



Beyond Broadband



How our communities can get the digital networks they need

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First published in Great Britain in 2010 by the Independent Networks Co-operative Association (INCA).

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Second edition (revised and extended) published in January 2012.

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INCA would like to thank Point Topic for its help in researching this booklet.

Special thanks to Roger Darlington and Adrian Wooster for their contributions about the costs of NGA and mapping, respectively.

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FOREWORD

Broadband has transformed the way that many of us live, work and play. In the words of the Digital Britain report: “We are at a tipping point in relation to the online world. It is moving from conferring advantage on those who are in it to conferring active disadvantage on those who are without.”

Yet many people live in parts of the UK where broadband still isn't available or cannot deliver the performance they need to become fully engaged online. And already many countries are moving on to the next level – broadband over optical fibre – to enable video-rich applications and entertainment, to facilitate small businesses and home working, and to support multiple users in each household.

The UK has been slow to deploy next-generation access and fibre-to-the-home. As a country we do not feature in the FTTH Rankings – a league table of nations where at least 1% of households subscribe to broadband over fibre connections. Indeed, analysts estimate that the UK lags the leading fibre nations like Japan and Sweden by at least five years.

The cost of delivering next-generation access is high and reaching 100% coverage is currently beyond the scope of the major private sector players. This means that without co-ordinated regional and local action, many areas will be left without high-speed broadband for many years to come.

INCA's vision is to achieve 100% coverage as quickly as possible, nobody left behind. To get there, particularly in areas where commercial operators are less likely to invest, INCA advocates a partnership approach that brings together public, private and community sectors to plan next-generation access regionally and locally. It is our belief that by working together, sharing knowledge and experience, we will facilitate investment, encourage innovation and speed up deployment to deliver a truly next-generation broadband Britain.

This booklet is an important part of the process of sharing knowledge and information. It was conceived as a companion document to the *FTTH Business Guide*, a publication from the FTTH Council Europe that offers practical advice on the business case for fibre-to-the-home. The *FTTH Business Guide* analyses the high-level issues in fibre deployment, focusing on the major influences on income and expenditure and their effect on the business plan. This booklet homes in on UK-specific issues, including public policy, industry stances, sources of guidance and information, and different project approaches – in other words, what works and where.

Feedback on the first edition was very positive. However, this is a rapidly developing industry, and much has changed in the 18 months since the guide was originally published. The second edition has been extensively revised and updated to take these changes into account. We hope that it will continue to be a valuable resource to all those involved in the next-generation broadband scene in the UK.



Malcolm Corbett, CEO of the Independent Networks Co-operative Association

What is broadband?

When broadband first appeared in the late 1990s, it was characterised by two things: it was always on, allowing customers to surf the internet and make phone calls at the same time, and the speed of data transfer was faster than dial-up modems. Today the term broadband is synonymous with always-on access to the internet regardless of the technology used.

A caveat: although the term broadband is becoming increasingly diluted, it usually refers to the sort of affordable internet access offered to consumers and small businesses, not to the bespoke high-capacity internet connections for the enterprise market.

What is superfast broadband?

Superfast broadband originated as a marketing term without a strict definition, but Ofcom is now using it to describe broadband speeds greater than 24 Mbps. The significance of 24 Mbps is that this is the maximum possible speed for broadband delivered over existing copper telephone lines.

What is next-generation access?

The majority of homes and small businesses in the UK currently receive broadband services through the access network that connects them to their local telephone exchange via a twisted-pair copper cable. The term next-generation access (NGA) describes a significant upgrade to the access network.

In NGA networks, some or all of the copper in the network has been replaced with fibre. Since fibre is capable of sustaining much higher data transmission speeds over longer distances than copper cable, NGA is the key enabler for faster broadband. It is generally accepted that NGA includes fibre-rich infrastructure and technologies such as fibre-to-the-cabinet (FTTC), fibre-to-the-home or premises (FTTH/FTTP) and upgraded cable TV networks.

There has been some confusion about the difference between broadband and NGA. Broadband is a service that provides a connection to the internet; NGA is the physical cables and equipment to deliver the service.

Bandwidth, bits and bytes

The performance of a broadband connection is most often described by its bandwidth. This is the amount of digital data that can be sent or received in a given time, measured in bits per second. A bit is the smallest unit of information, either 0 or 1, in the digital language of computers.

Dial-up modems connected at 56 thousand bits per second (kilobits per second or kbps). Today the average download speed of broadband connections in the UK is over 100 times faster at 6.8 million bits per second (megabits per second or Mbps), according to the latest information from Ofcom (May 2011).

Like hard disk capacity, the total quantity of data is measured in bytes rather than bits, where a byte equals eight bits. A typical email is just a few thousand bytes (kilobytes or kB), while standard quality BBC iPlayer requires a continuous 800 kbps of throughput; so watching a 30-minute programme would consume 180 million bytes (megabytes or MB) of data.

A number of internet service providers (ISPs) in the UK have introduced bandwidth allowances, which place an upper limit on the total amount of data consumed during the month, typically 10 billion bytes (gigabytes or GB) for any entry-level broadband account. Consumers exceeding their allowance may incur penalties, such as a surcharge on their bill or have their connection “throttled” (reduced in speed).

A 10GB data allowance will allow hundreds of hours of web browsing, but it is not particularly generous for streaming video. For example, using an online video service such as LoveFilm or the recently launched Netflix to stream a 90-minute film in high definition at 5 Mbps would consume 3.4 GB. Future applications are likely to make even heavier use of video.

While many ISPs advertise “unlimited” broadband services, such accounts often come with fair use policies, which could include higher fixed data usage limits (e.g. 300 GB), or more general wording invoking unspecified penalties for “heavy users”.

Latency and interactivity

The bandwidth of a broadband connection is often called speed, but strictly speaking it is the capacity – the amount of data arriving in a given period of time. Bandwidth doesn't actually tell you how long the data takes to travel over the internet to your computer. The time delay between sending out the data at one end and receiving it at the other is usually called latency.

When you run a speed test on a broadband connection, you will notice that it outputs three numbers: download speed, upload speed and the "ping". The ping is the time it takes for a small packet of data to travel to the nearest server and back, and this provides a way to measure latency. A high latency connection generally suffers from long time delays. A low latency connection will be more responsive.



Testing broadband performance using speedtest.net

Both bandwidth and latency affect how long it takes to move data. For example, in a publicity stunt in South Africa, Winston the carrier pigeon was declared faster than broadband. The pigeon had a huge capacity (a 4GB data stick strapped to his leg), and even though his speed was relatively slow (he took two hours to fly 96km), his average rate of data transfer was higher than the broadband connection. In the same time, just 4% of a 4 GB file had downloaded over ADSL.

Latency can be the reason that some broadband technologies, while they appear to have plenty of bandwidth, sometimes perform less well than expected. Sources of delay include long physical journey times (satellite networks), multiple levels of data processing (older mobile data networks), and network congestion. It is important to remember that bandwidth alone is not enough to describe how well a broadband connection will perform in real life.

DEFINITIONS OF SPEED

Advertised speed is the speed that ISPs use to describe the packages they offer to consumers. They are usually expressed as "up to" speeds because they are only a guide to the speed the ISP can provide. Few subscribers (if any) can get the "up to" speed of service advertised by internet providers, something that is the source of consumer dissatisfaction and much debate.

Line speed is usually the maximum speed a customer's telephone line can support, which depends on factors such as distance to the telephone exchange and line quality. The line speed will always be slightly higher than the speed the customer actually experiences because 10–15% of transmitted bits are protocol overheads used to manage the connection.

Throughput speed is the actual speed a consumer experiences at any particular moment when they are connected to the internet. This figure is dependent on many factors, including the ISP's traffic management policy, the number of subscribers sharing the local connection (contention), network congestion in the internet, and the speed of the target website's connection to the internet. Poor in-home wiring and old computer equipment can also reduce throughput.

Perfect symmetry?

The majority of broadband services are designed to be asymmetric, which means that the bandwidth available for downloads (from the network to the user) is greater than that available for uploads (from the user to the network). Historically, internet use has been dominated by downloads, but that is changing. Upload speed is becoming increasingly important as more people become creators of content, uploading photographs and video clips to social networking sites, for example. Poor upload speeds can also restrict the use of interactive services based on two-way video communication, cloud-based applications such as internet back-up, photo or video storage, software-as-a-service, and thin-client applications that run on a remote server. An adequate upload speed is the key, rather than symmetry in itself.

Asymmetric Digital Subscriber Line (ADSL)

ADSL is the technology used to provide the first-generation of broadband connections over existing copper telephone lines, and has been deployed on a mass scale around the world. Data is transmitted over the telephone line at frequencies that are too high for the human ear to hear. A DSL filter, known as a “splitter”, fitted to the telephone socket inside the house breaks out the frequencies for voice from those used for data, and sends them to the correct piece of hardware (telephone or computer). At the other end of the line in the telephone exchange, a so-called DSL Access Multiplexer (DSLAM) separates the voice and data traffic so that it can be carried over the phone company’s separate voice and data networks.

ADSL, which is available in all but a handful of UK telephone exchanges, offers headline speeds of 8Mbps. However, the speed a user actually receives depends on a number of factors. ADSL works better over shorter distances from the telephone exchange to the customer premises. Other factors like the quality of the copper and connectors, aluminium cables in the network and line-sharing devices (DACs) also affect the service. Hence it is estimated that around 10% of homes and businesses cannot get a 2Mbps service from their connection and around 166 000 cannot get any sort of ADSL broadband.

BT is in the process of rolling out 21CN (an abbreviation for 21st Century Network), which is long-term project to upgrade the core of the network so that it can carry both voice and data – for the simple reason that it is more efficient to manage one network rather than two. Related to this programme, BT is replacing DSLAMs in the exchanges with new equipment that supports ADSL2+. ADSL2+ has a headline speed of 24Mbps, which can represent a significant bandwidth boost for some. But, like all copper-based technologies, the speed of ADSL2+ depends on line quality and distance; beyond 3km from the exchange there is no real speed advantage over ordinary ADSL. An estimated 50% of telephone lines are capable of speeds above 8Mbps, with the majority remaining in the 8–12Mbps bracket.

Fibre-to-the-cabinet (FTTC)

FTTC boosts broadband speeds by shortening the distance from the electronic equipment to the customer. This involves laying fibre-optic cables from telephone exchanges to green street cabinets or their equivalent, and installing faster VDSL2 equipment in the street cabinet to provide broadband over the remaining few hundred meters of telephone line.

The speed offered by VDSL depends on its “profile” which is essentially the set of frequencies used. The most common configuration in the UK today offers up to 40Mbps download. As with other copper-based technologies, top speeds are only available for users located next to the cabinet. Speed decreases rapidly with distance from the cabinet, and at distances beyond 1 km VDSL2 offers ADSL-like performance. The average distance from the street cabinet to customer is around 300m, so the majority of end users can expect to see broadband speeds in the region of 25Mbps with this approach.

Cable networks

Modern cable television networks are often described as hybrid fibre-coax because they already contain significant amounts of optical fibre. Fibre has been laid to street cabinets, then coaxial cable is used to reach homes, serving 500–1 000 homes per cabinet. Unlike telephone lines, however, coaxial cable was designed to transmit high-frequency electrical signals so it can carry more information. Most of that capacity is given over to TV channels; the amount allocated to broadband depends on the cable operators’ equipment and its configuration. In addition, the coaxial segment of the network contains amplifiers to boost the signal, so that the data rate is not affected by distance.

Aside from the choice of service package, the main influence on the speed a customer actually receives is the fact that customers share the broadband channel on a section of coaxial cable. In the downstream direction, data is received by all cable modems; the modem decodes only the data addressed to it. As a result, data rates can drop off noticeably at busy times when lots of customers are using the network.

Fibre to the home or premises (FTTH/P)

FTTH networks use fibre all the way to customer properties, usually terminating at a box on the wall. The capacity of fibre is so high that to all intents and purposes it can be considered to be unlimited. The actual speed of the connection depends on the choice of equipment. FTTH operators around the world are providing broadband at 100Mbps and even 1Gbps.

Gigabit Passive Optical Network (GPON) uses shared optical fibres to reduce deployment costs. Fibres are installed in a tree and branch (point-to-multi-point) configuration. GPON is termed “passive” because there is no need for electronic equipment in cabinets in the field – instead “passive splitters” at branching points share light across multiple fibres.

Point-to-point (P2P) fibre networks, also known as “home run” networks, provide a dedicated fibre to each end user. This configuration offers the highest capacity upstream and down. P2P networks are easier to upgrade than GPON because there is no sharing of infrastructure so users can be upgraded individually.

What about wireless ...

Wi-Fi (IEEE 802.11) is an important technology for wireless connectivity around the home and for enabling “hot spots” at internet cafes, for example. It is usually specified at 54Mbps over up to 30m, although actual throughput depends heavily on signal strength and the number of users on the network.

WiMAX (IEEE 802.16) provides similar broadband performance to Wi-Fi, but over a wider geographical area, up to ~30 miles for fixed connections. Fixed wireless connections use larger aerials mounted on homes to boost signal reception and get higher speeds over greater distances. A number of community broadband projects around the UK are using WiMAX.

LTE (Long Term Evolution) is the emerging fourth generation of mobile broadband technology, which can provide peak download speeds of 100Mbps per user, although the actual capacity will depend on the amount of spectrum allocated to the service. Fixed LTE services are currently being trialled in the UK, but wide-scale deployment by mobile operators is unlikely to begin until more spectrum is allocated. Auctions have been delayed but should take place in 2012.

The role of mobile broadband is still being debated, but for the next few years at least it is expected to provide a niche solution – access to broadband on the move – rather than a direct substitute for fixed-line broadband. One reason for this is price – mobile broadband plans tend to be more expensive and have lower usage allowances than fixed-line broadband.

And satellite?

Satellite broadband can also be considered a form of wireless technology because it transmits signals through the air rather than over wires. Thanks to the launch of high-capacity satellites, consumers can use satellite broadband to access the internet at typical speeds of 4–10Mbps. The main advantage of satellite broadband is ubiquity: it is available anywhere with a reasonable view of the southern sky (the satellites are in geostationary orbits around the equator). The cost of the equipment (satellite receiver and modem) has come down considerably in recent years.

The main drawbacks are higher latency than fixed-line broadband and more restrictive usage allowances. Even at the speed of light, the signal takes almost half a second to travel to the satellite and back – although acceleration techniques can help to minimize the perceived delay. Satellite broadband also has tighter restrictions on usage than terrestrial services simply because of the higher cost of providing the bandwidth.

The technology hierarchy

INCA promotes the idea that there is a hierarchy of technologies: they are not all equal. All possibilities to provide the network using a “better” technology should be exhausted before settling for a lesser one, depending on local conditions. Generally speaking, in descending order of desirability the technologies are:

- Fibre to the Premises – P2P
- Fibre to the Premises – GPON
- Cable networks
- Fibre to the Cabinet
- Long range wireless
- ADSL and related technologies
- Satellite

Why? Technologies at the top of the list provide the highest speeds with the greatest flexibility and ease of upgrade in the future; going down the list both speed and upgrade potential become increasingly restricted.

Background

Technology never stands still. Having completed a range of measures to promote the roll out of first-generation broadband, it soon became apparent to the Government that other countries in Europe were investing in infrastructure capable of delivering even higher speeds. What should the Government do? Was the economic competitiveness of the UK in jeopardy?

The development of UK broadband policy can be chronicled through the publication of several key reports. The debate was opened up by the Broadband Stakeholder Group (BSG) in 2007 with *Pipedreams? Prospects for Next Generation Broadband Deployment in the UK*, which laid out the issues confronting the UK in rolling out new access network infrastructure. BSG then commissioned Analysys Mason to study fibre deployment costs, and calculate the investment needed to roll out NGA across the whole of the UK. The headline figure was between £5 billion and £29 billion depending on the approach chosen – clearly a substantial sum (see Creative Accounting, p12). So the Government asked Francesco Caio, former chief executive of Cable & Wireless, to carry out a comprehensive and independent review of broadband in the UK, paying particular attention to barriers to investment, which was also published in 2008.

In 2009 this was followed with a series of strategy papers under the banner “Digital Britain”, which were to inform new policy in this area. The final Digital Britain report took a wide-ranging view of communications strategy, covering topics as diverse as digital inclusion, the digital TV switchover, digital radio, public service broadcasting, the role of the BBC, online copyright, monetization of content, and addressing IT skills shortages.

From the point of view of improving broadband infrastructure, the plan had two stages:

1. A universal service commitment (USC) to provide 2Mbps to all UK households by 2012; and
2. Coverage to 90% of homes with NGA at speeds of 40Mbps or more by 2017, which would be market-led for two-thirds of the population, with subsidies available for the remainder.

To meet the objectives outlined in Digital Britain, the Government created a delivery body, christened Broadband Delivery UK (BDUK). This body was initially to concentrate on delivering the USC, using £200 million from the Digital Switchover Help Scheme underspend and the Strategic Investment Fund.

KEY POLICY PUBLICATIONS

April 2007	<u>Pipe Dreams? Prospects for Next Generation Broadband Deployment in the UK</u> Report by the BSG Executive.
September 2008	<u>The Costs of Deploying Fibre-Based Next-Generation Broadband Infrastructure</u> Final report for the BSG by Analysys Mason.
September 2008	<u>Review of Barriers to Investment in Next Generation Access: Final Report</u> by Francesco Caio (also called The Caio Review).
June 2009	<u>Digital Britain: The Final Report</u> by Department for Culture, Media and Sport
March 2010	<u>An Assessment and Practical Guidance on Next Generation Access (NGA) Risk in the UK</u> by Communities and Local Government.
October 2010	<u>The Costs and Capabilities of Wireless and Satellite Technologies - 2016 snapshot</u> Report for the BSG by Analysys Mason
December 2010	<u>Britain's Superfast Broadband Future</u> The Government's vision for a superfast broadband network in the UK

The Final Third

Digital Britain introduced an important concept, the so-called “Final Third” – the areas left behind by the current wave of commercial NGA deployment plans. In March 2010, the Department of Communities and Local Government (DCLG) published an *Assessment and Practical Guidance on Next Generation Access Risk in the UK*, which identified areas likely to become part of the Final Third. These are predominantly rural areas due to the higher cost of installing fibre, but some urban populations may also be at risk as a consequence of social deprivation. Note that the Final Third occupies 85% of UK land mass.

Coalition government policy

Following the change in government in May 2010, new objectives were issued by Jeremy Hunt, Secretary of State for Culture, Olympics, Media and Sport, who is responsible for broadband policy under the Liberal Conservative coalition government:

1. The universal service commitment of 2 Mbps is still a target, but the timeline for achieving this was pushed back until the end of the current parliament in 2015; and
2. A new undertaking to deliver NGA: “Our goal is simple: within this parliament we want Britain to have the best superfast broadband network in Europe.”

In essence, BDUK has been tasked with achieving both the USC and superfast broadband in the same timeframe, and so both objectives have been rolled into a single approach. The plan is to use superfast broadband to solve the USC problem wherever practical, cost effective and affordable. Where other solutions are necessary, BDUK seeks to promote technologies with an upgrade path to superfast broadband to minimise wasted investment.

The Government wants to “unlock private investment” in NGA. South Korea provides the inspiration – its broadband program was Government led, but 95% funded by the private sector. To encourage private sector investment, the Government has been examining measures that will reduce the cost of fibre deployment, such as sharing of ducts and poles and other utility infrastructure.

Targeted interventions are being made in the Final Third. The Government is advocating a national policy with a local approach – NGA procurement projects are led by county councils, sometimes in partnership with neighbouring councils, with BDUK acting as central bankers and advisers to these local programmes.

Funding of £530million has been allocated to broadband for the period up to 2015, including £230million as previously pledged, and a further £300million from the BBC licence fee. The licence fee settlement includes a contribution of £150million per year for broadband in the four years between 2013/14 and 2016/17, taking the potential funding period beyond the end of the current parliament.

BDUK funding allocations

To date, over £420million of funding has been allocated to counties based on BDUK’s analysis of their broadband needs. Local authorities must use this money to procure a solution that brings “basic broadband” at 2Mbps to everyone, and “superfast broadband” – defined as a headline speed of 24Mbps or greater – to at least 90% of the population.

Following an initial information-gathering exercise, BDUK announced four pilot projects in Cumbria, North Yorkshire, the Scottish Highlands & Islands and Herefordshire. A fifth pilot project in Rutland was later added. Three more projects – Devon and Somerset, Norfolk, and Wiltshire – were approved in the second wave, followed by funding allocations to all counties.

In order to draw down the funding, counties are expected to develop a Local Broadband Plan and seek match funding from other public and private sources since the BDUK funding is far from the total required. BDUK has recently set a deadline – counties wishing to access funding must have submitted their draft Local Broadband Plans by the end of February 2012.

BDUK has issued guidance to local authorities and is setting up a procurement framework of major suppliers, both measures designed to assist counties with little experience of developing major broadband projects. Most are expected to adopt a “gap funding” approach where the BDUK funding, when added to investment from other partners, will make the difference between viable or non-viable business cases.

Rural Community Broadband Fund

The funding from BDUK is expected to extend the reach of superfast broadband to 90% of the population: that still leaves 10% outside of the current plans. To address this gap, the government set up the Rural Community Broadband Fund (RCBF). Jointly funded by BDUK and DEFRA, RCBF will make up to £20 million available for small community projects to implement superfast broadband services in areas that have been identified as being part of the 10% in Local Broadband Plans.

Community projects must be able to demonstrate demand for superfast broadband and the means to make it happen at reasonable cost. Launched in November 2011, applications for the first round of the RCBF must be submitted by 31 January 2012. For details, see: rdpenetwork.defra.gov.uk/funding-sources/rural-community-broadband-fund

Urban Broadband Fund

In the Autumn Statement 2011, the Chancellor George Osborne announced that £100 million would be made available so that up to 10 cities would become super-connected with 80–100 Mbps broadband.

The four capitals – London, Edinburgh, Cardiff and Belfast – will benefit while other cities will be chosen through a competition. UK cities with more than 150 000 dwellings can apply: they are Birmingham, Bradford, Bristol, Glasgow, Leeds, Liverpool, Newcastle, Nottingham, Manchester and Sheffield.

To claim a share of the fund, cities will have to show how they will use super-connected status to drive growth, with a particular focus on SMEs and strategic employment zones. Proposals will also need to include plans for city-wide high-speed mobile connectivity.

Proposals have to be submitted by 13 February 2012 and the successful cities will be announced in the Budget in March. The Government will then work with the successful bidders to produce fully developed plans and the money allocated to each city will be announced in July. Bidding cities will be expected to contribute to the total project cost by providing additional investment or using public assets.

For more details see: www.culture.gov.uk/publications/8729.aspx

Mobile Infrastructure Project

Also in October 2011, the Chancellor committed a further £150 million to improve mobile coverage and quality with the aim of extending coverage to 99% of the population. Although the chief aim is to eliminate voice “not-spots” in places where people live and work, ideally new infrastructure will be 4G-capable so that it can also provide mobile broadband. Industry views are being sought on the best way to proceed, so that DCMS can begin the procurement process in the spring of 2012 and consumers can start to benefit from 2013. The procurement is dependent on getting state-aid clearance from the European Commission. For more details, see: www.culture.gov.uk/what_we_do/telecommunications_and_online/8757.aspx.

European broadband policy

Against the backdrop of developments in the UK, there have been significant policy developments in Europe. In the Digital Agenda for Europe, Commissioner Neelie Kroes and the Directorate General for the Information Society (DG Infosoc) have stated an ambition that by 2020 all citizens of the European Union should have access to broadband speeds of at least 30 Mbps downstream and half of citizens should have taken up services offering 100 Mbps. These are extremely bold targets – such high take-up of 100 Mbps services implies almost universal availability.

On 20 September 2010 the European Commission published a broadband Communication, which describes measures necessary to achieve those targets. All European member states are expected to set national broadband targets and adopt operational plans in line with the European broadband targets. For details see: [European Broadband: investing in digitally driven growth](#)

In October 2011 the Commission proposed a budget of almost €9.2 billion from 2014 to 2020 for pan-European projects to meet the Digital Agenda objectives. If approved, the funding, part of the proposed Connecting Europe Facility, will take the form of both equity and debt instruments and grants, to complement private and public investment. The Commission hopes to leverage this investment to produce between €50 and 100 billion of investment – a substantial proportion of the estimated €270 billion needed to meet Digital Agenda broadband targets.

Fibre-optical cables are a business asset and as such will attract non-domestic property rates. The Valuations Office Agency (VOA) is responsible for setting the rateable values for fibre-optic telecommunications networks, which are reviewed every five years; the period of the current list is 2010 to 2015.

Fibre-optic cables are assessed according to values laid out in a table called the “tone of lists”, which relates to the distance, amount of fibre in the scheme and the number of fibres lit. The rateable values start at £1 500 for a single lit fibre of 1 km length outside London and go up from there. The bill must be paid by the company that lights the fibre.

At the opposite end of the scale, BT’s extensive fibre network is deemed too complicated to assess on this basis, so the rates liability is calculated according to the Receipts and Expenditures (R&E) method. The overall assessment is adjusted by an unpublicised formula relating to BT’s market share. As a result, BT’s rates bill has fallen in recent years even though its fibre network has grown substantially.

A barrier to investment

Alternative operators typically pay rates according to the “tone of lists” and the bill can add up to a hefty sum, particularly in rural areas where longer runs of fibre will be needed to reach the population centres. This creates a disincentive for small or new entrant operators to invest in fibre; the smaller the network, the larger the rates bill relative to the operator’s budget.

There is widespread acknowledgement that the business rates charged on fibre represent a disincentive for small operators to invest in fibre networks. In November 2009, a Commons Select Committee report on broadband concluded that “that the current arrangements hinder the delivery of investment in NGA, which is being championed by Government. We recommend that the Government review the application of business rates to fibre optic networks as a matter of urgency, and develop a uniform system for all providers.” Nevertheless, there are no plans to change the ratings regime.

Assessing NGA connections

In August 2010, the VOA published initial guidelines for assessing the rateable value of NGA networks using FTTC and FTTP connections. This cost must be taken into account in NGA business plans. (The new approach only applies to alternative operators; BT’s network continues to be assessed as a whole.)

For domestic users, FTTP attracts a rateable value of £20 per home connected, using an approach based on that used to rate cable television networks. For FTTC the rateable value is reduced to £18, to reflect the fact that the telephone line from the cabinet to the customer is already included in BT’s rating.

The rateable value only includes fibre in the access network; fibre linking the local aggregation point back to the operator’s network is still rated according to the “tone of lists”. For business connections, the fibre is also valued according to the “tone of lists”.

The NGA rating also drew criticism. The decision to rate networks according to subscribers connected rather than homes passed (at a lower rate) penalizes successful network operators. There was also a lack of clarity on how to assess connections to small businesses; how are they to be rated when shared fibre is employed? In January 2012, the VOA issued revised guidance, which addresses the second issue. SMEs use the same per-home connected rate as residential connections, unless they are high bandwidth or point-to-point connections. The number of business connections in an area is limited to 14% of the total.

The latest guidance also provides different rateable values for NGA connections in Final Third areas. Working with the BSG, the VOA has produced models for a hypothetical Final Third operator in each county using the R&E method and the characteristics of the area. This has resulted in a different rateable values per end-user connection of £2, £6.50, £10 or £13 depending on which county the end user is located. And even this is not likely to be the end of the story, as the VOA is monitoring the situation, and will update the guidance should Final Third area plans change.

How much would it cost to give the UK nation-wide NGA?

The honest answer is that we do not know precisely. It depends on so many variables – crucially whether we are talking about fibre-to-the cabinet (FTTC) or fibre-to-the-home (FTTH), whether the cost of laying the fibre can be reduced from current procedures, and whether we are thinking of roll out only to urban conurbations, to most of the country, or to the whole country.

Analysys Mason was commissioned by the BSG to investigate the costs of deploying fibre-based next-generation broadband infrastructure. The resulting report examines how the costs stack up as fibre is rolled out across the country, starting with the lowest cost areas. Whilst the report should be read principally from the incumbent operators' viewpoint (it is based on the existing network of BT), it does provide useful insight into the likely commercial viability of NGA.

The headline figures for the different options were:

- FTTC/VDSL – £5.1 billion
- FTTH/GPON – £24.5 billion
- FTTH/PTP – £28.8 billion

Clearly these are very substantial figures. To put this in context, the report notes that deploying FTTC/VDSL on a national basis would cost three or four times more than the telecoms sector has spent in deploying the current generation of broadband services.

The report concluded that deployment costs will be relatively constant across areas of higher population density. This implies that, if a commercial case for deployment exists, the market should be able to deliver to approximately two-thirds of the UK population – and indeed since then BT has decided to deploy FTTC/VDSL to two thirds of the UK.

Another observation was that the fixed costs of deploying new infrastructure far outweigh the variable costs. This means that the cost per premises connected is highly dependent on take-up, which suggests that pre-registration schemes and demand stimulation activities will play an important role.

Why does fibre deployment cost so much?

The principal cost of an optical fibre network is not the fibre itself or even the electronic equipment. The main cost comes from installing the actual physical infrastructure, commonly referred to as the “civils”. UK planning laws mean that the overwhelming majority of lines from the street cabinet to the exchange are provided through underground access. This means that by far the largest cost element of a fibre network is the civil engineering involved in digging holes to lay ducts or fibre. Overall these civil engineering costs might account for some 70% of the total.

How could deployment costs be reduced?

Sharing infrastructure, avoiding the need to dig new trenches as far as possible, offers the greatest possibility for cost reduction. One option, which has already been used successfully in the UK, is to use the sewer network, since fibre-optic cable can happily coexist with water. Several other options are under active consideration including sharing infrastructure owned by other utilities, such as overhead power lines.

Ofcom introduced a market remedy called Physical Infrastructure Access (PIA), which requires BT to allow third-party access to its underground ducts, chambers and telephone poles. BT launched PIA wholesale offers in June 2011, which are currently being trialled by several network operators. However, PIA cannot be used to provide business connections or backhaul.

Mandating fibre installation in new buildings is another obvious way forward, although not something that's happened in the UK. Co-ordination of street works would also be desirable, taking advantage of any open trenches to install fibre at the same time – although in practise this has proved to be difficult to co-ordinate.

Data from FTTH installations in other countries such as the US show that the cost of fibre deployment is already falling year on year, thanks to new deployment methods such as micro-trenching, more efficient installation techniques that require fewer engineers, and new products such as bend-insensitive fibre. Costs will continue to fall as the industry matures.

Would wireless broadband be cheaper?

To help provide some kind indication of the merits of different technologies, the BSG commissioned a second Analysys Mason study to examine the technical capabilities and costs of terrestrial wireless and satellite broadband networks in detail. Published in October 2010, the study estimates how the costs of wireless and satellite deployment vary across the UK.

Rather than totting up the costs to supply the whole of the UK with a single technology, the study compares the cost per premises for a number of delivery mechanisms – including several forms of wireless, satellite and FTTC/VDSL, which was the cheapest option from the earlier study on fibre networks.

The authors report that modelling the capabilities and costs of wireless networks is far more complex than for fibre networks, and the results are highly sensitive to a number of technical variables, giving them less confidence in the numerical value of the results than in the fibre study. The results are particularly sensitive to the level of traffic to be carried on the network. Therefore, the report considers scenarios of low, medium and high demand (corresponding to 28, 40 and 50% annual growth in internet traffic until 2016).

The report's conclusion is that terrestrial wireless technology could cost-effectively deliver the medium demand scenario to the final 15% of UK homes, although this would require a large increase in the number of base stations deployed. Under the high-demand scenario, however, wireless was almost always more expensive than FTTC/VDSL.

The study also concludes that, while satellite is typically more expensive to deploy than fixed wireless, it can still play an important complementary role by delivering broadband services to homes that are most difficult to reach by other means.

The report doesn't factor in the cost of radio spectrum (airwaves). Existing licences can be taken out of the equation as a sunk cost, however, acquiring licences to new spectrum, such as that released by the switch-off of digital TV, could be expensive. The report also assumes that leased fibre-optic connections are available in the majority of locations to connect base stations to the operator's core network (backhaul).

Backhaul as the bottleneck

Backhaul is the high-capacity connection that carries network traffic from a local aggregation node (such as a telephone exchange) back to an internet gateway. This is also termed the "middle mile" as it sits between the operator's core network and the "last mile" or local access network. Neither the report on fibre costs nor the later report on wireless addressed the cost of providing backhaul.

The backhaul link has to carry broadband traffic from the entire community. Not everyone will be using the link simultaneously, but ideally the network should be able to cope with peak demand.

Backhaul is not currently available in every community, however, and it can be costly and complicated to install as, by its nature, it involves long digs across a variety of landscapes. The fibres will also attract business rates, leading to high on-going costs (see Business Rates, p11). Even when available, adequate backhaul is not necessarily affordable. For example, the Connected Communities network, which serves 10 000 customers on the Western Isles of Scotland, pays £140 000 per year for a 34 Mbps backhaul connection, according to the Digital Scotland report.

Published by the Royal Society of Edinburgh, the [Digital Scotland](#) report looks at the issue of backhaul in some detail, and sets out a proposal to create a "Digital Scotland Trust" that would build a network to bring a fibre connection within reach of every community of at least 2000 people in Scotland.

A few UK projects have focused on supplying backhaul connections, including FibreSpeed in North Wales and NYnet in North Yorkshire. A secondary aim of these projects is to create a more competitive market for backhaul services, in order to drive down prices. This was one reported effect of the FibreSpeed network.

Another possible solution to the backhaul problem would be to open up public-sector and education networks. However, many of these networks have restrictions on private-sector use, and require users to enter into complicated framework agreements. The Government is considering ways to encourage the re-use and re-usability of public sector networks, but has yet to report its findings.

This chapter describes the main players in the UK broadband market and their plans to deliver NGA. Only larger companies that operate their own telecoms equipment and infrastructure are included; numerous smaller retail ISPs sell broadband, but they do this by buying wholesale products from BT.

BT Group

BT Group is the incumbent telephone operator covering all parts of the UK except Hull which, for historical reasons, is served by a different operator. BT, at the urging of Ofcom, was the first telecoms operator in the world to implement structural separation with the creation of Openreach in early 2006. Openreach manages the “last mile” wiring from customers’ homes to the local telephone exchange.

In 2008, BT announced that it would spend £1.5 billion building a NGA network to bring headline speeds of 40Mbps to 10 million homes by 2012. Most of the planned deployment was FTTC, with FTTP only being rolled out in selected new-build locations, starting with Ebbsfleet, a new commuter town in Kent. The following year, BT pledged a further £1 billion of investment, deciding to enhance coverage from 40% to two thirds of the country, and increase the proportion of homes covered by FTTP from 10% to 25%.

BT launched consumer superfast broadband products in January 2010 under the brand name “Infinity”. The company says FTTC services are now available to more than six million homes and businesses (June 2011), and announced in November 2011 that it is accelerating its fibre rollout and expects to cover two thirds of UK premises by the end of 2014, one year earlier than originally planned.

FTTP pilots took place in three exchange areas: Bradwell Abbey in Milton Keynes, Highams Park in north-east London and Chester South. After some delays as engineers got to grips with blocked ducts, commercial FTTP products were launched on 31 October 2011 and will soon be available to order by 100 000 homes across 10 exchanges.

Broadband speeds will be going up: BT says the FTTC product will get an upgrade from 40 to 80Mbps sometime in 2012, and the highest speed on the FTTP product will increase from 100 to 300Mbps.

BT has been involved in projects to bring FTTC to areas outside its main deployment plans. For example, a grant from Kent County Council of roughly £10 per premises enabled BT to connect 1 350 homes in the village of Iwade using FTTC delivered from the telephone exchange in Sittingbourne, roughly 3 km away. This involved laying new fibre from Sittingbourne to street cabinets in Iwade that had previously been served from a slightly closer but smaller exchange in Newington. Crucially, the Sittingbourne exchange had already been scheduled for upgrade to FTTC as part of BT’s NGA investment programme.

BT has also been awarded large-scale NGA contracts in partnership with local authorities. The highest profile project is the “The Big Build”, a contract to bring superfast broadband to 86% of homes and businesses in Cornwall by 2014 with around half of properties expected to benefit from FTTP. The project will cost about £135 million with £78.5 million coming from BT and £53.5 million from the European Regional Development Fund (ERDF).

KC (Kingston Communications)

As the UK’s last remaining independent local telephone company, KC supplies broadband to consumers on its own network in Hull and the surrounding area of East Yorkshire under the brand name Karoo. (Parent company KCOM also owns national ISP Eclipse).

KC has been upgrading its core network in preparation for the anticipated increase in internet traffic, and in 2011 turned its attention to the access network. In September 2011, KC began a six-month trial of 100Mbps services to around 300 homes in the East Yorkshire village of Woodmansey and to flats in Hull city centre. The trial is being followed by the roll out of superfast broadband, predominantly using FTTP, to 15 000 homes across Hull and East Yorkshire by the end of 2012. The operator’s long-term aim is to upgrade its entire access network.

SHAKING UP THE LLU MARKET

Local loop unbundling (LLU) is the mechanism that helped to create a hugely competitive broadband market in the UK. This is the process whereby an alternative operator connects customers directly to its network by placing its own equipment in BT telephone exchanges.

BT's FTTC roll out is likely to cover the same exchanges as the LLU operator networks because these have proven to be the most commercially attractive areas. This leaves LLU operators in a tight spot: how can they compete with "up to 40Mbps" FTTC services in terms of speed?

Unlike copper telephone lines, individual FTTC connections cannot be physically separated at the exchange, so the LLU concept cannot be extended in a straightforward fashion. LLU operators have two main options: they can invest in putting their own equipment in street cabinets up and down the country, called sub-loop unbundling (SLU), or line up behind BT as a wholesale customer.

TalkTalk Telecom Group is now the UK's second largest ISP following the acquisitions of AOL and Tiscali. TalkTalk's network connects 1 948 exchanges, with 76% of customers unbundled. To date TalkTalk is the only LLU operator to sell superfast broadband based on BT's products.

British Sky Broadcasting (Sky) is the UK's dominant satellite TV provider (not including Freeview), and bundles TV packages with "free" broadband inside its network footprint. Sky has unbundled 1 275 exchanges; more than 90% of its customers are on unbundled connections. Sky undertook a small-scale FTTC trial in 2008 (one cabinet), but concluded that it was not economically viable to deploy new cabinets en masse. (There are about 88 000 cabinets in the UK compared to 5 500 exchanges).

In February 2011 Sky and TalkTalk announced a shared R&D project to deploy a FTTP network to 3 600 homes in north-west London. The project's aim is to better understand the technical and commercial aspects of Openreach's fibre roll out.

Virgin Media

Cable operator Virgin Media has a hybrid fibre-coax network that reaches around half of all homes in the UK. Outside the network footprint, the company provides ADSL broadband (reselling BT's wholesale product). Virgin Media has completed a roll out of DOCSIS3.0 technology across its network, which allows it to offer 50Mbps broadband to all of its customers. The operator started an upgrade program to make 100Mbps available across its entire network, due to be completed in mid-2012, and recently announced an uplift of top speeds to 120Mbps. It has also been testing 200Mbps services with customers in Ashford and Coventry, and 1.5Gbps with business customers in the "silicon roundabout" area of London.

Virgin Media has begun the first expansion of its network for many years, having identified around 500 000 homes whose proximity to its existing network makes it commercially attractive to reach them; the expansion will be complete in mid-2012. In addition, the company has been exploring the use of "non traditional methods" to bring superfast broadband to communities in rural or harder to reach areas.

In April 2010 Virgin Media began a trial using aerial fibre-optic cable and purpose-built telegraph poles to bring broadband to the village of Woolhampton in Berkshire. Then in August, following an agreement with Surf Telecoms, a second trial began in the Welsh Village of Crumlin, Caerphilly, to deliver broadband and TV services using fibre strung on electricity poles. The company is also taking part in a trial with Fujitsu.

Fujitsu Telecommunications

Fujitsu became the biggest new name to enter the broadband infrastructure scene when in April 2011 it announced plans to work in collaboration with Virgin Media, TalkTalk and Cisco to deliver next-generation broadband to five million homes in rural Britain. However, its willingness to build the network depends on attracting a least 60% of the available state funding for broadband as well as access to BT's underground ducts and telephone poles. Fujitsu and partners started a six-month trial in September 2011 to assess the suitability of using BT's infrastructure to deliver services. 10 volunteers in Greasby on the Wirral are receiving 100Mbps broadband and TiVo video-on-demand service over Fujitsu's fibre in BT's ducts.

Perhaps the question to ask before this is “Why create a broadband project in the first place?” The answer is that the market has struggled to deliver an adequate, universally available first-generation broadband service and will struggle even more with superfast broadband. Around 10% of homes and businesses cannot get a basic 2Mbps service and, in terms of next-generation broadband coverage, our current best estimate is that around two-thirds of the population will be covered through commercial investment. That leaves a lot of people in the broadband slow lane. Hence there is a need to take action at local level – and probably the reason you are reading this booklet.

But where to start? There is more than one approach to deliver superfast broadband, and the requirements and resources of every community or region will be different. Nevertheless, it is possible to identify key stages in the lifetime of a broadband project – from the initial decision to “do something” to a completed project with a sustainable business providing broadband in the target area.

In general the project stages will follow each other sequentially over time, although it is likely that some decisions may need to be revisited as new information comes to light. There will be a number of different threads – such as community engagement, business models, technology options and funding requirements – that will run through all phases of the project, and which should be kept constantly under review.

STAGE ONE – FORM A GROUP

As an individual frustrated with broadband provision, the obvious first step is to check whether your home can be expected to receive an upgrade to superfast broadband under the announced plans of the major service providers, or as part of the regional, county-led deployment. There may also be community projects underway in the local area that you could support. Demand aggregation is such an important element in next-generation broadband projects that you will usually have a greater chance of success by joining an existing scheme than by creating a new project group and dividing the support base.

Stage	Requirements
One: Individual	Check existing provision Contact local councils Form community groups
Two: Group	Identify area of problem Collect evidence of demand Build partnerships Investigate technology options and legal structures
Three: Company	Write the business plan Consult potential suppliers Create service templates Find funding / investment
Four: Funded Project	Tender for the project build Appoint suppliers Take-up marketing

Should your search prove fruitless, then you will have to start from scratch, but don't be deterred! A small but enthusiastic team of committed volunteers can make a huge difference. You will need to join forces with like-minded people, who recognise the importance of broadband and understand the potential benefits. Talk to local contacts and to people with influence locally such as major landowners, schools and local businesses (especially those in the IT industry), the parish or town council and others, to discover those like-minded people.

Parish or town councils can play a particularly useful role in broadband projects. As the first tier of local government, they have legal status in the administration of the community and certain powers to help them carry out their work. They generally have established communications channels with the relevant local authorities, as well as access to information sources and support through county and national associations. Although parish councillors are elected, they are also community volunteers and often possess the experience, knowledge and skills to carry out local projects. Even if not directly involved with a project, endorsement from the parish council is likely to have a positive impact on discussions with other stakeholders.

SPREAD THE WORD

Raising community awareness about the benefits of broadband is vital. Not only does the business case for broadband depend heavily on getting customers to sign up; homeowners and landowners need to be on-side when it comes time to dig trenches and install cables, cabinets and other equipment. You could:

- Hold a public meeting – this is a great way to identify and agree project objectives and recruit volunteers to fill roles in the group.
- Distribute leaflets and posters
- Start a website
- Lobby business leaders and local councillors
- Speak to the media

In fact, local authorities (parish council and higher) often do assume the project lead because they have a vested interest in the economic prosperity of the local area, and because they have the resources – both human and financial – to direct projects of this nature. But this is not the only way forward – community action groups often lead successful projects.

The campaigns that have the greatest chance of success are those with a champion, someone who is absolutely passionate about the project and will see it through to the end. The rest of the team will need a variety of skills: accountant, lawyer, technical, market research, communication, sales and marketing. If you don't have those skills within the team, seek outside help as and when required.

STAGE TWO – IDENTIFY DEMAND

Establishing the level of demand in a community will help to stimulate supplier interest and will provide evidence to support any fund-raising activities. There are a couple of ways to do this: do some mapping of existing provision, and carry out a survey.

Mapping exercises use empirical data about existing levels of broadband provision and the local geography to provide valuable insight into the level of potential demand and the challenges you may face in trying to improve the situation – in fact we've devoted a whole section to the subject (see Maps & Directions, p20).

A survey will create a more detailed, more subjective profile of your community and its communications needs. You can easily find examples of such surveys with an internet search. Questions usually start with the basics, such as the number and ages of people in the household. Who provides the existing broadband service (if any), and is the performance satisfactory? Surveys often include questions about how much time people spend using the internet and what they spend time doing. Do they run a business at home, for example? The survey should be clear and concise, and explain its purpose in non-technical terms that the average person can understand.

You can also ask questions about the interest in and willingness to pay for superfast broadband. Be careful how you ask such questions, however. If you make it too easy for people to say yes, then when it's time to part with hard-earned cash, they are no longer interested and the business model falls apart. Also bear in mind that people may be reluctant to answer questions about their willingness to pay in case it gives suppliers a good excuse to charge high prices!

Don't assume that an online survey will meet all your requirements. People lead busy lives. A knock on the door from a campaign representative, enquiring as to whether the survey has been completed, will often increase the response rate to the survey. And of course, an online-only survey will exclude those with the greatest need because they cannot get working broadband in the first place.

While demand is being assessed, the team should research other community projects to see what could be learned. Find out about and stay up to date on technologies, applications and legislation. The team will need to develop sufficient knowledge to be able to explain their vision to others, to evaluate business proposals and negotiate effectively with solutions providers. Suppliers are usually more than happy to engage with projects to discuss technical information.

Based on this research, the team should refine the vision and scope of the project. What are the goals in terms of the end-user experience? How do these goals align with the available funding? Identify likely synergies that will help to move the plan forward as well as possible obstacles.

SOCIAL ENTERPRISE

A company will set the business plan in motion, taking responsibility for procurement of a solution. For community-led projects, the social enterprise is an attractive way to do this.

Social enterprises are “businesses with primarily social objectives whose surpluses are principally reinvested for that purpose in the business or in the community, rather than being driven by the need to maximise profit for shareholders and owners.” If you decide to go down this route, there are two basic models:

- A **co-operative** is a democratic organisation run by its members: one member, one vote, regardless of the amount invested. Co-ops registered under the Industrial and Provident Societies Act enjoy limited liability in the same way as companies registered under the Companies Act. Community Benefit Societies (BenComs) are a special type of co-op that can adopt an “asset lock”.
- A **community interest company (CIC)** is a newer structure for limited companies. Social enterprise status is achieved by a “community interest test” and “asset lock”, which ensures that the CIC is established for community purposes, and the assets and profits are dedicated to these purposes, even if the company is wound up.

This is also a good time to start to build partnerships. Identify which organisations in your community might take an active role in the project. It is vital that the stakeholders understand the benefits of broadband in the context of their own interests. The opportunities created by high-speed internet could be the incentive for a school or hospital to get involved, which creates income for the network and a stronger social argument for obtaining funding. Local businesses such as hotels, housing authorities or mobile phone networks may also be interested in becoming collaborators.

STAGE THREE – BUSINESS MODELS

Not all communities will have the same appetite for getting involved in broadband issues. Some communities will be content to sit back and wait for services to be delivered. Others will want to take a

more active role building local demand or go further and raise money to develop their own local project.

Aggregating demand may be all that is necessary to bring broadband to a community. BT’s “Race to Infinity” campaign, which took place in December 2010, is a high-profile example of a demand aggregation campaign in which individuals voted for their exchange to be added to its superfast broadband roll out. In the end 10 winning exchanges were named. There are also a number of alternative service providers who will, at their own expense, install broadband networks in a community when a sufficient number of pre-service contracts have been signed.

Local authorities are working hard to extend the coverage of superfast broadband to at least 90% of households with the help of government funds. For communities outside these plans, BDUK and DEFRA have identified five broad business models. These fall into two main groups depending on whether they are delivered by the local authority’s chosen broadband supplier or by the community organising itself such that is capable of engaging directly with a supplier.

GROUP 1: Facilitate local authority project

- **Demand registration:** The community signs pre-service contracts to lower the risk for the local authority’s chosen broadband supplier.
- **Build and benefit:** The community formally offers to lower costs for the broadband supplier by, for example, digging trenches, arranging wayleaves or paying higher installation charges.

GROUP 2: Community enterprise

- **Partnership:** The community raises some of the finance, but engages a partner to bring in the rest of the investment, and to design, build and operate the network on its behalf. Gap funding is the most common approach.
- **Concession:** The community is prepared to raise all of the finance, but brings in a partner to design, build and operate the network. The community retains ownership of the network but grants an exclusive right to the partner to run the network.
- **DIY design, build and operate:** The community is prepared to raise the finance, design, build and operate the network themselves.

COMMUNITY SHARES

The [Broadband for the Rural North \(B4RN\)](#) project is planning to bring 1Gbps broadband to around 1 450 homes in deeply rural Lancashire. It intends to fund the work by raising £2 million from the community in the form of withdrawable share capital – more commonly known as community shares.

Withdrawable share capital is a type of risk capital unique to co-operatives and community benefit societies. This can be a powerful approach, allowing large amounts to be raised from many small contributions. It works best when the community purpose of the enterprise is the primary motive for investment.

For more information see:

[Practitioners' Guide to Community Shares](#)

Whichever model is selected, you will need a business plan – a document that contains all the information to justify the project, along with the supporting information about how you will make it happen, including market analysis, current bandwidth needs and projections, and complete financial information.

The level of technical detail in the plan will depend on the chosen business model. The plan could be mainly a procurement exercise, inviting suppliers to design a cost-effective technical solution to deliver a specific outcome. This approach makes a lot of sense. OnsNet in the Netherlands, a municipal network with a strong community focus (OnsNet means “Our Network”), has the mantra “[community owned, professionally run.](#)”

At the opposite end of the spectrum, a community can design, build and operate its own network. The plan should then include complete technical information, and consider network reliability and customer support, as well as future expansion and upgrades. Don't forget to include the marketing and operating costs in the equation as well as the capital costs of digging and equipment. The financial information should contain realistic revenue and cost projections that lead to sustainability – in other words the project should be able to support itself financially over the longer term.

The “DIY” option is potentially the most risky as it is highly dependent on the skill of the team members. Another challenge for community projects is that small networks often have trouble attracting service providers. Creating a new ISP creates further business challenges, and the lack of retail competition would leave the project exposed to the risk that the state could fund a competing deployment in the same area.

However, solutions to these problems are emerging: in 2011 Hampshire County Council worked with Fluidata, NetAdmin and Magdalene to trial a wholesale aggregation platform that brings 40 service providers to the table. INCA is also developing the “Quality Marque”, which will specify a set of standards against which community networks can be developed.

STAGE FOUR - APPOINT A SUPPLIER

The final stage of the planning process is to approach suppliers and discuss your requirements. Keep everyone informed, especially your key stakeholders and collaborators. Report back to the community regularly, and keep your website updated.

Funding can come from many different sources, including government grant or loan, angel investors and banks, various charitable award schemes such as the National Lottery, and of course the community itself, through a community shares program (see box). In-kind payments are also worth considering. Instead of paying the landowner to cross his field, offer free installation of a high-speed internet connection.

If government funding is involved, then issues of state aid can arise, which can delay a project or, in the worst case scenario, require repayment of funding plus interest. Expert advice may be needed to choose the right financial structure and appropriate procurement process. There are precedents for public funding of broadband networks in the UK, both large and small. State-funded networks must be open access, offering wholesale access to all customers on an equal basis.

Keep up the momentum! It takes time for a project to reach a successful conclusion. Prepare for setbacks and persevere. You may have to revise the plan several times before finding a solution that is acceptable to all parties and within your financial means. Remember: the long-term benefits will make it worthwhile.

A recent study of broadband services in a rural area of England, involving both a mapping study and a survey of businesses, threw up a fascinating insight into the problem of developing a clear understanding of demand and availability. The name of the area will remain anonymous but it could have been any one of a number of communities.

The received wisdom in this area was that a number of small towns were poorly served by broadband and the survey of local businesses largely supported this view. However it was strongly contradicted by the mapping exercise which suggested quite the opposite. In an attempt to reconcile the difference it was much easier to check the cold, hard data than to suggest to businesses that they might be mistaken.

For example, a specific town in the area that had raised the greatest concerns was a tight, nuclear market town and had its own telephone exchange located at its centre. This seemed to further support the mapping exercise over the survey results as it was reasonable to assume that the existing copper lines were generally quite short. As a further check, line tests were carried out on each of the businesses lines, which further corroborated the data. There remained little scope to support the business community's belief that they were poorly served by broadband.

So what was going on? A theory was developed along these lines. Defined market towns tend to build up their own support structures which can lead to the community becoming reliant on a narrow and possibly isolated pool of expert advice; the more esoteric and scarce the skill, the greater the scope for that advice to be of less than the highest quality. In this environment a respected opinion can become the received wisdom and a local mythology can easily develop. This mythology can then be propagated and perpetuated in a tight-knit, well-structured community.

Contrast this with more sparsely populated areas where people tend to travel further to plug into support networks and different people may seek support in different directions. This is likely to create

a richer, more diverse advice network where myths are more readily challenged. More sparsely populated communities are perhaps also more accepting of poorer infrastructure, and may have less effective communication channels. As a result, sparsely populated rural areas – relative to small towns – may under report their broadband problems.

As the shape of the digital divide hardens, with the most densely populated urban areas seeing some form of NGA investment while other areas remain largely as they are, the debate is increasingly becoming emotive. And this can make it harder to understand the business case for investing in broadband.

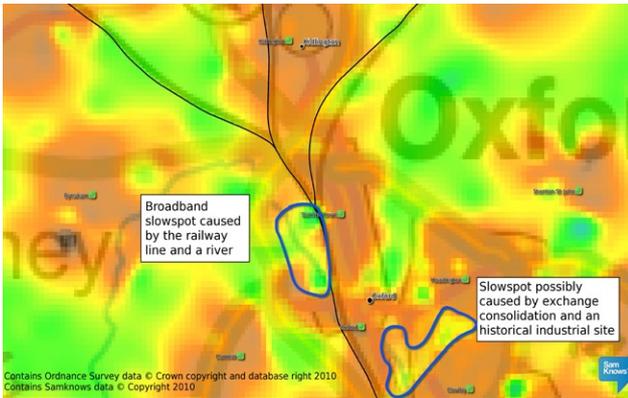
The lesson to take away from this case study is that, while the narrative of communities is important in developing a business case for broadband, it should mainly be used to add colour and to personalise cold, empirical data. The description of the problem should be based on facts, while the narrative gives voice to the kinds of services the community may demand.

The broadband landscape

The first exercise has to be to understand what the broadband landscape looks like today. It is important to base this on data from primary resources – the incumbent operator, the cable companies, and so on.

To test the level of competition for a new broadband network it is necessary to plot existing broadband services and the number and type of operators. In the UK that typically means mapping ADSL performance; the extent of Virgin Media's cable network; and the number of operators unbundling the local loop.

A variety of mapping techniques can be useful in order to gain the fullest understanding. As well as maps that blanket fill a postcode polygon with traffic light colours to represent poor, mean and good broadband speeds, it's worth considering other techniques such as contoured heat maps. While it's harder to say precisely what the speed is at a given location, it does provide a much richer picture from which the broadband landscape can be described.



The map above was generated from broadband data in Oxfordshire. There had been long-established rumours that broadband in parts of central Oxford were slow, and the reasons given seemed perfectly plausible but unproven. The story was that some phone lines had to take a long, circuitous route skirting around the old Morris car plant, which made them too long to support a good broadband service. The map clearly shows a “ghost valley” of poorer broadband to the north east of the city. While the now BMW car plant is much more compact, the data appear to support tales of Oxford’s industrial past.

Supporting the business case

Technical broadband data is one aspect, but other data sets can provide important contributions to the business case. A combination of land use and population datasets from the Office of National Statistics provides a way to assess the “mean distance between neighbours” as a proxy for the cost of the civil works required for a fibre-optic network build.

Maps can also provide clues about the kinds of services that might appeal to the community, and therefore drive take-up. There are a number of possible datasets available that can provide clues, such as the ONS output area classification system and perhaps more usefully the eSociety classification system from the Centre for Spatial Literacy.

Only when combining such data with the previous technical mapping is it possible to fully understand the business case for investing in a new broadband infrastructure. It is quite possible, for example, to find a community which is under-served by first-generation broadband and which is sufficiently densely populated to suggest a lower cost of deploying fibre, but which has little interest in adopting new services.

PRIMARY DATA SOURCES

BT Openreach has a postcode checker for ADSL to indicate the expected line speed and another for VDSL to show the activation status of the exchange to which the line is connected. Openreach also agreed to make data on street cabinets available in bulk to communications providers that may wish to unbundle sub-loops. www.btwholesale.com/includes/adsl/main.html
www.superfast-openreach.co.uk/where-and-when/

Samknows provides a comprehensive database of information about telephone exchanges and the availability of services at each exchange. Samknows’ data is sourced directly from BT and other ISPs and is backed up with its own broadband speed studies. www.samknows.com

Office of National Statistics (ONS) has set up the Neighbourhood Statistics Service (NeSS), a free-access portal providing local area information such as household counts, population density and indices of deprivation. www.neighbourhood.statistics.gov.uk

Department of Communities and Local Government (DCLG) commissioned a model that attempts to predict which areas are likely to see investment in superfast broadband. The resulting data set with its “traffic light” classification of NGA risk is available to download. www.communities.gov.uk/publications/communities/assessmentngafinalreport

OS OpenData provides Ordnance Survey data in a variety of formats, including raster and vector data for 1:50000 and 1:25000 maps, as well as other location resources such as parliamentary constituency boundaries and postcode data. www.ordnancesurvey.co.uk/opendata/

E-society is an academic research programme investigating the impact of digital technologies, particularly the internet, on society. They have developed a model of “eTypes” based on levels of awareness of ICT, usage patterns, and attitudes to their effects upon quality of life. <http://esociety.publicprofiler.org>

A great deal can be learned from the success – or failure – of others. Accordingly, part of the foundation stage of any next-generation broadband project should involve research to find out how other people have approached the challenge of bringing next-generation access to their communities.

In this section we offer snap shots of next-generation broadband projects. Each profile includes the vital statistics of the project, including details of project partners, overall aims, investment and progress to date. The examples presented here have been chosen to illustrate the variety of commercial and business models behind NGA networks in the UK. There is no single blueprint for success but, as these examples show, there are many different options. Identify which approaches are most likely to suit your circumstances, but remember that these are not the only choices.

The examples in this section do not form a comprehensive list of NGA deployments in the UK; lack of space in these pages, and the fast developing nature of the market make this impractical. If you're looking for a more complete list of NGA projects in the UK, the Communications Consumer Panel published a comprehensive list of UK fibre projects in 2009, although this is now somewhat out of date. Point Topic, an analyst firm that tracks the UK broadband market, also publishes regular reports detailing NGA projects and subscriber numbers in the UK.

PROJECT PROMOTER: DIGITAL REGION

Location: South Yorkshire

Type of project: FTTC/VDSL deployment

Partners: South Yorkshire's local authorities (Barnsley, Doncaster, Rotherham and Sheffield) own the network though Digital Region Ltd. Thales UK is the lead contractor for design, build and operation, and provides wholesale access services.

Planned coverage: The plan is to reach 97% of premises in South Yorkshire (440 000 homes and 40 000 businesses). The first 80% has been funded through loans; revenues will be used to extend the network to reach 97%.

Stage: Phase one to reach 80% of premises in South Yorkshire is nearly complete – 1 251 out of 1 359 street cabinets have been commissioned (Nov 2011). First customers live in October 2010.

Service providers: four service providers – RiPWIRE, Digital City Region (formerly DRBSY), ask4 and Lyndos – and 20 resellers

Finance: Yorkshire Forward is the largest investor, contributing £44m out of the total £93.8m including £30m from the European Regional Development Fund. Project partners contributed the rest. State aid approval was granted in 2006.

See also: www.digitalregion.co.uk

PROJECT PROMOTER: MDDA

Location: Manchester Oxford Road area

Type of project: trial deployment of FTTP

Partners: Manchester City Council owns the network. Manchester Digital Development Agency (MDDA) and Corridor Manchester (redevelopment partnership) appointed Geo to install the fibre and provide wholesale access following an open OJEU tender.

Planned coverage: 500 businesses and 1 000 residential units across 12 sites

Stage: Construction of the core network was completed in summer 2011. Final connections into sites have been delayed by issues around wayleaves. When these are signed, connections can be extended to individual buildings and end users.

Service providers: open access network, open to any service provider

Finance: £850 000 capital funding from North West RDA. As a pilot project, the Oxford Road core installation does not need state aid approval as it is classed as "de minimis". Extending the network will require state aid approval, currently underway. MDDA is also exploring alternative models for expanding the roll out, such as installing fibre alongside Metrolink tram tracks during refurbishment and extension.

See also: www.manchesterdda.com/tag/fttp/

PROJECT PROMOTER: CITYFIBRE

Location: Bournemouth

Type of project: FTTP/GPON using low cost installation methods such as micro-trenching

Business model: CityFibre Holdings owns the network and provides wholesale services to third-party service providers. CityFibre purchased the assets of FibreCity in January 2011, including a contract with Bournemouth Borough Council and the city's unfinished FTTP network.

Planned coverage: ~80 000 homes in Bournemouth by mid-2013; CityFibre has the ambition to reach one million homes in the UK's second-tier cities over the next five years.

Stage: ~24 000 homes ready for service in 2012.

Service providers: Fibreband, the first ISP on the network, is offering 250 customers a free six-month trial of 1 Gbps broadband.

Finance: Funding undisclosed. Financial advisors Macquarie Capital were appointed to help raise money for future expansion.

See also: www.cityfibreholdings.com

PROJECT PROMOTER: GIGACLEAR

Location: Hambleton, Rutland

Type of project: point-to-point FTTP network

Partners: Rutland Telecom initially engaged with the villagers, but the network was built by Gigaclear, which has since bought a majority stake in Rutland Telecom.

Coverage: 60% of the village (41 houses) pre-signed service contracts. Hambleton Hall Hotel is the anchor tenant. Gigaclear plans to connect another 20 communities in 2012.

Stage: commercial services were launched in October 2011

Service providers: Gigaclear sells wholesale services. Rutland Telecom is the only retail provider at present, but 40 more are expected to join when a new wholesale platform from Fluidata is integrated.

Finance: £150 000 was raised from local villagers plus investment from Gigaclear.

See also: <http://gigaclear.com>

PROJECT PROMOTER: CYBERMOOR

Location: Alston, Cumbria

Type of project: Community-owned wireless network being upgraded to FTTP

Origins: Cybermoor was founded in 2002 as part of the "Wired up Community" initiative to bring computers to disadvantaged communities – Alston is the most sparsely populated parish in England.

Planned coverage: 350 subscribers on wireless; aims to deliver 300 FTTP connections by end 2012.

Stage: Fibre link connecting Alston to Nenthead went live in September 2010 – the first fibre network built and owned by a co-op. Trial customers were connected along the route. Phase one of the FTTP roll out is to be installed over a period of six months by local people trained in ducting and splicing.

Service providers: Cybermoor Ltd. provides retail broadband and is developing a wholesale offer.

Finance: Cybermoor Networks Ltd. was established as a new Industrial and Provident Society in February 2011 to raise additional funding for NGA through a community share offer to be issued in early 2012. Money to connect 300 homes was secured from the Rural Development Programme for England, which is being matched by the share offer and industry.

See also: <http://fibremoor.org>

PROJECT PROMOTER: NEXTGENUS UK CIC

Location: Ashby de la Launde, Lincolnshire

Type of project: "Dig where you live" FTTH and wireless to nearby villages

Business model: NextGenUs worked with AFL Telecommunications and CTTS on the deployment in Ashby; the company prefers to train local people in installation techniques to reduce costs.

Coverage: Approx 60 houses on fibre in Ashby de la Launde and 400 wireless customers. The project was a showcase for FTTH; other projects underway in 10 counties use fibre to a central distribution point (the "digital village pump") then high-speed wireless.

Stage: Network went live November 2010.

Service provider: Nextgenus UK

Finance: private investment by NextGenUs

See also: www.nextgenus.net

PROJECT PROMOTER: IFNL

Location: A variety of locations, including Liverpool, London and Leeds

Type of project: FTTP on Greenfield sites.

Business model: Part of the Inexus Group, IFNL (Independent Fibre Networks Ltd) installs fibre in new housing developments where the Group has contracts with the developers to install all utilities.

Coverage: IFNL has 20 sites connected or underway, corresponding to 50 000 homes across the UK. It is the leading alternative operator in terms of live FTTP connections (Point Topic, Dec 2011).

Service providers: Inexus Group has a subsidiary, Seethelight, which provides retail broadband. In January 2012, IFNL announced a partnership with Fluidata to connect IFNL sites into Fluidata's national network to take advantage of its wholesale platform. As a result, ISPs will be able to access Fluidata's network for a one-off cost, giving IFNL's customers a choice of up to 40 service providers.

Finance: Commercial deployment

See also: <http://ifnl.net> and www.fluidata.co.uk

PROJECT PROMOTER: CALL FLOW SOLUTIONS

Location: Kings Hill, Kent

Type of project: FTTC via sub-loop unbundling. Radio overlay from the cabinet enables customers beyond the reach of VDSL to receive services.

Partners: Call Flow uses local knowledge and partnerships to minimize installation costs. Organisations such as hotels, schools and farms offer secure space to ensure the project is viable.

Coverage: 300 customers in Kings Hill (end June 2011). A second project is live at West Peckham and others are planned.

Stage: Services in Kings Hill launched late 2010

Service provider: Call Flow Solutions

Finance: Kent County Council provided a subsidy to connect homes in Kings Hill under its community broadband grant scheme and has since approved a grant to connect a further 700 homes in the Crockenhill area. West Peckham is a commercial deployment.

See also: www.cfsbroadband.com

PROJECT PROMOTER: WWHC

Location: Cambuslang on the outskirts of Glasgow

Type of project: Greenfield FTTP/GPON for a housing association

Partners: West Whitlawburn Housing Cooperative (WWHC) owns and operates the network. Reseller Fibre Options supplied and installed the equipment.

Coverage: 100 homes

Stage: Completed. Extension of the network to nearby tower blocks is being investigated.

Service providers: WWHC provides services. As well as offering triple-play (voice, broadband and TV), the network supports landlord/tenant interaction, home help alarms via VOIP, CCTV to ensure "evidence quality" video, and community-generated content.

Finance: Private investment.

See also: www.wwhc.org.uk

PROJECT PROMOTER: RUTLAND TELECOM

Location: Lyddington

Type of project: FTTC via sub-loop unbundling

Stage: Network went live in 2009 with 50 customers.

Coverage: Rutland Telecom has carried out a number of similar projects, including some wireless.

Service provider: Rutland Telecom

Finance: Villagers raised £37 000 to pay for installation. A pre-registration scheme was used to make sure the network was commercially viable before the deployment got the green light.

See also: www.rutlandtelecom.com

PROJECT PROMOTER: VTESSE BROADBAND

Location: Cornish villages of Higher Pill and Hatt

Type of project: FTTC via sub-loop unbundling

Coverage: Services became available to 574 households in Higher Pill and 262 in Hatt in 2010. Vtesse has since connected other villages in Herefordshire, Wiltshire, and Cambridgeshire. However, a notice on the company's website says it is "no longer accepting orders due to an unfavourable regulatory environment" (see Business Rates, p11)

Service provider: Vtesse Broadband

See also: www.vtessebroadband.com

FURTHER READING

This booklet provides a brief introduction to the issues around superfast broadband. More information can be found at the companion website www.beyondbroadband.coop, which includes a wide range of articles contributed by experts in their field. Topics are broad ranging, from innovative fibre installation methods to community-driven funding models to telecommunications legislation and state aid.

We also recommend:

FTTH Business Guide (registration required)
Produced by the Business Committee of the FTTH Council Europe, this guide deals with the crucial early phase of an FTTH network, from project conception to the development of a business plan with emphasis on the major influences on revenues and expenditure.

A Guide to Broadband Investment (PDF 2MB)
EU guide on models for investment for public authorities investing EU funds in broadband and NGA infrastructures. This guide is the result of a joint effort from Analysys Mason, various Commission services, the European Broadband Portal and the Bottom up Broadband initiative born under the Digital Agenda for Europe.

Government policy

The **Department of Culture Media and Sport** (DCMS) has overall responsibility for broadband policy, having taken over these duties from the Department of Business, Innovation and Skills (BIS) in 2011.
www.culture.gov.uk/what_we_do/telecommunications_and_online/7763.aspx

Broadband Delivery UK (BDUK) has been created to implement the Government's broadband policies.
www.culture.gov.uk/what_we_do/telecommunications_and_online/7781.aspx
(Note: BDUK's old BIS website is not being updated).

BDUK and DCMS have supported development of the **Rural Broadband Partnership** website, which provides a database of community broadband projects as well as other materials on project development.
www.ruralbroadband.com/for-communities/

The **Broadband Stakeholder Group** (BSG) is an industry-government forum that helps to shape government policy on broadband issues and NGA.
www.broadbanduk.org

Ofcom is the independent regulator and competition authority for the UK communications industries (telecoms, TV, radio and spectrum).
www.ofcom.org.uk

Regional broadband development

Local councils must develop a Local Broadband Plan and procure a solution to extend the reach of superfast broadband to at least 90% of the UK.
www.direct.gov.uk/en/DI1/Directories/Localcouncils/

Over the past decade **Regional Development Agencies** (RDAs) actively supported broadband development because good communications infrastructure boosts economic growth. RDAs in England have now been replaced with **Local Enterprise Partnerships** (LEPs), which promote economic growth at a more local level. Economic development organisations in the devolved nations remain unchanged.

RDAs and LEPs support broadband in several ways:

- Identifying issues and opportunities
- Demand registration and take-up activity, e.g. EREBUS in the East of England
- Procurement projects, e.g. FibreSpeed in North Wales, NYnet in North Yorkshire
- Investing in projects e.g. Digital Region

England's Local Enterprise Partnerships: www.bis.gov.uk/policies/economic-development/leps
Invest Northern Ireland www.investni.com
Scottish Enterprise www.scottish-enterprise.com
Highlands and Islands Enterprise www.hie.co.uk
Welsh Assembly: www.wales.gov.uk/broadband

Business and social enterprise

ACRE (Action with Communities in Rural England) is the national umbrella body of the 38 rural community councils, which are charitable development organisations that support rural communities across the UK. Typically operating at county level, ACRE members consult with and advise people who live and work in rural areas to identify their needs and develop local facilities such as village halls. Some rural community councils are leading demand aggregation activities on behalf of county-led broadband projects.
www.acre.org.uk

The **Plunkett Foundation** works to develop and support rural co-operatives and social enterprises. The support function includes advisory services and funding. It is perhaps better known for its activities with rural community shops and Post Offices, but also actively supports broadband projects.
www.plunkett.co.uk

The **National Association of Local Councils** (NALC) provides resources and guidance to town and parish councils in England. It operates through county-level associations, which provide the first point of contact for member local councils in need of free advice.
www.nalc.gov.uk

Business Link is a government-backed organisation providing access to information and support for business. Topics covered include starting up a business, finance and insurance, tax, health and safety, employment and pay, and more.
www.businesslink.gov.uk

The **CIC Regulator** provides guidance on creating or converting to a community interest company (CIC). Its primary role is to consider applications to form a CIC, and ensure that CICs comply with regulations.
www.bis.gov.uk/cicregulator/

The **Financial Services Authority** (FSA) is the registration and reporting body for co-operatives and benefit of the community societies (BenComs).
www.fsa.gov.uk/Pages/Doing/small_firms/MSR/

Trade associations

Co-operatives UK is the national trade body that campaigns for co-operation and works to promote, develop and unite co-operative enterprises.
www.uk.coop

The **Independent Networks Co-operative Association** (INCA) was set up in 2010 to create an umbrella for the wide range of organisations developing or promoting next-generation broadband networks.
www.inca.coop

The **Internet Services Providers' Association** (ISPA UK) is the UK's trade association for providers of Internet services.
www.ispa.org.uk

International perspective

The **FTTH Council Europe** is an industry organisation whose mission is to accelerate the adoption of FTTH in Europe. Its members are mostly manufacturers of FTTH equipment and organisations deploying FTTH. It also publishes a technical handbook and case studies.
www.ftthcouncil.eu

The **European Broadband Portal** is a web portal where stakeholders can exchange information, ideas and best practise for broadband deployment. The portal provides searchable databases of projects, strategies and action plans, calls for tender, industry suppliers, and European policy and regulation documents.
www.broadband-europe.eu

The **UN Broadband Commission**, launched in 2010 by the International Telecommunications Union (ITU) and United Nations Educational, Scientific and Cultural Organization (UNESCO), wants to define international strategies for accelerating broadband rollout worldwide. ShareHouse is its online library of studies.
www.broadbandcommission.org

Value of the Web is a compilation of research that attempts to quantify the internet's impact on society. Published by Google, the site launched in January 2012 with 19 studies from across the world.
www.valueoftheweb.com

About INCA

The Independent Networks Co-operative Association (INCA) was set up in 2010 to create an umbrella for the wide range of private, public and community organisations developing or promoting next-generation broadband networks.

INCA's vision is to achieve 100% coverage of next generation broadband as quickly as possible, nobody left behind. To get there, particularly in harder to reach areas, INCA advocates a partnership approach bringing together public, private and community sectors to plan next generation network coverage regionally and locally. It is our belief that by working together, sharing knowledge and experience, we will facilitate investment, encourage innovation and speed up deployment for a truly next generation broadband Britain.

As a co-operative organisation, INCA aims to help members share knowledge and develop activities of mutual benefit. INCA promotes common technical and operational standards amongst local projects, supports the Next Gen Events programme and runs a seminar programme for its members. INCA also actively promotes the sector and lobbies government and Ofcom to ensure that the voice of independent networks is heard.

To find out more, visit www.inca.coop.



Who should read this guide?

- * regional and local authorities, including county, district and parish councils
- * community groups and individuals wishing to start a community project
- * private network operators planning next-generation networks and services
- * policy makers looking for ways to enhance broadband provision and uptake
- * anyone interested in the future of next-generation access in the UK