openreach

The Impact of High-Speed Broadband for Communities

REGENERIS

A Report by Regeneris Consulting for Openreach
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REGENERIS

Regeneris Consulting is an independent economics consultancy that provides research-based advice to major corporates, developers, national government bodies and local government. Regeneris specialises in preparing robust assessments of economic impact, focusing on the impact of new technology, physical developments, policy changes, investment programmes and corporate economic footprint. Regeneris work across the UK from their offices in London and Manchester. See: www.regeneris.co.uk for further information.

1. Executive Summary

With national coverage of superfast broadband on track to hit 95% by the end of 2017, the UK is an increasingly digitally connected society[1] Openreach, the fixed digital infrastructure business which is part of the BT Group, has played a pivotal role, through its commercial investment programme and by investing in the public/private Broadband Delivery UK (BDUK) partnerships which have delivered superfast broadband in areas that were not covered by any private sector plans.

The challenges of delivering fibre infrastructure to isolated communities that still do not have access to high-speed broadband remain considerable. Openreach is deploying an expanding variety of technologies, techniques and co-investment models to address this.

This report looks at the benefits of the Openreach approach to connecting communities that remain on the wrong side of the digital divide. It also provides an assessment of the business, residential, social and environmental impacts associated with Openreach's Community Fibre Partnerships (CFP) programme, drawing on the latest evidence about how fibre broadband has affected the communities that Openreach has connected to date. We assess impacts generated through ten channels:

1) **business productivity:** generated by firms and employees when they take-up fibre broadband and exploit a new generation of business production and process applications
2) **business innovation and access to new markets:** created by businesses able to develop and promote new and richer products and services online and across wider geographical markets and leading to turnover and economic growth
3) **new business start-ups:** created when entrepreneurs capitalise on fibre broadband to operate new business models at lower cost and more flexibly than established businesses
4) **flexible working:** enabled through gigabit cloud, file transfer and communications/ conferencing applications and delivering additional productivity improvements
5) **private benefits to households:** accrued through increases in house price and housing wealth
6) **resident use value:** estimated by monetising the value residents attach to enhanced connectivity
7) **social value:** focussing on the benefits to older residents of reduced isolation, increased community engagement, confidence and financial and time savings associated with access to online services
8) **access to employment:** enabled when residents gain access to wider job opportunities online and benefit from employment and increased salaries
9) **healthcare impacts:** generated as advances in connected health technologies deliver cost savings on hospital admissions
10) **reduced carbon emission:** resulting from a shift from physical to digital product and increased flexible and tele-working from cloud and video/audio technologies.

1. Premises able to access and order 24mbps+, made available by private and public sector investments. thinkbroadband.com

Table 1 summarises our headline estimates of the impact that will be generated from Openreach's Community Fibre Partnerships and demonstrates the breadth and scale of those impacts for communities across the UK.

In total we estimate that the economic and social impacts generated by Openreach's Community Fibre Partnerships will be just over £XX billion over 15 years[2].

Table 1: Community Fibre Partnership Impact Assessment: Headline Economic & Social Impacts Over 15 Years

Business Impacts	
Productivity	£xxm
Innovating & Opening New Markets	£xxm
New Business Creation	£xxm
Flexible Working Benefits	£xxm
Total Business Impacts	**£xxm**
Economic Benefits for Residents*	
Increased Housing Wealth	£xxm
Resident Use Value	£xxm
Social Benefits*	
Social Value: 75+ year old residents only	£xxm
Access to Employment: through online job search	£xxm
Healthcare technology	£xxm
Total Social Benefits	**£xxm**

Source: Regeneris Consulting. * Caution should be taken in summing impact values. No total economic benefit for residents is provided; there is likely to be some cross-over between resident welfare benefits and increased housing wealth. Some of the economic benefits to residents may also be accounted for within social benefits.

2. This excludes resident user benefits, to avoid double counting impacts associated with increased housing wealth.

2. Introduction

Over the last seven years, a sustained period of investment with the support of government, local authorities and communities has enabled Openreach to extend its fibre infrastructure to many areas including remote and rural communities, business parks and industrial estates, as well as new-build residential developments. Coverage of superfast broadband across the UK is above 94% at the time of writing and it is on track to hit the government's target for 95% by the end of 2017[3].

The disruptive nature of technology has impacted on many aspects of home and working life. The UK has become an increasingly digitally connected society, dependent on future-proof digital infrastructure to underpin its continued evolution. A new hierarchy of international competitiveness has emerged based on digital connectivity and innovation competencies. The government's 2017 Digital Strategy reflects this with a commitment to embed technology into all elements of the economy.

This report explores the benefits of Openreach's continued and extensive investment in fibre broadband for communities across the UK. It then examines the impacts generated specifically by Openreach's investment through its Community Fibre Partnerships (CFP) programme, drawing on compelling evidence showing the impacts of fibre broadband. Throughout the report, we highlight a series of testimonials offering local insight into the tangible benefits of fibre broadband. The findings set out a compelling case for continued investment in high-speed broadband infrastructure and for the UK to continue building its digital capabilities.

The Openreach Commercial Rollout

The Openreach Commercial Rollout

- extending fibre to remaining communities[4]
- extending gigabit capable fibre to the premise (FTTP or 'full fibre') technology to 2 million premises and 100mbps+ capable Gfast broadband to 10 million by the end of 2020
- developing a business case to build a large-scale FTTP network across the UK[5]
- helping the government deliver a universal broadband service to give every home in Britain access to a minimum of 10Mbps by 2020[6].

Broadband Delivery UK (BDUK) Partnerships

The majority of £1.58 billion of public investment in fibre networks by July 2017[7], has flowed through the government's Superfast Broadband Programme, delivered by BDUK in conjunction with BT, devolved and local authorities and the European Union. With significant investment from BT, this has allowed the UK to make considerable progress in achieving its target of connecting 95% of premises to superfast broadband by 2017. It is also making a valuable contribution to an evolving ultrafast broadband agenda, through the deployment of full fibre technologies in locations across the UK.

By the third quarter of 2017, the BDUK programme has enabled superfast broadband access to over 4.6 million properties[8]. The rollout will continue to push into more challenging locations, often rural, but also in areas of concentrated commercial activity and new residential and business developments.

3. thinkbroadband.com
4. including through debt funding, enabled by the government's £40 billion UK Guarantees Scheme for infrastructure.
5. Openreach is currently undertaking a consultation to explore the means to delivering major full fibre investment. See www.btplchere
6. Introduced in the 2017 Digital Economy Act.
7. This figure includes BDUK phase 1 and 2 (Superfast Extension Programme) contracts only. Information made available by BDUK here. This report assumes expenditure doesn't include any phase 3 investment commitments.
8. This information is published by the UK government at quarterly intervals. Q3 data is available here.

"With our high-speed fibre connection, we're now able to operate a site-to-site Virtual Private Network (VPN) service between our clinics which has improved security and privacy when sharing data. The better connectivity also allows us to operate an internet based phone service between our clinics, saving us money."

Chris Matthews, Founder and Chief Executive Officer, Silverlink Clinics

The Openreach Community Fibre Partnership Scheme

Community Fibre Partnerships (CFP) augment Openreach's commercial and BDUK rollout. To date, more than 400 contracts have been signed to bring fibre broadband to communities via fibre-to-the-premises (FTTP) and fibre-to-the-cabinet (FTTC) technologies.

The CFP scheme reflects Openreach's desire to 'never say no' to working together with individual communities to find a suitable and affordable fibre broadband option. We set out the key benefits of the CFP approach below. These are framed around the Openreach network, its inherent qualities and deployed technologies.

"We were delighted when Openreach got in touch and told us that the installation would be Fibre-to-the-Premise broadband – meaning Cotwalton would receive future-proofed download speeds of up to 330Mbps. That's equal to the best in the whole country which is astonishing for a tiny village like ours!"

Brian Scott, resident of Cotwalton, Staffordshire

An Open Wholesale Network

The Openreach network is intrinsic to BT's fibre rollout, including commercial, government co-funded (BDUK) and CFP deployments. With an open access platform at its core and the wealth of experience which Openreach brings to large-scale rollouts, CFP projects are afforded a solution which allows communities to reap the rewards of fibre.

"BT was a real saviour. They offered a continual presence, understanding of community fibre and how to jointly fund a cabinet."

Sam Schofield, Local Broadband Campaigner, Kings Cliffe, Northamptonshire

Crucially, this means that CFPs also benefit from the following Openreach network qualities:

Choice of Internet Service Providers

CFPs also benefit from Openreach's wholesale platform in that it provides equivalent access to a wide range of residential and commercially-focused Internet Service Providers (ISPs). This ensures that CFP communities can access:

- a choice of Communication Providers (CPs)[9]
- a variety of services from competing CPs, resulting in lower prices
- a robust and resilient network, managed to the highest regulated standards, ensuring consistent quality, performance and reliability.

9. CP choice is a hallmark of FTTC fibre networks, with a range of products available from a wide range of providers.

A Flexible Solution
The CFP approach offers flexibility around:

- partnership models allowing for engagement with local bodies to jointly contribute
- funding approaches with an emphasis on gap funding[10], leveraging investment from resident and business cash contributions and external funding sources such as vouchers and grants
- solutions exploring all possible network configurations and deliver best value to the consumer
- sustainable solutions, serving communities in perpetuity and removing the risk of long-term ownership and management Ï network assets

> "I would highly recommend using Openreach to provision a community as this removes much of the risk and liability of owning infrastructure and keeps an open market for subscribers."
>
> **Jon Wohlters, Resident and Community Broadband Campaigner from Coleorton, Leicestershire**

Openreach also offers a grant to CFPs to reduce the cost of fibre for communities where the new infrastructure serves the local school or similar Ofsted equivalent organisation. Rural areas have often been left out of national voucher schemes for enhanced broadband. Moreover, the costs of connecting in these areas often exceeds the voucher limit on offer. In these instances, Openreach will contribute up to £30,000, capped at 75% of the cost of the 'gap' fund for the community to find. As of November 2017, 50 grants have been awarded at a total value of over £560,000.

Expertise and Delivery Experience
Openreach has a wealth of experience and expertise in delivering fibre broadband to millions of homes and businesses across the UK. This includes working in some of the most challenging locations and within multi-agency partnerships, to develop solutions and connect communities to high-speed fibre.

> "After three years' campaigning including the last year planning with Openreach, the benefits to the local community, who dug deep in their pockets to fund this, are already clear, and there's no doubt that making fibre broadband available will encourage some businesses to stay, who might have otherwise relocated. Senior managers at BT were instrumental in introducing us to the Community Fibre Partnership programme, which appeared to be our only way forward."
>
> **Paul Severs, chairman, Bussage & Chalford Broadband Action Group, Gloucestershire**

Dedicated teams in Openreach act as the conduit for community engagement, providing:

- expertise in planning, network design and cost estimation
- efficient network construction deployment, accommodating local sensitivities to bring a sustainable approach to installations
- robust and highly-regulated network management processes and systems to ensure long-term viability of the new fibre broadband.

10. The funding 'gap' represents the value of funding required that will not be covered by Openreach's commercial investment.

Bridging the Digital Divide

In 2016, the average broadband speed in rural areas was 12Mbps compared to 40Mbps in urban areas[11] and although the UK's fibre broadband footprint has expanded, there are considerable challenges associated with delivering fibre to everybody.

The costs of fibre roll-out can outweigh likely revenue streams in harder to reach and more sparsely populated areas, so innovative technical and funding solutions are required as a result.

Openreach is working with communities across the UK to address the nation's connectivity challenge and BT has offered to play a leading role under a voluntary offer to government to deliver universal broadband at minimum speeds of 10Mbps to around 99% of the country by the end of 2020. The government is currently considering this offer alongside the option of introducing a Universal Service Obligation (USO) which would give every home and business in the UK the legal right to request a high-speed connection, with a universal minimum speed of 10Mbps. The ambition would be to deliver this by the mid-2020s.

Under the BT offer, which would be legally binding and largely delivered by Openreach, many premises would be expected to receive substantially faster speeds than 10Mbps, with many also expected to receive connections more quickly than could be delivered under a regulatory approach.

This will ensure the UK continues to push the boundaries of technology for the benefits of its citizens, businesses and environment.

11. Ofcom, 2017 'UK Home Broadband Performance'.

3. Strengthening Community Economies

Delivering fibre broadband to communities strengthens local economies by supporting local businesses to grow and attracting and retaining a local workforce. Slow connectivity can act as a barrier for economic growth in rural communities, particularly for Small and Medium-sized Enterprises (SMEs)[12]. Access to fast, reliable broadband is fundamental to running a business efficiently and working patterns and business practices are increasingly dictated by effective broadband connectivity and the demands of technology.

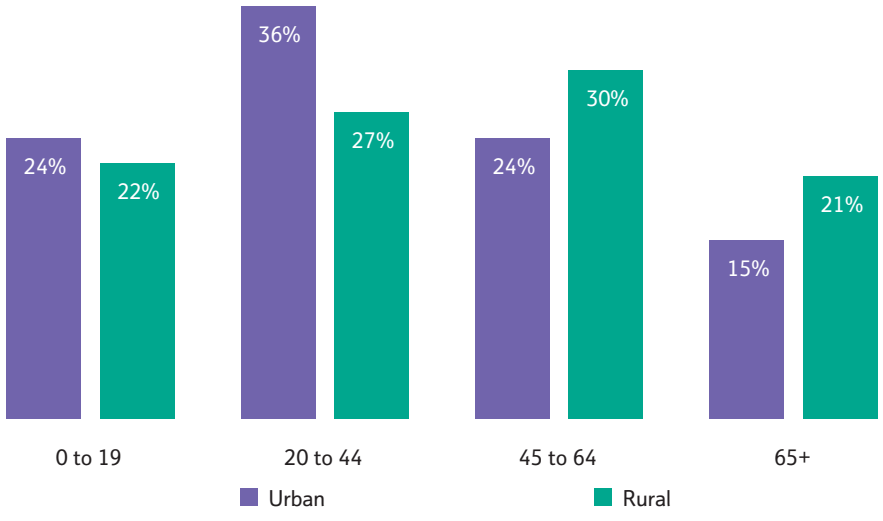
Smaller communities across the UK face challenges associated with supporting an ageing population and with retaining younger people and those of working age. In rural areas 21% of the population are 65+, compared to 15% in urban areas. Those aged 20 to 44 represent 27% of the population compared to 36% in urban areas.

Fibre broadband contributes towards communities retaining and attracting the younger people that are crucial to maintaining a sustainable workforce and local economy, by enabling:

- young people to access education resources and courses remotely
- people to start businesses from home and access education from home in rural areas
- greater access to public services, a key component of rural deprivation[13].

These outcomes align with other elements associated with the social and environmental impacts described in chapters 6 and 7 of this report.

Figure 3.1 Urban & Rural Population in Great Britain by Age (% of total population)



Source: England, Wales and Scotland Census Data

12. See for example Rural England (2016). 'State of Rural Services'
13. See English Indices of Multiple Deprivation, 2015.

4. Assessing the Impact of Fibre for Communities

Through the remainder of this report we examine the economic, social and environmental benefits that arise by delivering fibre broadband to communities across the UK.

"Faster broadband speeds have made even the simplest things more efficient. Ordering stock online for the gallery and gift shop takes a fraction of the time and we've been able to create a fantastic website and use social media to promote the business and attract new customers. And we can both be doing different things online at the same time rather than having to take it in turns."

Jane, Co-Owner, Gallery 45, Northumberland

We also provide estimates of the impacts resulting from Openreach investment through Community Fibre Partnerships. We evaluate the scale of impact by drawing on published research and accepted methodologies. The findings reflect conservative estimates in the context of rapid technological change and an evolving research base that is probing further into the transformative impacts of fibre connectivity.

"Upgrading the broadband capabilities of the Castle Quarter will have a tangible impact on businesses in the area, enabling them to operate the way you would expect from a business in the capital city, thereby helping Cardiff retain businesses and, indeed, attract new ones."

Adrian Field, Executive Director, Cardiff Business Improvement District

NOTE: These impacts refer to the CFP investment only. They are nonetheless indicative of the impact associated with the wider Openreach investment in communities which, through its commercial fibre roll-out and BDUK partnerships, will stretch beyond this. Case study quotes in the following sections include business insights taken from communities outside the CFP deployment to provide a rich account of community experiences.

Business Impacts

The core economic impacts associated with fibre for communities will be created by businesses adopting and exploiting fibre to deliver economic growth.

"Broadband is essential to our business. Our whole business model relies on it. We had a week without broadband once and we had to de-camp to a local restaurant to use their wi-fi. We just can't function without it."

Andy Hibbs, Director at Craft ICT, Norfolk.

It is possible to quantify the business impacts associated with fibre in communities across four primary channels:

1) Increased productivity
2) Innovation and opening markets
3) Business start-ups
4) Flexible working practices.

"We can now investigate, diagnose and resolve many faults in factory machinery remotely, and as soon as they occur, without having to send engineers to site. Our orders, invoices, accounts and stock control system are always available, so our people aren't wasting their time waiting for information or systems they need to do their jobs. People are less frustrated at work, and that helps us be a more harmonious and productive team."

Chris Jones, MD, Corgi Socks, Carmarthenshire

1) Increased Productivity

To compete in national and global markets, businesses need to be able to deliver efficiently and effectively. Fibre will drive productivity in community level economies, among employees and by enabling a new generation of business production and process applications.

"There are four people in the office here and each of them loses about half an hour a day due to slow broadband speeds. I've calculated the cost savings to my business will be £6,000 per year with superfast, as we'll be able to work more efficiently."

Anthony Pilkington, MD BookCheck Ltd, Chalford, Gloucestershire

Recent efforts to assess the productivity effects associated with enhanced broadband connectivity converge on a 0.3% uplift where a doubling in speed is achieved. This is applied in the Department for Community and Local Government (DCLG)'s 2017 assessment of the economic impacts associated with the Universal Service Obligation as well as in the 2013 Evaluation of the BDUK National Broadband Programme. This draws on 2012 research by Chalmers, which found a doubling of speed is associated with a 0.3 percentage point increase in Gross Domestic Product (GDP) growth in OECD countries[14].

Community Fibre Partnerships Impact Assessment: Productivity

We assume that on average, businesses taking up fibre broadband for the first time in CFP communities can generate productivity improvements in line with the 2017 DCMS assessment. We also assume that those impacts vary by sector and size. A 2008 European Commission study estimated broadband productivity impacts for a range of industry types[15]:

- manufacturing and construction: 0.14% increase in GVA per firm per annum
- knowledge intensive[16]: 0.58% per annum
- other services: 0.32% per annum (efficiency benefits only).

This approach allows us to apply impacts to individual businesses and to be tailored to the locations supported through the CFP scheme.

14. Rohman, Ibrahim Kholilul, and Erik Bohlin. (2012). 'Does Broadband Speed Really Matter for Driving Economic Growth? Investigating OECD Countries.
15. Micus Management (2008). 'The Impact of Broadband on Growth and Productivity'. European Commission, DG Information Society and Media.
16. These are the information and communication (Standard Industrial Classification J), financial (SIC K) and professional, scientific and technical (SIC M) sectors.

"We're already finding that ultrafast broadband is giving our business a major boost. Everything we do online now works so much more quickly and efficiently. Our remote and rural location helps to give the beers that we produce their purity and character, the downside has always been that we have lagged behind in terms of connectivity.

"Ultrafast will be a vital part of the future development of the business whether we are communicating online with our customers and suppliers or using the technology to work more efficiently. It has already strengthened our infrastructure as we continue to expand the business which includes greater use of e-commerce and a recent redesign of our website."

Patrick McCaig, Managing Director of Otter Brewery, Devon

Applying productivity uplifts for a doubling in speed represents a conservative approach, given the marked increases in speed delivered through CFP, which provides 100Mbps broadband and above to communities that are often still receiving less than 2Mbps.

Our assessment suggests that over a 15-year period, £XX million in GVA could be generated within communities benefitting from CFP investment due to productivity improvements alone[17].

17. Appendix A contains the detailed assumptions applied to all business impacts, covering our approach to fibre adoption, technology change, disaggregation of impacts by business sector and size and discounting and multiplier effects over our 15-year assessment period. **A Note on Terminology:** We refer to fibre broadband throughout the impact assessment. All estimates of impact for the CFP programme assume a step change in connectivity from basic broadband (below 24Mbps) to superfast (24Mbps) broadband. Many homes and businesses are accessing fibre through CFP speeds well in excess of 24Mbps, and some less, dependent on the technology deployed. Overall, our assumption is a conservative one.

2) Innovating and Opening New Markets

Through enhanced upload and download speeds, businesses will be able to develop and promote new and richer products and services online and across wider geographical markets. They will be stimulated by greater exposure to innovation, information and an international online community and marketplace.

"Since we connected to superfast broadband, our ecommerce business has really taken off, doubling in two years. Corgi is now a significant exporter, with new major distributors in Korea, China, Japan and Australia."

Chris Jones, Managing Director of Corgi Socks, Carmarthenshire

Fibre-enabled innovation is driven by rapid technological change and therefore can be difficult to forecast. Examples of the tools and applications that business can exploit through fibre, now and in future, include:

- next generation digital design and prototyping
- additive manufacturing (3D printing)
- next generation HD video conferencing
- user generated products and services and online point of sale (PoS) software
- smart sensor technology, e.g. in monitoring and making automatic adjustments in production and supply-chain management

"Video conferencing is now seamless which allows us to keep in touch with our staff and customers around the world much more easily. It's reduced our travel costs and therefore enabled us to offer a more cost-effective service to our customers."

Andy Hibbs, Director at Craft ICT, Norfolk

This increase in innovation sets the scene for a new ecosystem which will evolve through the application of digital technologies, the use of smart data and internet enabled devices[18].

"Fibre broadband has provided a platform for us to generate revenue through internet-driven services, and it gives us confidence to examine future revenues. We saw the potential to generate new revenues through internet-driven services, so long as we had reliable access to sufficient bandwidth."

Iain Brown, MD, Sandy Balls Holiday Village, New Forest

Community Fibre Partnerships Impact Assessment: Innovation and Opening New Markets

We estimate businesses will, on average, replicate the productivity gains described above, by innovating, extending market share and entering into new markets.

This would see £XX million in GVA created for CFP community economies over 15 years.

3) Enabling New Business Creation

Over a quarter of UK businesses (486,000) are in the countryside and more people start businesses in rural areas than in major towns. A 2015 study by the Department for Environment, Food & Rural Affairs (Defra) found that increasing numbers of people are relocating to the countryside from towns, and many of those doing so are starting businesses[19]. The availability of fibre broadband stands to accelerate this trend.

Fibre broadband acts as a stimulus for new business creation and entrepreneurship. Through access to fibre infrastructure, communities and individuals benefit from increased opportunities to trade online, access global markets remotely and operate businesses from home, including rural locations.

Specifically, businesses in communities gaining access to fibre for the first time will enjoy an increase in the power of cloud computing and be able to conduct more of their operations and collaborative working online. This enables new business models and new ways of working, and offers a greater ability to reach new markets and retain staff through flexible working. It also reduces the costs associated with starting and running a business, e.g. through lower premises costs.

"You can't just 'pop down the road' to see global customers, but you can meet, see, share documents and talk with them online whenever you need. Export is now the fastest-expanding part of our business, and there's no doubt that our superfast communications are making this growth both possible and manageable."

Laurence Harris, Owner, Daioni organic dairy farm, Pembrokeshire

18. Find out more from EEF (2016). 'The Fourth Industrial Revolution: A Primer for Manufacturers'.
19 Murphy Salisbury, 2015 'Rural start-ups to rival urban businesses due to superfast broadband'.

Community Fibre Partnerships Impact Assessment: New Business Creation
We have estimated the number of business start-ups that could arise if barriers to entry, including costs, were reduced in certain sectors. Assumptions have been informed by a study which estimates that business creation could rise by up to 1.7% per annum due to increased cloud computing power[20].

It is estimated that CFP investment will create £XX million in GVA for the UK economy over 15 years, as a result of business creation.

4) Flexible Working

Research shows that flexible working practices, including working from home and at remote locations, are 21% higher among firms who are utilising fibre broadband versus basic broadband[21], and that employee productivity rises significantly as a result[22].

Businesses in fibre connected communities will be able to begin using a wide range of digital human resource (HR), communications and other business process applications. These will enable more employers and employees to communicate and work efficiently and flexibly, leading to the following benefits:

- reduced overheads associated with business premises
- lower business and commuter travel costs and carbon emissions
- healthier work-life balance, which in turn has been proven to improve employee motivation and retention
- reduced barriers to work for carers, single parents and disabled people
- increased employer access to a wider labour pool when recruiting.

"I have the opportunity to work with Royal British Legion Industries, helping veterans and their families. The work involves a great deal of travelling but when I get fibre I will be able to do that work online, without leaving my home!"

Margaret Saunders an Occupational Psychologist from Moy in Scotland

Community Fibre Partnerships Impact Assessment: Flexible Working
We assume that productivity will be 20% higher for employees working flexibly versus purely office-based employees. This is deliberately conservative and is five percentage points lower than suggested by the research, allowing for levelling off in the increase in worker flexibility and productivity gains over time.

Through an increase in the adoption of flexible working practices, CFP could create an estimated £XX million in GVA, over a 15-year period.

20. Etro, F (2009). 'The Economic Impact of Cloud Computing on Business Creation, Employment and Output in Europe'.
21. Strategic Networks Group (2013). Data refers to a survey of 16,000 firms in the US.
22. Rockbridge Associates Inc. (2005/6). "The National Technology Readiness Survey". estimates that employees working flexibly are 25% more productive than other employees. 20% has been applied in estimating impacts allowing for some levelling off in the increase in worker flexibility and productivity gains over time.

Community Fibre Partnerships Impact Assessment: Summary of Business Impacts
The business and employment benefits, attributed to CFP projects over a 15-year period, are summarised in **Table 4.2** below.

In total, the benefits to communities connected to fibre by the CFP scheme sum to £XX million over our 15-year assessment period.

The impacts associated with Openreach's national rollout of fibre broadband technologies, through commercial and BDUK partnerships, would be considerably greater, reflecting the scale of delivery to millions of new businesses and homes.

Table 4.2: Community Fibre Partnership Impact Assessment: Summary of Business Benefits (15-year Period)

Productivity Benefits	£xxm
Innovating & Opening New Markets Benefits	£xxm
New Business Creation Benefits	£xxm
Flexible Working Benefits	£xxm
Total Benefits	**£xxm**

Source: Regeneris Consulting. Figures may not sum due to rounding.

5. The Economic Impact for Residents

In this section, we explore the economic benefits that will accrue to community residents, using an assessment of 'willingness to pay', and through evidence on the effects of broadband connectivity on house prices and wealth.

Gauging the Personal Benefits to Community Residents

Assessing people's willingness to pay for a product or service is a widely used approach in economic impact analysis and recommended under HM Treasury's guidance[23]. By looking at the amount residents are willing to pay for a fibre broadband subscription versus older copper-based connection, we get an indication of the value they place on fibre and, by proxy, a monetary value of the personal benefits. The approach assumes that benefits cannot be less than the additional cost, otherwise consumers would not make the purchase.

This approach is taken in three studies, by the Fibre to the Home (FTTH) Council, WIK-Consult and Plum Consulting, suggesting residents' willingness to pay for an upgrade to fibre broadband at a minimum of 5 euros (£4.40[24]) per month, or £53 annually[25].

Community Fibre Partnerships Impact Assessment: Resident Use Value

We apply the evidence set out above to evaluate the personal economic benefit to residents who have upgraded to fibre as part of the CFP scheme.

Assuming take-up of fibre broadband among households rises to 35% within five years, this suggests a total economic benefit of £XX million over our 15-year assessment period.

In addition to the installation and rental costs associated with accessing fibre broadband, it is evident from the considerable time and money that many CFP community groups have committed that residents value fibre connectivity greatly.

> "Life-changing sounds a bit over the top but it really has transformed how we live and work at home. Broadband is an essential utility now. It's something people look for in a new property. Now, I can get on the company's VPN instantly and work online, the kids can get on with their homework and we can all stream movies and download music – all at the same time."
>
> **Andy Godward, Local Broadband Campaigner, Eshott, Northumberland**

The majority of CFP communities have mobilised and established formal groups to campaign and ultimately co-funded a fibre broadband solution, in partnership with Openreach. In doing so, communities have made significant monetary contributions to bridge the commercial funding gap, which has prevented fibre broadband from being deployed in more challenging and harder-to-reach areas.

23. HM Treasury (2013). 'The Green Book: Appraisal and Evaluation in Central Government.'
24. Applying the exchange rate from xe.com on 10.07.17.
25. DotEcon and the FTTH Council Europe (2012), 'Regulatory policy and the roll-out of fibre-to-the-home networks'; WIK-Consult (2012), 'Re-thinking the Digital Agenda for Europe (DAE): A richer choice of technologies'; Plum Consulting (2011). 'Copper Pricing and the Fibre Transition'. NOTE: This does not reflect current or future prices for BT fibre broadband. Rather it is a finding based on research from across Europe of the additional price residents have been willing to pay for fibre versus older copper connections.

The financial and opportunity costs[26] incurred by both residential and business communities alike, are difficult to measure but testament to the value placed on bringing fibre broadband to their area.

The Effect on House Prices and Wealth

Research undertaken by leading price comparison sites highlights the importance placed on broadband connectivity when purchasing a new home:

- a GoCompare survey of 2,000 house buyers found that 43% prioritised a good, reliable broadband connection strong enough to stream TV and films[27].
- a survey by Rightmove, of over 3,000 users, found that information on broadband connectivity was ranked as a more important feature when searching for property than transport links and nearby schools. The property search site now includes a tool for users to check connectivity at any address[28].

Housing markets where only basic broadband is available appear to have suffered. Savills conducted a survey which found that nearly 70% of respondents reported that slow broadband was a constraint on letting properties in rural locations[29].

Analysis of the relationship between broadband and house prices undertaken by the Spatial Economic Research Centre (SERC) showed that, on average, house prices rose by 2.8% where dial-up internet was replaced by first generation ADSL broadband connections[30]. The survey undertaken by Rightmove (see above) suggested slow broadband could reduce the value of a home by up to 20% .

> "Reaching a solution through the Community Fibre Partnership was certainly worth it for our community as it is really helping to protect the housing market from any depreciation associated with poor broadband speeds."
>
> **Jon Wohlters, Resident and Community Broadband Campaigner from Coleorton, Leicestershire**

Community Fibre Partnerships Impact Assessment: Housing Wealth

The estimated average house price in CFP communities is £326,000[32]. Applying the 2.8% rise in prices estimated by SERC suggests house prices would rise by £9,100, on average, where a doubling in speed is achieved. This is likely to be an underestimate; CFP case studies show that in many locations speeds will rise from basic (2Mbps or less) to superfast (30Mbps or above).

Summing these house value uplifts across the residential properties set to benefit from CFP, gains in housing wealth total £XX million[33].

26. The cost to residents of foregoing leisure time and time in which they could potentially be earning income.
27. After a good neighbourhood (66%), low crime rate (59%), proximity to shops (51%) and a good GP or dentist (44%). moneywise.co.uk July 2017.
28. rightmove.co.uk August 2016.
29. Savills (2015). 'Estate Benchmarking Survey'.
30. SERC (2014). 'Speed 2.0: Evaluation Access to Universal Digital Highways'.
31. Rightmove, August 2016.
32. Based on district level average house price data from CLG and Registers of Scotland, 2017.
33. This is a one-off benefit and so, unlike other benefits assessed in this report, we do not count over 15 years.

Community Fibre Partnerships Impact Assessment: Summary of Economic Benefits for Residents

The private economic benefits for residents, attributed to existing and planned Community Fibre Partnerships, are summarised below.

As for the results in previous sections, the impacts associated with national Openreach rollout of fibre broadband technologies, through commercial and BDUK partnerships, would be considerably greater, reflecting the scale of delivery to millions of new businesses and homes.

Table 5.1: Community Fibre Partnership Impact Assessment: Summary of Resident Benefits (15-year Period)

The Effect on House Prices and Wealth	£xxm
Resident Use Value	£xxm

Source: Regeneris Consulting. Caution should be taken in summing impact values. No total economic benefit for residents is provided; there is likely to be some cross-over between resident welfare benefits and increased housing wealth.

6. Social Benefits

The Social Value of Digital Inclusion

In St Breward, Cornwall, a village without fibre broadband, just 27% of the population currently use email and 15% use social networking. Yet, 59% of those surveyed believe that the internet is intrinsic to community cohesion, making people feel more socially connected and involved[34].

This is supported by PriceWaterhouseCoopers (PwC), which examined how digital and social exclusion are interrelated and appear to be mutually reinforcing. Of those surveyed, 81% of those aged over 55 reported that being online makes them feel a greater part of modern society and as a result, less lonely[35].

> "We believe that fibre broadband promotes social inclusion by improving access to health, education and commercial services and supports sustainable employment by encouraging flexible approaches to working from home and the growth of small businesses. It will encourage some businesses to stay, who might have otherwise relocated."
>
> **Paul Severs, chairman of the Bussage & Chalfont Broadband Action Group, Gloucestershire**

BT has published a study on the value of digital inclusion[36], drawing on:

- interviews with people that previously had low levels of digital literacy but who recently started to use the internet at least once a week
- tried and tested methods for assessing Social Return on Investment (SROI) – most notably, individuals stated and revealed preferences for engaging in certain online activities
- previous research into the value attached to a number of online activities and benefits.

The study revealed that the social benefits of getting online are worth £1,064 a year to someone using the internet for the first time[37]. This value comes from a combination of benefits, including:

- financial savings associated with online shopping
- enhanced and wider employment opportunities through online job searches
- reduced feelings of isolation and improved confidence.

A range of further evidence exists to support some of the specific benefits listed under **Table 6.1**:

- **Reduced Isolation and Community Engagement:** research undertaken by HACT across a wide range of indicators suggests a social value associated with internet access of £2,413 per user, higher than estimated under BT's SROI research[38].
- **Access to Employment Through Online Job Search:** research by PwC found that the potential economic impact of getting everyone in the UK online would create a £500m economic benefit, derived from shorter periods of worklessness[39].

34. Varley, 2015 'Sustainable Digital Neighbourhoods: A Study of the Social and Spatial Effects of Technological Transition in a Rural Village'.
35. Cabinet Office, 2014 'Government Digital Inclusion Strategy'.
36. BT. 'Digital Inclusion: The Social Return on Investment'.
37. The detail evidence and method applied is set out in BT's Valuing Digital Inclusion report – www.btplc.com/Purposefulbusiness/Connectivity/Beingonlineisgoodforsociety/Valuing-Digital-Inclusion.pdf
38. HACT Social Value Bank and Value Calculator hact.org.uk/value-calculator
39. Core Cities, 2015 'Speed Up Broadband'.

Table 6.1: Monetised Social Value Attached to New Internet Users Based on Interviews with Digitally Excluded Individuals

Outcome	Value	Likelihood	Source	Total
Confidence	£707	34%	Magnitude in change in confidence	£240
Reduced Isolation	£1,055	24%	% more active in their community & socialising online	£253
Time Saving	£785	37%	% using government services online	£290
Hobbies & Reduced Boredom	£77	57%	% reporting engagement in online hobbies	£44
Financial Savings	£560	31%	% shopping online	£173
Online Job Search	£1,325	4.7%	% of workforce that are job seekers	£274
Total				**£1,064**

Source BT. 'Digital Inclusion: The Social Return on Investment'. Note: some of the social benefits listed here may be accounted for in the willingness to pay assessment provided in Section 4. To avoid double counting, caution should be taken in combining values from the two assessments.

- **Access to Online Public Services:** as government services become increasingly digitised, digital exclusion will become an even greater problem for those who cannot access fibre broadband. This is just one more factor highlighting the crucial importance of fibre broadband to areas left on the wrong side of the digital divide.

The UK is leading the way in delivering public services online:

- The UK Government runs an estimated 89% of public services online.
- In 2015/16, the government made £339 million of operational savings through digital transformation[40].
- The UK was ranked No. 1 in the 2016 UN E-government Survey, based on delivery of basic economic and social services, education, health, labour and employment and finance, and assessed on:
  - the adequacy of telecommunication infrastructure
  - the ability of human resources to promote and use ICT
  - the availability of online services and content.

40. Cabinet Office, Government announces efficiency savings for 2015/16, 2017. Page 4.

Community Fibre Partnerships Impact Assessment: Social Value

To produce a conservative estimate of economic value relevant to CFP communities, we apply these benefits in Table 6.1 to people aged 75 and over, excluding the value associated with online job search[41]. We apply the value associated with online job search to the estimated number that are currently unemployed in CFP communities[42].

There were an estimated 7,500 people aged 75 and above resident in CFP communities at the time of the 2011 Census. Although many others are likely to benefit, it is this age group that are most likely to not have engaged in significant online activity previously, and which stand to benefit from increased confidence and reduced isolation.

Assuming 35% of those aged over 75 adopt fibre broadband, £XX million in social value will be generated as a result of CFP, over a 15-year period.

Applying the value associated with online job search from the BT research to unemployed residents in CFP locations, and assuming 35% adoption of fibre, suggests a total benefit of £XX million, over a 15-year period.

Healthcare Benefits

Fibre broadband is assisting the healthcare sector to develop and deploy transformative technologies and improve access to healthcare. This is having a multi-faceted impact on medical and health-based industries and patients, as new forms of outreach, remote diagnosis and patient monitoring become increasingly commonplace and deliverable.

Investment in E-Health Services

The government is investing £4.2 billion in NHS England over the next five years in areas such as electronic patient records, apps and wearable devices, telehealth and assistive technologies.

Fibre broadband is also set to change the systems through which patient's access healthcare, with NHS England investing an additional £45 million over the next five years, as part of the General Practice Forward View, to stimulate the use of online consultations.

It is estimated that 10% of patients in every general practice will book appointments and order repeat prescriptions online by March 2018. This digitisation of healthcare services stands to play a vital role in rural areas, where 52% of inhabitants live within walking distance of a doctor's surgery (compared to 62% in urban areas)[43].

Improved Health Outcomes

The development of new applications in the field of healthcare has been facilitated by high speed connectivity. It is also borne out of the need to respond to an ageing population and the growing number of people with long term conditions (LTCs), such as chronic obstructive pulmonary disease (COPD), heart failure and diabetes.

41. Applying population by age at district level from the 2011 Census.
42. Drawing on the latest Annual Population Survey, 2016/17.
43. Townsent, Sathiaseelan and Fairhurts (2013) 'Enhanced broadband access as a solution to the social and economic problems of the rural digital divide'. Local Economy: The Journal of the Local Economy Policy Unit.

NHS England spends 70% of its budget on the 15 million people nationally who have one or more of these conditions. As the population ages, these numbers are expected to grow by 23% over the next 20 years[44]. The current approach to the delivery of care to people with LTCs is unsustainable in terms of cost and quality of care. The advances being made in the field of telehealth offer the possibility of substantially reducing the number of hospital admissions and the unit cost of contact between patient and specialists.

Telehealth technology is significantly improving health outcomes. The Nuffield Trust ran a whole-system telehealth demonstrator trial for 3,100 patients diagnosed with COPD, heart failure or diabetes. It found that telehealth services delivered a 45% reduction in mortality, reduced emergency admissions by 20%, led to 14% fewer elective admissions and 14% fewer bed days[45].

Community Fibre Partnerships Impact Assessment: Healthcare Benefits

The Nuffield trial found that overall costs of hospital care were £1,888 lower among telehealth users with COPD, heart disease or diabetes, than for control patients.

Applying Clinical Commission Group (CCG) data from Public Health England and regional data from the British Heart Foundation we estimate that 9,400 individuals are diagnosed with COPD, heart failure or diabetes in areas benefitting (or set to benefit) from CFP fibre broadband deployments.

Applying the costs savings over our 15-year assessment period and assuming 35% take-up of whole service telehealth, suggests potential costs savings to hospitals of £XX million across CFP communities[46].

Education Benefits

Higher Education

Fibre broadband is an increasing necessity for schools and pupils, to keep pace with changes in the way education is delivered. UK schools currently spend £900 million annually on education technology.

There are close links between educational attainment and fibre internet access. Pupils who grow up in rural communities could be at a disadvantage compared to their urban dwelling peers, as they may be less able to access online learning resources and carry out research-based projects[47].

"The internet plays an important role in our school today, from students researching projects to developing new computing skills which are vital for their working lives ahead. We are looking forward to seeing the benefits of the new high-speed link to our students and staff when it goes live next year."

Paul Gardner, Teacher at Dunedin School, Edinburgh

44. 2020 Health (2010) - Healthcare without walls – A Framework for Delivering Telehealth at Scale.
45. Nuffield Trust (2012). ''The Impact of Telehealth on the use of Hospital Care and Mortality'.
46. This provides broad indication of the scale of cost savings that could be brought about but should be treated with caution. The Nuffield study concluded that there was a need for further investigation to evidence causality. Moreover, these savings cannot be attributed solely to fibre broadband alone. They will also be dependent on further investment to ensure the widespread deployment and take-up of telehealth technologies and services.
47. Turner, 2017 'Poor Broadband puts children's education at risk in rural areas'. The Telegraph, 17th January 2017.

The increasing use of fibre-enabled educational tools and applications extends past primary and secondary education in to higher education and adult learning:

- A recent study of over 7,000 higher education students found that c. 70% thought digital technology improved their learning when used effectively by teaching staff[48].
- Cambridgeshire County Council's Adult Learning and Skills team runs computer and internet classes in some of the county's most remote towns and villages[49], to develop a range of computer literacy skills and promote digital inclusion.

> "This new technology will provide a leap in digital services that will benefit every single member of the school community, pupils, parents, staff and visitors."
>
> **Rob Connolly, Head Teacher at Ditcham Park School, Hampshire**

The evidence outlined here suggests higher educational attainment, enhanced skills and greater employability among those that can access e-learning applications and services. Inevitably this will benefit local businesses in their search for job-ready and skilled employees, result in higher value employment and wages, and facilitate economic growth within communities.

> "Superfast broadband is proving to have many benefits for family life: We can access the fullest high-quality media, which means my young children can take advantage of a raft of educational resources."
>
> **Jon Wohlters, Resident and Community Broadband Campaigner from Coleorton, Leicestershire**

As yet, there is no clear evidence of the strength of the relationship between online learning and higher value employment or economic growth. We have not sought to quantify these effects here but the signs are that they add significantly to the ways in which fibre broadband is strengthening local economies.

48. The Joint Information Systems Committee (Jisc) 2016 Student Digital Experience Tracker 2016: results from the pilot project. Page 22, para 15.
49. Online Centres Network, 2015 'Rural Centres: Cambridgeshire Adult Learning and Skills'.

7. Environmental Impacts

On top of economic and social benefits, fibre broadband reduces business and commuter travel and energy use, resulting in CO^2 abatement. It does so through a range of mechanisms:

- **Dematerialisation:** in recent years fibre broadband has fuelled a shift in production and consumption of news, books, music and films to digital platforms. This reduces the need to manufacture, publish, print and ship a range of physical products and results in reduced carbon emissions.
- **E-commerce:** fibre provides a more seamless online shopping experience and drives increased e-commerce, both business to consumer (B2C) and business to business (B2B). E-commerce reduces the need for commercial, retail and wholesale floorspace and associated energy requirements.
- **Video conferencing:** fibre has made video conferencing services an effective and accessible option for most businesses. Roll-out to businesses not yet receiving fibre will allow them to take part in video meetings and avoid business travel.
- **Cloud computing:** enabling widespread and seamless use of online file sharing and business process applications (e.g. CRM and HR systems). This supports a rise in home/remote working (and so a decrease in business and commuter travel) and reduces the need for physical IT equipment and associated production and energy use.
- T**elecommuting:** everyday use of cloud and video conferencing and the more general rise of online communications and commerce has opened the opportunity for many to work and do business remotely and from home. This reduces commuter travel and congestion.

The distance travelled to shop, work and attend face-to-face meetings is greater for residents in more isolated areas. The power of fibre-enabled telecommuting, e-commerce and videoconferencing to reduce these journeys will be greater than in urban areas.

> "We have been able to cut costs and address our environmental responsibilities by reducing the amount of paper we use. We print fewer catalogues, and we present our promotions, letters, invoices and statements online to customers wherever we can."
>
> **Chris Jones, Managing Director of Corgi Socks, Carmarthenshire**

Community Fibre Partnerships Impact Assessment: Carbon Abatement

The Carbon Trust worked with Openreach to assess carbon abatement from a breadth of broadband enabled applications. The resulting method paper sets out the evidence and approach taken to assess carbon abatement across a number of areas.

Using the Carbon Trust assessment, we have applied CO^2 reductions per user per annum for de-materialisation, e-commerce, telecommuting and video conferencing. These are applied to households and businesses covered by Community Fibre Partnerships to provide an estimate of total carbon savings over our 15 year impact assessment period.

Table 7.1: Community Fibre Partnerships Impact Assessment: Carbon Emissions Reductions Impacts, Applying Carbon Trust Methodology

	Carbon Trust CO^2 Reduction Per Unit, pa (kg)	Unit of CFP Measurement	CO^2 Abatement Units/Users	CO^2 Abatement Over Per Annum, (tonnes)*	Over 15 Years (tonnes)**
De-materialisation	31	Residential Connections	42,300	460	5,600
E-commerce	83	Business Connections	3,700	110	1,300
Flexible/ Home Working	950	Telecommuters	800	270	3,300
Video Conferencing	28	Number of conference calls	2,200	1,150***	14,100
Total			**9,000**	**1,980**	**24,300**

Source: Regeneris Consulting; Carbon Trust (2016). 'BT's 3:1 Carbon Abatement Methodology'.

*based on 35% fibre adoption. **based on fibre adoption rising to 35% over five years. *** based on an average of one call per fibre adopting business per week.

Our estimates of environmental benefits are likely to be conservative. We apply average carbon reductions per user from UK-wide data, but (as stated above) the effect of broadband on carbon abatement is likely to be especially pronounced in the often rural communities covered by CFPs.

Over a 15 year period, carbon abatement resulting from de-materialisation, e-commerce, telecommuting and video conferencing will total 24,300 tonnes of CO^2.

Annually, this is equivalent to the carbon emissions produced by more than 3,000 drivers, or 5% of all drivers in CFP communities[50].

50. Based on: average kilometres driven per driver from the 2016 National Travel Survey; average CO2 emissions produced by cars, per kilometre from DfT Vehicle Statistics; the proportion of those aged 17+ with a full driver's license from the DVLA.

8. Summary of Overall Benefits

This report has explored the diversity of benefits delivered through the Openreach investment in fibre, in areas that remain without the high-speed fibre broadband that is now available to the vast majority of people across the rest of the UK. Significant benefits will arise from:

- delivering on the ground and financial support to groups looking to bring fibre to their community where commercial investment has not materialised
- the added resilience afforded to community economies by tackling challenges associated with a lack of business investment, an ageing population and retaining a local workforce
- the economic value residents' place on fibre broadband and increases in house prices derived from its availability
- greater community engagement and well-being and reduced isolation
- access to an emerging set of healthcare and educational technologies and services
- reductions on carbon emissions and pollutants.

We have also estimated the scale of benefits that will arise as a result of Openreach's commitment to extend fibre to over 60,000 premises[51] in communities across the UK through its Community Fibre Partnerships programme. Over a 15 year period we estimate that CFP will lead to the following benefits:

- businesses in CFP communities to date stand to generate £XX million for local economies across the UK
- residents in CFP communities to date will benefit from around £XX million in economic value, mainly through increased housing values
- the monetised value of social, educational and health benefits will total around £XX million
- An estimated 24,300 tonnes of carbon emissions that would have otherwise entered the atmosphere, will be saved as a result of CFP.

In total we estimate that the economic and social impacts generated by Openreach's Community Fibre Partnerships will be just over £XX billion over 15 years[52].

These impacts provide an indication of the larger scale benefits that will be achieved through Openreach's wider investments in fibre for communities. The findings overall set out a compelling case for continued investment in fibre broadband networks, and in locations that lag the rest of the UK on broadband capability in particular.

51. As of December 2017. More premises will have been contracted subsequently.
52. This excludes resident user benefits, to avoid double counting impacts associated with increased housing wealth.

Table 8.1: Community Fibre Partnership Impact Assessment: Headline Impacts Over 15 Years

Business Impacts	
Productivity	£xxm
Innovating & Opening New Markets	£xxm
New Business Creation	£xxm
Flexible Working Benefits	£xxm
Total Business Impacts	**£xxm**
Economic Benefits for Residents*	
Resident Use Value	£xxm
Increased Housing Wealth	£xxm
Social Benefits*	
Social Value: 75+ year old residents only	£xxm
Access to Employment: through online job search	£xxm
Healthcare technology	£xxm
Total Social Benefits	**£xxm**

Source: Regeneris Consulting. *Caution should be taken in summing impact values. No total economic benefit for residents is provided; there is likely to be some cross-over between resident welfare benefits and increased housing wealth. Some of the economic benefits to residents may also be accounted for within social benefits.

Appendix A

Community Fibre Partnerships: Fibre Technologies

CFP deployments adhere to the same standards of construction and installation as those associated with nationwide rollouts. Fibre components within the local network may rely on elements of the existing copper infrastructure or be overlaid by end-to-end fibre.

Openreach has a selection of fibre solutions at its disposal to achieve superfast and ultrafast outcomes. These are outlined below and are at various stages of maturity, with some technologies expected to become increasingly important in future deployments.

Table A.1: Openreach Fibre Broadband Technologies

Technology	Summary	Speed Capability
Fibre to the Cabinet (FTTC)	• Fibre-copper hybrid solution • Most widely-deployed technology across the UK • Reliant on existing infrastructure • Subject to incremental performance uplifts	Superfast
Fibre to the Premise (FTTP)	• Pure fibre solution • Increasing component of Openreach network • Suitable in rural and urban settings • Highest specification Openreach technology	Ultrafast
FTTP on Demand	• Offered in conjunction with FTTC • Subject to different ordering process and additional installation fees	Ultrafast
G.Fast	• Currently under trial • Operates in conjunction with FTTC to offer increased performance • Widespread deployment anticipated	Ultrafast

Source: Openreach

At present, CFP rollouts have mainly used FTTC (90%), with FTTP deployed in remaining locations (10%). The evolution of Openreach's technical mix and pending the results of ongoing field trials, means this balance is likely to change in the future. It is anticipated that FTTP will become an increasingly prominent solution, while new build development sites will also see full fibre installed as the preferred technology of choice.

Appendix B

Estimating CFP Business Impacts

To produce estimates of economic growth (through Gross Value Added, or GVA), and employment, a baseline GVA and employment position has been formed for the locations that stand to benefit from the CFP deployment. This draws on the following data:

- forecast CFP premise coverage: provided by BT (over 60,000)
- estimates of the business : premise ratio at local authority level: using DCLG data on residential dwellings, CoStar.com business premise data and ONS Business Counts (enterprise data)
- GVA per business, based on:
  - ONS Regional GVA data by sector
  - employee data from the ONS Business Register and Employment Survey (BRES)
  - average employees per micro, small, medium and large business, by sector, from the Annual Business Inquiry (ABI).

We have applied a 20% dampening factor business:premise ratio for communities that lie outside of cities and larger towns. This reflects the lower proportion of business premises situated in smaller towns and villages versus more densely populated areas within any given local authority area.

Modelling Assumptions
All impacts have applied the following:

- a 15-year assessment period consistent with European telecommunication infrastructure assessment guidance
- a 3.5% discount rate consistent with HM Treasury's Green Book[53]
- a combined multiplier effect of 1.25. Each of the six channels of impact that have been assessed are multiplied by this figure to account for the knock-on benefits generated due to increased employee/resident spending power (induced multiplier effects) and increased supply chain purchasing by businesses (indirect multiplier effects)[54].

Adoption
We assume that adoption of broadband amongst businesses rises to 35%, although take-up is assumed to be higher from knowledge-based businesses, lower among other manufacturing firms and lower still within other service sectors. It is also assumed that larger businesses adopt at a faster rate. This is a conservative assumption that draws on Openreach adoption rates to date.

Time Dependency
Our modelling of productivity and innovation impacts has assumed the following build-up periods:

- broadband services enabled: one year after the start of network build
- 35% adoption rate reached: after five years
- productivity benefits achieved: one year after adoption
- innovation benefits realised: four years after adoption.

53. HM Treasury Green Book Appraisal Guide. Indirect multiplier effects have not been factored into the assessment of private household benefits.
54. HM Treasury Green Book Appraisal Guide. Only induced impacts applied in the assessment of private household benefits.

Sector Analysis
We have applied the following sector definitions for knowledge intensive and other service sectors from the Standard Industrial Classifications (SIC):

- knowledge based: information & communication (J), financial & insurance (K) and professional, scientific & technical (M) activities
- other services: transport & storage (H) and administrative and support service activities. Wholesale and retail (G) and other service activities (S) have been excluded from the assessment as the benefits from broadband are currently less clear.

Technological Change
The benefit to businesses of high speed broadband will increase over time, as new and improved applications will emerge in reaction to the enhanced capabilities offered by fibre broadband. As businesses make use of these applications they will be able to generate new impacts.

Based on available research, it is difficult to predict the exact scale of these effects and project the associated benefits in the future. To account for this, we have applied a conservative assumption that technological change will lead to a 2.5% uplift on all productivity and innovation impacts in the short term (after 5 years), a 5% uplift in the medium term (after 10 years) and a 7.5% uplift in the long term (after 15 years).

New Business Creation
A peak increased growth rate of 1.5% is applied to knowledge based sectors, whilst a 1.2% growth rate is applied across other manufacturing and construction and other services sectors, as a result of fibre broadband connectivity. This compares to estimates produced by Etro (2009) suggesting growth in business creation of up to 1.7% per annum[55].

It is assumed that the annual business growth rate builds up to a peak rate in year 5, then persists in years 6 to 8 before decreasing by 10% per year thereafter. Survival rates are applied across two broad sectors (knowledge based firms and 'other services'[56]) based on National Statistics business counts data.

It is assumed that 99% of start-ups established in year one are micro businesses (0-10 employees) and by year 15, business sizes have grown to reflect the national average[57]. Average employee numbers for each area are applied across micro, small and medium sizes and large businesses for each sector drawing on the 2008 Annual Business Inquiry.

Economic impact estimates have been generated by applying GVA per worker figures across knowledge based industries, manufacturing and construction and other services. The proportion of GVA created by new businesses attributed to CFP fibre rollout is programmed to fall to zero over a five-year period, with the first employees within start-up businesses being counted for one year.

55. Applies estimated SME business creation across the UK of 34,843, 1.7% of the total number of SMEs at the time according to National Statistics Business Counts, 2009. Etro, F (2009). 'The Economic Impact of Cloud Computing on Business Creation, Employment and Output in Europe'.
56. The knowledge based sector covers information & communication, financial & insurance and professional, scientific & technical activities. Other services cover transport & storage and administrative & support service activities.
57. This projected level of business growth means that 95% will still be micro firms after a 15-year period.

Flexible Working Impacts
Rates of flexible working are programmed to increase at roughly the same rate that has been achieved through the move from basic (<2Mbps) to superfast broadband. This assumes increases will occur at the following rates:

- 3% per annum in the financial and professional services sector (the sectors most likely to utilise these technologies)
- 1% per annum in all other sectors

Baseline GVA estimates have been generated by applying GVA per worker figures across knowledge based industries, manufacturing and construction and other services.

Notes

Notes

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www.communityfibre.openreach.co.uk