriate way in which this should be taken forward at this stage.

### **Practical development of active next generation access products is starting in the UK**

*Question 6 - What are the characteristics of high quality, fit for purpose active wholesale products? How far can active products with these characteristics support effective and sustainable competition?*

- A1.34 Respondents were generally of the view that there was a need for high quality, fit for purpose active wholesale products and that these needed to be flexible and support differentiation. Active products need to replicate as far as possible access to passive infrastructure and they should provide similar scope for innovation and control.

- A1.35 Other respondents provided more specific examples of the type of control required and service offerings that active access products should support. One respondent stated that operators should be able to install the end-user's equipment in the home (CPE). A number of respondents also stated that active products needed to support multicast video/TV services and others also stated that they needed to be able to set the speed.
- A1.36 BT emphasised that it was proactively consulting industry on FTTC/GEA and that the product specification for its Generic Ethernet Access (GEA) product was subject to ongoing discussions at industry groups including the Openreach Next Generation Access Forum. These industry groups were the appropriate place to refine active products and take matters such as trialling active products forward. Many respondents agreed that these discussions and ongoing engagement had been useful and that Ofcom intervention should only be required should these discussions fail to resolve differences or lead to an effective active product which supported competition and differentiation. A number of other respondents, however, suggested that the development process via the consultation process was slow and that the scope of the discussions was limited.
- A1.37 A number of respondents commented that standardisation work was essential and they welcomed Ofcom's input. For super-fast broadband to be workable, operators should not need to conform to different standards to connect to each network.
- A1.38 On a more general point, a number of respondents stated that active products were more likely to support competition than passive products and that they would, in any case, be needed in areas in which passive products would not be economic.

### **Ofcom's view**

- A1.39 Ofcom agrees that high quality, fit for purpose active wholesale products are needed and that they should enable differentiation. These products are likely to be the only economic means of supporting competition in the provision of services in parts of the UK. We also consider that the functionality that they support should be as close as possible to passive products. Annex 2 sets out the characteristics of active line access and the extent to which BT's GEA product conforms with these characteristics.
- A1.40 In terms of the specific requirements of GEA, respondents' views were generally consistent with those proposed in our draft Technical Requirements, and their comments are integrated into the revised version of the Technical Requirements which we have also published today. There is also general industry consensus as to the principle characteristics on which a fit for purpose Ethernet active line access product should be based, and this matches the characteristics which Ofcom identified in previously.
- A1.41 Overall these responses support our view that, whilst the gap between passive and active can never be completely closed, it is possible to reduce it with the right, fit for purpose, wholesale access product. There is general industry consensus on what the high level characteristics of such a product should be and our work with industry on the characteristics of Ethernet active line access, as described in detail in the September consultation<sup>28</sup> reflects general agreement and consensus on the essential technical requirements for Ethernet active line access. There is however

<sup>28</sup> [http://www.ofcom.org.uk/consult/condocs/nga\\_future\\_broadband/](http://www.ofcom.org.uk/consult/condocs/nga_future_broadband/)

ongoing debate around the technical specification and how existing products can be optimised to meet this.

- A1.42 We are pleased to observe that industry is working to develop fit for purpose wholesale active access. Openreach's GEA has many characteristics in common with Ethernet active line access.

## Fibre and wavelength unbundling

*Question 7 – Are there other options for promoting competition through regulated access that have not been considered here?*

- A1.43 Respondents were generally of the view that Ofcom had identified the main options and commented, in particular, on fibre and wavelength unbundling. One respondent stated that dark fibre is essential for providing low cost, high bandwidth business services. They added that FTTC infrastructure should be developed with access to dark fibre in mind.
- A1.44 Another respondent suggested that Ofcom understated the competition potential of dark fibre given that it represents the next generation access equivalent of unbundled copper while another stated that Ofcom should continue to investigate regulatory solutions based on fibre and wavelength unbundling and not discount them. A further respondent stated that the technologies to enable wavelength unbundling will be available in 3 to 5 years. One respondent was sceptical about the potential for dark fibre to be useful regulatory access mechanism as it was not clear that dark fibre access would be available given that it was not designed for multiple operators and may be in the wrong place.
- A1.45 Respondents also made other varied points. One respondent stated that BT should be required to de-couple traditional voice from super-fast broadband and offer a naked VDSL product. One other respondent stated that Ofcom had not taken account of mobile broadband development.
- A1.46 Another respondent stated that as technology evolves other options are likely to emerge and that regulation will need to be flexible and supportive of innovative market developments.

## Ofcom's view

- A1.47 We recognise that wavelength unbundling could potentially be an alternative means of providing competition in the provision of next generation access in the longer-term for FTTH deployments. This will be one of the future options considered for the promotion of competition. However, given the current plans for FTTH deployment and the current technical development of wavelength unbundling, we do not believe that it is likely to be a viable near-term solution. This may change quickly though, and we must therefore monitor developments in this sphere.
- A1.48 On the issue of dark fibre. This could be a potential remedy to market power in super-fast broadband in the following two situations.
- to provide access to consumers premises in FTTH deployments; or
  - as a backhaul remedy from street cabinets for sub-loop unbundling.

- A1.49 In either case for dark fibre to be a remedy it must be the case the fibre has already been installed. In the case of access there are limited FTTH deployments today. Further, for access, the attractiveness of dark fibre as a remedy is likely to be influenced by the network topology deployed, for example passive optical networks (PON) or point-to-point fibre networks. In the case of a PON topology it may be the case that wavelength unbundling is the most attractive option. In the case of backhaul from the street cabinet dark fibre may represent an attractive option, however at the moment there is little demand for access to street cabinets as described in Section 6.
- A1.50 Questions on the role and prospects for naked VDSL products are similar in many ways to questions on naked ADSL in today's copper access networks. In terms of regulation if a provider is found to hold a position of SMP in a market which includes ADSL and/or VDSL then that provider would be required to provide a wholesale service. Whether, or not, it is reasonable for that provider to make the provision of this wholesale service contingent on the provision of another service, such as traditional voice, would need to be tested on the facts following demand for the naked product. A point to note, however, is that a move to a naked product is unlikely to result in the situation where the traditional voice service is simply not paid for. This is because, generally, the cost of the access network is being recovered through the charge for the traditional voice service and therefore if this voice service is removed the cost of the access network will need to be borne by the naked product - thus making a naked product more expensive than a product that is provided incrementally to traditional voice. This being said we recognise that there may still be genuine demand for naked products and we will thus continue to monitor this issue.

### Joint investment

*Question 8 - How far may options for joint investment provide greater opportunities for competition based on passive inputs? Are there lessons that can be learned from similar ventures in other industries? What are the risks and advantages of such approaches?*

- A1.51 BT considered that joint investment proposals may not be commercially or operationally acceptable. Nonetheless, it suggested that tangible proposals would be explored further. But, though risk-sharing arrangements were theoretically possible, the commercial arrangements of any such venture would need to be acceptable before it would consider entering into such agreements.
- A1.52 A number of respondents suggested that joint investment options could enhance the attractiveness of sub-loop unbundling. Most, however, did not indicate that they would actually choose to pursue joint investment models and that these should, in any case, be driven via commercial discussions. One respondent suggested that joint investment models were more likely to succeed where the parties involved were not competing with each other in the provision of a service and therefore the joint arrangement would not overlap with their existing interests. They suggested that investment at the cabinet would involve overlapping interests at both wholesale and retail levels.

### Ofcom's view

- A1.53 This issue is covered in detail in Section 6. We consider that coordinated models of investment could play a useful part in the rollout of super-fast broadband services. We recognise that the relevant rollout costs are high and that approaches to sharing



these costs, or limiting duplicative costs, in the promotion of passive competition are of significant interest. However, as outlined in Section 8, we must remain alive to any risks or competition concerns that could arise as a result of innovative investment or pricing models.

## Standardisation is important for future active products

*Question 9 - What should be the respective roles of Ofcom and industry in defining and implementing product standards?*

- A1.54 Respondents were generally of the opinion that industry should take the lead in developing standards. Many respondents suggested, however, that Ofcom has an important role in promoting the development of industry standards and encouraging industry participation in the relevant groups. One respondent stated that the Broadband Forum is already setting the appropriate standards and suggested that active line access product set requirements could be set at NGNuk and the Network Interoperability Consultative Committee (NICC) defining product architecture and required service standards. Another respondent was of the view that Ofcom should only intervene in cases where developments are against Ofcom's regulatory policy or in cases where an impasse has been reached. Ofcom should facilitate discussion and encourage engagement.
- A1.55 Other respondents, however, put forward the view that Ofcom was not being proactive enough. One respondent suggested that Ofcom needed to safeguard the timely launch of a product, and that we should extend the scope of our work on Ethernet active line access to include processes of ordering, provisioning, migration. Another respondent welcomed Ofcom's input in defining active line access requirements but felt that Ofcom could play a greater role in engaging with those that supply businesses to ensure that needs are not compromised.
- A1.56 Respondents also noted that standardisation of active line access products is essential so that communications providers need not conform to different standards for each next generation access network.

### Ofcom's view

- A1.57 As outlined in Section 5, we consider that significant progress has been made with industry standardisation of active line access. The draft Technical Requirements ([http://www.ofcom.org.uk/telecoms/discussnga/eala/eal/eal\\_technicalre.pdf](http://www.ofcom.org.uk/telecoms/discussnga/eala/eal/eal_technicalre.pdf)) published in September attracted both formal responses and informal input as part of industry seminars. The Broadband Forum and the MEF have discussed how to take forward the standardisation of Ethernet active line access requirements and the NICC has set up a work stream to address them. The European Commission's draft statement on next generation access sets out the importance of standardisation and as a result we would expect to see more engagement from ETSI and the ITU. We think therefore that for the moment there is not need for formal intervention.
- A1.58 We remain concerned, however, that industry may deliver standards too late, once competition has been foreclosed, or standards are too heavily influenced by the desires of vertically integrated operators to limit downstream competition. We will continue to actively engage with industry and standardisation bodies and encourage widespread participation. We recognise that standardisation is key and will take proactive steps should we consider that industry is not moving forward

progressively. We expect major players and stakeholders to engage and promote standardisation for the benefit of all.

### Flexible pricing can increase investment and take-up

*Question 10 - How far do stakeholders consider the pricing approach outlined here of pricing flexibility for active products and cost orientation plus considerations for risk is appropriate at this stage of market development?*

- A1.59 On actives, a number of respondents welcomed Ofcom's initial approach in that higher returns were appropriate to encourage investment to begin with and that prices would, in any case, be constrained by current broadband products. There was also a fairly common position that should active products stimulate take-up they should not immediately be subject to price regulation to protect the initial investment and not undermine the business case on which it was made. Modelling absent known demand, at this stage, could be problematic. Appropriately set anchor product pricing could, however, act as a constraint.
- A1.60 A number of respondents, however, considered that investment in passive products would be limited and therefore active products should be subject to regulatory rules traditionally reserved for products deeper in the network (i.e., Ofcom's proposed pricing approach to passives).
- A1.61 On passives, respondents generally accepted that cost-oriented pricing which took account of the initial relevant risk to protect the investment was appropriate. One respondent, however, even had reservations about this approach and the possible deterrent that could prevent investment.
- A1.62 Another common theme was that Ofcom had not stated what would happen when the chain of substitution breaks down and super-fast broadband products were not constrained by current generation broadband products or when the existing copper network was withdrawn.
- A1.63 Many respondents were, however, of the view that it was too early to assess pricing options for active or passive products. They considered that pricing approaches should not be made until demand has been assessed and the market had developed. At that stage, Ofcom should carry out the market review of the appropriate product set and assess market power and the need for price regulation.

### Ofcom's view

- A1.64 We continue to believe that introducing pricing regulation for new active products is likely to be disproportionate at this stage. Where demand is uncertain, forecasting costs and revenues is likely to be very difficult, and carries the risk of stifling investment if prices are set too low and reducing consumer benefit if prices are set too high. We recognise that pricing freedom may carry a risk of high prices. We consider, however, that this risk may be mitigated by constraining effects on pricing at the retail level from cable and current generation broadband.
- A1.65 We acknowledge that a number of respondents consider that passive investment is unlikely and therefore competition might be reliant on active access. We consider that it is too early to speculate and that, in any case, direct regulation on cost-oriented terms could stifle investment and be of detriment to consumers.



- A1.66 We also recognise that the chain of substitution is likely to breakdown at some future point and that when this happens active prices would not be constrained by current broadband pricing. We do not consider that this is likely in the near term future and therefore we do not believe that it is necessary to forecast what we would do when the breakdown in substitution occurs.
- A1.67 On passive access, we continue to believe that where risks are low, cost-oriented pricing is appropriate. If, however, there is a greater associated risk, that investment should be recognised and rewarded appropriately through risk reflective returns and pricing approaches.

*Question 11 - Will indirect constraints allow for an approach based on more price flexibility for active products? How will such an approach affect the incentives of different operators to invest and deliver super-fast broadband services to end customers?*

- A1.68 Respondents raised many of the same points that they made in regard to their position in relation to Question 10. A number of respondents suggested that pricing for active products might be constrained by current generation broadband products. Alternative networks could also act to constrain pricing.
- A1.69 A number of other respondents, however, stated that Ofcom needed to protect against market dominance and therefore Ofcom would need to be able to adapt its regulatory position accordingly. Direct regulation of active products might be required. They suggested that too much pricing freedom could reduce demand and Ofcom needed to guard against this.
- A1.70 Quite a number of other respondents stated that there was no evidence available to make an assessment. They suggested that it was too early to state whether or not constraints on pricing would exist on the basis of present generation broadband products. The extent to which passive products were available and effective would be important in assessing whether active prices would be constrained. One respondent cautioned against direct regulation at this stage.

### **Ofcom's view**

- A1.71 At this early stage of market development there is limited evidence on which to base positions. In this situation, a relatively broad market definition seems appropriate, and be consistent with the presence of indirect retail price constraints. For super-fast broadband deployments to be successful, we believe that industry must be provided with opportunities to experiment and trial with new services. This flexibility is important. However, it is important that this does not result in anti-competitive outcomes or competitive market distortions. We acknowledge the concerns relating to margin squeeze: where we were to see evidence or the risk of such behaviours, we would expect to take suitable action to protect competition. This is explored in more detail in Section 8.

*Question 12 - What period of time would be appropriate for such an approach to ensure a balance between the need for longer term regulatory certainty with the inherent demand and supply side uncertainty in super-fast broadband and next generation access?*

- A1.72 BT stated that as long as there were overlay products and indirect constraints pricing flexibility should remain. Once these did not exist it would be appropriate to carry out a market review.

A1.73 A number of other respondents broadly agreed that regulatory certainty was needed and that pre-judging the period of time for decisions in relation to super-fast broadband was not presently required and too early to state either way.

A1.74 Other respondents, however, suggested that market reviews are generally conducted on a four-yearly basis and that this duration could act as a reasonable proxy for super-fast broadband services.

### **Ofcom's view**

A1.75 We need to strike a balance between the need for longer-term regulatory certainty and the inherent demand- and supply-side uncertainty in the market. We agree that to the extent that pricing constraints remain flexible pricing could potentially continue. We consider, however, that the appropriate pricing approach would need to be considered at the point of the relevant market review and at every market review thereafter.

### **What could trigger a review of our approach**

*Question 13 – What are the key factors that could make a review of any pricing approach necessary?*

A1.76 BT suggested that should fibre turn out to be the prevailing technology, the appropriate pricing approaches and the need or otherwise for regulatory remedies would need to be considered in the relevant market review(s). A number of other respondents suggested that changes to the definition of the relevant market(s) and demonstrable failure of the market(s) to deliver competitive outcomes could necessitate regulatory intervention. They suggested that Ofcom may need to intervene should the market not be able to deliver consumer benefit. One respondent stated that lack of retail take-up of super-fast broadband services would be a good indicator of appropriate pricing at the wholesale level.

### **Ofcom's view**

A1.77 We agree with all of the comments above on possible triggers to review pricing approaches. In practice, a number of indicators may suggest the need to revisit the policy positions set out in this statement. These will include, but will not be limited to:

- evidence that shows that constraints provided by the upstream passive products is ineffective;
- evidence of a break in the chain of substitution between super-fast and current generation broadband services;
- an earlier than expected transition from copper to fibre access networks and the closure of fibre access networks; and
- changes to Access Network Frequency Plan, maximising the performance of FTTC based broadband services but reducing the quality of exchange based broadband services.

## Transition from copper to fibre access networks

*Question 14 - How far can the generic model for transition outlined here deliver both incentives to invest in next generation access while ensuring existing competition is not undermined?*

- A1.78 Respondents were generally of the view that the generic model for transition outlined was suitable and it was unlikely to deter investment. A number of respondents stated, however, that it was difficult to pre-judge when transition should and would occur.
- A1.79 BT welcomed the view that parallel running of the new networks and the legacy network would not be economic and stated that migration would not occur without consultation with its customers and notification of changes to the network. BT stated, however, that communications providers should not be able to block the transition to the new network and that communications providers had to move together. This point was echoed in another response. A number of other respondents stated that BT should give as much notice as possible and one respondent suggested that BT should be required to give 18 months' notice before changes to its network.
- A1.80 BT stated that it should not be required to provide regulatory products over fibre which had traditionally been required over copper. Another respondent stated, however, that on the closure of an exchange, communications providers should be able to continue to provide the same products to their customers at the same costs and the same level of innovation should continue to be possible.
- A1.81 BT's response also recognised that it will eventually make savings on removal of the legacy network but there was significant operational detail before these will be realised.

*Question 15 - What triggers would be appropriate for the commencement of any transition process?*

- A1.82 A number of respondents stated that product, technology evolution and, most importantly, end-user take-up of services based on new networks would be the main deciders for the commencement of any transition process. Respondents' views on when this may occur, however, were mixed. BT stated that a period of 2-5 years was a reasonable estimate whereas another respondent stated the commencement of the transition process was likely to be in a longer timeframe. Two other respondents suggested that it too early to say although it was sensible to raise the issue.
- A1.83 Some respondents also stated that it was important that investments in infrastructure for local loop unbundling should be protected and that forced migration could lead to stranded assets.
- A1.84 One respondent stated that Ofcom had not considered the potential for transition to wireless networks which would also be a factor.

*Question 16 - Once triggers or circumstances for transition are achieved, what would be an appropriate period for the various phases of transition (consultation, notice period, transition)?*

- A1.85 Respondents' views were broadly similar or were covered in response to Questions 14 and 15. These included the view that it was too early to assess. BT's response also stated that there was little worth in speculating on notification periods given uncertain demand. BT stated, nonetheless, that it was likely to give 6 months' notice basis on an exchange basis and that period of overlay would be included in any transition process. Eventually it may be possible to reduce these timescales given experience.
- A1.86 One other respondent suggested that five years' notice would be required for the withdrawal of significant market power products such as local loop unbundling unless a wholesale broadband product was available which could adequately replace local loop unbundling on the same terms.

*Question 17 - Over what geographic area should any process of transition be managed, for example region by region or nationally?*

- A1.87 BT considered that it was too early to give a definitive view in relation to this matter but, nonetheless, it stated that transition would be conducted in consultation with its customers. Most other respondents considered that it was likely that there would be regional differences given different network topologies. Exactly what this would mean in practice was probably too early to say.

### **Ofcom's view**

- A1.88 Our overall position to the transition from copper to fibre access networks are set out in Section 9. Overall, we agree with many comments that suggested that it was too early to plan in detail for any future transition. However, we consider the overall approach and processes set out in the consultation will provide a good starting point for transition once it becomes a live issue.
- A1.89 One issue that is raised with respect to transition relates to stranded assets. As outlined in this statement, we will continue to ensure that competition continues after transition. However, this does not imply that it will continue in exactly the same form, or indeed necessarily involve the same competitors.
- A1.90 In some cases, it may be appropriate for wholesale products flowing from remedies on the new network will look identical to existing ones. However, there will be other cases where this is not efficient or even technically possible. Overall, it is likely that the wholesale products available following transition will look different from today. We also think the business models of competitors using these products may need to change quite significantly.
- A1.91 We need to ensure that a suitable migration path for existing infrastructure investments is allowed for following the deployment of new technologies. However, Ofcom's role is not to protect existing infrastructure investments against market risks that may arise, for example from the emergence of new technology developments that supersede some operators' current market propositions. It is appropriate for Ofcom to consider operators' interests in terms of the availability of wholesale inputs, throughout the life of the assets in which they have invested. This will be balanced by the prospective for overall consumer benefits from any transition to new networks.

## Alternative revenue opportunities from a new value chain

*Question 18 - What actions, if any, should, Ofcom undertake to support new revenue models from next generation access?*

- A1.92 Most respondents were of the opinion that Ofcom did not need to take any action at present as commercial negotiations and market developments would drive demand. One respondent stated that Ofcom could support new revenue models by minimising regulation and providing certainty and flexibility. One respondent stated that consumers needed to be protected and therefore price transparency requirements were important.
- A1.93 One respondent stated that there needed to be a level playing field (open access) for access to content given IPTV's prominence in driving roll-out and this must include access to premium content.
- A1.94 One other respondent suggested that Ofcom's website could be used to give generic information on the types of products available.
- A1.95 A further respondent suggested that Ofcom had given views on the acceptability and desirability of specific business models. They stated that these matters should be market-driven and that Ofcom should not endorse one business proposition above others.

### Ofcom's view

- A1.96 We continue to believe that new commercial models could be important to generate additional revenues. We recognise, however, that commercial negotiations are likely to determine the extent to which new commercial models are developed and that we may not have a role to play in such discussions. A more significant role for Ofcom is to ensure there is no significant consumer detriment arising from new business models. However, we may have some role in enabling the market to develop such new business models. For example, where we witness the emergence of novel new products or business models, a sensible regulatory framework can help provide users with confidence to engage and investors in complementary products to make investments.
- A1.97 The intention of the September consultation was not to endorse one business model over any others in terms of delivery of content and quality control. We stated that, as an example, the model referred to could serve to generate new revenues. But so could others. We believe the market continues to be best placed to determine the types of model that could achieve new revenues and support investment while delivering services that consumers demand.

## What role can the public sector play in next generation access deployment?

*Question 19 - What role should public sector intervention have in delivering next generation access?*

- A1.98 Respondents were generally of the view that need for public intervention was not known at this early stage of development of next generation access networks given that the extent of potential rollout of commercial networks was unclear. At this point in time, the market had not failed to deliver. They broadly agreed, however, that universal rollout was unlikely to materialise and public intervention may be needed in certain areas. Respondents were therefore generally in accord with the Caio

report which suggested that the need for public intervention was at present weak. One respondent stated that the Caio report also recognised that barriers such as the ratings system needing to be revised.

- A1.99 A number of respondents stated that the public sector could raise awareness of the potential benefits of super-fast broadband networks thereby stimulating demand.

### **Ofcom's view**

- A1.100 Since publishing the consultation, the level of debate on the need for actions including roles for the public sector, in increasing the availability and take-up of services has increased substantially. We are contributing to this debate in terms of current generation broadband through our work on access and inclusion. In addition, we will work closely with government on this issue to ensure that consumers, citizens and businesses can benefit most from these new services.

### **Delivery of next generation access will require collaboration across many parties**

*Question 20 - Are these the right actions for Ofcom and other stakeholders to be undertaking at this time? What other actions need to be taken or co-ordinated by Ofcom?*

- A1.101 Respondents broadly agreed that the actions identified were those that needed to be undertaken and welcomed clarity. A number of respondents suggested, however, that direct regulatory involvement was not necessarily required or that intervention was needed in commercial negotiations.

### **Ofcom's view**

- A1.102 Since publishing the consultation document, developments in super-fast broadband have continued to gather pace. We outline what we see as the key next steps for regulation in Section 10 of this statement. In general, we need to continue working closely with all stakeholders, including communications providers, application and service developers and providers, consumer and business groups and the public sector to help drive super-fast broadband forwards in ways that deliver consumer benefits through investment and competition.

## Annex 2

# Glossary

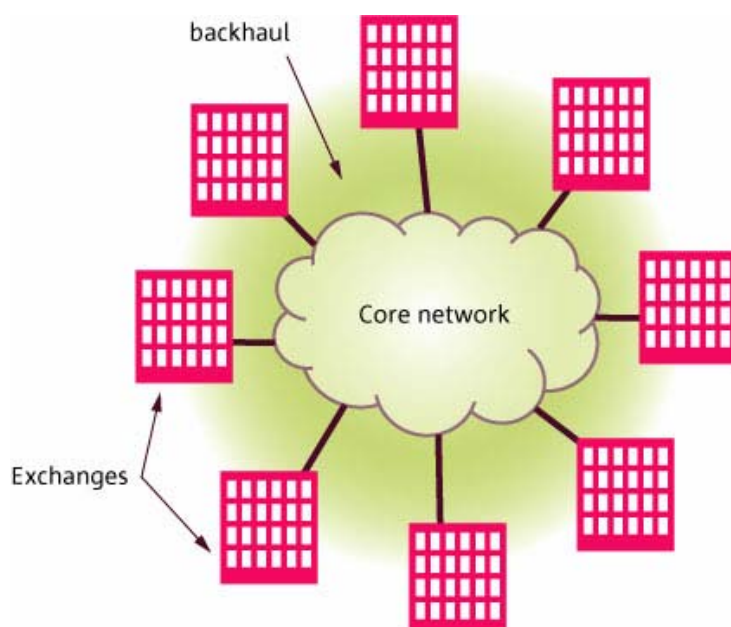
**21CN:** BT's upgrade of their core network (the backbone of the network).

**Access network:** The part of the network that connects directly to customers from the local telephone exchange.

**Active Access:** Wholesale access to the network infrastructure through electronic equipment.

**ADSL (Asymmetric Digital Subscriber Line):** A technology used for sending data quickly over a conventional copper telephone line. It is used in current internet services with download speeds up to 24Mbit/s.

**Backhaul:** The middle of the network, this is a high capacity line which links the core network with the access network.



**Bandwidth:** This is the measure of the how much data can be carried across a link in the network.

**Broadband:** An internet service which provides high speed access to the internet.

**Business Connectivity Market Review:** An Ofcom consultation published in January 2008, with a follow-up in July 2008, in which Ofcom set out a number of proposals in relation to the regulatory framework for retail leased lines or business lines in the UK.

**Communications Providers (CPs):** Companies which provide telecommunications networks or services to a customer's home, such as telephone and internet services, and which usually own some infrastructure.

**Core Network:** The backbone of a communications network, which carries different services such as voice or data around the country.



**DOCSIS (Data Over Cable Service Interface Specification):** The international standards for sending data over a cable network.

**DSL (Digital Subscriber Line):** general name for range of technologies that offer broadband over copper access networks, including ADSL and VDSL.

**Ducts:** Existing pipes which hold copper and fibre lines.

**Duct Access:** When service providers other than the owners of telecommunications ducts can access existing pipes to deliver connections to end customers. In practice, communications providers can pull their own cables through the existing pipes without needing to dig new trenches and lay new ducting.

**Downstream/upstream competition and products:** Describes the relative positions of different players, or their products, in the supply of broadband. The most 'upstream' provider is the one that sells the most basic product (for example copper or fibre access). Players who are 'downstream' of this are those that buy this basic product, add their own elements (for example their own electronic equipment to the end of copper links). These are often called wholesale providers. Further 'downstream' still are players who buy these 'wholesale' products, add their own branding, billing and customer services, and sell them on to customers. In practice, one company may do all three stages above, either explicitly or implicitly (for example Virgin Media or BT).

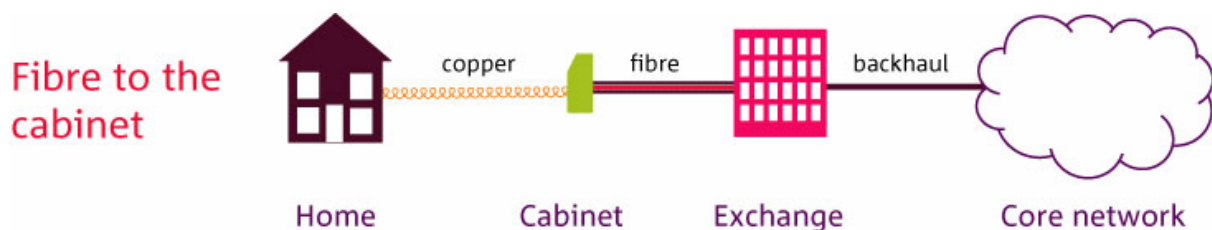
**ERG:** European Regulators Group of which Ofcom is a member.

**Ethernet:** A common technology which allows computers on a network to talk to each other.

**Exchange:** A building which houses electronic equipment that connects telephone calls. Backhaul links from a content provider are terminated here to connect access links to end users.

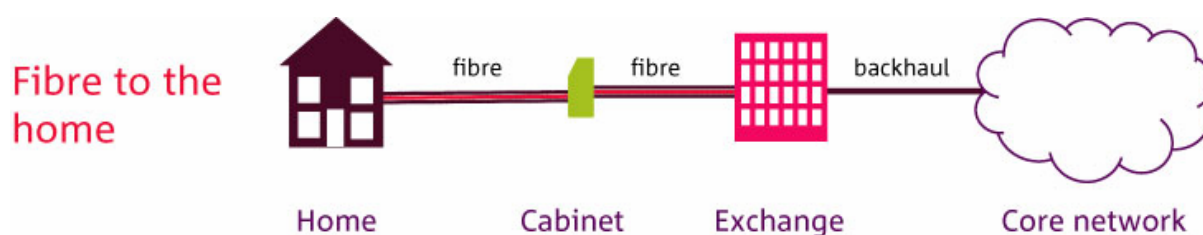
**Gigabit Passive Optical Network (GPON):** A shared fibre network architecture that can be used for next generation access.

**Fibre-to-the-cabinet (FTTC):** An access network structure in which the optical fibre extends from the cabinet to the cabinet. The street cabinet is usually located only a few hundred metres from the subscriber's premises. The remaining part of the access network from the cabinet to the customer is usually copper wire but could use another technology, such as wireless.

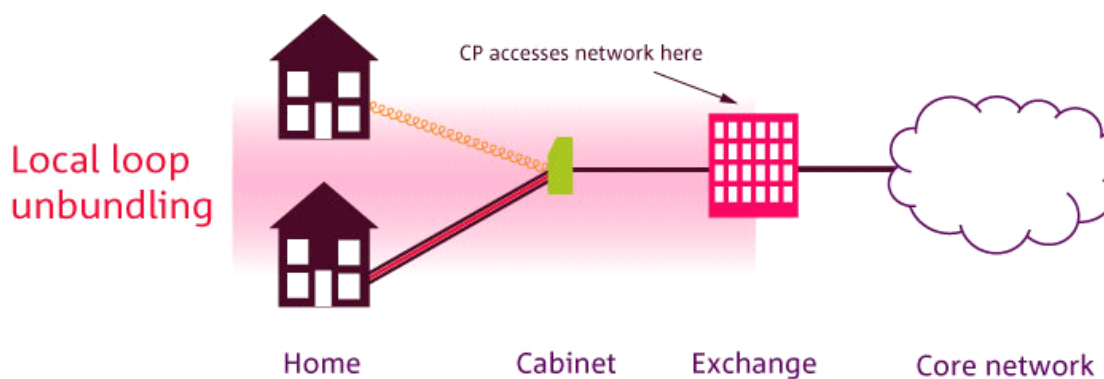


**Fibre-to-the-home (FTTH):** An access network structure in which the optical fibre runs from the local exchange to the end user's living or office space.





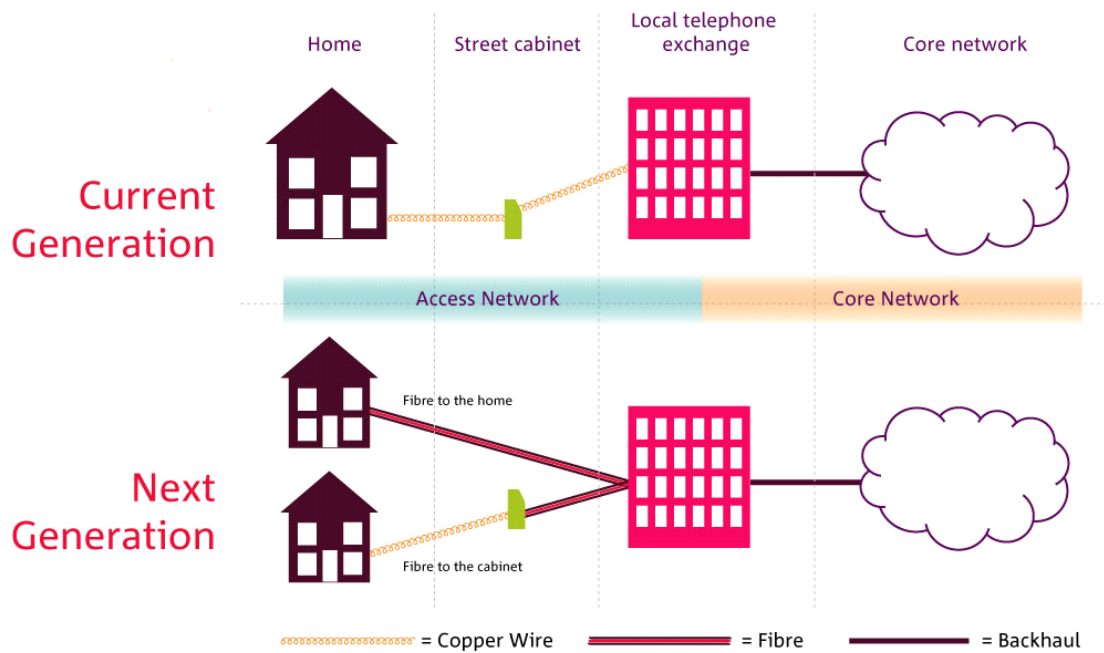
**Local Loop Unbundling:** When communication providers can gain access to the network by placing their own equipment at the exchange. Communications providers then take control of the line from the local exchange to the customer and the backhaul runs from the local exchange to their own core network.



**Narrowband:** A service which provides connections up to 56 kilobits per second (or 0.056 megabits per second). This is most commonly used for making phone calls over a copper wire, but was originally used for dial-up internet connections before broadband services took off.

**Network neutrality:** A way of processing data which does not differentiate between different bits of data when they move through the network, so that all traffic and all services (e.g. voice calls, web browsing, gaming etc) are given equal treatment.

**Next Generation Access (next generation access):** New or upgraded access networks that will allow substantial improvements in broadband speeds and quality of service compared to today's services. This can be based on a number of technologies including cable, fixed wireless and mobile. Most often used to refer to networks using fibre optic technology



**Next Generation Networks (NGN):** An upgrade to the core or “backbone” part of the network to new technologies.

**Not-spots:** Areas where there is not sufficient broadband access.

**NRAs:** National Regulatory Authorities, such as Ofcom in the UK.

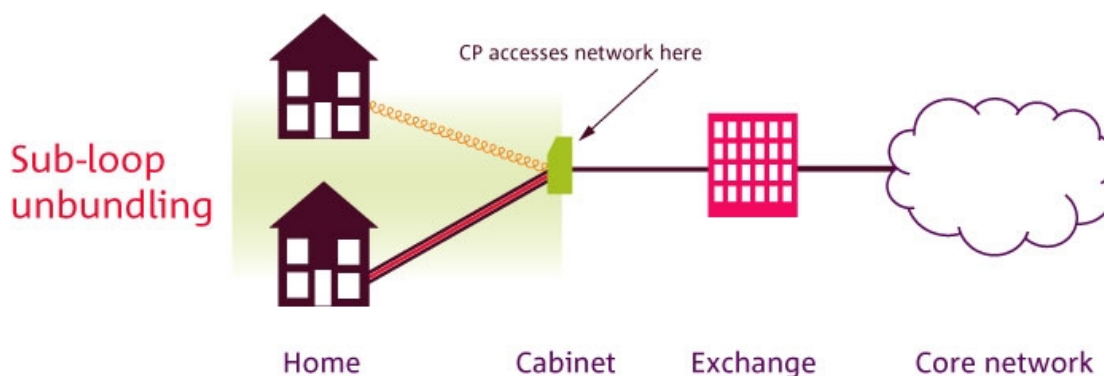
**Passive Access:** Wholesale access products based on direct access to the physical infrastructure of the network (e.g. copper, fibre, duct), without the need to connect to electronic equipment.

**Service providers (SPs):** Companies which provide services, such as telephone or internet services, to a customer’s home or business.

**Splitter:** A piece of equipment used in fibre optic technology which splits a beam of light into many optical signals.

**Street cabinet:** A green box close to your house that connects your telephone line to the exchange.

**Sub-loop unbundling:** Like local loop unbundling (LLU), except that communications providers interconnect at a point between the exchange and the end user, usually at the cabinet.



**Traffic shaping:** When certain types of packets are given priority as they pass through the network, or when customers connection speed is managed to take account of the level of demand on the network. This is the opposite of net neutrality.

**Upstream/downstream competition and products:** Describes the relative positions of different players, or their products, in the supply of broadband. The most 'upstream' provider is the one that sells the most basic product (for example copper or fibre access). Players who are 'downstream' of this are those that buy this basic product, add their own elements (for example their own electronic equipment to the end of copper links). These are often called wholesale providers. Further 'downstream' still are players who buy these 'wholesale' products, add their own branding, billing and customer services, and sell them on to customers. In practice, one company may do all three stages above, either explicitly or implicitly (for example Virgin Media or BT).

**VDSL (Very high bitrate DSL):** An upgrade to ADSL technology which allows for very fast internet access over copper lines. It is likely to be the technology which will be used in FTTC deployments.

**WiFi:** Short range wireless technologies that allow an over-the-air connection between a wireless device and a base station, or between two wireless devices. WiFi has a range of over 30 metres indoors, and around a kilometre outside.

**WiMAX (the Worldwide Interoperability for Microwave access):** A wireless technology, similar to WiFi, but with a longer range which can cover many kilometres. WiMAX has been considered as a wireless alternative to fixed access connections to provide high speed access links instead of using copper to properties.