Cromdale and Advie Community Broadband

Technical Options Overview

Community Broadband Scotland

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Plan Design Enable

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Executive summary

The communities of Cromdale and Advie, are two communities located within the Spey Valley in the proximity of Grantown-On-Spey. The scoped area comprises of 319 premises including a number of small businesses that are currently poorly served with broadband services.

There are two exchanges that serve the scoped area, Grantown-On-Spey exchange which offers ADSL/ADSL2+ broadband services (up to 24Mbps) and Advie exchange that only offers services of up to 512Kbps to a limited number of connections. The Broadband issues within the area are a result of the long copper line lengths for those communities served from Grantown-On-Spey exchange, and the lack of basic broadband services from the Advie exchange.

The Digital Scotland Superfast Broadband (DSSB) programme delivered in partnership with BT is in the process of providing the infrastructure needed to deliver next generation access (NGA) to those areas in Scotland where the market does not currently serve. It is expected that through the DSSB project the Grantown-On-Spey exchange will be upgraded to deliver Superfast Broadband services during the second half of 2015. The information available shows that some premises in Cromdale will be covered by this upgrade and will receive superfast broadband services, however the exact premises served and speeds experienced is still unknown. A number of the premises in Cromdale and all of the premises in Advie will not benefit from the currently planned DSSB project upgrade.

A number of technical solutions have been considered to serve the premises not currently expected to benefit from the DSSB programme. The first option considered is the possibility of an extension to the current DSSB programme with additional pubic funding through the new Superfast Extension Programme (SEP). This would likely involve BT installing additional fibre enabled structures in the area. Considering the scoped area, a significant proportion of premises are clustered together in such a manner that they could be expected to benefit from such an extension to DSSB if it were to occur.

It should be noted that the estimated cost of extending BT's fibre enabled infrastructure to the scoped area via the Superfast Extension Programme (SEP) is as yet unknown as it is subject to funding approval and appropriate surveys and final design.

We can conclude that the most feasible solution for the provision of Superfast broadband services in the area is with the current DSSB plans and with any possible extension of this programme under the publically funded Superfast Extension Programme (SEP). This is assumed as the remaining unserved premises in the Cromdale and Advie area appear to be suitable for additional BT fibre enabled structures under the extension programme and so this currently appears to be the most feasible solution to serve the community.

1. Background

1.1. Cromdale and Advie

The communities of Cromdale and Advie are located in The Highland Council area, along the A95 within the Spey valley next to Grantown-on-Spey.

The scoped area within this study contains 319[1] predominantly rural premises which are scattered across the area in small hamlets. The largest clusters of premises are situated in the centre of Cromdale and Advie. It is noted that there are a small number of local businesses and some housing developments planned in Cromdale and Balmenach.

An overview of the Cromdale and Advie area is shown below in Figure 1, with information on the surrounding infrastructure provided in Figure 2.
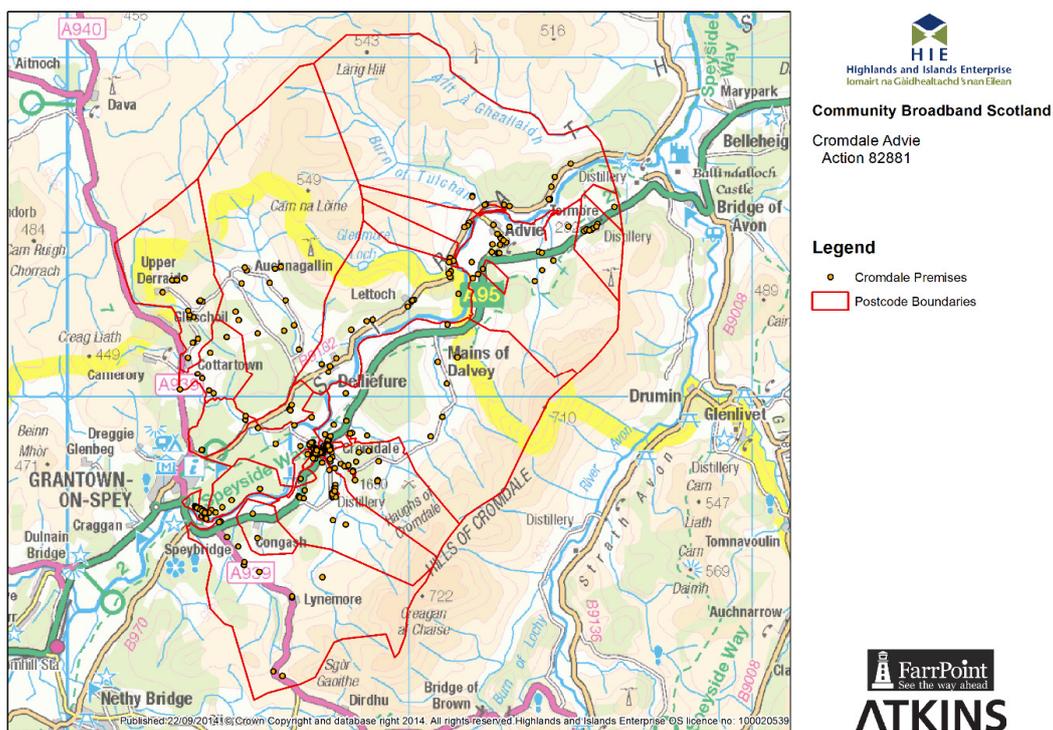

Figure 1   Cromdale/ Advie - Postcode and Premises Overview

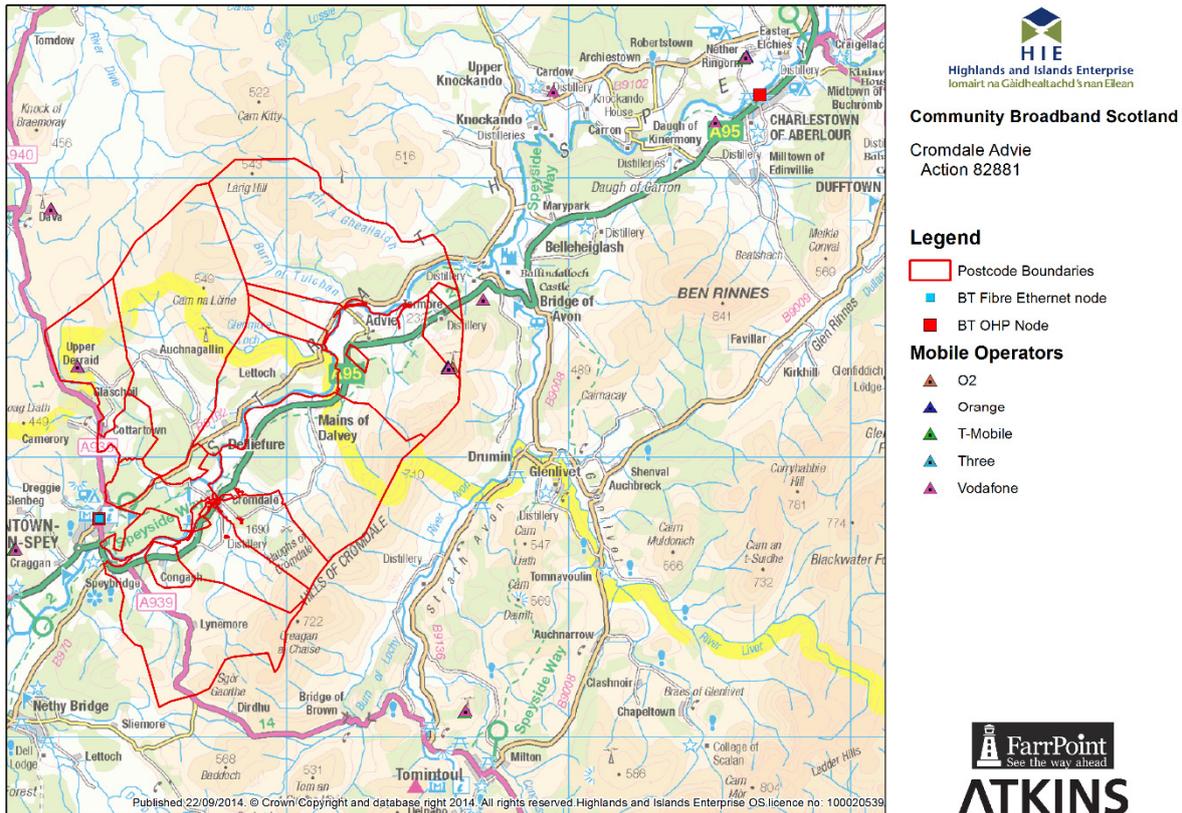[1] Accordimg to Codepoint July 2014

Figure 2   Cromdale/ Advie – Existing Infrastructure Overview

1.2.   Current Provision

The only wired broadband infrastructure in the area belongs to BT Openreach and therefore the services available are limited to those offered by ISPs that utilise this infrastructure.

The community of Cromdale is served from Grantown-On-Spey exchange, with a number of premises in the centre of Cromdale served from an existing street cabinet. The remaining premises in Cromdale appear to be served directly from the Grantown-On-Spey exchange (referred to as Exchange Only or EO lines). The community of Advie is served directly from Advie exchange, which is located within the village centre.

The Grantown-On-Spey exchange has been enabled for ADSL and ADSL2+ services offering up to 8Mbps and 24Mbps services respectively to connected premises, dependant on distance from the exchange. It is also Local Loop unbundled with Talk-Talk offering unbundled ADSL2+ services. Figure 3 below, provides an overview of the coverage and speed of ADSL/ ADSL 2+ services from the Grantown-On-Spey telephone exchange.

It should be noted that the map illustrates the _maximum theoretical speeds_ achievable within a postcode area, however ADSL/ADSL2+ performance degrades with the quality of line plant and with distance and therefore premises within the postcode but further away from the serving structure will experience slower speeds.
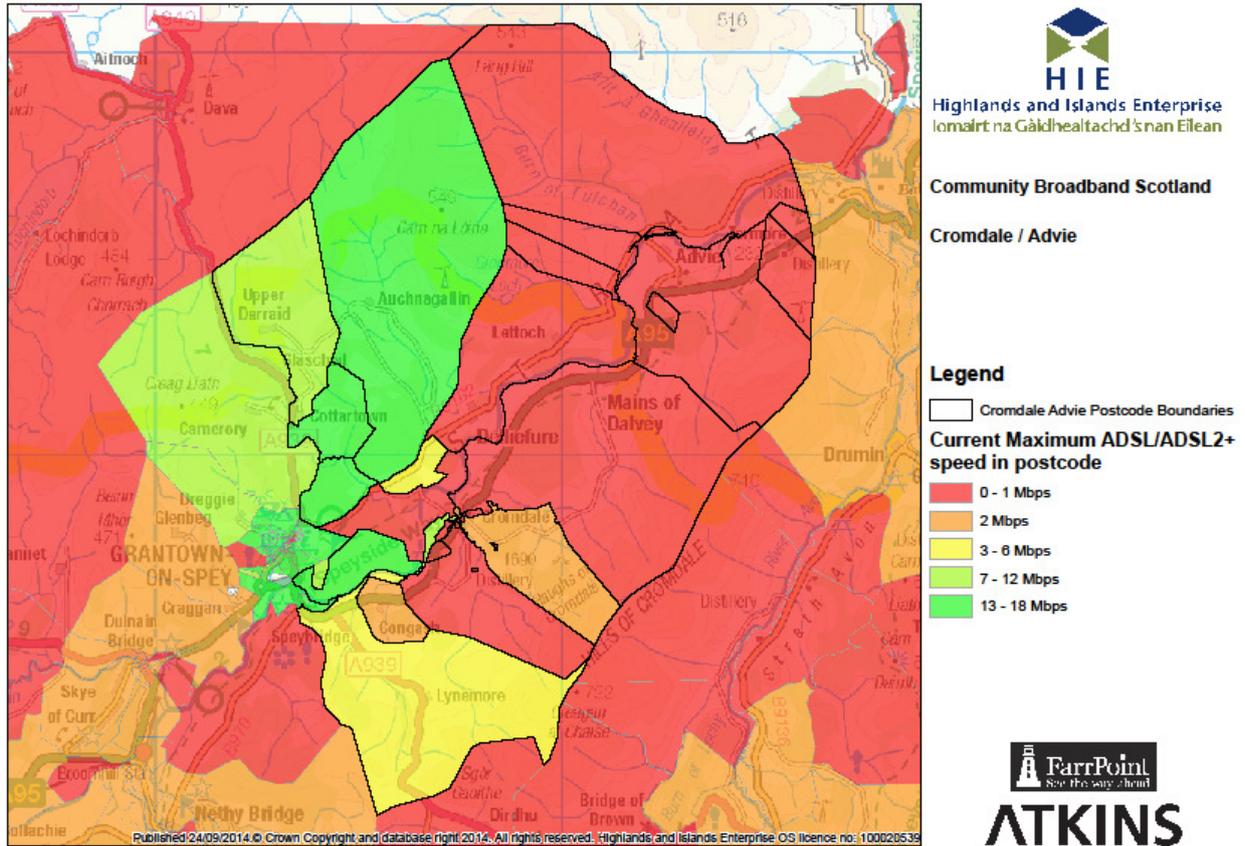
Figure 3   Grantown –On-Spey Theoretical ADSL/ ADSL2+ Coverage

The Advie exchange does not offer ADSL or ADSL2+ services and is limited to Exchange Activate which is a similar technology but offers a maximum download speed of only 512kbps to a limited number of connections.

It is noted that mobile coverage is poor from a number of operators, with one mast site identified south-east of Advie. The Ofcom Sitefinder database shows a number of masts utilised by mobile operators in the general area with coverage maps from the various mobile operators showing a varying degree of 2G and 3G coverage with no operator providing 4G coverage. Coverage maps can be found at the following sites:

https://www.vodafone.co.uk/our-network-and-coverage/uk-coverage-map/

https://coverage.ee.co.uk/ee/coveragechecker.html

http://www.o2.co.uk/coveragechecker

1.3.   The Issue

The premises in Cromdale are located between 3 and 6 kilometres away from Grantown-On-Spey exchange, and depending on the actual cable route from the exchange, this can result in them receiving poor ADSL and ADSL2+ speeds.

From the local information provided, it is noted that the quality of the BT line plant between Grantown-On-Spey and Cromdale appears to be poor, which would further reduce the achieved speed with ADSL and ADSL2+.

Since the Advie exchange only offers Exchange Activate services and has not been enabled for ADSL or ADSL2+, the maximum speed achievable is limited to 512kbps dependent upon distance from the exchange.

The Community Overview provided states that the community desire speeds of at least 6Mbps, increasing in the future, with the following desired outcomes from access to faster broadband services:

- Improve business and employment opportunities;
- Encourage families to remain and move to the local area;
- Decrease isolation for older residents by improving connectivity and the ability to access public services online.

2.   Future Plans

2.1.   Digital Scotland Superfast Broadband (DSSB)

The Digital Scotland Superfast Broadband (DSSB) programme is delivered in partnership with BT and is in the process of extending the infrastructure needed to deliver next generation broadband to those areas in Scotland where the market does not currently serve.

The Grantown exchange area is planned for upgrade to deliver Superfast Broadband services to the area in the second half of 2015. As a result, this will offer services of up to 80Mbps download to premises served from the current infrastructure, dependent on the premise distance to the serving structure. The information available shows that some of Cromdale premises will be covered by Superfast Broadband, however the exact premises served and speeds experienced is still unknown.

It is expected that a number of the premises in Cromdale and all of the premises in Advie will not benefit from the currently planned DSSB project upgrade delivered by BT.

2.2.   SWAN

The Scottish Wide Area Network (SWAN) is a public sector network being rolled out across Scotland that will provide connectivity to all NHS and local authority sites across Scotland. However, no NHS or publically owned buildings have been identified within the scoped area that would be served by this project.

2.3.   Other Information

No public sector assets have been identified in the community area that could be utilised by a provider to assist in their deployment.

The overview notes the following funding sources:

- Pauls Farm Windfarm fund – application via Cromdale & Advie Community Council;
- Berry Burn Windfarm community fund – direct application available now;
- Cairngorms Leader funding – open for applications Jan 2015.

3.   Options

3.1.   Introduction

When considering the potential options to improve broadband availability in the Cromdale and Advie area, a number of different factors must be considered. These can be split into three key points; core backhaul, local backhaul and service provision to subscribers. These different elements are depicted in Figure 4.
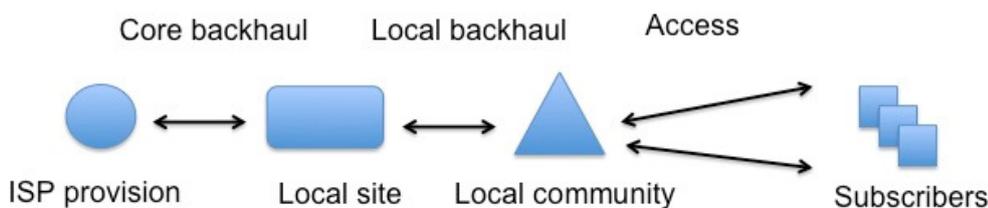

Figure 1.   Elements of Service provision

Backhaul may be split into "core backhaul" and "local backhaul". The core backhaul portion of the network is that which connects the access network to the wider Internet via a direct Internet feed or a point-point link into an ISP peering point (i.e. Edinburgh, Glasgow, Manchester etc.). Because this carries the aggregated bandwidth for a large number of users, it typically requires a high bandwidth connection to ensure that sufficient bandwidth to users can be delivered, especially at peak times. Fibre would be the preferred technology for a core backhaul due to the high quantity of data that it transports although microwave-backhaul technologies could be considered a valid alternative where fibre is not possible.

The Local backhaul is the portion of network closer to the access network and designed to carry the traffic collected from the "edge" of the network and feed it to the core backhaul. Typical access backhaul technologies are fibre, Point-to-point or Point-to-multipoint microwave technologies, and DSL variants.

Access is concerned with the technology used for the 'last mile' connectivity to premises. This encompasses a wide range of technologies including Fibre-to-the-Premise (FTTP), Fibre-to-the-Cabinet (FTTC), Fixed Wireless Access (FWA) and others.

Service provision relates to who then offers broadband services over the access and backhaul infrastructure to premises. Some infrastructure providers allow access for multiple ISPs to deliver services over the same infrastructure, providing choice and competition for end users. However, all service providers will be limited by the capability of the underlying infrastructure as to what services can be offered. Additionally, when only a small number of premises are connected to a service provider's infrastructure, the cost for new ISPs to connect to this network can be prohibitive unless there is large number of potential customers to justify the initial outlay. This can lead to many small networks only offering a single ISP.

Whilst a range of technologies can be utilised to provide Superfast Broadband to premises, it must be considered which ones are most likely to be deployed in the current market conditions and demographics in rural areas of Scotland. Some service providers will have a preference or a capability to deploy only certain technologies based on their business model and available infrastructure.

3.2. Backhaul Options

3.2.1. Core Backhaul

BT is the only Telecommunication provider that has been identified with core backhaul infrastructure in the area. The closest BT core backhaul interconnection point, known as a BT Access Serving Node (ASN) is located in Grantown-On-Spey at a distance of about 6km from Cromdale. Core Backhaul from a number of communication providers could be obtained from either of these exchanges and fed across to the scoped area using a Local Backhaul link via fibre or wireless infrastructure. No other backhaul infrastructure providers have been identified in the area around Cromdale and Advie.

3.2.2. Local Backhaul

The Local backhaul is the portion of network closer to the access network and designed to carry the traffic collected from the "edge" of the network and feed it to the core backhaul.

The communities of Cromdale and Advie are both located close to Grantown-On-Spey, which is a core node in BT's backhaul network and offers very high speed dedicated fibre Ethernet connections to any location within a 45 km radius of the exchange location. These services typically have distance related charging, such that the proximity of these communities to an Ethernet node will benefit the business model by reducing the cost of backhaul required to serve the community.

In addition, it is believed that the core fibre route likely follows the A95 passing through Cromdale and Advie, meaning that it is highly probable there is a significant portion of existing duct routes that could be utilised by BT to deploy services without the need for extensive civil works along this route.

3.3. Access Options

In order to improve Cromdale and Advie broadband services it is necessary to analyse different options for the efficient and cost effective provision of access technologies.

A high level description of Next Generation Access (NGA) technologies including analysis of their ability to serve the area is explored below:

3.3.1. Fibre to the Cabinet

A typical Fibre-to-the-cabinet deployment from BT involves installation of a new street cabinet connected via fibre-optic cable to the serving exchange. This new cabinet is located next to the existing street cabinet and houses the electronic equipment to which lines are connected to offer Superfast Broadband services to premises. By moving the electronic equipment closer to premises, the distance of copper line is reduced, resulting in improved broadband speeds.

Because this deployment requires an existing BT street cabinet, the preference is to target existing structures first due to the fact it is a straightforward installation.

Premises that are served directly from the exchange and not via an existing street cabinet are termed Exchange Only (EO) Lines. For these areas BT is deploying new fibre enabled street cabinets which are placed at an optimal position to serve EO premises that share the same copper cable route. In this instance the existing copper cables are diverted and re-jointed to connect to the new fibre enabled street cabinet. This re-jointing, or 'Copper Rearrangement' can be complex given the location and quality of the line plant, and the size of cable, and can affect the line characteristics for existing premises. Because of this, new fibre enabled street cabinets installed to address the EO line issue, are typically more expensive than a normal FTTC installation.

FTTC is the preferred fibre broadband deployment of BT given that a large number of end users can be connected to each enabled street cabinet and receive a significant increase in speeds of up to 80Mbps, dependent upon the line distance between the fibre enabled street cabinet and the premise. It is expected that premises located within 1km of an FTTC cabinet should expect to receive Superfast Broadband speeds of greater than 24Mbps.

3.3.2. Fibre to the Remote Node

Fibre-to-the-Remote-Node or FTTrN is a technology currently under development by BT and is very similar to FTTC in that fibre optic cable is deployed to a new location where a mini fibre enabled cabinet or pole/ underground unit is installed in order to provide superfast broadband services to premises. These generally

connect a smaller number of premises than a normal fibre enabled cabinet, at around 16 premises. FTTrN is expected be more expensive than FTTC per premise passed, but allows for smaller clusters of premises to be connected, resulting in better achievable speeds. As for the FTTC solution it is expected that premises located within 1km of an FTTrN node should be expected to achieve Superfast Broadband speeds of 24Mbps.

FTTrN is not currently featured in any rollouts as it is still under development; however it is anticipated that it could be deployed in the near future, if an extension to the DSSB project went ahead utilising Superfast Extension Programme (SEP) funds.

In most cases, the cost per premise is still expected to be significantly lower than a direct fibre to the premises solution.

3.3.3. Fibre to the Premise

Fibre to the premise (FTTP) is the technology able to deliver the fastest broadband speeds by deploying new fibre optic cable all the way to the customer premises. This is a very future proof method of delivery with services of 300Mbps and faster currently offered.

Due to the need to deploy all new infrastructure to the premise, the BT cost of deploying FTTP can be extremely high. This is further exacerbated in rural areas where there is little or no duct infrastructure which can be reused. Although aerial fibre can be used to decrease the deployment cost by utilising existing poles, this is dependent on the condition, loading and capacity of existing poles.

In addition, the dispersed nature of premises and increased distances mean this is currently rarely deployed in rural areas as the business case does not support the high deployment cost.

3.3.4. NGA Wireless

Broadband can be delivered wirelessly using a number of different technologies. In order for a wireless network to meet the EU NGA criteria, it must be designed to ensure that Superfast Broadband services and speeds can actually be delivered to premises in practice, not just theory.

Wireless technologies can be significantly cheaper to deploy than those based on fixed fibre infrastructure as they usually do not require the same level of civil works which constitute the bulk of the cost of fixed broadband deployments. However, it is subject to other issues such as obstacles (other buildings, terrain, dense foliage etc), available frequency channels, and capacity planning. These are especially important when aiming to deliver broadband speeds of at least 24Mbps to premises which can be difficult to achieve to a significant number of premises. The most commonly deployed fixed wireless broadband utilises point-to-multipoint technology, where multiple end users are connected to a single access unit, which is then connected to the wider infrastructure and backhaul. These radios typically operate in the unlicensed 5.4 and 5.8GHz bands, meaning they can be subject to interference from other operators and that the availability of channels is not guaranteed.

Mobile phone networks are increasingly providing faster data speeds to devices, especially with the transition from 3G to 4G technologies which can achieve very high peak speeds in the regions of Superfast Broadband. 4G can deliver peak speeds in excess of 24Mbps, subject to the received signal strength at the end user premises. However, 4G is currently not typically considered an NGA technology and it is also unclear what the level of contention would be between users and what the actual speeds achievable would be at peak times.

The mobile spectrum utilised by MNOs is a lower frequency than the 5.4 and 5.8GHz unlicensed bands, and thus should be capable of delivering greater coverage from each mast location.

3.4. Access Technology Feasibility

In this section a number of Access Technology options have been considered in order to complement the premises that are not likely included in the DSSB programme.

3.4.1. Fibre to the Cabinet/Remote Node

Looking at the remaining premises which are expected to be unserved following the current planned DSSB rollout, a significant proportion of these are clustered together, such that an FTTC or FTTrN deployment is expected to be a cost-effective way of serving the majority of premises.

It is expected that those premises within 1km of an FTTC/FTTrN node would receive speeds of greater than 24Mbps, whilst any premises located further away than this would still expect a step change in the current speeds available if connected to a new node.

Given the proximity of Advie exchange to the core BT fibre route on the A95, it is expected that with appropriate funding under the Superfast Extension Programme, this exchange could be connected to the main fibre routes without significant civil works. Subject to planning and survey and depending on cost and funding, this could enable the current EO lines at Advie exchange to be connected to a new fibre enable street cabinet and hence to offer superfast broadband services.

An alternative cost option, subject to planning and survey and depending on funding could be for the exchange to be upgraded to offer ADSL and/or ADSL2+ services. This would provide an improvement to the current speeds available and an increase in the number of premises receiving broadband services. it should be noted that this upgrade option is dependent on the available space within the existing exchange building to install the required electronic equipment.

3.4.2. Fibre to the Premise

To deploy an FTTP solution would require a significant level of new build to every premise that needs to be served.

These new fibre routes could be installed in the road or footpath (in which case Ofcom Code Powers would be required to undertake the work), and/or potentially across private land if appropriate way leaves were possible

with the land owners. The communities in scope span across the River Spey so consideration would need to be given to where fibre routes could cross the river, and any other geographic features that could complicate the deployment.

If a new infrastructure provider were installing FTTP, then a very large amount of civil build would be required to reach every premise.

If BT were deploying FTTP they would be able to utilise some existing assets, however the extent of new build may be significant, dependent on the extent and condition of existing infrastructure.

3.4.3. Wireless

To deploy a wireless solution to serve the remaining premises would require the installation of access nodes on a number of mast sites in order to provide sufficient coverage and access line speeds in excess of 24Mbps. This would need appropriate mast sites on which to site equipment to serve the area, which is located in a slight valley with a number of woodland areas. The wireless equipment would need to be located at sufficient height to ensure a clear line of sight to premises. It is likely that some premises would be affected by obstacles and clutter which may reduce the speeds achievable.

When considering Cromdale and Advie, there are few suppliers who would be likely to deploy a fixed wireless network to this area and it may be difficult to ensure that Superfast Broadband speeds are delivered to all premises.

Two mobile mast sites have been identified in the area around Cromdale and Advie, which currently host equipment for MNOs. The installation of any new equipment on these masts would be subject to available space on the mast, and a site sharers agreement including the agreed rental cost. Onward connectivity to a backhaul connection or the service providers' network would also need to be provided to these mast sites.

3.5. Service Provision

If an extension to BT's network was undertaken, various Internet Service Providers using this infrastructure would be able to offer services to the region. For a community based solution, Internet access would be through the provider of the Internet access circuit with an organisation required to design, build and operate the bespoke backhaul/access network for distributing the bandwidth to each premise in the community. This could be a community organisation or a company who is contracted to provide a backhaul radio link, for example.

4.   Financials

Considering that the only infrastructure currently present in the area belongs to BT, and from this desktop study it appears feasible that this may be extended if an extension to the DSSB project were to proceed, this is the only solution that has been considered at this stage as it is believed this is the most viable option to deliver additional coverage to the unserved premises in Cromdale and Advie. This approach will extend fibre closer to premises, which should enable even faster services in the future.

It is estimated cost to deploy an FTTC/FTTrN solution to the premises unserved by the DSSB project will be subject to the appropriate surveys and design and therefore is as yet unknown.

5.   Conclusion

In the first instance, it is expected that some premises in Cromdale will received superfast broadband services from the planned DSSB rollout, however the exact number of premises to benefit from this is still unknown. For the remaining areas the proximity of the upgraded Grantown-on-Spey exchange and planned DSSB rollout in Cromdale, together with the ability to naturally cluster remaining premises would suggest that the provision of new fibre enable structures via a BT FTTC/FTTrN solution funded under the Superfast Extension Programme would be the preferred option.

APPENDIX A

Glossary

ADSL - Asymmetric Digital Subscriber Line – a technology which enables faster data transmission over copper telephone lines and is the basis of standard broadband services provided by BT. ADSL Max is the marketing term used by BT for their up to 8Mbps service, speeds depending on distance from exchange and condition of the copper telephone line;

ADSL2+ - an enhancement to the original ADSL technology that provides higher download speeds of up to 24Mbps depending on the distance from the telephone exchange and the quality of the copper line;

CBS - Community Broadband Scotland, set up to provide support to the final premises not covered by mainstream broadband provision;

DSSB – Digital Scotland Superfast Broadband project - a programme delivered in partnership with BT which is in the process of providing the infrastructure needed to deliver NGA to those areas in Scotland where the market does not currently serve;

Exchange Activate – a technology which enables data transmission over copper telephone lines that can achieve a maximum speed of 512Kbps, depending on distance from exchange and condition of the copper telephone line;

EO - Exchange Only - Premises whose telephone lines are served directly from the exchange, and do not pass through a street cabinet;

FTTC – Fibre to the Cabinet - fibre connected green street cabinet, currently able to provide up to 80Mbps download speeds over copper, connecting the cabinet to the premise;

FTTP – Fibre to the Premises, fibre connected to the premise with no copper used. Depending on the products offered by an ISP, speeds of up to 330Mbps – 1000Mbps are achievable.

FTTrN – Fibre to the Remote Node, new technology planned for introduction by BT, which is similar to FTTC but uses a smaller node mounted on pole or in the ground to serve a smaller number of clustered premises;

ISP – Internet Service Provider, customer facing organisations which manages the connectivity between user and Internet using underlying infrastructure, which could be from 3rd parties. Eg Tesco ISP offering broadband services over BT infrastructure;

Kbps – Kilobits per second – a unit of data transfer rate. 1,000 Kbps is equal to 1Mbps;

Mbps – megabits per second – a unit of data transfer rate. Standard speeds of computer ports are 10Mbps or 100Mbps, ADSL2+ is up to 24Mbps, FTTC is up to 80Mbps etc.

NGA – Next Generation Access – an EU definition of broadband networks that use wholly or partly fibre optic elements. These are networks that can deliver faster services than the current ADSL/ADSL2+ networks, and must be capable of delivering peak download speeds of at least 24Mbps.

Ofcom – The Office of Communications, UK telecoms regulator charged with monitoring market activity and responding to non-competitive practices

SEP – Superfast Extension Programme - a further £250 million UK government investment with an ambition to extend Superfast Broadband to 95 per cent of the UK by the end of 2017.

Superfast Broadband – Defined as greater than 24Mbps in the UK, greater than 30Mbps in Europe.

SWAN - Scottish Wide Area Network, a Scottish wide public sector network which is open to all public sector organisations and currently being implemented. SWAN will provide connectivity to all NHS sites and a number of local authorities, including Highland Council (in 2016).

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