BSG
Broadband
Stakeholder
Group

Options for accelerating the deployment of terrestrial fixed and portable wireless broadband services by 2005

BSG Wireless Working Group

November 2003

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EXECUTIVE SUMMARY

Wireless broadband technologies have the potential to play a critical role in the development of Broadband Britain and will be essential for: extending platform competition across the UK market; extending broadband coverage to 'rural' areas; and enabling the introduction of new higher speed next generation broadband services. In its second annual report the BSG highlighted wireless broadband technologies as having the potential to make the biggest impact on extending coverage and enhancing competition by 2005.

The term 'wireless' can be used to describe a wide range of technologies and platforms including satellite and mobile (GPRS, and 3G) etc, all of which have a vital role to play in the development of Broadband Britain. However, this report is focused specifically on the issues related to fixed wireless access and W-LAN type services that provide service characteristics similar to or better than equivalent fixed line broadband platforms such as ADSL and Cable.

For a number of reasons (outlined below) Fixed Wireless Access type[1] services have so far only had a limited impact on the UK broadband market[2]. Building a viable business case for these services presents various commercial and technical challenges and the 2002 BSG Wireless Working Group Report recommended that Government should do more to facilitate the development of wireless and develop a strategic plan for the deployment of wireless broadband services in the UK. That report also clarified the nature and status of the requirements for spectrum, mindful of the UK's strong capabilities in this technology.

The objective of this paper is to examine the commercial and regulatory reasons for the lack of progress in terrestrial wireless broadband deployment to date and assess what regulatory measures could be taken in the short term (2003-2005) by RA/ OFCOM to help facilitate the development of this market as well as to look at the longer-term requirements for spectrum (post 2005) for wireless broadband. While the regulatory framework is by no means the only determining factor on the success or failure of wireless broadband services, it does have a profound impact in a market where access to scarce spectrum resources is so fundamental.

There have been a number of positive developments over the last 12 months, including the rapid development of WLAN market; the successful auction of 15 regional licenses in the 3.4GHz band; the release of unlicensed spectrum at 5 GHz (bands A and B) etc. However, there have also been set backs, such as the delayed release of 5.8GHz (band C); the imposition of additional technical constraints in some bands; and the lack of a clear strategy for enabling wireless broadband. Overall, there is a strong perception that spectrum policy is struggling to keep pace with technological and market developments and that there is a need to develop a more integrated market orientated approach to spectrum management that provides greater regulatory clarity while minimising regulatory intervention. The BSG therefore welcomes the high prioritisation given to spectrum management issues by the OFCOM board.

Six recommendations are identified in this report:
1. RA/OFCOM should introduce geographically differentiated regulation to increase the EIRP level at 2.4GHz to enable the use of directional antennas in rural areas to achieve greater range
2. RA/ OFCOM should expedite the urgent release of 5GHz Band C as planned
3. RA/OFCOM should consult on options for allocating further spectrum in the short term
4. Industry should do more to articulate the economic case for wireless broadband services in order to justify requests for new spectrum allocations
5. RA/ OFCOM should undertake an urgent review of spectrum requirements for wireless broadband services and set out a strategic plan for wireless broadband, as called for in the BSG 2002 Report
6. OFCOM should undertake a major review of Spectrum Management on the model of the FCC's Spectrum Policy Task Force[3].

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[1] Including fixed point to point; point to multi-point, mesh and portable point to multi-point systems
[2] The extent of wireless broadband deployment is probably underestimated as many smaller community and public sector networks are not included in official broadband coverage estimates
[3] Details on the FCC Spectrum Policy Task Force can be found at www.fcc.gov/sptf/

The working group's approach

Following publication of the BSG's second annual report Keith Todd, Chairman BSG, in February 2003 met the Chief Executive of the Radiocommunications Agency (RA) and DTI officials to discuss how the recommendations on spectrum should be pursued. They agreed to set up a small joint working group to explore the case for further release of spectrum for broadband.

Core members of the group were drawn from the BSG secretariat and the broadband teams in the RA and DTI. After some discussion the group agreed on an approach that would seek to identify (i) wireless technologies that could impact on the coverage problem, given the need for a realistic commercial assessment of each one's potential, (ii) identify any barriers to their deployment, (iii) identify options for mitigating those barriers, and (iv) outline longer term implications for spectrum policy.

The group decided to discuss this approach with a cross-section of the industry – including telecom companies, operators and vendors. Over the summer it had one-to-one meetings with a number of companies in order to canvass different views and opinions. The draft report was then presented to the BSG Wireless Working Group for further discussion, input and approval.[4]

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[4] This report has been drafted by the BSG Secretariat on the basis of inputs from BSG members and does not reflect the specific views of any one particular company or organisation

1. INTRODUCTION

Encouraging the successful exploitation of wireless technology for the deployment of broadband services is critical for the future of Broadband Britain for three reasons:

a) Increasing platform competition. (Platform competition between cable and ADSL is limited to approximately 50% of the UK market. There is no major competitive platform to ADSL in the rest of the market.)

b) Achieving rural broadband coverage. (Projections for 2005 show that coverage outside urban areas and market towns will remain low: rural villages 32% and remote rural 8%. Wireless may be the only way of reaching such low-density rural areas[5].)

c) For delivering next generation broadband services across the UK. (Next generation services will offer speeds in excess of 2 Mbps. They may be deliverable over DSL but at severe cost to coverage. Wireless may be the only realistic way to deliver higher bandwidth services throughout the country.)

The term 'wireless' can be used to describe a wide range of technologies and platforms including satellite and mobile (GSM, GPRS, and 3G) etc, all of which have a vital role to play in the ongoing development of Broadband Britain. However, this report is focused specifically on the issues related to fixed wireless access and W-LAN type services that provide service characteristics similar to or better than equivalent fixed line broadband platforms such as ADSL and Cable.

Although the actual extent of deployment of this type of wireless broadband is probably underestimated (as many of the smaller community and public sector networks are not included in official broadband coverage estimates[6]), wireless broadband services[7] have so far only had limited impact on the UK broadband market to date. It should be stressed that wireless technologies should not be viewed solely as 'rural' technologies – however they should offer better potential for deployment in rural areas than wireline services and therefore offer an important opportunity for increasing rural coverage.

The objective of this report is to examine the reasons for the lack of progress in terrestrial wireless broadband deployment to date and to explore potential regulatory options for expediting the deployment of wireless broadband services by 2005 in order to influence the UK's target to have the most extensive and competitive broadband market in the G7. The report also looks at the longer-term requirements for spectrum (post 2005) for wireless broadband services.

In addition to this report the BSG has recently published a report on the Impact of Public Sector Interventions on Broadband in Rural Areas[8], which sets out the range of public and private sector initiatives currently being developed at national, regional and local level across the UK. It is recommended that these reports are read together in order to gain a better picture of the full range of commercial and public sector and regulatory initiatives aimed at extending broadband coverage to rural areas.

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[5] Rural areas comprise groups of dispersed population clusters (market towns and their serviced communities around); overall the population density is low but the majority (>65%, 80% is fairly common) live within 4.5 km of the centre of a market town. The length of the backhaul and distribution service to reach these clusters makes the business case unattractive. Rural broadband needs long legs, but typically the same short arms as everywhere else for their access networks.

[6] The DTI should seek to improve the accuracy of its Broadband map by encouraging smaller operators, including community and public sector to provide their coverage data

[7] Excluding the market for 'indoor' WLAN access products and WLAN hotspots which has shown significant growth in the last 12 months

[8] www.broadbanduk.org

## 2. POTENTIAL WIRELESS TECHNOLOGIES FOR PRE-2005

2.1 Assumed requirements:

The working group assumed the following requirements for suitable technologies:

- Available now or soon (deployment in 2004 at the latest, some degree of future proofing)
- Capable of supporting today's services (Always-on; 512 Kbps downstream or better, 128 KBPS or more upstream; contention ratios of 50:1 or better)
- Delivering Quality of Service for business users
- Low cost – mass market application
- Capable of supporting users (consumers and SMEs) efficiently and affordably

2.2 Platform types considered for this report:

The primary focus of this report is to understand why terrestrial wireless broadband services have not yet had a significant impact on the broadband market in the UK and what could be done in the short term to ameliorate this situation. However, there are clearly other platforms capable of delivering broadband services that must not be overlooked. In particular satellite services (both 2-way and 1-way hybrid services) are already being used in a number of different ways (for both single access and shared access[9]) to deliver access to consumers and SMEs and both high and low altitude platforms both have the potential to play a role in the future.
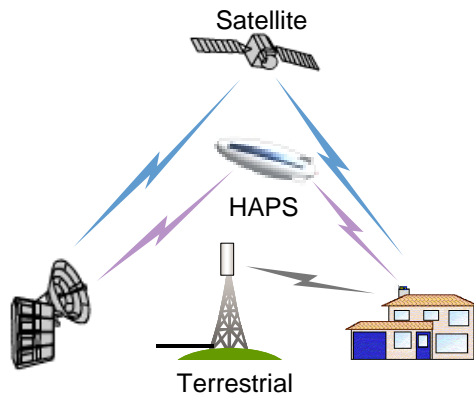

- **Satellite services:**
  Unlikely to achieve mass market pricing w/in 2004 timescale

- **High Altitude Platforms (HAPs)**
  Not commercially available within the 2004 timescale

- **Terrestrial:**
  Main focus of this report

2.3   Access and Backhaul

Access and backhaul are separate but related issues that both need to be addressed if wireless Broadband services are to de delivered to rural locations.

While there are a variety of technology solutions for providing access to rural areas, access to low cost backhaul remains a major barrier.

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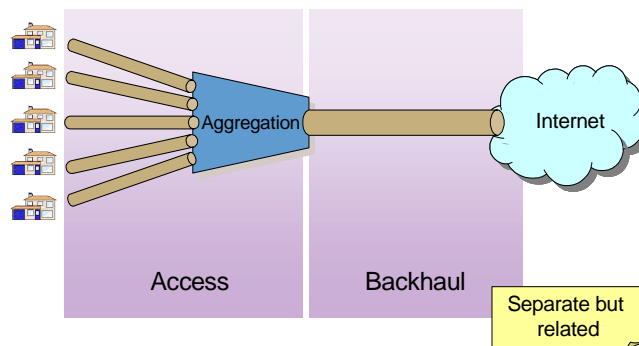
[9] A number of Community Networks use 2-way satellite connections (for backhaul) in combination with Wi-Fi to provide affordable broadband access to a local community.

2.4 Frequency bands suitable for current generation mass-market broadband
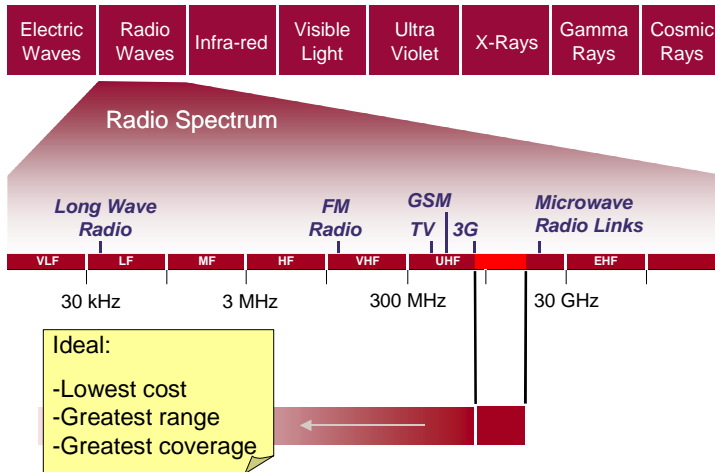
The ideal frequency range for wireless broadband services is between 2-11 GHz. This spectrum range provides lowest cost, greatest range and greatest coverage[10].

There are allocations for WLANs and FWA within this range. However, this is a very heavily used part of the spectrum and making additional allocations within it will be difficult.

2.5 Barriers to the deployment of wireless broadband services

Delivering mass-market (i.e. consumer) wireless solutions that offer equivalent levels of service to ADSL and Cable (and at a similar price point: £20-30 p.m.) in rural areas represents a major challenge. Almost by definition rural areas represent 'low-value' for operators. Wireless solutions for these areas will therefore have to be very low cost if operators are going to have any prospect of achieving the necessary return on investment.
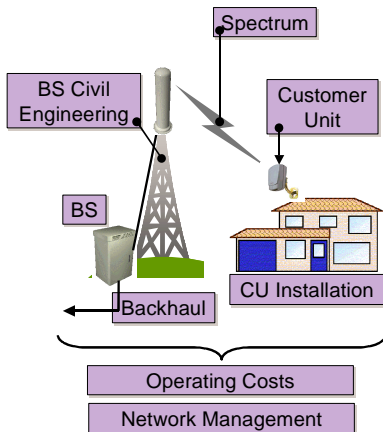
There are a number of key cost elements that will vary from one type of wireless system to another, but all of which need to be minimised:

- Customer Unit (CU)
- Customer unit installation
- Base station (BS) equipment
- Base station "civil engineering"
- Backhaul
- Network Management
- Spectrum costs
- Operating costs

The coverage and capacity offered by a wireless solution is influenced by a number of factors:

Some of these are "fundamental":
1. Underlying radio performance
2. Frequency of operation and bandwidth availability
Some are "regulatory":
3. What power/antennas are you allowed?
Some are "economic":
4. How high can you get both ends of the link? (More height = more range. Although this does not apply in the case of all network configurations)
5. How much "gain" do your antennas offer?
6. How many base stations are you willing to put in to cover a given area?

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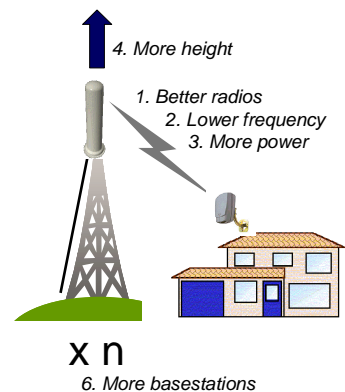
[10] It should be kept in mind that higher data rate services will require more bandwidth which could make higher frequencies above 11GHz more suitable in the future.

The strong link between cost, coverage, aggregate capacity and supportable user data traffic rates means that they must be considered together.

A range of different network configurations can be used to deploy wireless systems including: Point-to-point, point-to-multipoint and mesh networks.

The cost factors working against mass-market wireless broadband deployment:

- **Equipment costs**: need to be able to utilise low cost equipment manufactured in scale for large markets. Therefore need to use same or similar spectrum as other leading international markets.
- **Installation costs**: services requiring line of sight are expensive to survey and install. No install, self install and easy install services require spectrum in the lower frequency bands.
- **Backhaul cost:** lack of access to affordable backhaul often fatally undermines the business case outside urban areas. The cost of fixed link wireless backhaul is an issue. Many operators would want to use different spectrum for backhaul and access. Many small projects are currently using leased lines or satellite links to provide backhaul.

These factors can be mitigated by:

a) using appropriate and sufficient spectrum that maximises coverage from a base station, enables the use of low cost terminal and base station equipment, minimises installation costs, etc
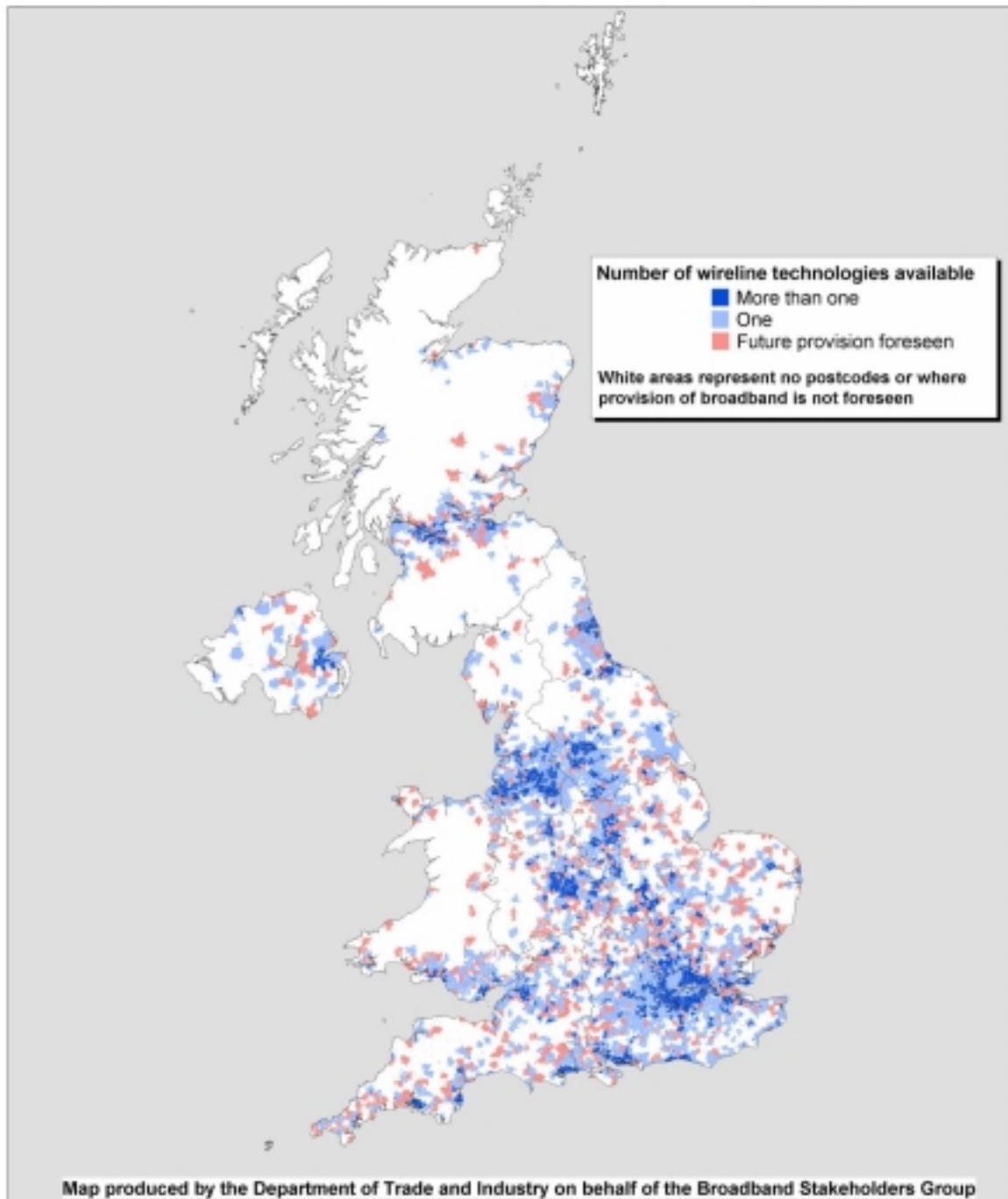b) finding alternative low cost options for backhaul [such as satellite, fibre, point to point wireless etc]

Causes of additional market uncertainty
In addition to the need to minimise costs a number of additional factors have contributed to a climate of uncertainty that is causing many commercial companies to hold back from making key strategic decisions. These include:

- the challenges of operating in an extremely demanding financial climate and the difficulty of accessing new capital for infrastructure investment.

- the very slow pace of regulatory decision making compared to the rapid pace of technology development (the Cave Report recognised that the pace of regulatory decision making is out of sync with the pace of technology development, and this is one of the issues that it is hoped that spectrum trading and other measures yet to be defined in detail such as spectrum re-farming will address).

- planning also remains a problematic issue. The slow speed of decision-making around the siting of masts and antennas at local authority level causes significant delays to the provisioning process.

- the difficulty of predicting future demand.

- uncertainty about how the competitive landscape will evolve (vis fixed vs wireless vs mobile etc) and the impact of developing government policies (such as public sector aggregation).

2.6 Business models for wireless broadband deployment in rural areas

United Kingdom Fixed Line Broadband Coverage (Cable and DSL) Q3, 2003

Number of wireline technologies available
- More than one
- One
- Future provision foreseen

White areas represent no postcodes or where provision of broadband is not foreseen

Map produced by the Department of Trade and Industry on behalf of the Broadband Stakeholders Group

Current coverage includes exchanges that have been committed to be enabled by the end of 2003.

* 2-way Satellite services are also available across the UK and some terrestrial wireless services have been deployed in a number of locations.

** Future provision foreseen is any BT exchange that currently has a trigger level set

This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the controller of Her Majesty's Stationary Office. ©Crown copyright. All rights reserved. DTI. 100037208. September 2003.

The map above illustrates the extent of geographical coverage of fixed line broadband services in the UK. Whilst approximately 80% of UK households can have access to broadband services, the total geographical coverage is significantly lower.

Rural areas comprise groups of population clusters (market towns and their serviced communities around); overall the population density is low but the majority (>65%, 80% is fairly common) live within 4.5 km of the centre of a market town. The population density in these clusters can be as high as 1800 per sq km and is often 500 to 1000 per sq km. The key issue is the core backhaul and distribution network to reach these clusters; the access network issues are the same as those to be found in most communities around the country. There is a further group of more isolated dwellings (5-9%) but they tend to be "near" to the smaller communities.

The total populations are not high, at a gross level they are thinly spread, however, as utility users they are for the most part clustered. The length of the backhaul and distribution service to reach these clusters (and therefore the inherent cost exacerbated by current regulatory conditions) makes the business case unattractive. The markets are individually small but research[11][12] focused on two areas shown to be statistically valid[13] has shown that their need for access increases the propensity to take service when available.

Example: Rural South Devon

27,000 homes, 90,000 people in an area of 625 sq km within South Devon: an area that is typical of rural England and the border areas.
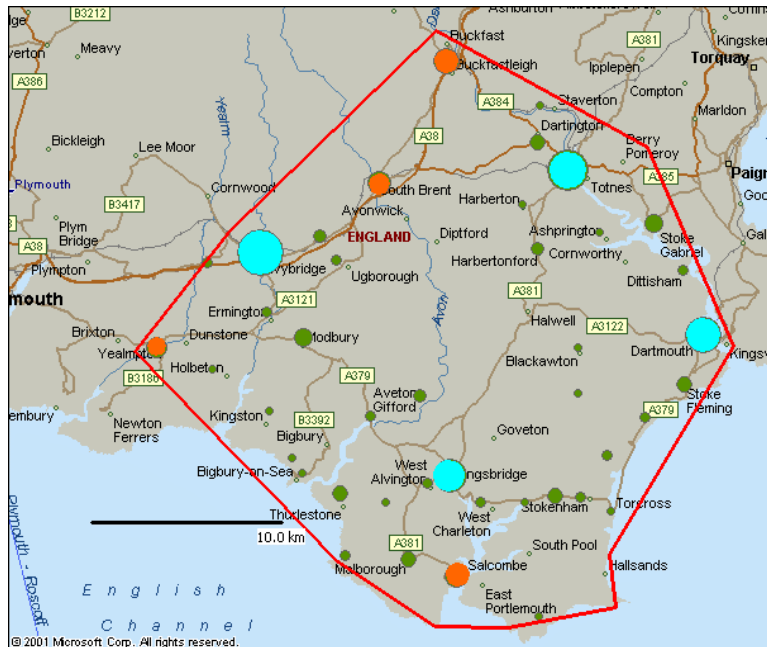
The tier 1 towns (blue) account for 48% of the population

The tier 2 towns (brown) account for 14% of the population

The Tier 1 & 2 towns account for 62% of the population.

With a 4.5 km hinterland they account for >80% of the population (because they extend beyond the study area; would be 87% if the areas were congruent).

Rural broadband networks need long legs (backhaul) but, typically, the same short arms as everywhere else for their access networks.

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[11] Rural broadband project for SWRDA – BAS LLP 2002

[12] Market research for Devon Pathfinder and Orange Rural study – BAS LLP 2003

[13] Comparison of six rural areas around the UK – BAS LLP 2002

The business models being explored for rural wireless broadband deployment fall into three main categories: Commercial, public sector and community.

Commercial

- A number of companies are seeking to exploit wireless technologies to deliver competitive broadband services on a commercial basis across the country. These include: WLAN 'hotspot' services; fixed wireless access services and portable broadband wireless services.

  In many cases their business models tend to be focused on higher value business customers in higher density areas, however, some wireless operators are looking to combine a mix of business and residential customers. In order to extend their service provision to the urban fringe and rural communities some (not all) of these companies are looking for a demand-pull through aggregated public sector procurement of broadband services. Many wireless operators will 'hope to win public sector contracts through the Government's Broadband Aggregation Programme in order to justify new capital investment required to extend their reach. The potential of wireless services to extend coverage into unserved areas should not be overlooked by the Regional Aggregation Bodies currently being established.

Public Sector

- In a number of locations the Public Sector is investing directly in new wireless networks in order to connect key public sector sites in unserved areas (such as schools, libraries, GP's surgeries etc). In many cases local authorities are planning to open these networks to private sector and residential users. Examples include Anglesey Connected in North Wales and Project Access in Cumbria.

Community

- As a result of many commercial players holding back from making key strategic decisions, much of the progress in the deployment of new wireless broadband has been made at the micro/ community level. In a number of smaller communities, local residents frustrated with a lack of broadband access have decided to take a DIY route to provide broadband services for their local community, often exploiting a combination of low cost public sector backhaul (e.g. from a school) and low cost WLAN technology. The success of several high profile examples of Community Networks, including the Buckfastleigh Community Network in Devon and Alston Cybermoor in Cumbria (where there has been more than 30% take-up by local residents and businesses), has stimulated many more communities to take a similar approach.

  In time some of these initiatives may develop into sustainable long-term commercial concerns on a social enterprise type model whilst others may prove to be more short-term interim solutions. Either way, these community networks are currently providing important services to local people in the absence of investment by larger commercial operators.

3. UK FIXED WIRELESS ACCESS, WIRELESS LAN AND WI-FI FREQUENCY BANDS

Frequency band	UK assignment	UK status	Assignment per operator	Availability	Technical characteristics and capabilities	Remarks
2.4 GHz	2.4 – 2.4835 GHz	Licence exempt	Spread spectrum modulation allows operation across the band.	Commercial public services allowed since July 2002.	Limited power at 100mW eirp restricting range. Broadband devices giving about 11 Mbps but this will be divided by the no. of users of a system.	Free access but proliferation of devices may cause congestion. Providing it meets UK technical requirements 802.11b equipment may be used, as will 802.11g, which is under development for higher data rate equipment.
3.4 GHz	3.48-3.50 GHz paired with 3.58-3.60 GHz	Licensed	2x20 MHz per licence.	15 regional licences awarded June 03 following auction to: PCCW (13 licences), Red Spectrum (subsequently acquired by PCCW) and Public Hub.	Range typically 10 km. New techs. may facilitate non-line of sight operation. Bandwidth available will allow up to 2 Mbps per customer.	Good commercial equipment availability.
3.6 GHz	3.605-3.689 GHz paired with 3.925-4.009 GHz	Licensed	2x36 MHz	Licensed nationally to FirstNet (took over Liberty Broadband in January 03). Now owned by Pipex Communications. Serves Thames Valley, South London, Bristol, West Midlands, East Midlands and Yorkshire.	Standard services provided include data services at 512 kbps per customer but higher rates up to 2Mbps are possible.	Band under consideration for further licences. Sharing with other services will need careful co-ordination and subject to further study.
5 GHz Band A	5.15-5.35 GHz	Licence exempt.	Not applicable.	Commercial public services allowed from 12 February 2003.	Indoor use only. Limited power at 200mW eirp. Can provide up to 20 Mbps but depends on no. of users.	Technical requirements set out in Interface Regulation (IR) 2006 – currently an interim version pending inclusion of requirement for dynamic frequency selection (DFS) and Transmit Power Control (TPC) implementation. 802.11a devices will comply with current (interim) IR. 802.11h devices will include DFS and TPC.
5 GHz Band B	5.47 – 5.725 GHz	Licence exempt.	Not applicable.	Commercial public services allowed from 12 February 2003.	Limited power at 1W eirp restricting range. Outdoor use permitted. Can provide up to 20 Mbps but depends on no. of users.	See above.
5 GHz Band C (5.8 GHz)	5. 725-5.8750 GHz	Licensed.	To be decided.	Under consideration. Probably minimal licensing regime with requirement for DFS to protect other users in	Power to be limited – probably to 2W. Outdoor use permitted. Can provide up to 20 Mbps but depends on no. of users.	Final version of IR 2007 will set technical requirement for DFS and TPC.

						band. Availability scheduled for late summer 2003. Now postponed to late 2003.	
10 GHz	10.125-10.225 GHz paired with 10.475-10.575 GHz.	Licensed	2x30MHz per operator.	3 operators licensed in 1997 for national coverage. Two have surrendered their licences. NTL operating trials in London. RA considering new licensing process pending MoD discussions.	Good for medium distance cellular deployment (about 10kms). Line of sight. Restricted capacity for broadband services over about 2Mbps on any large scale.	Low equipment availability.
28 GHz	28.0525-28.4445 GHz paired with 29.0605-29.4525 GHz	Licensed	2x112 MHz per operator (3 licences in each of 14 regions).	16 out of 42 regional licences sold in November 200 auction. 5 licensees. Your Communications offering commercial services in W. Midlands, Manchester/Merseyside, NW and North England.	Propagation characteristics allow short links of 5 kms (line of sight). Assignments support broadband services of up to 5 Mbps per customer.	Reasonable equipment availability, but likely to have the highest cost of those bands listed. 27 licences still available. Consideration being given to smaller regions. Provisional further award process was envisioned for late summer 2003 but more likely early 2004

The Radiocommunications Agency's (RA) approach for wireless broadband has been to make spectrum available that can accommodate a full range of broadband services. In terms of bandwidth and quality of service (QoS), the RA has started to put this strategy into effect by opening a variety of bands in the range between 2 and 28GHz (as shown in the table on the following page). In the 2.4Ghz band, operators can offer best efforts WLAN services without the need for a (specific) licence, at the other end of the scale a 28GHz licence holder has exclusive spectrum which could provide un-contended services of 2Mbps plus.

4. REASONS FOR OPTIMISM - REGULATORY AND MARKET DEVELOPMENTS

4.1 UK is leading the roll-out of Wi-Fi Hotspots in Europe

Over the last year there has been considerable progress in developing commercial WLAN 'hotspot' services using 802.11 technology in the 2.4GHz license exempt band. The UK has the largest deployment of WLAN public access hotspots in Europe (the total number of hotspots is expected to exceed 4,500 by the end of 2003). These services are primarily being deployed in broadband enabled areas[14] and are generally targeted at 'nomadic' business users who want to get connected while travelling away from the office. Hotspots are being deployed in a variety of high-density public locations around the UK including airports, railway stations, service stations, coffee shops and even pubs. Usage is growing as the number of WLAN enabled terminals increases.

4.2 Auction of 3.4 GHz licenses and PCCW's announcement of a 'soft launch'

Regional licenses covering the whole of the UK for FWA in the 3.4 GHz band were awarded in June following an auction. These will allow operators to provide broadband services to customers over a much wider range than is possible at 28GHz. The licence holders, in particular, PCCW who hold fourteen of the fifteen licenses, have announced plans for the deployment of broadband services covering most of the UK.
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A number of industry commentators were originally sceptical about the impact that the allocation of licenses at 3.4 GHz would have on broadband roll-out. This was partly a matter of the technical limitations of the band, in terms of the limited bandwidth available (2x20MHz). But also a reflected uncertainty over licensees' intentions and whether the licenses would be used for broadband services, given the lack of any roll-out conditions attached to the licences. The picture has become somewhat clearer following PCCW announcement of its intention to 'soft launch' full commercial services in early in 2004. Further announcements regarding potential national rollout plans are expected later in 2004 following the soft launch.

4.3 Acquisition of Firstnet by GX Networks

Firstnet, with a national licence at 3.6 GHz (originally acquired from Tele2) is the most firmly established FWA operator, with approximately 12,000 customers and a coverage footprint of approximately 13% of the UK market. GX Networks acquired Firstnet earlier this year before also going on to acquire Pipex. With its combined assets and new brand Pipex Communications it has announced its intention to grow its wireless business both in terms of market share and geographical coverage. Pipex is positioning its wireless service as a business and high-end residential product but will seek to target a mix of customers (including business, public sector and residential) in the areas where it deploys services. Pipex believes that its business model will allow it to deploy in clustered rural areas.

4.4 Release of 5GHz band (Band A and B)

In February 2003 the RA opened parts of the 5GHz band, on a licence exempt basis for indoor WLANs (Band A) with higher power than allowed at 2.4 GHz and to outdoor nomadic services (Band B). There was general support for the development of the 5 GHz band, although reservations were raised about the technical constraints imposed by the RA (see below).

4.5 Continued innovation at the edge by leading Community Networks

As mentioned above, a result of many commercial players holding back from making key strategic decisions, much of the progress in the deployment of new wireless broadband has been made at the micro/ community level.

Views diverge on the long-term significance of the Community Network model. Advocates argue that Community networks demonstrate the ability of consumers on the edge of networks to harness new technology to provide low cost localised services to meet local needs in a way that was not previously possible. They argue that if replicated across more than 3,000 communities they would offer a model for extending broadband services to the last

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[14] And therefore do not address the rural digital divide issue

10% of users in the most rural communities. However, sceptics argue that Community Networks should not be perceived as a panacea for rural broadband and question the replicability, scalability and sustainability of the community network model. In particular they argue that to be successful Community Networks need access to people with technical skills and expertise, and the willingness to make a long-term commitment of their time, energy and leadership – and that such people are unlikely to be present across all the communities.

Access to affordable backhaul will be critical for the sustainability of Community Networks. Concerns relating to the circumstances in which community networks will be able to continue to access low cost public sector backhaul need to be clarified[15]. Geographically differentiated regulation of EIRP levels to enable the use of longer-range directional antennas in rural areas would reduce costs and increase potential coverage.

Issues around the replicability[16] and sustainability of the community network model may be addressed in time. Some of these schemes may evolve into sustainable commercial concerns on a social enterprise model, in other cases commercial operators looking to launch services in the area may seek to acquire their customer base.

While it is clear that currently, Community Networks are making an important contribution in a number of communities by meeting the growing demand for broadband in rural areas and that more could be done to support their development, it seems unlikely that they will be replicated on a sufficient scale to provide a complete solution to the problem of rural coverage. They should therefore be viewed, at least in the interim, as part of the solution rather than a panacea.

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[15] See BSG Report on the impact of public sector interventions on broadband in rural areas, November 2003 www.broadbanduk.org

[16] A number of initiatives are under way to share expertise and best practice between Community Networks e.g. http://www.seeonline.net/broadband/communityselfhelp/ and to develop necessary support structures and products e.g. back office functions such as billing, etc to make them more scalable (such as the Community Broadband Network which was announced at the Rural net conference in October 2003 http://www.ruralnet.org.uk/~cbuk)

5. REASONS FOR PESSIMISM

Whilst these developments are positive it is not clear that they represent a significant turning point in the fortunes of wireless broadband; significant things have not happened over the last 12 months:

5.1 Band C (5.8 GHz) has not been released, and has fallen well behind schedule

Plans to release Band C (5.8GHz) for higher power fixed wireless access (FWA) under a cheap and simple licensing regime have been delayed (due to problems with moving incumbent users out of the band) and the original target to release this band in the summer of 2003 has been missed. It is currently not clear when this band will now be released (although further announcements are expected in November). As well as being suitable for access, Band C band may also provide the potential for providing a cost effective backhaul solution into rural communities (where it can be used in combination with other wireless access solutions). Releasing this band is therefore of significant economic and social importance to the UK.

5.2 Technical constraints imposed on 5GHz band (Band A and B)

Concern was expressed about the requirement for Dynamic Frequency Selection (DFS) which adds significant complexity and cost to the equipment required. Bands A and B are seen as a migration path from 2.4 GHz (both bands are seen as "Wi-Fi" product bands). The RA has argued that the requirement for Dynamic Frequency Selection (DFS) was an international requirement predominately because of military use in a number of countries (not the UK). The US only recently opened Band B for operation, due to US military radar sensitivities (the US Military required the use of DFS, before agreeing to change of use).

5.3 28 GHz remains commercially unattractive for wireless broadband

Although spectrum has been allocated for FWA at 28GHz, few companies consulted could see much potential for the deployment of services in this band in the near to mid term due to the lack of low cost equipment. This band was targeted at the high-end SME market rather than the mass market. Further consultations on possible alternative approaches to licensing this band were expected in late summer 2003 but have now been held back to early 2004. Licensing base stations on an individual basis could however provide a helpful alternative approach.

5.4 The RA has not published a National Strategy for Wireless Broadband

The 2002 BSG WWG report called for the RA to develop a strategic plan for wireless broadband in order to ensure that the objectives for broadband are met including a time-plan with wireless broadband milestones. An RA action plan was published in the Government's response to the 2nd BSG report[17] and the RA has also published a Broadband Wireless Update. However, there has been no single document that has set out the RA's vision and strategy for the wireless broadband market.

Under the new Communications Act, OFCOM will take on management of the radio spectrum and setting spectrum licence fees. The Act places certain duties on OFCOM that could have an important bearing on the provision of spectrum for broadband. It will be operating within a statutory framework that embodies, in general terms, responsibilities for extending broadband: firstly, there is an explicit duty for OFCOM to have regard to the desirability of encouraging the availability and use of high speed data transfer (i.e. broadband) services throughout the UK; secondly, OFCOM has also to recognise the different interests of the people living in rural and in urban areas; and thirdly OFCOM has a general duty to encourage competition. These are not OFCOM's only objectives, of course, and in carrying out its spectrum functions, OFCOM will need to have regard to and balance a number of possibly conflicting factors.

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[17] http://www.broadbanduk.org/reports/gov_response_second_annual_report.pdf

However, given the relevance of wireless broadband for extending platform competition; extending broadband to rural areas and supporting next generation broadband services, the BSG believes that it would be appropriate and desirable for OFCOM to set out a strategic plan for wireless broadband as originally called for in our 2002 report.

Extract from Government Response to the 2nd BSG report

11.6 A strategic plan for wireless broadband Government Response: A co-coordinated plan for adopting the five wireless recommendations will be developed.

Action: The timeline for making spectrum available and a more flexible spectrum management regime is:
> 2003 Q1 - licence exemption of 5 GHz bands A and B for wireless LANs
> 2003 Q2 - consultation on use of 2010-2025 MHz for broadband applications
> 2003 Q2 - award of 3.4 GHz Public Fixed Wireless Access licences
> 2003 Q3 - consultation on use of 3.6-4.2 GHz band for Fixed Wireless Access
> 2003 Q3 - opening 5 GHz band C for Fixed Wireless Access
> 2003 Q3 - further stage in award of 28 GHz Broadband Fixed Wireless Access licences
> 2004 - removal of unnecessary licence conditions
> 2004 – possible introduction of spectrum trading

In addition, the UK Broadband Task Force will develop guidance on wireless access by public sector consumers by 30 May 2003 and ODPM is hoping to conclude consultation on possible changes by the end of June 2003.

6. SHORT-TERM OPTIONS FOR FACILITATING WIRELESS BROADBAND DEPLOYMENT (FOR EXISTING OR SOON TO BE OPENED BANDS)

Although significant progress has been made in the commercial deployment of public access WLAN hotspots in the last 12 months, this success has not been matched by progress in the Fixed Wireless Access market. In fact there has been no significant increase in the number of FWA users in this period. Nevertheless, it would be premature to conclude that there is no business case for FWA services. The arrival of a major new entrant (PCCW) with the potential to move into this market following its successful purchase of 14 regional 3.4GHz licenses and the recent acquisition of FirstNet (and its national 3.6 GHz licence) by GX Networks means that there is potential for renewed activity in this market over the next 12 months. However, it is difficult to predict in terms of hard figures what impact these new services will have on government targets, in particular on extension of availability into rural areas and to an extent we will have to wait and see how the market shakes out over the next 12 months.

The working group's discussions with industry confirmed much of the discussion within the BSG Wireless Working Group (WWG) that had fed into the 2002 BSG WWG report. Companies were asked what regulatory steps could be taken to mitigate the barriers to commercial deployment and to encourage the full exploitation of wireless technologies for rural coverage. A (relatively small) number of suggestions were offered as to how the regulations relating to the use of spectrum allocated for broadband could be amended to further stimulate the deployment of services.

Recommendations :

Rec. 1	Increase EIRP[18] at 2.4GHz to enable the use of directional antennas
The Issue	The opening of the 2.4 GHz band for commercial use was generally welcomed. It is at present the key band for many community groups and for commercial operators as well as for the deployment of wireless hotspots which are now being rolled out by a number of operators such as (see above). Both industry players and community networks argued for an increased power, which would improve the range and usefulness of the band for fixed access links in less densely populated areas. This could be done without worsening the interference environment if allied to a requirement for smart antennas. To address this issue in the US, the FCC has allowed for geographically differentiated regulation that allows services in rural areas to use higher power directional devices in rural areas in order to further extend the coverage.
RA Position	The RA argued that this issue had been addressed within CEPT in 2002 and rejected. The RA have considered whether the issue should be re-opened in CEPT but concluded that, given the multifarious uses in the band, increasing the power for only one user would be unacceptable and degradation of the band could be the ultimate result. They also point out that the new FWA allocation to be made in 5 GHz Band C should meet the requirement for higher power uncoordinated use (although this band has not yet been released see below).
BSG View	The RA should help the wider deployment of broadband services in rural areas by showing greater regulatory imagination and following the FCC example in allowing geographically differentiated regulation of power levels for 2.4GHz directional antennas.

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[18] EIRP: effective isotropic radiated power. EIRP represents the total effective transmit power of the radio, including gains that the antenna provides and losses from the antenna cable. You must take all of these into account when calculating the EIRP for a specific radio.

Rec. 2	**Expedite the urgent release of 5GHz band C as planned**
	Previously announced plans to release Band C (5.8GHz) for higher power fixed wireless access (FWA) under a cheap and simple licensing regime have been delayed (due to problems with moving incumbent users out of the band) and the original target to release this band in the summer of 2003 has been missed. It is currently not clear when this band will now be released. Band C band is regarded as vital as it provides the potential for providing low cost backhaul into rural communities (where it can be used in combination with other wireless access solutions.) This band has been available within the US under unlicensed regime, for a number of years, where it has proved effective for providing longer-range wireless broadband services. There was widespread agreement that this band should be released under similar conditions in the UK as soon as possible and deep frustration that the timetable for release has slipped. Industry players also argued that the power restrictions on Band C could be relaxed as has been done in the US in order to extend the application for longer-range, outdoor use. Some argued that the requirement for DFS would make exploitation of Band C for backhaul hops very difficult and that this requirement should be relaxed.
RA Position	The RA was not able to accept either of these suggestions due to the needs of the incumbent users of the band (the UK military use radars in Band C, leading to the requirement for DFS in the UK). RA still hopes to release Band C before the end of 2003.
BSG View	The rapid release of Band C is of critical importance for wireless broadband provision. A wide range of technologies can be developed for this band that could significantly increase broadband coverage in rural areas. However, the timetable for releasing the band has slipped repeatedly, at considerable cost to the companies seeking to optimise this opportunity.

Rec. 3	**Explore all options for allocating further spectrum in the short-term**
Issue	The allocation of further spectrum in bands below 10 GHz, particularly around 2 GHz, could encourage the introduction of technologies used in other parts of the world, particularly in the USA and Australia. For example, plug-and-play and portable wireless DSL systems have been developed that are relatively low cost and offer good user speeds. They could operate around 1.8 – 2.4 GHz.
RA Position	RA is proposing to consult (although it is not clear when) on opening bands that could be suitable for these and other systems. However, the RA has warned that spectrum within 1.8 - 2.4 GHz is heavily used and will be attractive to many different users and not just for the provision of broadband. Should spectrum become available in this band, its value would reflect this and could potentially be high.
BSG View	RA should launch its proposed consultations as soon as possible.

Rec. 4	Articulate the Economic Case for Wireless Broadband Services
Issue	RA (OFCOM) needs a strong evidence based justification to release spectrum for wireless broadband services. In the case of broadband services that could extend the provision of services to rural areas, justification is needed that goes beyond the commercial case and sets out the social and economic potential of the service for regional regeneration etc.
BSG View	Industry players should endeavour to make a stronger economic case to support requests for more spectrum to be released. Industry needs to explain why it is in the benefit of the UK. It is important to note that the commercial value of the spectrum does not always equate to the economic benefit to the UK economy. This issue is of particular relevance when considering spectrum trading and re-farming etc.

None of the suggestions put forward have so far been accepted by the RA. This absence of regulatory flexibility means that there are no easily implementable short-term solutions to help accelerate the development of this market in the pre-2005 timescale, which is regrettable.

Furthermore, the promised release of 5.8 Band C, which in the absence of other options had become the primary opportunity for most players, has been delayed with no indication of when it might be released. Failure to release this band would be a major set back for wireless broadband service provision in the UK.

7. FUTURE SPECTRUM REQUIREMENTS AND IMPLICATIONS FOR SPECTRUM MANAGEMENT POLICY

7.1   Future spectrum requirements

As highlighted above several bands have been or are being made available for wireless broadband services. In the case of the licensed bands at 3.4GHz and the unlicensed spectrum at 5 GHz, it is too early to judge what impact the provision of these bands will have on the market. However, there was widespread consensus that additional spectrum will be required in the future for both current and next generation broadband services.

Current generation broadband

In the case of current generation of services, there are broadly three potential scenarios.

i)   In the first case, where there is successful deployment and take-up of services it is likely that congestion will become a factor at some stage as the relatively limited amount of bandwidth available constrains the ability of operators to scale up their operations. In this situation there is likely to be demand for additional spectrum to be made available.

ii) In the second scenario, the spectrum being made available is sufficient to support successful deployment and take-up and the long-term development of the market.

iii) In the third scenario, operators fail to build viable business models for the provision of services to low-density rural areas due to the high costs involved and the low returns available. This is the scenario where it becomes evident that the wrong type of spectrum has been allocated for wireless broadband. In this case it can be argued that there would be demand for new spectrum to be made available that is better suited for very low cost deployments in rural areas and that the unused spectrum could be re-farmed.

The first and third scenarios are considered to be the most likely but it is very difficult to predict which of the two will prevail. In either case it is arguable that there will need to be additional spectrum allocated for the current broadband offering of DSL level services.

Next generation broadband

However, when we look forward to the next generation of broadband services it is generally agreed that the spectrum currently available will not be sufficient to deliver next generation broadband services (i.e. 2 Mbps + to the end user). The 28 GHz band can provide such connectivity and has been available since November 2000. But licensees cover only just over half the UK and have been unable so far to capture a significant part of the market. The RA is exploring how the licences and award process might be modified to encourage take up of the remaining licences and, more important, the development of services. But it has also recognised that further spectrum may be required in lower frequency bands to deliver next generation broadband. As mentioned above, existing technologies such as PWDSL have the potential to deliver affordable next generation type broadband services today, if suitable spectrum could be made available. This is work that will be taken into OFCOM.

There is continued commitment within the industry to provide a framework of standards that may help to reduce costs and mitigate some of the issues discussed in this report. Both IEEE and ETSI have published standards for Broadband Wireless Access made possible only through industry participation. ETSI HIPERACCESS standards and the accompanying conformance testing documents are published and in the US, WiMAX has been set up to support compliance evaluation to the published IEEE802.16a standard. Therefore we are now starting to see a framework that might encourage large-scale development of hardware, like chip sets, helping to reduce equipment costs to the level that might allow the market to take off.

Rec. 5	Set out a strategic plan for wireless Broadband
Issue	The 2002 BSG WWG report called for the RA to develop a strategic plan for wireless broadband in order to ensure that the objectives for broadband are met including a time-plan with wireless broadband milestones. An RA action plan was published in the Government's response to the 2nd BSG report[19] and the RA has also published a Broadband Wireless Update. However, there has been no single document that has set out the RA's vision and strategy for the wireless broadband market.
BSG View	Given the relevance of wireless broadband for extending platform competition; extending broadband to rural areas and supporting next generation broadband services; and the likelihood of the need to allocate new spectrum for wireless broadband services in the future, the BSG believes that it would be appropriate and desirable for OFCOM to set out a strategic plan for wireless broadband as originally called for in our 2002 report.

7.2   The future of Spectrum Management

As Michael Powell, Chairman of the FCC has recognised "We are living in a world where demand for spectrum is driven by an explosion of wireless technology and ever-increasing popularity of wireless services. Nevertheless, we are still living under a spectrum management regime that is 90 years old.[20]"

In the case of broadband wireless services in the UK, it is clear that spectrum policy is struggling to keep pace with technological and market developments. The slow pace of regulatory decision-making in the context of wireless broadband and the high degree of frustration expressed by stakeholders (large and small) highlights the need for a new approach to spectrum management. There is a need to evolve the traditional 'command and control' approach to spectrum into a more integrated market oriented approach that provides greater regulatory certainty while minimising regulatory intervention.

Consultation processes on wireless broadband issues are not regarded as having been particularly effective, and timescales for regulatory steps have repeatedly slipped. OFCOM must move ahead with more imaginative procedures. Whilst the BSG recognises the complexities involved it is clear that OFCOM needs a more flexible approach to spectrum management. The FCC's Spectrum Policy Taskforce offers a policy precedent for how these issues could be taken forward by OFCOM[21].

One of the reasons why license exempt spectrum has attracted so much interest in recent years is because operators and equipment manufactures have little confidence in their ability to access licensed spectrum in commercially viable timescales. Whilst un-licensed spectrum has the benefit of allowing operators to innovate and experiment with new services, in many cases operators would prefer to have access to licensed spectrum and the benefits that exclusive use provides. Going forward it is clear that there will be a need for a balance of licensed spectrum (exclusive use model) and unlicensed spectrum (commons model).

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[19] http://www.broadbanduk.org/reports/gov_response_second_annual_report.pdf

[20] Michael K. Powell, 2Broadband Migration III: New Directions in Wireless Policy, Remarks at the Silicon Flatirons Telecommunications Program, University of Colorado at Boulder, October 30,2000

[21] The FCC Spectrum Policy Task Force was set up in June 2002 and reported in November 2002. http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-228542A1.doc

Rec. 6	**Undertake a major review of Spectrum Management Policy**
Issue	Regulatory processes are too slow (discussions on the release of 5.8 GHz have been ongoing since the early 1990s). The regulatory difficulties encountered over the past twelve months by both industry and consumer access advocates with regard to the 3.4GHz auction and the 5.8GHz Band C "Licence Exempt Spectrum" issues, highlight the need to find a new more flexible approach.
BSG View	The establishment of OFCOM offers an opportune moment to review spectrum management policy and relate this to the public interest and the Broadband Britain Agenda. It is recommended that OFCOM conduct a high level review of spectrum management policy as an urgent matter of public interest. It is noted that OFCOM is now tasked with "a particular duty with regard to broadband" following the Communications Act. The policy precedent for such a high level, urgent review is the FCC's Spectrum Policy Task Force in the United States of last year: the UK Government and UK PLC need to relate to the global picture.