

# Telecoms connectivity in the Highlands and Islands

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## 1 Telecoms connectivity in the Highlands and Islands

Telecoms connectivity is a cornerstone of the digital economy, and provides opportunity for both innovation<sup>1</sup> and productivity increase. In order to maximise the potential for such development, it is vital that world-class telecoms connectivity be established.

Telecoms connectivity can be classified into two broad types: fixed-line connectivity and mobile connectivity. Both mediums are used to provide voice, broadband and other data services. This paper will focus solely on Broadband.

### *Fixed telecoms*

Fixed telecoms connectivity for consumers and SMEs in the Highlands and Islands is primarily provided by BT<sup>2</sup> using its copper-based access network, with a largely fibre core network. This network supports traditional telephony and broadband services using ADSL<sup>3</sup> technology.

BT provides fixed telephone lines to all premises in the Highlands and Islands as part of its universal service obligation, but not all of the lines are capable of delivering broadband. Some telephone lines are too long to receive an ADSL service even though they are connected to an exchange capable of providing ADSL. In addition, ADSL is not available in parts of the Western Isles, where the Connected Communities network provides broadband services.

### *Mobile telecoms*

Connectivity can also be provided over mobile networks. In the Highlands and Islands, such services are offered by five mobile operators: 3, O2, Orange, T-Mobile and Vodafone. These operators use a mixture of technologies which can be classified in to two main groups:

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<sup>1</sup> The role of broadband in innovation is discussed in detail in the Highlands and Islands Innovation System Review, May 2009

<sup>2</sup> Other suppliers (e.g. Cable & Wireless, Neos) have fixed networks in the region, but these are limited to a small number of large businesses and public sector sites.

<sup>3</sup> ADSL – Asymmetric Digital Subscriber Line is the technology used to deliver broadband, providing speeds of up to 8Mbit/s

- **2G technology** This is offered by four of the five<sup>4</sup> mobile operators and is used to provide voice, text and low-speed data services
- **3G technology** This is offered by all of the mobile operators and can support high-speed mobile broadband connectivity in addition to all of the 2G services. Mobile broadband services using 3G networks typically provide services with a download speed of around 1Mbit/s, though higher speeds are available in some areas.

## 2 Basic connectivity in the Highlands and Islands is good, but is below the UK average

Basic telecoms connectivity in the Highlands and Islands is good, with high levels of broadband availability. However, issues around low broadband speeds and network capacity are now becoming more prevalent. There is extensive 2G coverage from four different mobile networks but limited 3G coverage outside Inverness. Satellite broadband services are also common in areas that cannot receive either fixed or mobile broadband services.

Only six of the 384 exchanges in the region have been unbundled<sup>5</sup> to provide ADSL2+ services (“up to 24Mbit/s”), but this covers approximately 20% of premises. The vast majority of phone lines in the Highlands and Islands are connected to ADSL exchanges which offer “up to 8Mbit/s” services. There are over 80 exchanges, covering only 3% of premises, which provide broadband using Exchange Activate technology. With Exchange Activate, connection speed is limited to 0.5Mbit/s and the number of active connections available in a given exchange are restricted. A further limitation is placed on the choice of ISP for this service. This technology was installed in the smallest exchanges in Scotland where it was not financially viable to install full ADSL.

Telecoms connectivity is inherently more commercially attractive in urban areas due to the lower deployment costs per user. In the Highlands and Islands, as with most rural areas, it is more challenging to put forward a convincing case for widespread telecoms connectivity provided by the private sector.

To date, public sector investment in telecoms has focussed on providing basic coverage, rather than speed, such as:

- **Broadband for Scotland** This initiative supported the enablement of broadband services in exchanges that were not commercially attractive.
- **The Broadband Reach project** This has seen satellite and wireless broadband deployed in areas that cannot receive ADSL.

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<sup>4</sup> O2, Orange, T-Mobile and Vodafone

<sup>5</sup> Local Loop Unbundling is where an alternative operator (usually an ISP) provides services using a copper line from Openreach. One impact of this is that it allows the alternative provider to upgrade the services it offers to the end user to ADSL2+ technology.

- **Connected Communities** This project saw the deployment of a wireless network in the Outer Hebrides to cover areas not served by ADSL.

There has also been public-sector support for mobile coverage by Vodafone and O2 (previously BT Cellnet) via the provision of public-sector masts and European funding.

These projects have resulted in widespread access to modern telecoms services throughout the Highlands and Islands. The area can be seen to compare favourably to other rural areas, and also to the availability of services in other major countries. Indeed, the table below shows that the level of ADSL coverage in many major economies is lower than we have estimated for the Highlands and Islands:

<i>Country</i>	<i>ADSL coverage (at any speed)</i>
Netherlands	100%
UK	99.8%
Switzerland	98%
France	97%
Highlands and Islands	95%
Japan	94%
Spain	92%
Italy	90%
Germany	90%
Australia	81%
USA	78%
Greece	9%

*Figure 1: ADSL coverage in selected OECD countries compared to the Highlands and Islands [Source: OECD (2005), Analysys Mason]*

As well as a high level of basic broadband coverage, the Highlands and Islands also has a high take-up of broadband services. By the end of 2008, just over 60% of phone lines<sup>6</sup> in the Highlands and Islands had a broadband connection, with the UK average at 58% and Scotland at 53%. Figure 2 shows that many rural and remote areas have significantly high levels of take-up. However, it can be seen that the limited capacity in Exchange Activate areas may actually be limiting broadband take-up.

<sup>6</sup> This includes both business and residential phone lines.

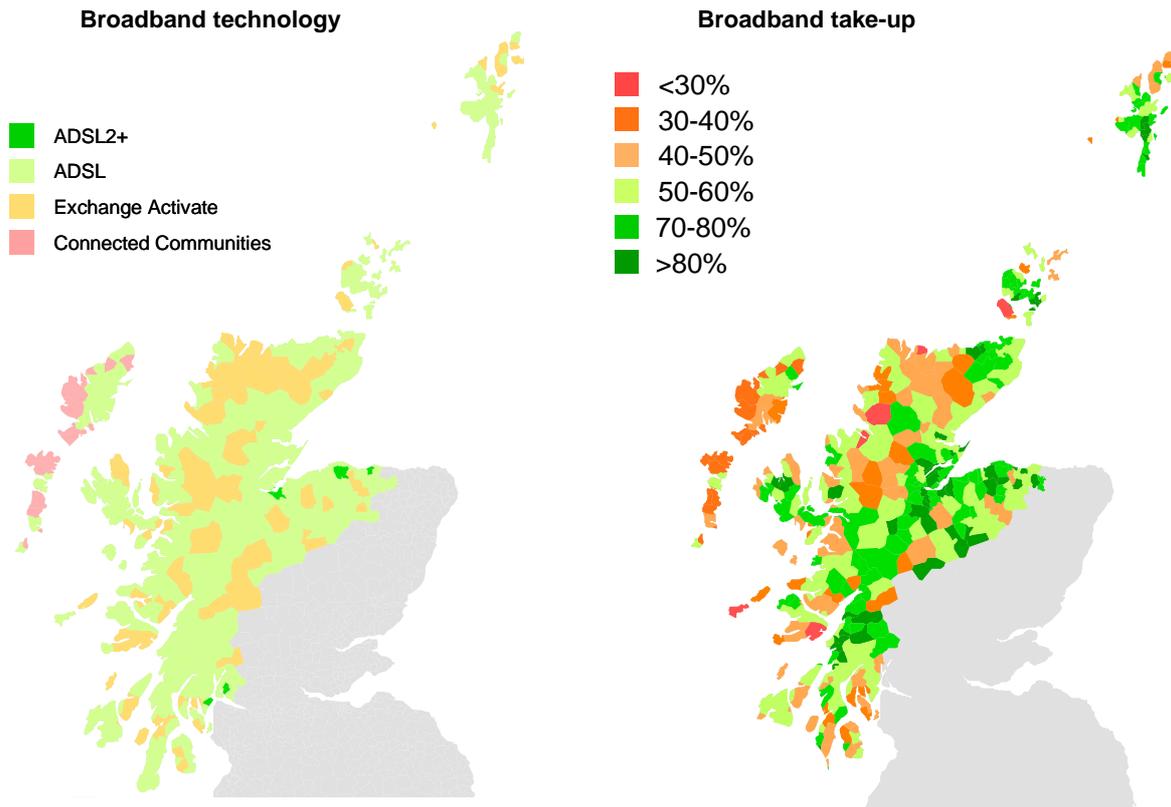


Figure 2: *Broadband technology and take-up in the Highlands and Islands [Source: HIE, BT (2008), Analysys Mason]*

### 3 There are some significant gaps in the current generation of telecoms connectivity

A consensus is emerging that to use a reasonably broad range of Internet-based services such as email, shopping, home working and streaming video, it is necessary to have access to a download connection of at least 2Mbit/s. Indeed, the UK Government's 'Digital Britain' recommends a 2Mbit/s universal service commitment (USC) for broadband by 2012. The USC will be delivered using a mix of technology solutions. We estimate that 28% of phone lines in the Highlands and Islands are unable to receive broadband services at a speed of 2Mbit/s or greater, compared to 11% of the UK. This is due to both the nature of the telecoms infrastructure in the Highlands and Islands, and to a lesser extent the use of Exchange Activate in some areas.

Where ADSL is available, the speed achieved by a subscriber is affected by the distance they are from the BT exchange, with longer telephone line receiving a slower service. Generally, a 0.5Mbit/s broadband service can be achieved where the length of the phone line from the exchange is less than 5.2km. If the phone line length is less than 4.1km, then speeds of at least 2Mbit/s are likely. Within the Highlands and Islands the average telephone line is 3.0km, compared to the UK average of 2.3km. This leads to a lower than average broadband speed in the region and a greater proportion of lines not being able to receive a 2Mbit/s service when compared to the UK average.

Also, whilst over 80% of UK phone lines are connected to an unbundled exchange (delivering ADSL2+ services of “up to 24Mbit/s), only 20% of lines in the Highlands and Islands are unbundled.

There are also some gaps in the provision of mobile connectivity. The Highlands and Islands is extensively covered by 2G networks with all major settlements and transport routes having a good level of coverage. As, however, with other UK rural areas, there are some parts of the region where coverage is less than optimal. Coverage from 3G networks is much more limited with very little coverage outside Inverness.

#### 4 A step change in telecoms connectivity is occurring, which will lead to challenges for the Highlands and Islands

##### *Fixed networks*

Fixed broadband networks are currently undergoing a step change in the connectivity that they can offer. Next-generation access (NGA) involves replacing some or all of the current copper phone line with fibre-optic cables to offer significantly higher broadband speeds – typically in excess of 20Mbit/s. It is anticipated that the deployment of NGA will deliver significant economic and social benefits. There are three main types of NGA:

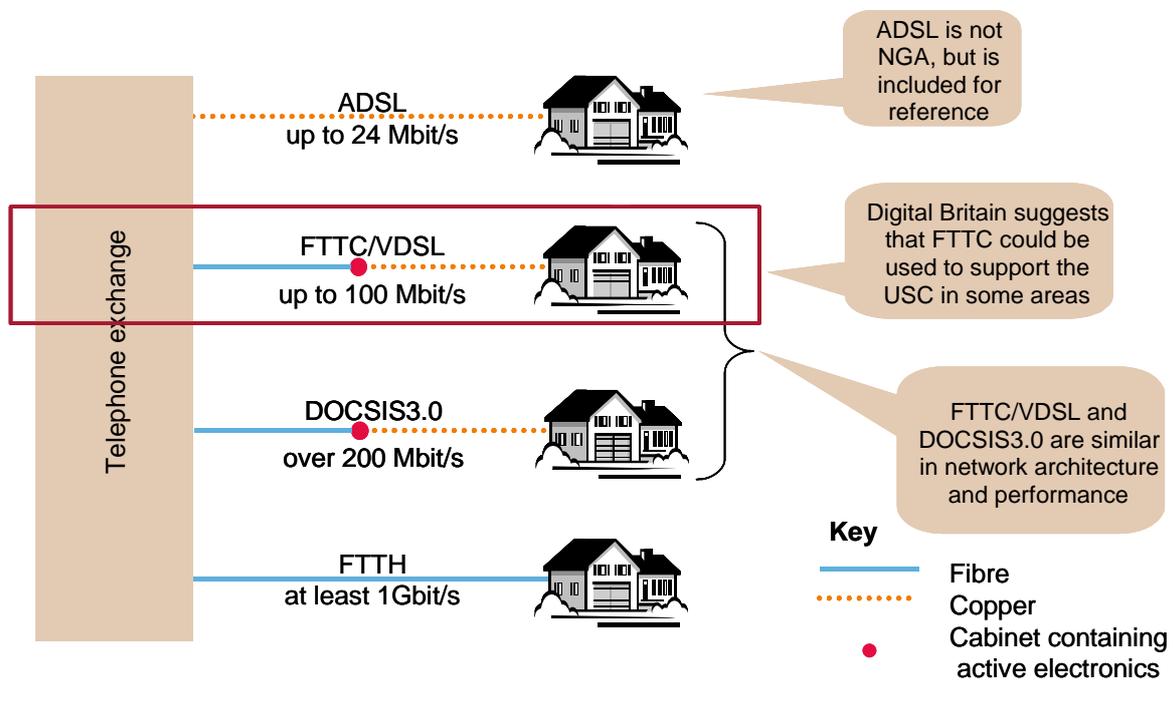


Figure 3: NGA architectures [Source: Analysys Mason]

NGA is already deployed across almost all of Virgin Media's network which covers around 45% of the UK using DOCSIS3.0 technology (Virgin Media currently have no network coverage in the Highlands and Islands and have no plans to extend their network). BT is in the early stages of deploying fibre to the cabinet (FTTC) to serve 10 million homes in the UK, and has announced the areas of initial coverage. However, none of the first 1.5 million homes to be covered are in the Highlands and Islands.

NGA is significantly more expensive to deploy than first generation broadband. A report by Analysys Mason for the Broadband Stakeholder Group<sup>7</sup> calculated that a UK-wide FTTC network would cost GBP5.1 billion, with nationwide fibre to the home (FTTH) costing up to GBP29 billion. Whilst commercially funded roll-out is likely to increase in the UK over the next few years, there is recognition that it is unlikely to extend to rural and remote areas. As the need for NGA is becoming more evident, many other Government's are now committing public funds to support and encourage the rollout of NGA:

- Finland is aiming for 99% of households and business to have access to 100Mbit/s by 2015
- The German government aims to deliver 50Mbit/s to 75% of households by 2014
- US Government has allocated £4.8bn for broadband projects
- Australian Government has announced £21bn project to cover 90% of households with FTTH and the remaining 10% served by wireless technology, delivering up to 12Mbit/s
- New Zealand Government has committed £0.6bn to provide 75% of households with FTTH

The recent Digital Britain report has acknowledged that the commercial deployment of NGA is unlikely to reach more than two-thirds of UK households. Recognising the importance of NGA and the risks associated with a perpetual digital divide, Digital Britain has proposed to introduce a GBP0.50 monthly levy on all fixed lines to provide funding to support the deployment of NGA to over 90% of the UK by 2017. This project is referred to as the Final Third Project. We estimate that this could increase NGA roll-out in the Highlands and Islands to around 85%. This is comparable with the roll-out of first generation broadband, where 15% of the region was left unserved following BT's commercially funded exchange upgrade programme. The remaining 15% was later served by the Scottish Government's Supply Side Intervention "Broadband for Scotland".

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<sup>7</sup> The Broadband Stakeholder Group is a UK industry-government forum tackling strategic issues across the converging broadband value chain. It provides a neutral forum to discuss and resolve key policy, regulatory and commercial issues, with the ultimate aim of helping to create a strong and competitive UK knowledge economy.

*Mobile networks*

Looking at mobile connectivity, recent years have seen explosive growth in mobile broadband services. Mobile broadband access is typically provided using a USB ‘dongle’ to connect laptops to the 3G network which provides download speeds of around 1Mbit/s. However, the availability of mobile broadband is not ubiquitous, with 3G coverage largely limited to urban areas of the UK. One of the key reasons for the limited 3G coverage is the lack of access to low-frequency radio spectrum (such as the ‘Digital Dividend’ spectrum freed up following analogue TV switch-off). This issue has been addressed in Digital Britain, and it is expected that operators will gain access to new spectrum that will allow them to increase 3G coverage to match 2G coverage in the medium term.

## 5 What gaps should be addressed?

Strategically, there are three identifiable gaps in the connectivity in the Highlands and Islands that could be addressed:

- Availability of first generation broadband at 2Mbit/s is not universal.
- Lack of NGA, which is expected to trail behind the average level of availability for the rest of the UK.
- Limited 3G coverage.

As mentioned previously, the UK Government’s Digital Britain provides details on some key recommendations that have the potential to significantly improve connectivity in the Highlands and Islands. Connectivity gaps in the Highlands and Islands could be addressed by:

*2Mbit/s broadband connectivity*

2Mbit/s broadband access over fixed networks is currently estimated to be available to 72% of businesses and households in the Highlands and Islands, with 5% unable to receive any ADSL services. This gap in connectivity is expected to be addressed by 2012 as part of a universal service commitment outlined in the Digital Britain report. The GBP200 million of funding for the nationwide project will come from an under spend in the digital switchover help fund. Priority will be given to areas with no broadband service at all.

*NGA*

Using the model of NGA costs that we built for the Broadband Stakeholder Group, we have carried out an analysis of the costs of deploying NGA in the Highlands and Islands. This shows that it would cost GBP81 million to deploy FTTC to all of the Highlands and Islands, and that

FTTH would cost up to GBP480 million.<sup>8</sup> The figure below shows that both FTTC and FTTH are significantly more expensive (on a per premises<sup>9</sup> basis) than for the UK as a whole. In rural areas, lower population density means that the costs for deployment are shared amongst fewer premises, thus leading to a higher cost per premises. Additionally, phone lines are on average longer in the Highland and Islands, so replacing them with fibre is more expensive. There are also very few cabinets in rural areas, so there would be a requirement to build new cabinets to deploy FTTC. BT's current FTTC upgrade programme in selected locations around the UK is comparable to investing around GBP150 per premises. Figure 4 shows that the average cost for rolling out FTTC across the whole UK is slightly higher than this and that the cost per premises in the Highlands and Islands is significantly greater.

	<i>H&amp;I</i>	<i>UK</i>	<i>H&amp;I variance</i>
FTTC/VDSL	346	186	+86%
FTTH/PTP	2034	1058	+93%

*Figure 4: Average cost per premises passed (GBP) [Source: Analysys Mason]*

Taking a similar approach to that used in the Digital Britain report (which was based on the assumption of commercial roll-out to around two-thirds of the UK population), we estimate that the commercial roll-out of NGA in the Highlands and Islands could approach 40% of premises.

The costs of deploying FTTC are relatively constant per home for the first 40% of the Highlands and Islands. The level of investment in these areas is similar to those being targeted by BT as part of its deployment to 10 million homes by 2012. It is therefore possible that a private investor (most likely to be BT) would deploy FTTC to around 40% of the Highlands and Islands.

The funding gap for the remaining 60% of the Highlands and Islands is estimated to be GBP46 million (with the private sector also investing around GBP22 million assuming they invest at the same level per premises as in urban areas). As a comparison, public sector investment in providing basic broadband in the Highlands and Islands was GBP13.82 million.

Some of this funding gap should be provided by the GBP0.50 levy proposed in Digital Britain, This levy is due to be included in the Government's Finance Bill later this year. Our analysis of the likely impact of the levy indicates that it should be able to deliver FTTC to in excess of 90% of the UK, and 85% of the Highlands and Islands. To deliver NGA to the final 15% of the Highlands and Islands may require additional funding of around GBP24 million.

<sup>8</sup> These costs cover upgrades required from exchange to the cabinet or the premises. There will be additional costs in providing backhaul to the exchange .

<sup>9</sup> Premises covers both business and residential premises

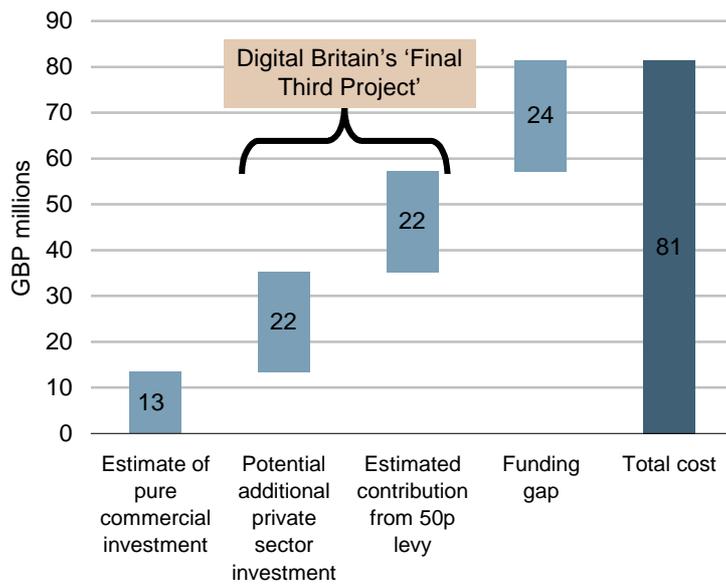


Figure 5: Illustration of potential funding mix for FTTC/VDSL in the Highlands and Islands  
[Source: Analysys Mason]

### 3G mobile networks

Whilst all five providers of 3G networks offer good 3G coverage in Inverness, there is only limited coverage beyond the city. This level of coverage is not dissimilar to other rural areas across the rest of the UK. For example, recent coverage maps produced by Ofcom<sup>10</sup> show that there is almost no 3G coverage in areas such as the Lake District. Much of the coverage from 3G networks in the UK as a whole is limited to urban areas. This is largely due to the poor propagation characteristics of the current 3G spectrum that is in the 2.1GHz band.

There are plans for lower-frequency bands to be used to provide 3G services in the near future. The exact plans are still to be confirmed but it is likely that multiple networks will gain access to 800MHz<sup>11</sup> and 900MHz<sup>12</sup> spectrum. These lower frequencies enable signals to propagate further and are particularly suitable for rural areas. Once these frequencies are made available, it is expected that 3G coverage will increase, and could reach current 2G coverage levels (i.e. all major settlements and transport routes in the Highlands and Islands).

<sup>10</sup> [http://www.ofcom.org.uk/radiocomms/ifi/licensing/classes/broadband/cellular/3g/maps/3gmaps/coverage\\_maps.pdf](http://www.ofcom.org.uk/radiocomms/ifi/licensing/classes/broadband/cellular/3g/maps/3gmaps/coverage_maps.pdf)

<sup>11</sup> 800MHz spectrum is currently used for analogue television and will be released as part of the Digital Dividend.

<sup>12</sup> 900MHz spectrum is currently used by O2 and Vodafone to provide 2G services but is expected to be made available for 3G services as well.

## 6 Implications and suggested actions for Highlands and Islands Enterprise

Whilst the Highlands and Islands is well served in basic level connectivity, there is growing concern that the region will fall behind in terms of broadband in the future, and especially for next generation access. This was highlighted in the Highlands and Islands Innovation System Review where most businesses surveyed stated they could not get the bandwidth they required. This is also emerging as a key issue within the Highlands and Islands 'Digital Economy Action Plan' which is due to be published in October 2009.

We have identified five areas for action that Highlands and Islands Enterprise should pursue to ensure that telecoms connectivity is improved and to help the region to address the challenges that it will face in the future. The most pressing actions should be identified and then a detailed strategy developed for them.

### *Action 1: Ensure rapid deployment of the USC to the Highlands and Islands*

Highlands and Islands Enterprise could identify areas with no or limited access to broadband and provide information to the USC delivery body<sup>13</sup> to ensure that these are addressed first.

### *Action 2: Encourage deployment of mobile broadband once new spectrum is available*

Highlands and Islands Enterprise could register demand from consumers for 3G and mobile broadband services. This could be used to persuade mobile operators to deploy infrastructure sooner in the Highlands and Islands once they gain access to new lower-frequency spectrum.

### *Action 3: Ensure BT deploy FTTC to as much of the Highlands and Islands as possible as part of its planned GBP1.5 billion investment*

The existing announcement by BT regarding FTTC deployment appears to show uneven rollout around the country, with some regions such as the North West having a significant proportion of the initial phase of FTTC deployments by BT. HIE should discuss with BT what they can do to prioritise part so the H&I for FTTC rollout.

### *Action 4: Stimulate and register demand for NGA*

Commercial investment in NGA could be promoted by ensuring that operators are aware of demand for NGA services. Highlands and Islands Enterprise could develop a plan to (i) register

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The Digital Britain final report has suggested that the USC will be delivered by the Network Design and Procurement Group, which will be operated at arm's length from central Government.

existing demand for NGA and (ii) stimulate additional demand. This may help to ensure that NGA is delivered sooner to the Highlands and Islands.

*Action 5: Investigate providing additional incentives and funding to extend NGA coverage*

Digital Britain may not deliver universal NGA to the Highlands and Islands by 2017. Highlands and Islands Enterprise could investigate options to provide additional incentives and funding alongside central government funding to have more extensive NGA coverage. Key public sector stakeholders to engage with are: Department for Business, Innovation and Skills (BIS), Technology Strategy Board and Scottish Government. HIE could also be involved in facilitating technology trials and demonstrations of rural NGA roll-out.