Britain's Superfast Broadband Future

December 2010

BIS | **Department for Business Innovation & Skills**

dcms

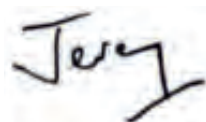department for culture, media and sport

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Foreword

Broadband is one of our top priorities. We took office earlier this year with a clear vision of what we want for Britain – we should have the best superfast broadband network in Europe by 2015.

That's a challenging goal but it's one that we can and must achieve. It's vital for the growth of the economy – especially to small businesses who are so often the engines of innovation. It's essential for the rebalancing of our economy – the internet defies distance so that a small business in Sheffield can sell its goods and services as easily to customers in Aberdeen, Belfast and Cardiff as they can to customers in Rotherham.

Effective, reliable and secure communications infrastructure is increasingly essential to life in our rural communities and we must make sure that they can benefit from the convenience of the delivery of online services – whether those come from government, local authorities or the private sector. Local participation in deciding what is the most useful and appropriate communications solution for your own community is one of the themes of this strategy. We want to do more than bridge the digital divide – we want communities to have the tools to participate fully in the Big Society.

This strategy brings together the work that we have had underway since May this year and maps out how we will deliver our vision over the lifetime of the current Parliament. Private sector investment freed from unnecessary barriers, supported by government funding where the market cannot reach unaided and with the active participation of local communities can get us there. Where we do see a case to deploy public funds, value for money will be at the heart of the project.

Jeremy Hunt
Secretary of State Culture Media
Sport and the Olympics

Ed Vaizey
Minister for Culture Communications
and the Creative Industries

Executive Summary

1. The Government is currently conducting an overarching Growth Review, and broadband infrastructure investment is vital in supporting the overall growth agenda. The Government is committed to ensuring the rapid rollout of superfast broadband across the country. Rural and remote areas of the country should benefit from this infrastructure upgrade at the same time as more populated areas, ensuring that an acceptable level of broadband is delivered to those parts of the country that are currently excluded.

2. This strategy document sets out the Government's vision for broadband in the UK, and how we will deliver this, and demonstrates evidence of progress in the first 6 months of the Coalition Government.

3. This includes how Broadband Delivery UK will be investing the £530m (including the existing underspend from the Digital Switchover Help scheme) secured as part of the Spending Review over the lifetime of this Parliament, as well as setting out how we will create the right regulatory and policy environment to allow the market to deliver as far as it can. We also provide a snapshot of current market deployment in the UK. In simple terms, the Government wants the UK to have the best superfast broadband network in Europe by 2015.

4. We believe that it is essential that we deliver this ambition. A world class communications network will help the economy grow as we recover from the recession. As consumers we will have even greater choice and costs will be reduced. The delivery of public services will be more efficient and cost effective, as well as more inclusive. The way we access entertainment will alter, with greater options for consumers. Demand for better connectivity is growing as services and applications that take advantage of the greater bandwidth emerge.

5. The Government is currently conducting an overarching Growth Review, and broadband infrastructure investment is vital in supporting the overall growth agenda. The way in which businesses operate will change – both in terms of their opportunities to expand into new markets and communicate with customers and suppliers, as well as operating more efficiently by bringing costs down.

6. The benefits of superfast broadband have an impact across the whole economy – whether this is through greater scope for tele-working and home-working, which reduces the pressure on the transport network and lowers carbon emissions, or better delivery of public services – such as remote education services.

7. We believe that the UK is in a good position today. We have one of the most competitive markets in the world, and over 70% of households subscribe to a broadband service.

UK Broadband Statistics	
• Percentage of UK Households with broadband access	71%
• EU average = 56% OECD Average = 53.5%	
– % of UK households with fixed broadband access	65%
– % of UK households with mobile broadband access	15%
• Average UK broadband speed	5.2 Mbps
• Average monthly cost of a residential fixed line broadband connection	£13.31
• Percentage of UK business with 10 or more employees with broadband access (EU average = 81%)	87%
• Percentage of UK business with 10 or more employees with own website (EU average = 64%)	75%
• Percentage of UK business with 10 or more employees selling online (2nd in OECD)	32%
• Percentage of UK business with 10 or more employees purchasing online (8th in OECD)	47%
All data sourced from either the Ofcom Communications Market Report 2010 or the OECD ICT Outlook 2010[1]	

8. There are however firm signals that our use of the internet is going to require significant improvements to the network most people currently use. There are also still some 2m households who cannot access a good level of broadband. In the interests of a balanced economy, but also simple fairness, we remain committed to ensuring virtually all homes will have access to a minimum level of service of 2Mbps by 2015.

9. The market in the UK is making great strides in delivering superfast broadband services, with Virgin Media and BT rapidly deploying networks. Already nearly 50% of households in the UK can access 50Mbps. Smaller communications providers such as Rutland Telecom and Vtesse and Geo are finding innovative ways of delivering superfast broadband in areas where it is economically challenging to do so. Community broadband schemes are also playing a vital role in the deployment of superfast broadband.

10. A mix of technologies –fixed, wireless and satellite – will be needed to deliver superfast broadband throughout the UK. One technology choice will not be suitable for all circumstances. Our approach to delivery therefore remains technology-neutral, although it has to be recognised that high-capacity fibre

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[1] Ofcom Communications Market Report – 19 August 2010 http://stakeholders.ofcom.org.uk/binaries/research/cmr/753567/CMR_2010_FINAL.pdf and OECD ICT Outlook 2010 http://www.oecd.org/document/20/0,3343,en_2649_33757_41892820_1_1_1_1,00.html

optic deeper into the network is likely to be a key feature of the UK's network going forward. Whether this is directly to people's homes, a street cabinet or to a mast remains will depend on local circumstances.

11. At the same time we wish to facilitate the development of the next generation of mobile broadband services, based on new wireless technologies, enabled by the award of the 800MHz and 2.6GHz spectrum.

12. We recognise that the business case does get more challenging in less densely populated areas, and we want to ensure the right regulatory and policy environment to allow the market to deploy beyond the more densely populated areas. This means ensuring access to utility infrastructure, including BT's network of ducts and poles, as well as other utility infrastructure.

13. We are publishing a Publicly Available Specification for new build homes which will give developers and housebuilders a clear steer as to what connectivity homes should contain. We are also looking at the Electronic Communications Code and whether there is scope for this to be amended, particularly around the issue of wayleaves.

14. We will continue to work with local authorities to see if streetworks and micro-trenching can play a role in reducing the cost of roll out of superfast broadband. We will continue to work towards allowing the deployment of telecoms cables overhead, which again will have a role to play in reducing costs.

15. However, in the more remote areas, this still may not be sufficient, due to the challenging business case. This raises the prospect of a new "digital divide", where some households are not able to access the same level of services as the majority of other households in the UK, purely due to their geographic location. We want to minimise this divide as much as possible, and that is why we are committed to investing some £530m of public funds in these areas over the lifetime of this Parliament. We are beginning with the four superfast broadband pilots that were announced by the Chancellor as part of the Spending Review.

16. We are determined that communities and local authorities should have a say in how these networks will be built. By putting the people who will eventually use the infrastructure in a position to shape it, we can bridge the gap between competition and investment: community need should drive the process, not Government decisions made in Whitehall.

17. Where local authorities determine that improved access to broadband is an essential component of their development plans, we aim to use the public investment to provide a network infrastructure upgrade. This is likely to include a mixture of network elements, including middle mile upgrades which will reduce investment costs. Our aim is to ensure every community has a point to which fibre is delivered, capable of allowing the end connection to the consumer to be upgraded – either by communities themselves, or since this will make the business case more viable, industry itself might choose to extend the network to the premise. We also want to ensure communities have the opportunity to further extend the reach of the network where demand exists.

18. We will look to communities to lead in demand stimulation and assist in moving customers to superfast broadband. Where communities wish to extend or even build their own networks we will work with them to ensure that this can be done where it is practical to do so.

19. Whilst we continue to believe 2Mbps to be the minimum level of service acceptable to deliver a reasonable user experience, the evidence from our work with industry over the summer shows us that most solutions that we could employ to deliver 2Mbps would in fact deliver far more to most people. Therefore, that is our ambition, and why we believe it is appropriate to align both our superfast broadband and universal service objectives.

20. In practice, this means that we believe the majority of homes without this level of service will be addressed by a superfast broadband connection, such as fibre to an existing point as described above.

21. We believe this will deliver better and faster broadband to more households and will provide efficient and effective use of public funds and provide greater value for money, as well as minimising the risk of deadweight investment. Further value for money can be provided through ensuring competition in the procurement process.

CHAPTER 1: WHY WE NEED THE BEST SUPERFAST NETWORK IN EUROPE

1.1 Superfast broadband will provide the foundations from which the UK economy will grow and recover from the recession. It will change the way we do business, how we interact with people and how we access entertainment. It will offer better and more efficient channels for delivering public services, making them more accessible. It will reduce costs for consumers and enhance the capability of businesses to communicate and exchange information with their customers and suppliers. This is fundamental to our future prosperity.

1.2 For the UK to be competitive in global markets, it is essential that we ensure we have a world class communications network capable of delivering world class services. This will ensure that the UK has a firm basis with which to drive forward technological and service innovation. It is the high-technology, high-skilled sectors that will provide this growth. We simply cannot afford to stand still. This is why we have outlined a vision for the UK to have the best superfast broadband network in Europe by 2015.

1.3 The vision is two-fold – firstly to ensure superfast, higher bandwidth, and more reliable services for consumers and businesses. Secondly, to ensure high-quality broadband to mobile devices. Both of these are essential for the modern world, and the way in which they are delivered over networks dove-tail together.

1.4 This vision of world class connectivity embraces a wide range of technology solutions. We believe that fixed, fixed-wireless, mobile and satellite communications networks will all have a part to play in delivering this vision if we are to bring the benefits of broadband to as many people as possible.

1.5 We start from a strong position. UK consumers enjoy the benefits of one of the most competitive communications markets in Europe – including for the first generation of broadband services. According to Ofcom, over 70% of UK households have now taken up a broadband offering, with recent growth being driven primarily by the rapid growth in mobile broadband.[2] This level of penetration is higher than many other major economies including the United States, Germany and perhaps most surprising, Japan.

1.6 The UK is also a leader in use of the internet. As a recent Boston Consulting Group report puts it "UK consumers are active and avid online shoppers".[3] The BCG report says that the UK is the largest per capita e-commerce market in the world while the latest official statistics show that as many as 66 per cent of adults in the UK had used the internet to order goods and services in 2009, the highest in the European Union. Demand for better connectivity is growing. Ofcom research from May 2010 shows that the average speed of broadband

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[2] Ofcom Communications Market Report – 19 August 2010
[3] "The Connected Kingdom" – Boston Consulting Group – October 2010

connections in the UK grew by 25% in the previous year[4]. The report shows that Internet Service Providers are offering packages with higher headline speeds and consumers are moving over to those packages. This trend has continued since the report was published with the launch of BT's Infinity product (up to 40 Mbps) and Virgin Media's 100 Mbps service.

1.7 While the UK generally is in a reasonable position now, there are clear signals that our use of the internet is going to require significant improvements to the networks we are using today. And of course, as has been identified in previous reports[5], quite a lot of people in the UK do not enjoy the full benefits of the internet, either because the speeds they can receive do not support more data-rich services such as video-streaming, or indeed they cannot get fixed-line or mobile broadband service at all.

1.8 Access to a basic service of 2Mbps remains the minimum level of service that we feel is acceptable to deliver a reasonable user experience at the edge of the network, the evidence tells us that most solutions would to deliver considerable more than 2Mbps to most people and that should be our ambition.

1.9 Investment by the private sector is the best way to develop the networks we need. And in the UK, the market, primarily as a result of the large-scale investment by BT and Virgin Media, has gathered pace in the last year. At present, superfast services are set to be available to around 50% of the UK population by the end of 2012[6] and to 19 million premises (66% of the UK population) by 2015[7].

1.10 The potential to earn greater revenues is strongest in urban areas as the more densely populated an area is, the greater potential revenue streams. The cost of deployment is also lower, per household connected. Conversely, the business case for broadband is weaker in rural areas and in some cases non-existent as the cost of deployment rises considerably. Work carried out by the Broadband Stakeholder Group suggests that the cost of deploying superfast broadband to the last 10% of households is up to 3 times higher than the first two-thirds of the population.

1.11 Therefore, there is the risk of a "digital divide" emerging where some households are not able to utilise the same range of broadband applications and services as the majority of households in the UK, because of the area they are located in. We want to minimise this as much as possible – on equity

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[4] Ofcom – UK Broadband Speeds 2010 – http://stakeholders.ofcom.org.uk/market-data-research/telecoms-research/broadband-speeds/main/

[5] Digital Britain Final Report – July 2009

[6] Virgin Media 50Mbps service available to half of all homes, Virgin Media press release 25th Feb 2010

[7] BT 2009/10 financial results statement, 13th May 2010 -http://www.btplc.com/News/ResultsPDF/q410release.pdf

grounds – starting with ensuring a good level of service for everyone in the UK, and hope that superfast broadband solutions will deliver a service to the majority of households that currently experience a sub-standard service, or no service at all.

1.12 Furthermore, the market by itself will not capture the likely spillover benefits; where the social benefits of broadband deployment may be greater than private benefits of deployment that network operators accrue. These are not taken into account in investment decisions which means that the extent of network deployment may be less than the "right" level from a long term strategic perspective for the UK.

1.13 To achieve our vision, we need superfast broadband in rural and urban areas and we are committed to driving superfast broadband services into areas where commercial investment alone will not deliver it. That's why we have committed £530 million in the Spending Review to support broadband rollout[8]. One of the key lessons learned from the work done by Broadband Delivery UK over the summer with the industry in its Universal Service theoretical exercises was the importance of backhaul for the deliver of both superfast broadband and more basic broadband service.[9] We remain committed to delivering a decent level of broadband service to virtually all, but a further key conclusion of the exercise is that it does not make sense to attempt to separate out the effort to deliver universality from the drive to provide superfast broadband in the more difficult to reach areas.

1.14 We are hopeful that the market will be able to deliver beyond the two-thirds of the population in the plans that have been announced by major operators. But in order to make this possible, we have to make sure that we create the right policy conditions to enable the market to deliver so that private sector investment can be accelerated and the benefits of superfast broadband can be brought forward.

1.15 As with all communications networks, the impact of the availability of superfast broadband networks becomes greater the more people are connected. The explosion in social networking demonstrates the value of connecting the many rather than the few – the wider network benefits – as superfast broadband reaches a tipping point of connections, the new generation of services can develop in the UK, harnessing the collective creative force of users in this country.

1.16 As these wider benefits begin to emerge, the argument for government intervention to extend superfast broadband beyond what the market would deliver is considerably strengthened, in turn helping to meet the increased expectations of society in terms of what a competent network should be able to deliver.

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[8] http://www.hm-treasury.gov.uk/spend_sr2010_speech.htm
[9] BDUK Theoretical Exercises: Conclusions and Lessons Learned

1.17 The same issues apply to businesses, and it is important that the vision of broadband is not limited to domestic users only – the effect on businesses can be just as dramatic.

1.18 Take-up and the effective use of broadband can help firms develop and adopt more productive and efficient ways of working by making it quicker, cheaper and easier for businesses to communicate and exchange information with their suppliers and customers. For example, firms can make cost savings from the removal of paper transactions and greater use of electronic processes such as on-line invoicing. Increasing productivity requires firms to do more than just have access to the technology, but it is a fundamental driver to achieving that outcome.

1.19 Access to broadband can also help encourage greater innovation activity by:

- Helping to spread new ideas and knowledge more quickly and widely
- Bringing about the transformation of business models and organisation structures as well as greater collaboration between firms and academia through virtual networks and new ways of working (e.g. teleworking, cloud computing)
- Development of new applications, such as services and content including new business products and applications (e.g. software as a service), on-line services (e.g. internet banking) and entertainment applications (e.g. iPlayer)
- The development of components and software needed to support this revolution is important to the creation of jobs. Companies like Ubiquity[10], Autonomy[11], etc. make a significant contribution to the UK's growth story.

1.20 The use of ICT and broadband has also demonstrated the potential to enable small businesses to access new markets which may not have been previously possible due to the existence of high barriers to entry, compete effectively with larger companies by offering niche products, and exploit the new business opportunities created by the rapid growth in e-commerce which can extend beyond the UK borders. Gearing businesses more towards e-commerce can also help firms achieve cost savings and efficiency gains through the transformation of their business models and processes and organisation structures with greater automation.

1.21 In addition, many of the applications which may be supported by superfast broadband, require faster and more symmetric upload and download speeds, and may deliver a number of benefits. Two-way video conferencing may encourage more employees and employers to make greater use of tele-working whereby some employees work from home where they can be more productive. This can deliver benefits both to the firm, the employee as well as wider economic, social and environmental benefits. For example tele-working can:

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[10] www.ubiquitysoftware.com
[11] www.autonomy.com

- Help reduce the barriers to entering the labour force for those groups which may be less mobile (e.g. disabled and parents with child-care responsibilities who wish to work part-time)
- Potentially contribute to the reduction in traffic congestion and carbon emissions
- Improve work-life balance

1.22 Superfast broadband can help improve the quality and delivery of public services to people in more rural and remote areas, helping them become more skilled, productive and earn a higher wage. Australia is an excellent illustrative example of where this is actually happening. According to DCITA[12], higher speed broadband has led to the creation of virtual classrooms which help to deliver a better quality of service and enables teachers to engage with students as a group through video conferencing.

1.23 Superfast broadband can also play an important role in improving the quality and delivery of healthcare services. This can have implications in rural areas where healthcare providers in rural areas will come under increasing pressure over the next 20 years as the ageing population will require more services from the NHS (the median age of rural residents is nearly 6 years older than their urban counterparts).

1.24 The NHS' Whole System Demonstrator programme is a world leader in telehealth and telecare and the learning from that programme is shaping policy on the importance of coverage for mobile broadband.

THE ECONOMIC PRIZE

1.25 Rolling out superfast broadband in the UK is likely to have a significant positive impact both on gross value added in the economy and on employment in the information and communications technology sector and the wider economy. Work carried out by the London School of Economics (LSE) and the Information Technology and Innovation Foundation estimated that 280,000 jobs could be created with a £5 billion investment in broadband networks[13].

1.26 Superfast broadband allows the growth of online entertainment to continue. Digital delivery of games, music and films through services such as iTunes and Steam already complement boxed products – the BPI estimate that 126m singles and 21m albums will be downloaded from legal services in 2010. Just 4 years ago, 53.1m singles and 2.8m albums were sold digitally[14].

1.27 Increasingly, it is SMEs that are taking advantage of the internet economy.

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[12] DCITA (2007) The economic effects of broadband: an Australian perspective. This paper can be accessed at: http://www.oecd.org/dataoecd/29/9/38698062.pdf

[13] UK's digital road to recovery, Liebenau, J, Atkinson, R, Kärrberg, P, Castro, D and Ezell, S, 2009.

[14] BPI

As reported by Boston Consulting Group, online sales for SMEs grew at a faster rate than for larger companies over the period 2004-08 and those companies marketing or selling their goods and services online are seeing overall sales growth significantly higher than those that don't.[15]

1.28 We would expect these trends to increase as the network capacity increases and as bandwidth availability increases. Competitive service provisions in these markets will increase, and delivery will be much swifter, allowing greater choice for consumers (assuming regional rights issues can be agreed). Alongside the very efficient satellite and terrestrial TV broadcast facilities, customers will have more choice on how they wish to consume entertainment services.

1.29 As evidence of these wider benefits begins to emerge it is clear that we cannot wait. Without Government intervention now, there is a danger that we will not reap the benefits that better, faster connectivity can deliver that is needed to maintain the UK economy's competitiveness. So we believe that there is a case to be made for further support to push forward the roll out of super-fast broadband and ensure that it goes as far as it can. Therefore it is important that our vision for superfast broadband is not narrowly defined but instead will take advantage of the many developing strengths in the UK. As a result, we are likely to see a mix of technologies – from fibre-based solutions to mobile, wireless and satellite.

The Prime Minister's Council for Science and Technology – recommendations on Broadband

In their recent letter to Ministers the Council specifies that while good progress is being made in this area, it is essential that Government continues to prioritise broadband.

- The Council has concerns that the current infrastructure may not be adequate in terms of both speed and penetration. It believes delivery of broadband to the final third of the population is best achieved by a patchwork approach and that a mix of technologies will be needed.

- It will be important that the money Government has available should be used to leverage in other sources of funding.

- A key element in stimulating take-up of superfast broadband will be Government sending clear signals about delivering more of their services electronically. A joined-up strategy is needed.

- Ofcom and other regulators urgently need to address issues of co-ordination and access, in particular network sharing. Digital systems need to be secure, resilient and robust so that personal data, financial information, and personal privacy are protected at all times.

- A better understanding of the 'people dimension' is vital. Full use of research evidence and more public engagement are needed.

[15] The Connected Kingdom – Boston Consulting Group – October 2010

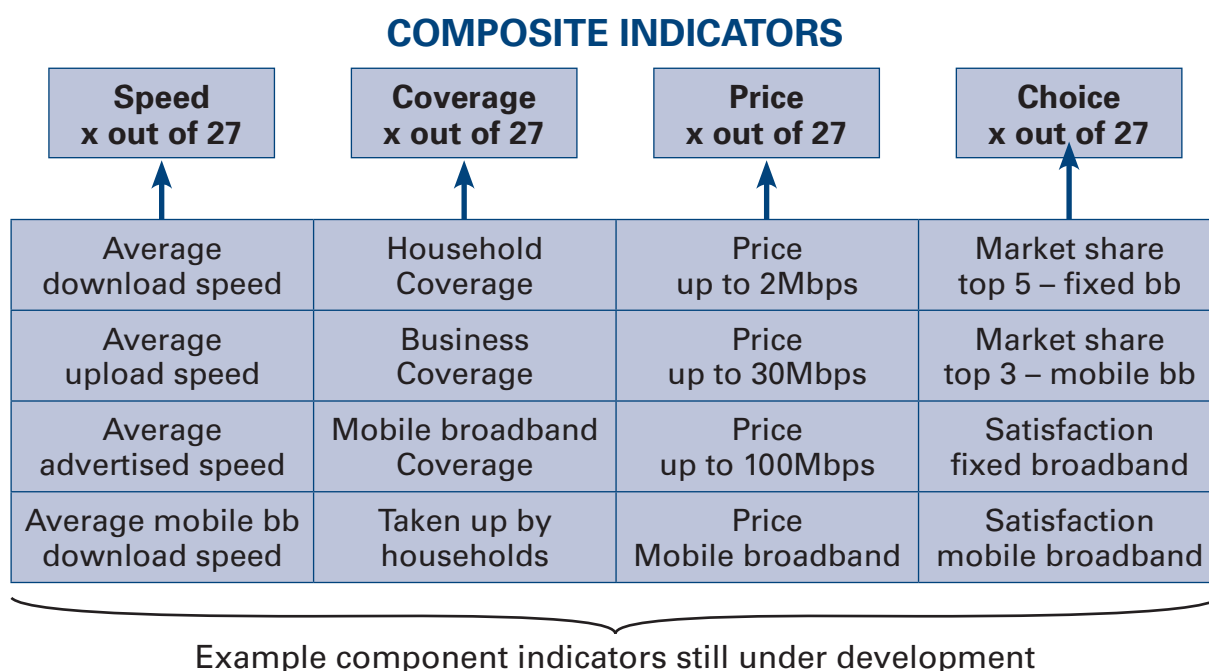# CHAPTER 2: DELIVERING THE BEST SUPERFAST BROADBAND NETWORK IN EUROPE

2.1 The UK's ambition is to have the best superfast broadband network and connected society in Europe by 2015. There is no single measure which will demonstrate whether we have been successful. We need more to look to the overall effects of the network, for consumers, for businesses, and for the way we think about communications.

2.2 A network that can provide superfast broadband to half the population but nothing to everyone else is not best in Europe; a network that can provide superfast broadband access to everyone, but at prices that few can afford is also not best in Europe; a network that provides superfast broadband that few are interested in using will not be best in Europe.

2.3 In order to determine what constitutes "the best" network in Europe, we will adopt a scorecard which will focus on four headline indicators: speed, coverage, price and choice. These will be made up of a number of composite measures rather than a single factor such as headline download speed – for example the coverage indicator may include percentage coverage of households for superfast broadband and percentage take up of superfast broadband.

2.4 This model is similar in concept and content to the broadband scorecard developed by the Berkman Centre at Harvard University[16]. We envisage that the indicators in the UK scorecard will be close to those shown in Figure 2.1.

Fig 2.1 Illustrative composite measures for inclusion in UK broadband scorecard

COMPOSITE INDICATORS

Speed x out of 27	Coverage x out of 27	Price x out of 27	Choice x out of 27
Average download speed	Household Coverage	Price up to 2Mbps	Market share top 5 – fixed bb
Average upload speed	Business Coverage	Price up to 30Mbps	Market share top 3 – mobile bb
Average advertised speed	Mobile broadband Coverage	Price up to 100Mbps	Satisfaction fixed broadband
Average mobile bb download speed	Taken up by households	Price Mobile broadband	Satisfaction mobile broadband

Example component indicators still under development

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[16] Next Generation Connectivity: A review of broadband Internet transitions and policy from around the world – Berkman Center for Internet and Society at Harvard University – Feb 2010 http://cyber.law.harvard.edu/sites/cyber.law.harvard.edu/files/Berkman_Center_Broadband_Final_Report_15Feb2010.pdf

2.5 The Key Performance Indicators (KPIs) that will sit underneath these are still in development. It should also be noted that the actual number of European States which we will compare will depend on the availability of data.

2.6 Working with Ofcom, we expect to be able to publish an initial version, of the best in Europe scorecard measures for discussion with interested parties in early 2011. We will need to ensure that the areas we want to measure have data available, not just in the UK but across Europe to allow a comparison.

2.7 Of course, the whole of Europe is striving for better connectivity, and in September, the European Commission published their Broadband Strategy. The Commission target is for all EU citizens to have access to a basic level of broadband (2Mbps) by 2013. As we move towards a superfast broadband world, the Commission want to see 100% access across Europe to at least 30Mbps by 2020, and for 50% of European citizens to subscribe to 100Mbps services by the same timescale. It is important to note that the European figure of 30Mbps for all refers to a capability, rather than a description of a discrete user experience.

2.8 This is a challenging target. However they are measured, countries across Europe will all be taking great strides in the next 5 years. But we believe our objective is the right one and that we can meet it. We believe that the interventions as set out in Chapters 4, 5 and 6, along with continuing market delivery, will ensure the UK is at the forefront of these targets and well placed to reap the benefits of superfast broadband.

CHAPTER 3: TECHNOLOGY OPTIONS

3.1 The UK data transport network will not be made up of any one technology – we will see fibre to the premises and to the cabinet, DOCSIS (Digital Over Cable Service Interface Specification), PON (Passive Optical Network) and point-to-point, wireless, mobile, satellite, and terrestrial TV broadcast facilities. This is essential due to the topography of the UK, and complex changes occurring in our consumption of entertainment, news and education services delivered over communications networks. One technology choice is unlikely to prevail, for a variety of reasons, including not least the possible convergence and re-use of resources to deliver service.

3.2 Although we outline various technology options it is important to note that these options combine to create what users experience as a single data transport fabric. All connectivity uses fibre and/or wireless elements. The only debate is where one finishes and the other begins and that will be driven by the costs.

FIBRE OPTICS

3.3 Fibre to the home (FTTH) and fibre to the cabinet (FTTC) are the two most widely deployed fibre solutions. Fig 3.1 illustrates the component parts for both FTTH and FTTC. The deeper into the access network fibre is deployed, the greater the available upload and download speeds possible. The DOCSIS network deployed by Virgin Media operates similarly to a FTTC solution, with the added benefit that the cable used by Virgin Media to connect premises, along with Cabinet technologies, are able to deliver greater headline speeds than a pure FTTC solution can currently, download speeds in particular.

Figure 3.1
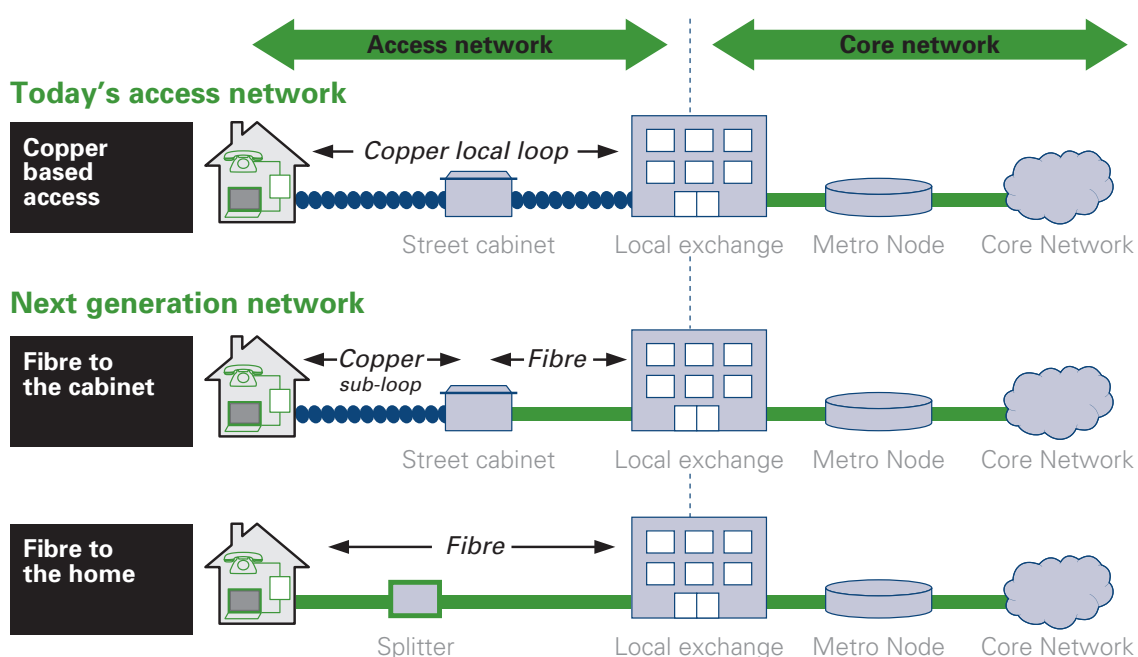
3.4 FTTH deployment also varies, with many incumbent network owners operating primarily Passive Optical Networks (PON – where the signal is split at a certain point in order to serve more premises), with some point-to-point networks, where a single fibre connects the premise to the exchange.
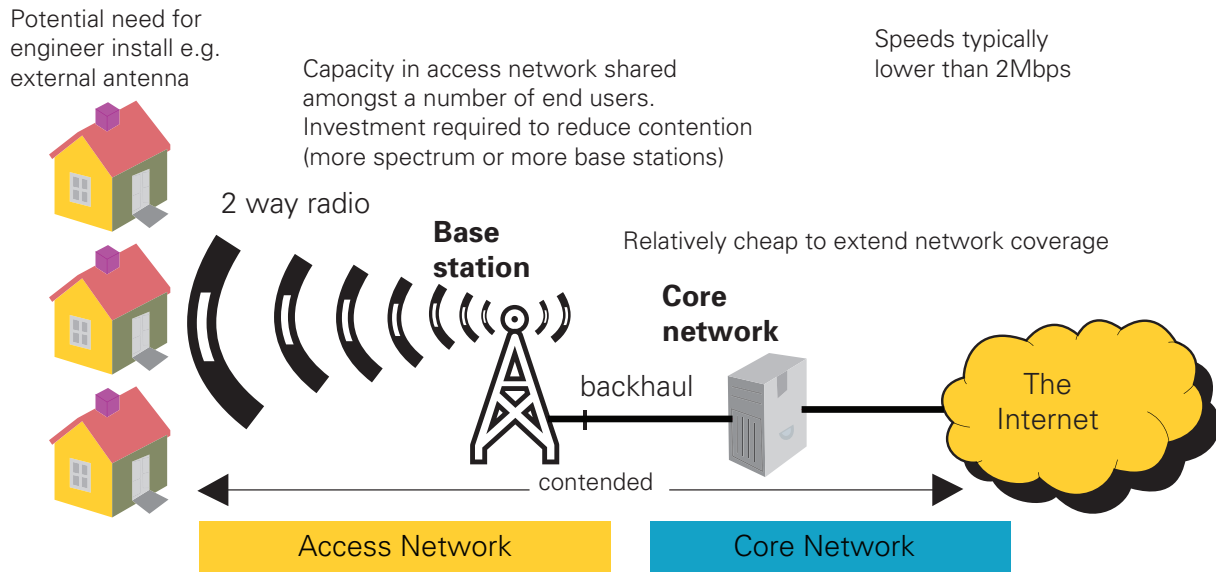
DEVELOPMENTS IN WIRELESS TECHNOLOGIES

3.5 Many of the most dynamic developments in broadband are in wireless devices and the development of very high data rates in mobility. Whether in the home or outside, consumers are enjoying services and content over devices which connect wirelessly.

3.6 As discussed in chapter 5, as spectrum becomes more readily available, and existing spectrum is better used mobile operators will be able to deliver faster broadband on the move. Figure 3.2 gives an overview of a mobile broadband network as currently experienced, but as spectrum is released to the market, there is scope for improved coverage and quality.

3.7 The mobile networks are looking to the next generation of technology to deliver the data capacity that customers are demanding. The current Mobile networks were engineered to support a real-time voice service which supported roaming between cells. Today, devices such as Apple's iPhone and iPad make very different demands on the network infrastructure, requiring operators to meet customer expectations of mobility, but with rapidly growing demands for data downloads. Mobile operators are primarily looking to Long Term Evolution (LTE) as the technology to deliver these services and this leads to far more integration of networks at an operational level.

3.8 The targets for LTE indicate bandwidth increases as high as 100 Mbps on the downlink, and up to 50 Mbps on the uplink. LTE is optimized for data traffic, and it will replace the existing, circuit-switched voice 2nd Generation Global Standard for Mobile Telephony (GSM) and 3rd Generation Universal Mobile Telecommunications System (UMTS) networks, with an network designed so that it separates out the data transport (bit carriage) from the applications that use the network.

Figure 3.2

Potential need for engineer install e.g. external antenna

Capacity in access network shared amongst a number of end users. Investment required to reduce contention (more spectrum or more base stations)

Speeds typically lower than 2Mbps

2 way radio

Base station

Relatively cheap to extend network coverage

Core network

backhaul

The Internet

contended

Access Network	Core Network

3.9 However it is important to remember that next generation mobile delivers a capability, a pool of connectivity which is then shared with the devices active in that cell. Capacity of a given mobile cell is limited and shared amongst all users on that cell. Speed is also dependent on the signal strength which varies with the distance from the transmitters. Even with these caveats next generation wireless services can make a significant contribution to the UK's superfast broadband network.

3.10 It is also important to recognise the synergies between mobile and fixed services, with shared backhaul and the offloading of mobile broadband data to the fixed network. As being connected increasingly becomes the norm the current distinctions between fixed and mobile networks will erode. This is increasingly common today with our devices connecting to any available network access point.
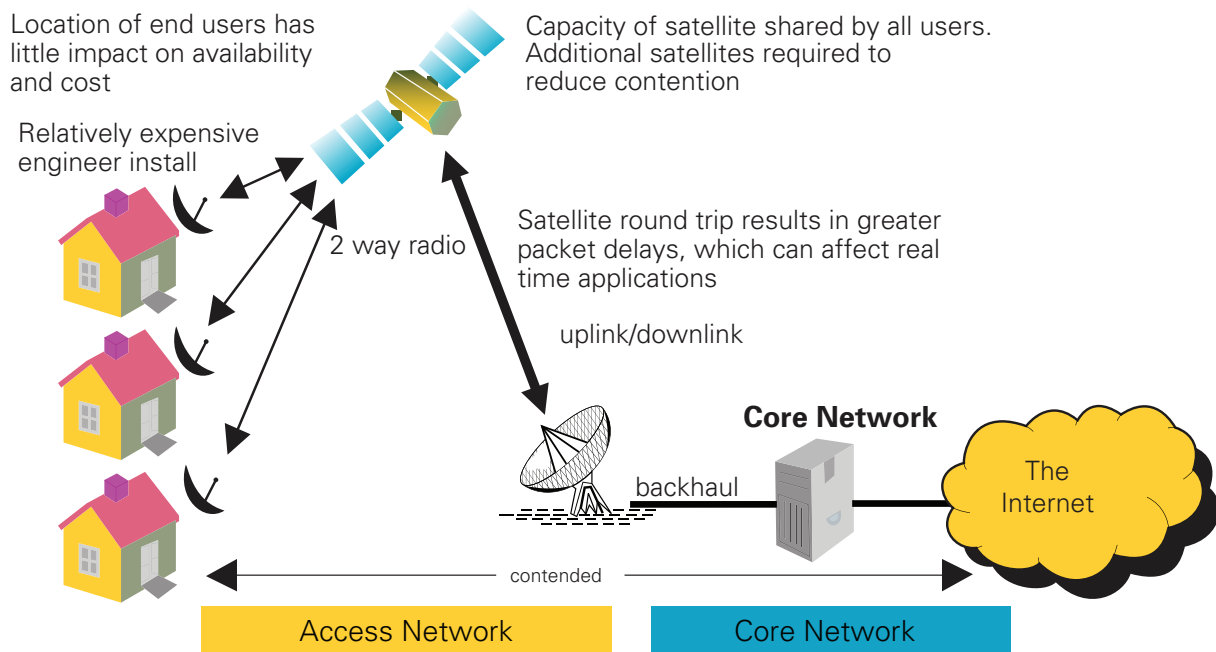
3.11 Developments in fixed wireless access are concentrated on WiMax. WiMax (Worldwide Interoperability for Microwave Access) is a wireless technology, similar to WiFi, but with a longer range which can cover many kilometres. WiMax has been considered as a wireless alternative for an access technology to provide high speed access links instead of using copper to properties. Currently, the technology provides up to 75 Mbps symmetric broadband speed without the need for cables but the latest versions under development could offer up to 1 Gbps to fixed locations. These high data rates are only available over short distances however and WiMax is primarily a data service although it can be used to deliver voice traffic.

3.12 There is growing evidence that mobile and fixed wireless options can be deployed more quickly and cheaply compared to fixed wired networks, but it is important to recognise that these solutions should very much be seen as complementary to any deployment of superfast broadband over fixed-line technologies. Whilst the headline speeds won't reach the levels enjoyed by fibre-based services, the greater mobility offered and variety of devices will deliver significant innovation in services and applications.

3.13 Another technology that can be used to deliver broadband services is satellite. The UK benefits from three satellite arrays. Providing broadband services over satellite to the general public is a new and developing market sector. Satellite using the Ka band can offer high data rate services to large number of customers at an acceptable price point – with more than 150,000 connections likely to be available before the end of 2011 following the successful launch of Avanti's Hylas1 satellite at the end of November 2010. While the physics of being 30,000 km away cannot be completely overcome, particularly its impact real time two way services (voice, video conferencing, gaming) it has a potential role to play in delivering data to set-top boxes and other computing devices. Satellite is a viable option for the most remote users and for those in some other not-spots. It will need to be part of any solution aiming at universal coverage.

Figure 3.3

Location of end users has little impact on availability and cost

Capacity of satellite shared by all users. Additional satellites required to reduce contention

Relatively expensive engineer install

2 way radio

Satellite round trip results in greater packet delays, which can affect real time applications

uplink/downlink

Core Network

backhaul

The Internet

contended

Access Network

Core Network

3.14 An alternative option is powerline communications (PLC), which uses the electric power network for the transmission of broadband. In some cases, this may be the most effective method of delivering higher bandwidths, but we expect this to be fairly limited, primarily as the cost of deployment and providing services is relatively high. We are also mindful of the potential impact this may have on radio users, with interference a possibility at higher frequencies. This could include interference to broadcast radio, aeronautical radio and navigation services.

3.15 Finally, another possible means of delivering broadband connectivity is by utilising the white space or interleaved spectrum that is unused spectrum between television channels. There is some limited use of this spectrum for broadband in the United States already. There are a number of technical issues to address if further use of this spectrum is to be successful. Ofcom has already consulted on these and a further consultation is currently underway (has just been completed). There are also discussions within Europe as to whether harmonisation in the use of this spectrum could be achieved. This remains therefore a very live area for consideration and possible exploitation. However it is worth noting that there are other alternative uses for this spectrum, such as broadcast of local TV.

3.16 The contribution of wireless technologies to the Government's broadband objectives depends on no small measure on the availability of spectrum. That is why the Government is in the process of directing Ofcom to take steps that will accelerate the release of spectrum at 800MHz and 2.6GHz, spectrum particularly suited to mobile broadband services. That is also why the Government has announced a target to release 500MHz of spectrum, below 5GHz, over the next ten years.

3.17 The Ministry Of Defence is currently reviewing its spectrum holdings and aims to release surplus military spectrum to the market in 2013. These planned releases will support Governments broadband vision by contributing to the Government target to release at least 500MHz of public sector spectrum below 5GHz for mobile communications.

CHAPTER 4: BUILDING BROADBAND FOR RURAL AREAS; HOW WE CAN BUILD A NETWORK FROM THE GROUND UP IN THE BIG SOCIETY

4.1 Around the world, including in the UK, Governments have spent nearly a decade looking to boost their broadband networks. The typical approach is first to let the market develop, possibly with some regulatory or public policy changes to incentivise investment, and then, when the limits of incumbent investment seems to have been reached, to decide the areas the market looks unlikely to deliver to, and fill in some of the gaps with public funding.

4.2 What Governments have seldom done – but which we are proposing for the first time – is enable communities to influence or take part in extending access networks. By putting the people who will eventually use the infrastructure in a position to shape it, we can bridge the gap between competition and investment: community need should drive the process, not Government decisions made in Whitehall. Communities have a critical role in securing and extending superfast broadband especially in their ability to stimulate demand, and Government will support this fully.

4.3 We are taking a new approach to delivering connectivity in rural and hard to reach areas that the market will not provide for. Where local authorities have superfast broadband as a development priority, BDUK will work with them to source an upgrade to the data transport infrastructure. This will be the foundation for the Government's £530m investment commitment over the lifetime of this Parliament.

4.4 BDUK will also explore the viability of a broadband community hub at a local level – which could provide the means of extending networks where the community will either take responsibility for the actual civil engineering of the network or take greater control over managing network elements. Networks can then be extended over time to provide enhanced access to broadband for individual premises in a variety of ways. For example, an operator's cabinet can be equipped to support the splicing of fibre builds into the access network. Interfaces can be made available such that wireless networks or indeed community managed femtocells can be added to the network. The latter needs to be agreed with industry and is subject to sufficient demand and support by communities.

4.5 It is envisaged that funding will be released by BDUK in waves (starting with the Superfast Broadband Pilots announced by the Chancellor as part of the Spending Review in October 2010) to public authorities including the devolved administrations, tier one local government bodies and Local Enterprise Partnerships (LEPs). Public authorities should work closely with lower tier authorities especially at neighbourhood level. Local bodies will be invited to prepare plans for broadband infrastructure upgrades to be funded from each wave. Further details on the exact process by which projects can apply for funding will follow in due course.

4.6 In order to enable universal access, those public authorities will be able to determine the balance between the focus of next generation access and the steps needed to achieve a minimum edge of network experience. BDUK will seek to facilitate the potential availability of a solution at a reasonable cost to virtually all those premises that will not receive the minimum 2Mbps connection from being connected to the hub, or over the Openreach PSTN network.

4.7 We will work with every local authority in England which wishes to take part, and the devolved administrations in Northern Ireland, Scotland and Wales, on encouraging the production of local broadband plans focussed on identifying investment needs where it is most needed. They should also involve local communities as much as possible. The needs and wishes of communities will differ across the UK, and this should be represented, including sparse, rural populations as well as urban communities. Among other benefits, Local Authorities own commitment to broadband delivery should help unlock innovation in public service delivery by ensuring they have an incentive to innovate in order to realise value for money on their investment.

4.8 Working with industry and standards bodies, we will provide the overall strategic steer for public investment in networks to ensure that the total is more than the sum of the parts. This means ensuring the technical standards for interconnect are standardised and service providers will see each new network as an opportunity. The Government does not intend to dictate standards to the market but rather seek the most efficient way to ensure public or community investment is spent on solutions which are future proofed and which are able to interconnect with national infrastructure.

4.9 The Government, through BIS officials, participates on the board of the NICC industry group as observers, as does Ofcom. NICC is a technical standardisation body for the UK communications sector that develops interoperability standards for public communications networks and services in the UK. It was formed initially by Oftel, latterly Ofcom, and is now owned and operated by its industry members. NICC is tasked with developing the standards that will enable providers to provide services over an existing network of a larger provider. One of NICC's roles is to develop standards to underpin the deployment of Next Generation Access technologies that are used to provide high speed broadband services.

4.10 These ALA standards have been prepared in conjunction with Ofcom. They will allow Communication Providers (CP) to offer services to end users in a consistent way regardless of the access network provider (whether that is BT, or another network provider such as Sky, TalkTalk or O2) that the end user is connected to. These standards can be used to support virtual unbundling of the access network where necessary; they can also provide a single transport solution for smaller community broadband networks that will enable them to connect their individual end users to any CP.

4.11 In addition BIS is working with the Broadband Stakeholder Group (BSG) and the smaller access providers on the COTS Project (Commercial, Operational and Technical Standards).

4.12 COTS is an industry-led project to examine what needs to be done in order to ensure consumers have access to a full range of service providers, regardless of the underlying network ownership or technology. The objective of this initiative is to work with representatives of independent local and community–led broadband projects, national network operators and major ISPs to develop an efficient standardised approach to enable service providers to offer retail services over local or community-led open networks to end users. It is intended to provide both commercial outline and a technical baseline (around ALA).

4.13 This initiative should mean that consumers and small businesses should be able to access a wide choice of service providers, regardless of how the underlying infrastructure is either provisioned or owned.

4.14 All of this will be underpinned by the right public policy and regulatory regime to ensure that community money can go as far as possible – we discuss the measures to achieve this further in chapters 5 and 6.
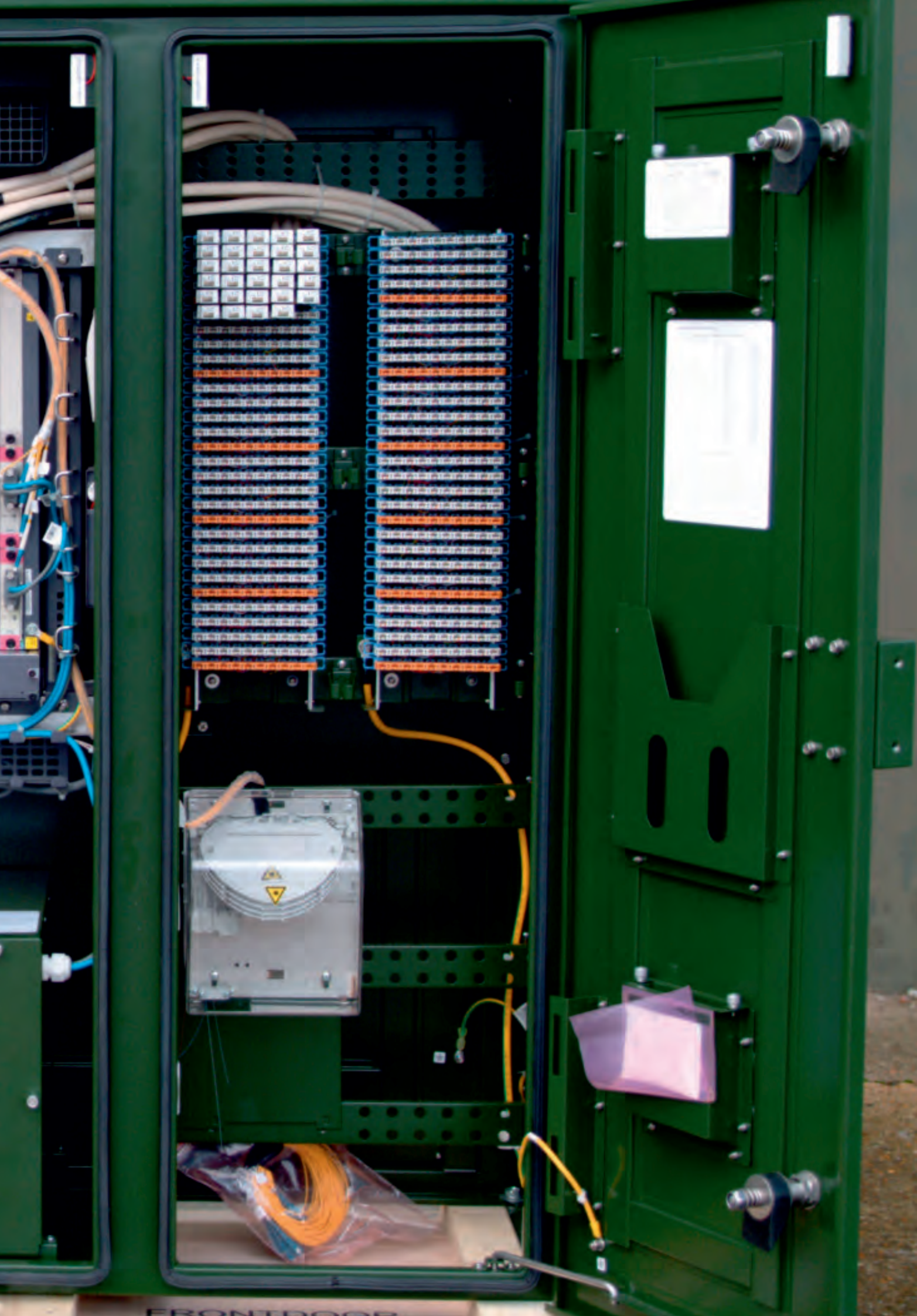
CHAPTER 5: LOWERING COSTS: HOW WE CAN MAKE THE CASE FOR INVESTMENT EASIER

5.1 Private investment has been the driving force behind advances in communications technology in the 26 years since BT was privatised. This must continue.

5.2 Private investment is the means by which modern, hi-spec networks will be established to compete for customers. Some will be more successful than others; some investments might fail altogether. This is entirely in the public interest. If we move away from this model towards a state-led investment plan, we would lose the dynamism of the private sector and risk replacing it with taxpayer-backed networks that could soon be obsolete, or worse never deliver what consumers wanted in the first place.

5.3 However, the Government and regulator have crucial roles to play. Ofcom is already taking steps to encourage investment, and we highlight some of the relevant regulatory developments in Chapter 6. But Government can do a lot to ensure that the costs of investment are directed more to those elements of the network that benefit consumers and less to civil engineering. It can also set the right framework for investment so that companies feel secure in long term commitments. Taken together, these can not only make investment in urban areas more compelling thus adding to competition, but could tip the balance for rollout in rural areas. This work will also support the value for money achieved by public funding.

CIVIL ENGINEERING

5.4 80% of the costs of deployment of superfast broadband can be in the civil engineering – in other words, digging up roads is what makes these networks expensive. So the more we can do to reduce those costs the better. Industry has highlighted a number of ways in which it could reduce costs – sharing existing infrastructure, deployment of new overhead infrastructure, microtrenching and sharing streetworks. We cover sharing of existing infrastructure elsewhere in this document. The Government is planning the following work in respect of the other techniques:

5.5 **New overhead deployment** BIS consulted in 2009 on whether or not to amend the Electronic Communications Code to allow for the deployment of new overhead communications cables.[17] The conclusion of that consultation was that new deployment should be permitted where the local community is in agreement. We will therefore continue to work towards allowing new overhead deployment for the first time in decades, with appropriate restrictions. Overhead deployment has the capacity to reduce deployment costs by as

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17 Overhead deployment of telecommunications cables – A consultation on whether it is appropriate to amend the Electronics Communications Code BIS – 2009
http://www.bis.gov.uk/Consultations/overhead-deployment-of-telecoms-cables?cat=closedwithrespons

much as 50% in some cases. We will publish further details shortly, particularly how local communities can take the lead and ensure they have a good level of connectivity, while recognising the impact on the streetscape.

5.6 **Microtrenching** Microtrenching has the potential to reduce costs significantly in some deployments. However, it is not a technique universally accepted by local authorities. We will work towards developing guidance for local authorities and communications providers to allow deployment of fibre through this innovative and unobtrusive method, addressing concerns of contestability and network resilience. We will make sure that this is correctly managed to in order to ensure there is no impact on existing infrastructure.

5.7 **Streetworks sharing** Sharing of streetworks has the obvious benefit of avoiding the cost and disruption of digging up the roads more than once. The problem has been to co-ordinate works between different utilities. Local authorities have the opportunity to promote the roll out of broadband in their area through sensible use of existing powers such as permit schemes, and ensure that such schemes are not a barrier to investment.

BUSINESS RATES

5.8 A number of telecoms companies have called for changes to the system of business rates as it applies to telecommunications networks – ranging from calls for "rates holidays" for telecommunications networks to wholesale review of the rating system. Business rating of telecommunications networks is a complex issue and often misunderstood by the industry and commentators. It has been extensively litigated in the UK and European courts and the rulings of the courts form part of the context for the consideration of the issue. It also has to be considered in the context of the business rating regime as a whole – decisions relating to one form of infrastructure would have implications for the system of rates as applied to other infrastructure.

5.9 We have examined these issues carefully, and several facts need to be acknowledged. First, that the decisions of the Valuation Office Agency are made independently of ministers. It is not our role to decide who is liable for what under the business rates regime. Second, that the existing rates regime has been tested in court numerous times and no ruling has required any change to the regime. Third, that while in general we favour a low tax environment for new investment; it is right that non-domestic property should continue to be taxed to provide the essential public services we all rely on. Fourth, that business rates are only one component of the cost of running a network, and considerable savings can be made elsewhere without undermining the delicate balances involved in the rating system.

5.10 We are though conscious that a problem can remain in assessing the likely liability for a fibre investment. We are therefore pleased that the VOA has carried out work with the telecoms industry to produce new guidance which was published in August 2010.[18] BIS will continue to work with VOA, the lead policy department CLG and the industry on the guidance and to gather valuation evidence with a view to ensuring that there is as much clarity and transparency in the business rating system as possible.

WAYLEAVES

5.11 Telecoms networks often travel across privately owned land and access to that land has to be negotiated between the company deploying infrastructure and the landowner. The framework for negotiating access is governed by the Electronic Communications Code, Schedule 2 to the Telecommunications Act 1984 as amended by Schedule 3 to the Communications Act 2003. The agreement covering deployment is called a wayleave.

5.12 The vast majority of wayleaves are agreed commercially with property and landowners. Increasingly, this not always possible, usually because the parties are unable to agree a compensation fee. Where wayleaves are not agreed, Code operators can apply to the County or Sheriff's court for an order in order to gain access to the land.

5.13 The Court process is time-consuming, with cases currently taking anything up to and beyond 2 years to decide; although it is anticipated that implementation of Article 11 of the Framework Directive will shorten this. Following implementation of the Directive, a decision on rights of way will be made within 6 months. Code operators agree that remuneration for access to land should be given, and that is right, but there are some inconsistencies in the Code, which refers to both "compensation" and "consideration", and agreeing appropriate compensation is often difficult as a result, with compensation packages varying wildly.

5.14 These factors create uncertainty for investment decisions. Government will therefore revisit some of these issues, as part of an overall review of the Communications Act during the lifetime of this Parliament.

5.15 We will consider whether it is appropriate to separate the grant of rights of way from the compensation element, which would at least allow companies to deploy networks more quickly. We will also be reviewing whether it is still appropriate that the County Court award compensation, or whether another body may be more suitable.

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[18] Valuation Office Agency Guidance for industry –
    http://www.voa.gov.uk/instructions/chapters/rating_manual/vol5/sect873/frame.htm

5.16 We will also be looking to actively engage with property and landowners, through organisations such as the National Farmers Union (NFU) and the Country Land and Business Association (CLA), which has named broadband rollout as one of its priorities, in order to try and address some of the issues faced by communications providers, and whether standardised terms and conditions may be appropriate in some cases.

USE OF OTHER UTILITY INFRASTRUCTURE

5.17 The UK has already seen some examples of use of non-telecoms utility infrastructure to roll out fibre. In particular, here and abroad operators have used sewers to carry fibre connections close to homes, but we have also seen some interest in access to electricity poles and other ducts. In July we published a discussion document to assess the level of demand and identify any barriers to what should be a win-win solution.[19]

5.18 The responses to that document confirmed that not only is access to other utility infrastructure important and sought after by both communications providers and utility companies, but also that the barriers that exist such as health and safety concerns and technical difficulties can be overcome. Experience in the UK and elsewhere (in Australia for example), has shown that these issues can be tackled. We believe that active dialogue between all parties is most likely to bring results quickly and will be working with the industry and regulators to facilitate that dialogue in the coming months. However, we are prepared to legislate for this should there be little movement by the market in the near future, and will review the need for legislation every 6 months commencing in June 2011.

> **Case Study – Virgin Media infrastructure sharing trial with Western Power – Crumlin, Wales**
>
> Virgin Media is working with Surf Telecoms – a subsidiary of Western Power – to deliver superfast broadband and next generation television to trialists in the Welsh village of Crumlin.
>
> Using Radio Frequency over Glass (RFoG) technology, the Crumlin trial delivers Virgin Media 50Mbps broadband and Virgin's next generation on demand television platform across a single fibre, whilst leaving frequencies available for alternate technology providers to provide services on the same fibre.
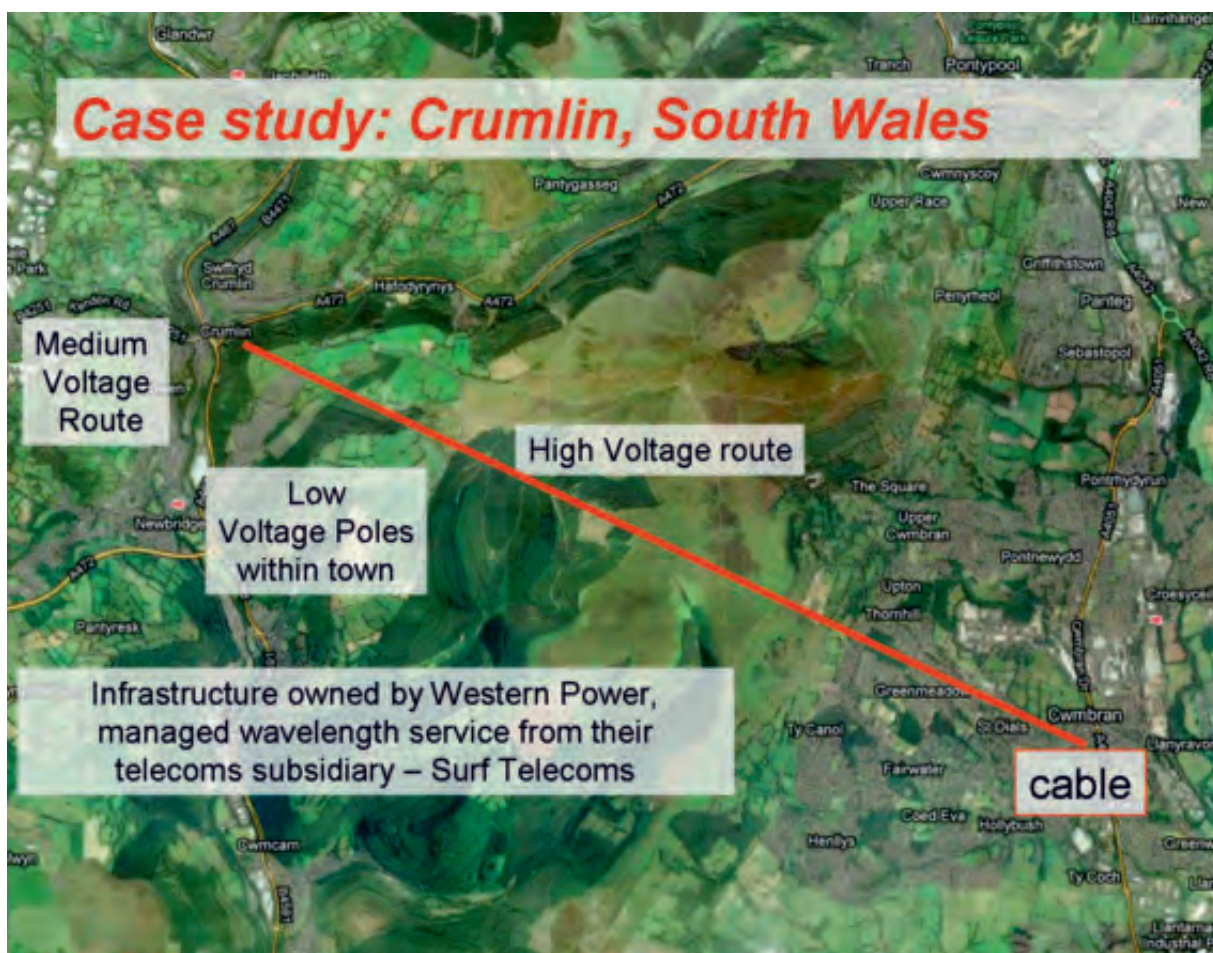>
> Starting at Virgin Media's existing infrastructure in Cwmbran, over 14Km from Crumlin, fibre is wrapped across Western Power's high voltage power infrastructure before flying down to existing shared low voltage telegraph poles on the street.

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[19] Broadband deployment and sharing other utilities' infrastructure http://www.bis.gov.uk/Consultations/broadband-deployment-and-sharing-other-utilities-infrastructure?cat=closedawaitingresponse

The fibre is then split on the pole, with each pole able to serve 8 households with a fibre line either close to the roofline or by digging to the front door.

Once inside the trialists home, the RFoG signal is converted back into the same standard cable signal used across the current Virgin Media network footprint, enabling customers to use exactly the same Virgin Media customer premise equipment.

As well as proving the technical case for delivery across live electricity infrastructure, the Crumlin trial has provided valuable insight into how the relationship between electricity network operators and broadband network operators might work at scale.

Case study: Crumlin, South Wales

Medium Voltage Route

High Voltage route

Low Voltage Poles within town

Infrastructure owned by Western Power, managed wavelength service from their telecoms subsidiary – Surf Telecoms

cable

LEVERAGING PUBLIC SECTOR NETWORKS

5.19 Public sector networks like those that connect our schools, hospitals and other public building to the Internet are often mooted as the answer to improved connectivity for locations where broadband connections are slow and it is easy to understand the frustration of those that know that a fibre passes within close proximity of their residence. It is correct that considerable public investment has been made in these networks, but it is not unfortunately correct that they provide an instant solution to slow connectivity.

5.20 Whilst there is definite scope for the re-use of public sector networks, particularly to address the absence of adequate backhaul, those that exist today may require extensive technical alteration to make them fit for purpose, which might render them impractical or too expensive for re-use, or may be subject to commercial contracts or procurement constraints that do not permit their re-use for the household consumer market.

5.21 Neither of these are absolute barriers, although in practice budget may be the defining factor, but where the re-use of and existing public sector networks provides an efficient means of improving household connectivity it will be part of the solution. Indeed there are some examples where the model has been applied, for example the North Yorkshire network, which was built and specified with the purpose of aiding and improving household connectivity in mind and further examination of the commercial arrangements will be explored during the BDUK superfast broadband pilots.

5.22 It does need to be highlighted that each service delivery to a school or public building using fibre means that route has been upgraded and has been readied making it easier and cheaper to upgrade. This is a potential contribution to upgrading routes to rural areas, and where suitable, we will look to make this re-use a reality.

BUILDING SPECIFICATIONS

5.23 New homes, where they are part of a larger development, should be built as standard with a superfast broadband connection. The incremental cost for deploying fibre to a home as opposed to copper is very small, and if we assume that the connections to the homes will at some point be upgraded, putting in copper connections that will need to be replaced seems wasteful and avoidable.

5.24 At the current time, choice of the level of connectivity beyond basic telephony is a matter for the homebuilder in conjunction with a communications provider. The Government believes this remains appropriate – regulation through building regulations would be disproportionate, and the value of the homes could be positively affected by the standard of broadband, meaning there is a market mechanism to bring about the right behaviour.

5.25 At present, there is limited evidence that homebuilders do in fact plan for superfast broadband in their new developments. This could be because of lack of awareness, or established relationships with communications providers who work to a standard solution. To overcome this, the Government and the British Standards Institution have produced a Publicly Available Specification (PAS 2016) which aims to inform housebuilders, builders and developers about the need to install digital infrastructure into all new build domestic dwellings.

5.26 PAS 2016 provides new best practice guidance to achieve the new build installations. While cabled media will be the preferred digital infrastructure, wireless connectivity is also likely to play a significant role. Wireless hubs provide convenience and flexibility for the connection of mobile devices in particular.

PAS 2016 is divided into five main sections:

- Generic dwelling types and zones of liability;
- External digital communications infrastructure;
- Internal digital communications infrastructure;
- Installation testing;
- Document and handover.

5.27 The document complements the ducting guidelines published by the Department for Communities and Local Government[20]. The PAS will be reviewed after two years to ensure it remains current, with the possibility of becoming a full standard in the future.

ENCOURAGING DEMAND

5.28 Supply of superfast broadband can to a degree be based on the expectation that it will be taken up by businesses and households in future. With take-up still growing Ofcom, looking forward, suggests that video streaming could provide the tipping point from current generation to super-fast broadband services and that the transition to internet-ready television would require higher bandwidths than only super-fast broadband connections can provide[21].

5.29 Therefore, part of the Government's strategy needs to be to work on the demand side. At one level this might be encouraging pre-registration of customers to make demand explicit for investors. But at a fundamental level we are working to ensure that consumers are comfortable with technology and that those currently excluded from the digital world, for whatever reason, are able to join it and reap the benefits.

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[20] http://www.communities.gov.uk/publications/planningandbuilding/dataductinginfrastructure
[21] Ofcom Communications Market Report (August 2010)

5.30 Martha Lane Fox's Race Online initiative to bring connectivity to those currently excluded is gathering momentum. Race Online 2012 now has almost 900 partners signed up, with a commitment to get over 1.75m people online by the end of the Olympic year. More and more partners from the public and third sectors are joining – from Jobcentre Plus to the Society of Chief Librarians, who have committed to getting 500,000 new people online through the library network by the end of 2012. Partners from all sectors are working together to develop solutions to getting people online – such as affordable hardware and broadband solutions using recycled PCs

5.31 In October 2010, Get Online Week received huge publicity with support from major partners, including the BBC's first click campaign. Nearly 30,000 people formally registered and took their first steps online, whilst the campaign itself reached over 8m viewers, with over 40% brand awareness amongst 65-74 year olds, a key demographic that the initiative is trying to reach.

Case Study – BT and the London 2012 Olympics

With less than two years to go until the London 2012 Olympic and Paralympic Games, the physical infrastructure for the games is taking shape in front of our eyes, all across the UK. It will be the biggest sporting event ever staged in this country. Beneath the ground, and in telephone exchanges across the country, another type of infrastructure project is taking place, on an epic scale; the installation of the telecoms networks that will transmit the games to a worldwide audience and connect athletes and visitors to their friends and family around the globe.

As official communications services partner for the London 2012 Olympic and Paralympic Games, BT Group is responsible for the provision and management of voice and data networks across each of the ninety-four Games venues across the UK, and for meeting the communications requirements of the athletes, National Olympic Committees and media. This includes keeping 14,700 athletes in touch with friends and family in 205 countries around the globe, and doing the same for the expected 500,000 additional visitors to the UK.

Openreach, BT's local access network division, and the Telecommunications Infrastructure Partner for the Games, is providing the core communications infrastructure for sites across the UK, including the Olympic Park in Stratford, East London – a site the size of 357 football pitches – and 21 other venues stretching from Glasgow to Weymouth and taking in Newcastle, Manchester, Cardiff and Coventry.

Openreach is currently engaged in a massive programme of infrastructure deployment to ensure that these locations are served by state-of the art fibre networks, capable of supporting the telephony, data and broadcast needs of athletes, media, officials and visitors. This includes working with the Olympic Delivery Authority and other organisations to ensure that there is a lasting legacy for residents, both existing and new, as well as businesses that will benefit from these technologies long after 2012.

Alongside the official requirements, the company is anticipating significant demand for new and temporary communications services ahead of the Games, as local businesses ready themselves for the opportunities presented by floods of visitors. For Openreach, the work doesn't stop after the Games either. The regeneration of the Stratford area of London and beyond means that Openreach's engineers will be kept busy for years to come, providing new communications links to homes and businesses, and connecting new residents to the modern infrastructure built for the Games.

HELPING TO DEVELOP MOBILE SERVICES

5.32 The Government wishes to see high speed mobile broadband available in areas covering as much of the population as possible. Mobile devices will play an increasing role in the delivery of key services including healthcare.

5.33 Competition policy has delivered a choice of affordable mobile services to c95% of the population. Improving coverage and the quality of service beyond c95% is economically challenging.

5.34 We will continue to seek solutions that cover as much of the population as possible. The work of BDUK will see the rollout of fibre based solutions into the final third, thus providing a platform for wireless services in some areas where they might otherwise not reach. Precisely where a fixed solution ends and a wireless solution begins will be one of the decisions BDUK will need to make to deliver best superfast broadband in Europe.

5.35 A realistic good outcome would be one or more high speed mobile networks, with coverage of the vast majority of homes – perhaps in excess of 95% – the bulk of workplaces, major transport routes, including rail, and sufficient capacity in areas where large numbers of people gather such as airports, stadia, shopping centres and so forth.

5.36 The Government considers this to be a valuable outcome for three reasons:

- First, just as fixed availability is important for social inclusion and rural development, availability of mobile technology will become an ever-more important issue economically and socially.

- Second, although in many respects they are complementary technologies, the threat or reality of fixed-to-mobile substitution means that the availability of high speed mobile networks can be a spur to greater levels of investment in fixed networks. This virtuous cycle of competition and investment can only be good for consumers.

- Third, the availability of mobile broadband services to deliver key services in the future , such as healthcare, is as important as fixed services

5.37 There are several ways in which the wide deployment of mobile networks can be supported. The first, and preferred option, is competition in the market. Competition between networks for customers drove very extensive build out in the late 1990s and early part of this century. The expectation is that competition between operators will continue in the deployment of 4G services. Indeed the Government has specifically directed Ofcom to do a competition assessment in advance of the auction of 800MHz and 2.6GHz and if necessary, address any expected competitive distortion through the design of the auction. Customer expectations will also be a driver, consumers will expect to use their devices wherever they are, regardless of whether the use is voice or data.

5.38 The second option is coverage obligations in the licences. The last major build out of mobile communications technology occurred following the auction of licences for 3G in 2000. These licences required each successful bidder to provide a service to an area containing 80% of homes by 2007. There are variations on coverage obligations in which only one licence carries the obligation, or the obligation is held jointly by all bidders. Alternatively, the licence might carry a requirement either to allow use of the spectrum by another (possibly subsidised) body which provided some sort of shared access to operators. In general, it is for Ofcom as independent regulator to determine the suitability of spectrum licence conditions, such as coverage obligations. However the Government's recent Direction to Ofcom, referenced above, requires Ofcom to implement certain coverage obligations on 3G spectrum licences

5.39 Although coverage conditions are a valid option, they raise a range of issues around determining what the right level of coverage is, both in terms of the percentage of population/geography to be covered and the bandwidth to be delivered, taking into consideration the characteristics of mobile signals and different topography. Monitoring and enforcement are also not necessarily straightforward. There is also a risk that coverage obligations favour incumbents over new entrants because it is easier to upgrade an existing network than build one from scratch, and new entrants' business plans might require a more gradual introduction to the market.

5.40 A third option is for the Government or another public body to subsidise the build out of high speed mobile services in rural areas, in competition with fixed services. Operators are encouraged to engage with BDUK to explore this further.

5.41 It is worth noting that there is not a 'free' option to the Government. If Ofcom, independent of the Government, chooses to apply coverage obligations to a licence under auction, then assuming the coverage obligation required operators to build beyond what their business plan would otherwise provide for, they would at least in theory discount the cost from their bid. In other words, the exchequer would forgo, for each licence encumbered by a rollout obligation, the cost of building that last section of infrastructure, and we cannot know how great that last section will be.

Next Steps

5.42 Ofcom are carrying out a further study of the availability of 2G and 3G mobile services. This will inform action by Ofcom and Government.

5.43 We expect Ofcom to issue a consultation document in 2011 setting out its intentions for the design of the auction of spectrum suitable for 4G mobile services. Ofcom will do so independent of Government, and must have regard to its statutory duties, the first two of which are:

- Ensuring the optimal use of the electro-magnetic spectrum
- Ensuring that a wide range of electronic communications services – including high speed data services – is available throughout the UK

5.44 It is important to note that neither of these requires any specific outcome, nor is Ofcom bound to take any other regulatory steps in this field if the action is not justified or proportionate.

5.45 As indicated above, a number of regulatory or public policy interventions are possible. Based on the further data from Ofcom, further consideration of developments in the mobile broadband market, and the direction of discussions on the auction rules, we and Ofcom will consider further plans to support the development of mobile broadband networks.

CHAPTER 6: REGULATION: HOW THE UK CAN ESTABLISH THE RIGHT REGIME FOR INVESTMENT AND COMPETITION

6.1 The independence of Ofcom, the regulator for the communications sector, has been the bedrock of the UK's competitive telecoms services over the past decade. Competitive markets in broadband, in which competition in infrastructure and services deliver choice for consumers and innovation in offerings, are the primary means for delivering investment. This will remain the case.

6.2 An independent Ofcom, operating under a statutory framework and accountable through reference to the Competition Appeal Tribunal, is the guarantor of these fair markets. Decisions on regulation are for Ofcom, and except in very limited circumstances, Ministers have no power to over-rule them. We do though take a close interest in the regulator's actions and ultimately are responsible for the overall regulatory framework in which it operates. Several localised broadband schemes have highlighted that with the right environment they can deliver investment in areas the established market cannot. We are committed to delivering the right environment – the challenge will then be passed to them to deliver the networks.

6.3 This chapter is intended to round up some of the relevant developments in broadband regulation which are aiding the ability of the market to invest and delivering competition for consumers.

DUCT ACCESS

6.4 This Government has, since assuming power, set out the importance of duct access – meaning allowing competitive service providers to deploy fibre via the ducts already in the ground and owned by BT or others – as a means to reducing cost and boosting competition.

6.5 Demand for duct access is yet to become entirely clear, but we have received representations from private sector bodies and public sector-supported projects making clear that they see such a product as important for the development of competitive superfast services in the UK.

6.6 Ofcom has recently published its statement on wholesale local access, which confirms their position set out in the consultation earlier in the year[22]. BT, as an operator with Significant Market Power, will be required to open up access to their duct and pole network and we are pleased that BT has confirmed its willingness to offer a duct access product. We need this to happen sooner, rather than later and hope industry will be able to come to a consensus on a fair and competitive price for access, and we are pleased BT intends to present an initial reference offer by January 2011.

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[22] Ofcom – WLA statement http://stakeholders.ofcom.org.uk/consultations/wla/statement

POLE ACCESS

6.7 All of the same principles as duct access apply to pole access, in which competitive service providers might be able to deploy fibre via BT's poles, in areas where they exist. This would be particularly valuable in long distance deployment but also potentially for the final drop.

6.8 As part of the Wholesale Local Access Review, Ofcom's statement confirms their intention to mandate that BT should offer passive infrastructure access to their pole network. As with duct access, BT have indicated a willingness to deliver this in a timely manner, and we look forward to their reference offer in January 2011, alongside the duct access offer.

IMPLEMENTATION OF THE EU COMMUNICATIONS FRAMEWORK REVIEW

6.9 Implementation of the Framework Review, which modernises Single Market measures to support competitive markets in telecoms, will give Ofcom further powers to apply infrastructure sharing measures to operators other than BT. This is an important power, which can only be used if proportionate, and could open the door to further opportunities for low cost deployment. A separate BIS consultation on the implementation of the Framework Review closed on 3 December.[23] We will consider responses on this issue and publish conclusions in the New Year.

SUB LOOP UNBUNDLING (SLU)

6.10 The first generation of broadband via copper telephone lines only really took off once the processes were in place to allow scale deployment of local loop unbundling, a process which saw alternative providers install equipment in BT's exchanges and use the copper connection to homes to provide a service. This led to massive choice (up to a dozen providers for some consumers), downward pressure on prices and innovation in services.

6.11 The lessons from Local Loop Unbundling are now being applied to Sub Loop Unbundling, in which alternative service providers run fibre to BT street cabinets and provide a connection into the last section of copper connected to the home. This has the promise of allowing competitive service providers to innovate and control costs while providing an alternative to the services wholesaled by BT.

6.12 There are several issues to work through before SLU can become a scale operation, and widespread demand is as yet unproven. It is notable though that some rural superfast broadband projects with public sector support would achieve far greater results if a ready SLU product were available.

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23 http://www.bis.gov.uk/Consultations/revised-eu-electronic-communications-framework?cat=open

6.13 As part of the Wholesale Local Access review, Ofcom have said that they see SLU as an important part of the continuing deployment of superfast broadband, and have decided to continue a requirement on BT to provide sub-loop unbundling. Whilst this is an existing remedy, it has so far only been used in limited situations. It allows alternative communications providers to physically take over (or share) the part of BT's existing copper lines between a street cabinet and the customer premises. This remedy will allow CPs to deploy FTTC technology where they consider this to be economic, and the costs imposed by Openreach on CPs should be justifiable and proportionate.

6.14 We want to understand the practicalities and the economics of SLU better and will be working with the industry starting in the New Year to examine in more detail the potential of SLU to aid rollout of broadband particularly in rural communities.

Case Study – Sub-loop unbundling in Northern Ireland

In March 2008, the Department for Enterprise, Trade and Investment in Northern Ireland completed work in delivering in Middletown, Co. Armagh, what is believed to be the first ADSL2+ trial via the medium of Sub Loop Unbundling of BT's infrastructure in the UK.

Middletown is a small, rural village. In the 1970's a bomb explosion destroyed the local telephone exchange, which has never been replaced. While telephone services were restored by running connections from the nearby exchange at Caledon, this exchange is too distant from the village to deliver reliable fixed-line broadband services to a number of premises.

The solution consisted of a 49-port DSLAM positioned in a street cabinet located some 25 metres from the BT cabinet. Backhaul was provided by a competing network operator via a 1 Gigabit port to Belfast. 12 pilot users (7 business and 5 residential) signed up for the trial. Of this user group, 2 had previously used ADSL broadband, 3 were satellite dependent and 7 used dial-up or no internet service at all. 11 of the 12 pilot users immediately elected to acquire a service on launch of commercial offerings.

User buy-in was successfully managed by the "appointment" of a "change champion" (the owner of the village Post Office) willing to assist with the recruitment of trial users, act as a "drop-off point" for applications, stimulate local interest in the project and act as a reseller of products. Services of between 7Mbps and 24 Mbps were delivered throughout the trial and the commercial service is now fully subscribed following launch of commercial products in September 2008.

Those acquiring a service have reported a range of impacts on how they now conduct their business. These include a local nurse who keeps her medical knowledge up to date by accessing specialised medical websites, the Post Office which streams data to inform decisions to hold, buy or sell currency and a local motor trader who buys vehicles on line in real-time from auction sites (replacing a previous requirement to travel twice monthly to England to attend the auctions in person).

ADVERTISED BROADBAND SPEEDS

6.15 We recognise that many consumers are unhappy with the headline speed they receive, particularly when they sign up for a service that seems to promise more, such as the "Up to" services offered by ISPs. However, we also recognise that due to the current technologies used to deliver broadband, it is difficult to guarantee that a user will receive a specific level of service.

6.16 Consumers have a right to expect to receive the level of service which they sign up for. We are therefore pleased that Ofcom have reinforced their broadband speed Code of Practice, whereby ISPs commit, on a voluntary basis, to ensuring consumers are aware of the speed they should expect to receive, at the point of sale.[24] Consumers must be given clear information on their service at the point of purchase so they can make an informed decision.

6.17 We will continue to work with Ofcom, ISPs, the Advertising Standards Authority and consumer bodies such as Consumer Focus and The Communications Consumer Panel on this issue so that consumers can have greater confidence that the service that they sign up for is the service they will receive.

THE ROLE OF BT

6.18 Following the Telecoms Strategic Review, concluding in 2005, BT's access infrastructure (from the exchange to the premises) is maintained by BT Openreach, which offers access to all service providers on an equivalent basis. This is underwritten by the Undertakings which BT management gave and which are legally enforceable.

6.19 For superfast broadband to be a real success in the UK, Openreach needs to be responsive to its customers. This means gearing up to provide products that support superfast broadband – as much as regulation, what really made a difference to first generation broadband rollout was the willingness of BT to act as a champion. A similar shift in attitude is needed now. We are therefore pleased with the steps BT is taking and the recognition of the national good of a superfast broadband network. We look forward to Openreach and BT Group continuing this evolution.

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[24] Broadband speeds – 2010 Voluntary code of practice http://stakeholders.ofcom.org.uk/telecoms/codes-of-practice/broadband-speeds-cop-2010/code-of-practice/

STATE AID

6.20 BDUK is working with the BIS State aid unit and engaging with the Commission to understand the scope for a UK wide State aid notification and clearance. Previously approved umbrella schemes (e.g. in Germany) appear to have been based on a fairly prescriptive and regulated framework and it remains to be seen if the level of flexibility required by the UK's current policy of decentralisation can be made compatible with the Commission's requirements for an umbrella approach. Since BDUK will recommend standardised commercial models and templates, local bodies taking the lead on broadband will be encouraged to innovate, and projects will be tailored and based on a range of possible commercial and delivery approaches, solutions and models to take account of specific local objectives, funding sources, etc.

6.21 In the meantime and pending approval of any umbrella scheme in the UK, BDUK intends to develop a single State aid notification for the Superfast broadband pilots and to promote a more consistent approach to State aid notifications to help reduce the Commission's case load generated by the UK. To this end, BDUK is developing a State aid template notification. This template will greatly reduce the effort and uncertainty for local bodies' state aid notifications. BDUK will also be producing supporting guidance on key issues such as the re-use of public sector networks, and intends to provide other tools (e.g. central mapping data, recommended commercial/delivery/sourcing/procurement models and processes), support and expertise.

CHAPTER 7: THE FIRST SUPERFAST STEPS: DEVELOPMENTS NATIONALLY AND LOCALLY

7.1 The UK has some distance to go before it can boast of the best superfast broadband network in Europe. However, there are several positive signs of development, on which we look to build.

ESTABLISHED PLAYERS

7.2 Virgin Media and BT have led the way with their investment in next generation broadband across their respective footprints. This market investment is the bedrock for delivering superfast broadband across the whole of the UK, not just to urban and densely populated areas.

VIRGIN MEDIA

7.3 Virgin Media's hybrid fibre and co-axial network passes 12.7m homes, approximately half of all households in England, Scotland, Wales and Northern Ireland. Separate bandwidth is allocated to broadband, digital television and video on demand. Virgin Media recently announced their plans to roll out 100Mbps services across their whole network by 2012, and has already trialled 200Mbps download speeds and 20Mbps upload speeds.

7.4 Virgin Media is midway through an expansion programme that will see 500,000 houses added to the network by the end of 2011. In July 2010, Virgin announced a partnership with Surf Telecoms, a Western Power Company, to trial the deployment of fibre optic across existing electricity infrastructure in Crumlin, Wales (see earlier case study). This builds on a trial across telegraph poles in Woolhampton, Berkshire. Both these initiatives illustrate that infrastructure sharing, and new overhead deployment can play an important role in delivering superfast broadband to the more rural of areas.

7.5 Virgin Media are also exploring the viability of wide scale deployment of cable services via existing utilities infrastructure which, in conjunction with appropriately priced BT passive infrastructure access and minor changes to existing regulation, could provide significant benefits to people living in areas currently poorly served by the telecommunications industry.

BT

7.6 BT has committed to extend its investment in superfast broadband to a total of £2.5bn by 2015, which will take coverage to approximately two thirds of UK homes, subject to appropriate investment conditions. BT is well on track, with fibre broadband products already available to over 2 million UK homes and a further 100,000 premises being added every week – 1.3m premises every quarter.

7.7 These homes are benefitting from Fibre to the Cabinet, which delivers speeds of up to 40Mbs at present, although faster speeds will be possible in the future. In addition, BT is conducting trials of its Fibre to the Premises product in York, Leytonstone, Milton Keynes and London. Fibre to the Premises will deliver speeds up to 100Mbs. These two products will reach a combined total of 10m premises by the end of 2012 and two thirds of the UK by 2015.

7.8 This is a major civil engineering programme for the UK involving over 30,000 engineers installing over 50,000 Km of fibre across the UK. All of these products are offered by Openreach as wholesale products to all UK communications providers on equivalent terms to those offered to BT's own divisions, ensuring a vibrant and competitive market to the benefit of all end users.

7.9 BT has also commenced a nationwide broadband survey which is designed to capture demand for high speed rollout across the entirety of the UK and help determine its strategy to reach its targets for rollout, building also a better understanding of demand in areas which are currently considered not to be commercially viable. This survey includes a competition element termed 'Race to Infinity'. The 5 exchanges with the highest demand (on a percentage basis of premises served after passing a threshold of 1000 votes) will be added to BT's deployment list for late 2011/early 2012.

NEW ENTRANTS AND INNOVATION

7.10 At the same time, a number of players have been developing networks, often with innovative business models. **Fibrecity** are deploying networks in Bournemouth and Dundee, primarily through the existing sewer network. **Vtesse Networks**, **Geo** and **Rutland Telecom** are proving that it is possible to make a business case to serve the final third. Vtesse have a number of sub-loop unbundled services in place, in Higher Pill, Saltash and Hatt, as well as Birch Green and Hertfordingbury. Rutland Telecom are providing the same level of service in Lyddington, Stoke-Dry and Thorpe-by-Water.

7.11 These examples show that it is possible to provide superfast broadband to rural areas, albeit in relatively small areas. The challenge now is to ensure that Government creates the right environment to enable other new entrants to enter the market place, and for existing communication providers to expand their networks. The measures outlined in Chapter 5 will be key to this.

BROADBAND IN THE NATIONS

7.12 The Devolved Administrations in Northern Ireland, Scotland and Wales have all identified broadband as a means of stimulating economic growth and have made the development of broadband infrastructure a key priority. All three have developed initiatives for their own nation which complement the work that is being done at the UK level. We are committed to continuing to work with

the Devolved Administrations in ensuring that we deliver our broadband goals throughout the UK.

Northern Ireland

Recognising the contribution good telecommunications can make to an economy, the Department of Enterprise, Trade and Investment (DETI) has led in the delivery of telecoms strategies in Northern Ireland. Commitments under its 2006-2010 action plan are now either in delivery phase or completed.

The most significant commitment is its fibre to the cabinet rollout. In December 2009 DETI awarded a contract to BT for delivery of a next generation broadband service to at least 85% of businesses across Northern Ireland. This is a £48 million investment, with BT is investing £30m of their own funds, a further £16.5 million coming from the Department of Enterprise Trade and Investment (DETI), under the European Regional Development Fund's (ERDF) European Sustainable Competitiveness Programme and £1.5 million form the Department of Agriculture and Rural Development (DARD), under the European Agricultural Fund for Rural Development (EAFRD) Rural Development Programme. This will build on our earlier investments in infrastructure and provides further opportunity for companies based here to improve their competitiveness.

The project is delivering fibre to 1,175 cabinets, offering access to services of up to 40Mbps and is on schedule for completion in May 2011. Taken alongside the ongoing rollout of BT's 21CN commitments, on completion of all works by 2011 approximately 1,700 of the 2,950 cabinets in Northern Ireland will have been upgraded.

When the investment rollout completes, it is estimated that the actual number of businesses able to access services of at least 2Mbps will be close to 95%. A number of additional service providers are also using the BT infrastructure under wholesale access arrangements set out in the contract.

Two additional projects have also been brought forward under a stimulation theme as part of the overall strategy to deliver access to and maximise use of next generation services:

- £1.9m Northern Ireland Broadband Fund – competitive fund offering support to businesses undertaking innovative broadband trials or deploying commercial networks in rural locations. A number of infrastructure projects have already been completed through the Fund, with significant deployment of fixed wireless services offering minimum specification 5Mbps services in some of the most rural parts of Northern Ireland; and
- £3.9m Logon-NI SME broadband advice programme to encourage SME take-up and higher-value use of broadband

A Digital Ambition for Scotland

The use of digital technology is central to fulfilling Scotland's potential as a nation and helping to ensure that the Scottish Government is well positioned to emerge from the economic downturn, with opportunities for all of Scotland's people to flourish in order to promote sustainable economic growth.

By harnessing advances in this area the Scottish Government can help:

– Give Scotland's young people the best start in life and prepare them for success in a 21st century marketplace;

– Boost people's job opportunities;

– Ensure that Scottish businesses can benefit from a first-rate broadband infrastructure that allows them to thrive in markets both at home and abroad; – Showcase and promote Scotland's rich cultural assets; and,

– Generate savings to Scotland's public purse by promoting the take-up of public services online.

The Scottish Government's ambition for Scotland's digital future is:

- **That next generation broadband will be available to all by 2020, and significant progress will be made by 2015;**

- **and That the rate of broadband uptake by people in Scotland should be at or above the UK average by 2013, and should be highest among the UK nations by 2015.**

Achieving this ambition is not just for the Scottish Government, it will require co-ordinated action and support from partners across Scotland – the enterprise agencies, local government, universities, colleges, cultural bodies, the private sector, communities, and individuals, MSPs, MPs, the UK Government and Ofcom. The ambition underpins a range of wider aspirations to realise all of the benefits that digital technology can bring to Scotland's economy, public services and citizens. An area of particular interest to the Scottish Government is to ensure that rural areas are not left behind as superfast broadband rolls out in Scotland – as has happened in the context of broadband rollout in the past. The Scottish Government will work with the UK Government to explore how this can potentially be achieved.

On 22 October, the Scottish Government published its digital ambition statement[25], which will be followed up with a more detailed strategy and action plan in the next few months.

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[25] http://www.scotland.gov.uk/Topics/ArtsCultureSport/arts/DigitalAmbition/DigitalAmbitionScotland

Fiona Hyslop MSP, (Scottish) Minister for Culture and External Affairs, is the Minister responsible for co-ordinating the Scottish Government's digital ambition. The Cabinet Secretary for Finance and Sustainable Growth, the Cabinet Secretary for Lifelong Learning and the Minister for Enterprise, Energy and Tourism will have responsibility for driving forward the digital agenda in their areas, including public service reform, the GLOW network and broadband infrastructure. The Scottish Government's wider focus will be led by Fiona Hyslop. This reflects the range of portfolio areas affected by digital technology and demonstrates a truly joined-up government approach.

The importance of this issue is shown by the range of organisations which have recently contributed ideas for how Scotland should take advantage of the digital world. Notable examples include: the Royal Society of Edinburgh, Reform Scotland, Ofcom and the Scottish Parliament; all of which have made significant contributions to the discussion on this issue. The Scottish Government welcomes the fact that there is such a vibrant debate on Scotland's digital future and is actively consulting a wide range of organisations and key industry players to explore how its digital ambitions can become a reality.

Wales – Delivering a Digital Wales

Delivering a Digital Wales[26] is a new Welsh Assembly Government policy framework which draws together key activities and interventions relating to the use and promotion of digital technologies. Access to a first class high-speed digital infrastructure underpins each of the priorities aligned with achieving the vision of an inclusive and sustainable society, skilled and competent people, a thriving and competitive digital economy and public services transformed through opportunities afforded by digital technologies. The Scottish Government's ambition for Scotland's digital future is:

This vision is also reflected in the Welsh Assembly Government's new economic policy **Economic Renewal: a new direction**[27] in which we expect that all businesses in Wales will have access to next generation broadband by the middle of 2016 and that all households will be enabled by 2020. This vision puts Wales at the forefront of the 30Mbps target set out in the **Digital Agenda for Europe**.

In order to deliver this next generation broadband ambition, the Welsh Assembly Government is currently engaging with the telecommunications industry to establish market plans for next generation broadband rollout and to identify those areas that are less likely to be addressed by the private sector alone.

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[26] Due to be launched 8 December 2010
[27] www.wales.gov.uk/economicrenewal

In early 2011, the Welsh Assembly Government will begin the procurement process for a next generation broadband solution for Wales with a view to working with the private sector to develop the best commercial and procurement models. The underlying principle for the procurement is that we will leverage funding from the private sector to invest in infrastructure where there is a commercial case to do so. Our approach is to encourage the ICT market to drive forward its own investment in areas where there is a strong commercial case to do so, and we will invest our own funds to accelerate the deployment of next generation broadband infrastructure in areas where there is a genuine requirement for government intervention. This work will also encompass efforts to improve the quality of mobile coverage by exploring options to make today's 3G mobile services available for all and laying the foundations that will enable the market to roll out next generation mobile services throughout Wales.

The importance of digital infrastructure to the social and economic development of Wales has long been recognised by the Welsh Assembly Government. Basic broadband provision has been supported by the Welsh Assembly Government through a programme of activities including exchange enablement and targeted action to tackle key notspots informed by a self registration notspot database facility. In the summer of 2010, this work entered a new phase with the launch of a £2m Broadband Support Scheme[28] to provide financial support towards the capital costs of installing a broadband connection. Through a technology neutral approach, individuals, communities, SMEs and Third Sector organisations have been getting together to look at satellite, sub-loop unbundling and high-speed wireless options to address broadband availability.

Businesses in north Wales have also benefited from the delivery of improved competition in the region resulting from Welsh Assembly Government investment in a £30m open access fibre optic backhaul network[29]. As a result of this investment, new subsea fibre routes have been announced which will connect Anglesey to Dublin providing a direct international route to Telecity in Manchester during 2011.

The pioneering Public Sector Broadband Aggregation (PSBA)[30] project has brought together a number of disparate public sector broadband networks into one aggregated communications network for the public sector. This £74m investment in a single, shared public service network is unique in the UK and provides a solid foundation for realising the public service ambitions set out in Delivering a Digital Wales.

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[28] www.wales.gov.uk/broadband

[29] www.fibrespeed.co.uk

[30] www.psba.org.uk

COMMUNITY AND LOCAL NETWORKS

7.13 The Government's belief in the ability of communities to change their broadband provision is borne out by a number of schemes around the country. In **Cumbria**, Alston Cybermoor[31] has continued to develop broadband access in this area by opening its first next generation broadband network. This comprises a 5 mile Fibremoor fibre optic link connecting Alston to Nenthead. A key aim of the project was to establish the cost of a local community to lay a cable if the work is managed and carried out by local contractors. This approach has shown that a cost of below £20 per metre is possible.

7.14 **Selling** is a village about six miles west of Canterbury contains about 340 properties, including businesses. The Parish Council set up a broadband committee to evaluate proposals, which were reduced to a shortlist of three. ICS was chosen to provide a fibre to the home implementation. ICS is building a new exchange to house their equipment. The exchange is connected to Selling Primary School and to another building at Gaskain's farm. This provides a resilient core for the local network and ensures that the service continues to run even if one of the core fibres is cut. Each subscriber that signed up before the end of July 2010 received free installation. New subscribers pay £290; this includes a router to distribute broadband around the property. Subscribers pay a monthly line rental of £14, plus £15 a month for a 20Mbps service. This has a monthly data allowance; an unlimited tariff is available at higher cost. In addition to the £50,000 grant from KCC, ICS has also spent some of its own money to ensure the project is a success. The service is due to go in the next few months.

7.15 **Iwade**[32] is a village about four miles north west of Sittingbourne. The parish contains about 1180 properties, including businesses. An additional 400 new house are planned to be built in the next few years. Through the same process as Selling Parish Council, BT Openreach was chosen to provide a fibre to the cabinet implementation. New waterproof cabinets with sufficient cooling were installed near the four existing BT Street cabinets. The new cabinets contain equipment that has, until recently, only been installed in exchanges.

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[31] Cybermoor: www.cybermoor.org
[32] Iwade Parish Council: http://www.iwadevillage.co.uk
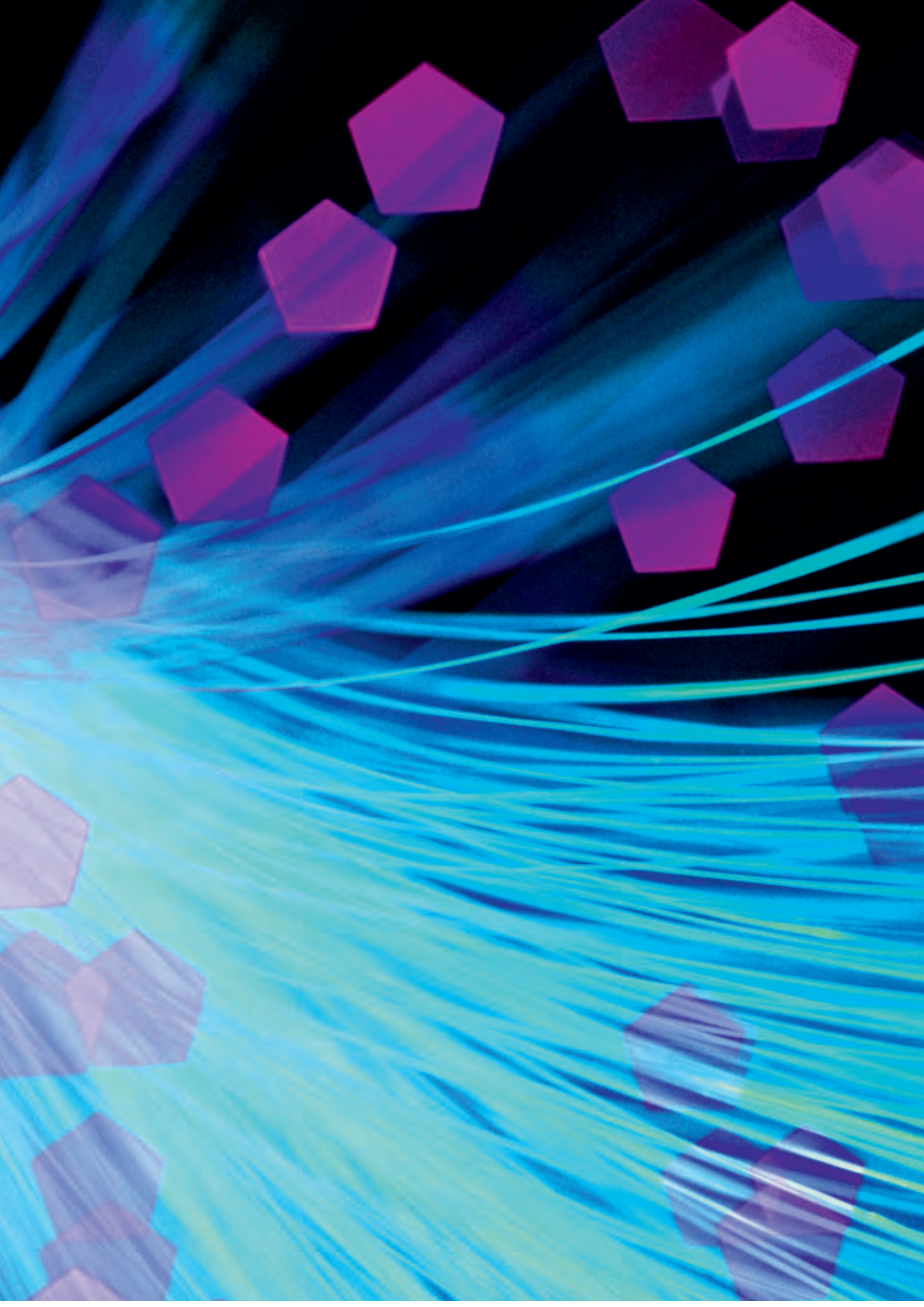
CHAPTER 8: FINANCIAL ASSISTANCE: HOW WE CAN USE AVAILABLE FUNDS TO BEST EFFECT

8.1 All of the developments in Chapters 4, 5 and 6 serve to provide the right environment for investment. And that investment has to be led by the private sector. But public investment is going to be part of the picture. Already in parts of the country we are seeing investment in different types of superfast broadband schemes. These will give us valuable early information as to the market and the best way to achieve value for money in the investment. We want to add to this stock of knowledge through four more pilots funded from within the £530m. At the same time we are committed to ensuring that universal provision of at least 2Mbps is delivered by 2015, using as great a proportion of superfast solutions as possible.

8.2 Achieving value for money and avoiding deadweight is central to the implementation plan. Naturally, in this type of programme where public and private investment sit side by side, there is a risk that some private investment could be squeezed out[33]. Government is alert to this risk and will put in places measures and controls to ensure rollout is complementary to any on-going infrastructure work funded outside of the public subsidy.

SOUTH YORKSHIRE DIGITAL REGION

8.3 Digital Region Limited (DRL) is a public sector-owned company delivering a groundbreaking transformational programme improving broadband speeds across South Yorkshire by using state of the art technologies. Through the use of VDSL access technologies, Digital Region will provide, on average, download speeds of 20-25Mbps, however live tests have shown users getting speeds significantly higher.

8.4 Digital Region will help the steady growth that the region has seen in recent years to become faster, and the potential for businesses to succeed will become greater. The network will cover the city, towns and villages of Sheffield, Doncaster, Barnsley and Rotherham and serve a population of over 1.3million citizens, 546,000 homes and 40,000 businesses. This is a major opportunity to transform South Yorkshire and achieve a step change that will positively impact on the entire sub-region-business, health sector, residents and public sector organisations.

8.5 Digital Region has currently rolled out more than 280km of fibre-optic cabling across the region. Out of a total network dig of approx 700km, approximately 40% of the infrastructure is in the ground. Digital Region have installed kit into 16 of the 54 exchanges covering South Yorkshire, and have commissioned services in 12 of these 16. Combined with the switching-on of more than 370 street cabinets, Digital Region services are available to more

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[33] This effect is known as deadweight.

than 18,000 premises today. By simply adding more cards to the cabinets, Digital Region can serve more than 120,000 premises with superfast, next generation broadband services.

8.6 There are currently 4 service providers signed up to the Digital Region network. These 4 ISP's are focused on reselling connectivity to a number of smaller organisations, to businesses and to the 3rd sector. We have educational specialists, and an ISP who has existing customers in the health sector, giving us presence in all of the major public sector markets. Digital Region have also been awarded the contract to supply Barnsley MBC with the connectivity to their offices and schools. This multi-million pound contract runs for 5 years and is expected to save the local authority more than £100,000 per annum.

CORNWALL

8.7 In September, Cornwall Council, confirmed plans to bring superfast broadband to Cornwall and the Isle of Scilly. BT have been selected as the winner of the tender process, which aims to bring superfast broadband to 80-90% of premises across Cornwall, which otherwise would not be served by the market alone. The £132m project is supported by ERDF funding and will create 4000 new jobs and safeguard a further 2000 jobs.

UK SUPERFAST BROADBAND PILOTS

8.8 The Comprehensive Spending Review confirmed that Government will be investing £530m until 2015 to help deliver superfast broadband into more rural and hard to reach areas. The bulk of this will be delivered by upgrading the data transport infrastructure, as outlined in Chapter 4.

8.9 The Government will contribute a proportion of initial funding for four superfast broadband pilots, in Cumbria, Herefordshire, North Yorkshire and the Highlands and Islands. These pilots will provide BDUK with valuable data, both in terms of procurement issues for larger projects, and on a more technical level to refine the process for the future waves of investment.

CHAPTER 9: FUTURE EVOLUTION: HOW WE BUILD ON ALL THIS

9.1 All of the policies detailed above are intended to provide the best possible climate for investment and private sector development of our broadband networks. However, our vision for superfast broadband is long term.

9.2 To build on the process we have already made, we will take pursue three major initiatives:

9.3 First, as confirmed in the Spending Review in October, the Government is committing £530m by 2014/15 in public funds to support this delivery, £300m of which will come from the TV Licence Fee settlement from 2013. This is a big commitment from Government and will deliver superfast broadband to the vast majority of homes in the UK, not just those in more urban and densely populated areas that the market will cater for.

9.4 We believe it is appropriate for the licence fee to be used in such a way, as much of the content that will be used across these networks is paid for though the licence fee's funding for the BBC. Therefore it is right that households which pay for that production should have the ability to receive it.

9.5 The BBC, through the BBC Charter, also have a Public Purpose objective in helping deliver to the public the benefit of emerging communications technologies and services, so there is a clear and accountable link to the licence fee.

9.6 Second, to ensure that we have the right environment for ever-increased investment and strengthening of our networks, we are reviewing the Communications Act 2003. This review, which focuses both on the role and functions of the independent regulator and the statutory controls around the Communications industry, will publish its initial conclusions in March 2012. In relation to broadband, this will include examination of the statutory framework for spectrum regulation, as well as examining whether the Electronic Communications Code remains fit for purpose.

9.7 Third, the Government will continue to work with Ofcom to examine how additional spectrum can be made available for potential use by wireless broadband services, where appropriate engaging in European and ITU discussions. Government has set a target to release at least 500 MHz of public sector spectrum below 5GHz by 2020 for mobile communications uses, including mobile broadband.

GLOSSARY

2G Second Generation Mobile services – see also GSM

3G – Third generation of mobile systems. Provides high-speed data transmission and supports multimedia applications such as full-motion video, videoconferencing and internet access, alongside conventional voice services.

4G – Fourth Generation of mobile services.

Access network – Electronic Communications Network which connects end-users to a service provider; running from the end-user's premise to a Local Access Node and supporting the provision of access based services. It is sometimes referred to as the local loop or last mile.

ADSL – Asymmetric Digital Subscriber Line. A digital technology that allows the use of a standard telephone line to provide high-speed data communications. Allows higher speeds in one direction (towards the customer) than the other.

ASA Advertising Standards Authority

BBC – British Broadcasting Corporation

BDUK – Broadband Delivery UK –The delivery arm for the Government's broadband programmes, part of the Department for Business, Innovation and Skills

Broadband – A service or connection generally defined as being 'always on' and providing a bandwidth greater than narrowband.

Broadband Stakeholder Group (BSG) – Website: www.broadbanduk.org

BIS Department for Business, Innovation and Skills

BPI British Phonographic Institute

BSI British Standards Institution

Boston Consulting Group (BCG) – Website: www.bcg.com

CGI Computer Generated Imagery, or Common Gateway Interface

CLG Department for Communities and Local Government

Cloud Computing –Term used for delivering hosted services over the internet

Contention ratio – An indication of the number of customers who share the capacity available in an ISP's broadband network. Figures of 50:1 for residential broadband connections and 20:1 for business are typical).

CPNI Centre for the Protection of National Infrastructure

Coverage – The extent to which broadband service is available should businesses and consumers wish to subscribe

CP – Communication Provider

CPS – Carrier Pre-selection. The facility offered to customers, which allows them to opt for certain defined classes of call to be carried by an operator that has been selected in advance and has a contract with the customer. CPS does not require the customer to dial a routing prefix or use a dialler box.

Digital switchover – The process of switching over the current analogue television broadcasting system to digital, as well as ensuring that people have adapted or upgraded their televisions and recording equipment to receive digital TV.

DAB Digital Audio Broadcasting

DCFS Department for Children, Schools and Families

DCITA – Department of Communications, Information Technology and the Arts

DCMS Department for Culture, Media and Sport

DETI – Department for Enterprise, Trade and Investment in Northern Ireland

DNS Domain Name System

DOCSIS Data Over Cable Service Interface Specification – a technology for next generation broadband services over the cable network

Dongle – A physical device, attached to a PC's USB port, which adds hardware capabilities.

DRM Digital Rights Management or Digital Radio Mondiale

DSL – Digital Subscriber Line. A family of technologies generally referred to as DSL, or xDSL, capable of transforming ordinary phone lines (also known as 'twisted copper pairs') into highspeed digital lines, capable of supporting advanced services such as fast Internet access and video-on-demand. ADSL, HDSL (high data rate digital subscriber line) and VDSL (very high data rate digital subscriber line) are all variants of xDSL).

DSO Digital Switchover (usually of TV)

ERDF – European Regional Development Fund

FTTC (Fibre-to-the-cabinet) – Access network consisting of optical fibre extending from the access node to the street cabinet. The street cabinet is usually located only a few hundred metres from the subscriber premises. The remaining segment of the access network from the cabinet to the customer is usually a copper pair but could use another technology, such as wireless.

FTTH (Fibre-to-the-home) – A form of fibre optic communication delivery in which the optical signal reaches the end user's living or office space.

FTTB (Fibre-to-the-building) – A form of fibre-optic communication delivery in which an optical fibre is run directly onto the customers' premises.

GHz GigaHertz, a measurement of frequency in radio spectrum

GPON – Gigabit Passive Optical Network

GSM Global Standard for Mobile Telephony, the standard used for 2G mobile systems.

GVA Gross Value Added

HDTV – High-Definition Television. A technology that provides viewers with better quality, high-resolution pictures.

HE Higher Education

HEIs Higher Education Institutions

Headline connection speed – The theoretical maximum data speed that can be achieved by a given broadband. A number of factors, such as the quality and length of the physical line from the exchange to the customer, mean that a given customer may not experience this headline speed in practice.

HSPA – Jointly, downlink and uplink mobile broadband technologies are referred to as HSPA (High Speed Packet Access) services.

HSDPA High-Speed Downlink Packet Access – an enhanced 3G service for data transfer

HSPA High-Speed Packet Access – an enhanced 3G service for data transfer with greater symmetry between the up- and down link.

IA Impact Assessment

ICT Information and Communication Technology

Internet – A global network of networks, using a common set of standards (e.g. the Internet Protocol), accessed by users with a computer via a service provider.

IP (Internet Protocol) – The packet data protocol used for routing and carriage of messages across the Internet and similar networks.

IPTV – Internet Protocol Television. The term used for television and/or video signals that are delivered to subscribers or viewers using Internet Protocol (IP), the technology that is also used to access the Internet. Typically used in

the context of streamed linear and on-demand content, but also sometimes for downloaded video clips.

ISDN Integrated Services Digital Network – a data transfer technology using the copper phone network

ISP – Internet Service Provider. A company that provides access to the internet.

Kbps Kilobits per second

KTN Knowledge Transfer Network

LAN (Local area network) – A network for communication between computers covering a local area, like a home or an office.

Leased Line – A transmission facility which is leased by an end user from a public carrier, and which is dedicated to that user's traffic.

LLU (Local Loop Unbundling) – LLU is the process where the incumbent operators (in the UK it is BT and Kingston Communications) make their local network (the lines that run from customers premises to the telephone exchange) available to other communications providers. The process requires the competitor to deploy its own equipment in the incumbent's local exchange and to establish a backhaul connection between this equipment and its core network.

Local Loop – The access network connection between the customer's premises and the local PSTN exchange, usually a loop comprised of two copper wires.

London School of Economics (LSE) – Website: www.lse.ac.uk

LTE – (Long Term Evolution). Part of the development of 4G mobile systems that started with 2G and 3G networks.

Mbps Megabits per second

MHEG Standard for delivery of multimedia information, developed by the Multimedia and Hypermedia Experts Group

MHz MegaHertz – a measurement of frequency in radio spectrum

Misc 34 The Cabinet Sub-committee responsible for Digital Inclusion

Mobile Broadband – Various types of wireless high-speed internet access through a portable modem, telephone or other device.

MP3 Digital audio encoding format

Narrowband – A service or connection providing data speeds up to 128kbit/s, such as via an analogue telephone line, or via ISD.

Next generation core networks (NGN) – Internet Protocol based core networks which can support a variety of existing and new services, typically replacing multiple, single service legacy networks.

Next Generation Access (NGA) – also known as next generation broadband, or superfast broadband – The term used to describe the infrastructure and set of technologies which provide superfast broadband, and connects the end-user to the core of the network

Next Generation Superfast Broadband – There is currently no agreed definition of next generation superfast broadband, but it is likely to be faster, have more symmetrical download and upload speeds and be more reliable and consistent across users and time compared with current generation broadband

Network Owners – Businesses that own all or part of a network such as BT Openreach or Virgin Media

NGM Next Generation Mobile – see LTE

OECD Organisation for Economic Cooperation and Development

Ofcom The Office for Communications

OFT Office of Fair Trading

PC Personal Computer

Peer-to-peer distribution – The process of directly transferring information, services or products between users or devices that operate on the samehierarchical level.

PSB Public Service Broadcasting

PSN Public Sector Network

PSTN – Public Switched Telecommunications Network

PTP Point-To-Point

RDA Regional Development Agency

Retailers – Businesses that sell services to the end consumer such as BT Retail, Virgin Media, Sky or TalkTalk

Service provider – A provider of electronic communications services to third parties whether over its own network or otherwise.

SME Small and Medium Enterprises

Streaming content – Audio or video files sent in compressed form over the internet and consumed by the user as they arrive. Streaming is different to downloading, where content is saved on the user's hard disk before the user accesses it.

Sub-Loop Unbundling – The process by which a sub-section of part of the local loop in the access network in unbundled and allows other operators to interconnect with the local access network at a point between an incumbent's site and the end user.

Take-up – The acceptance of broadband services where offered

Telecommunications, or 'Telecoms' – Conveyance over distance of speech, music and other sounds, visual images or signals by electric, magnetic or electro-magnetic means.

TV over DSL/TV over Broadband – A technology that allows viewers to access TV content – either in a linear programme schedule, or on-demand – using Internet Protocol via broadband services, either on a PC or (via a set-top box) on a TV set.

UMTS – Universal Mobile Telecommunications System. The 3G mobile technologies most commonly used in the UK and Europe.

USC Universal Service Commitment

VDSL – Very high bitrate digital subscriber line

VOA Valuation Office Agency

VoD Video on Demand – A service or technology that enables TV viewers to watch programmes or films whenever they choose to, not restricted by a linear schedule. Also Near Video on Demand (NVoD), a service based on a linear schedule that is regularly repeated on multiple channels, usually at 15-minute intervals, so that viewers are never more than 15 minutes away from the start of the next transmission.

VoIP – Voice over Internet Protocol. A technology that allows users to send calls using Internet Protocol, using either the public Internet or private IP networks.

Wimax A wireless data transfer technology

WLR Wholesale Line Rental – A regulatory instrument requiring the operator of local access lines to make this service available to competing providers at a wholesale price.

recycle