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31 APPENDIX A: Organisational members of Open Spectrum UK

Open Spectrum UK: Comments for Analysys regarding Ofcom's Digital Dividend Review

Open Spectrum UK (OSUK) is a coalition of non-profit organisations formed in January 2005 to work for the expansion of licence exempt use of the public airwaves. Most of the organizations participating in OSUK are actively engaged either in developing and managing community-based wireless networks, or in policy research and advocacy. Community networks have an interest in radio licence exemption because it is a policy that speeds network deployment, increases adaptability and reduces costs. Policy advocates are interested in licence exemption because it accelerates economic development, encourages innovation, increases the efficient use of limited resources and expands freedom of communication.

OSUK's first collaborative effort was the drafting and submission of a joint statement for Ofcom's "Spectrum Framework Review" consultation in February 2005.[1] Since then we have organised public and private events to promote awareness of "open spectrum" ideas, most notably at the London Science Museum, where we co-hosted two public workshops with CyberSalon during 2005.[2] The organisations constituting Open Spectrum UK are listed and described in **Appendix A.**

It may be important to note that our position on licence exemption is consistent with the European Union's regulatory framework for electronic communications, which says that "Member States shall, where possible, in particular where the risk of harmful interference is negligible, not make the use of radio frequencies subject to the grant of individual rights of use..."[3] The UK's Wireless Telegraphy Act 1949 (as amended by the Communications Act 2003) likewise gives Ofcom the statutory obligation to exempt from licencing any equipment whose use "is not likely to involve any undue interference..."[4]

SUMMARY

We commend Ofcom for initiating a "Digital Dividend Review" (DDR) and consulting with the public on options for future use of the radio spectrum released by the digital switchover of terrestrial television broadcasting.[5]

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[1] Available online at http://www.ofcom.org.uk/consult/condocs/sfr/responses/openspectrum.pdf

[2] "Wireless Utopias 05: An Open Future for Spectrum?" (26 May 2005) and "Future Wireless" (4 October 2005).

[3] Quoted from Article 5, paragraph 1 in "Directive 2002/20/EC of the European Parliament and of the Council of 7 March 2002 on the authorisation of electronic communications networks and services (Authorisation Directive)" *Official Journal of the European Communities*, L 108, Volume 45 (24 April 2002), page 21 – available online at http://europa.eu.int/eur-lex/en/archive/2002/l_10820020424en.html

[4] Section 1AA of the Wireless Telegraphy Act 1949: "Exemption from need for wireless telegraphy licence" – available online at http://www.opsi.gov.uk/acts/acts2003/30021--d.htm

[5] According to the DDR webpage (http://www.ofcom.org.uk/media/news/2005/11/nr_20051117), "Digital broadcasting is roughly six times more efficient than analogue, allowing more channels to be carried across fewer airwaves. The plans for digital switchover will therefore allow for an increase in the efficiency with which the spectrum is used - including the potential for a large amount of spectrum to be released for wholly new services... Ofcom estimates that the digital switchover programme will release up to 112 MHz of spectrum in the UHF (Ultra High Frequency) band for new uses... This cleared spectrum – the Digital

The switchover provides an historically unique opportunity to reassess the best uses of frequencies no longer needed for broadcasting, as well as the interleaved frequencies not assigned to DTV stations. Options for exploiting this prime spectrum in socially desirable and economically productive ways are far more diverse now than when these frequencies were first allocated to broadcasting, and spectrum management strategies have also evolved, so Ofcom's openness to "new uses" is welcome and appropriate. It is, moreover, aligned with the European Commission's policy on digital switchover:

> "Given the potential of the spectrum bands released by switch-off of analogue terrestrial television for new and innovative services, it will also be important to not constrain unduly the re-use of these bands. Member States' spectrum plans should be flexible enough to allow the future introduction of other electronic communications services, in addition to digital broadcasting services..."[6]

Among the examples of "new uses" cited in the DDR announcement, we strongly favor **"Wider coverage for advanced services in remote and rural areas"** and **"Wireless broadband services, with high-speed data and voice..."** Watching TV at a fixed location is not the most productive or efficient use of VHF/UHF spectrum, even with sharper pictures or more programme streams.

The main points we want to emphasize in our comments are these:

- The international framework for radio regulation provides enough flexibility for the UK to allocate part of the television broadcasting band to other services, and if these other services are unlikely to interfere with stations in other countries it is not necessary to coordinate the differing allocations with other countries.

- The most economically productive and socially beneficial applications of the "digital dividend" are to improve access to the Internet – especially but not exclusively in rural areas – and to enlarge the public's choices among different forms of broadband service.

- The UK's reliance on DSL-over-copper to create the most "extensive" broadband market in the G7 reinforces British Telecom's market dominance and discourages other service providers from creating access networks based on other technologies, particularly in rural areas. Yet DSL is not the best solution for the most sparsely populated regions.

- There is much interest in creating "hot zones" which blanket city centres with wireless Internet access, as well as consensus on the necessity of eliminating the urban/rural "digital divide". VHF and UHF are the most appropriate bands for services that society wants to make ubiquitous. High-speed Internet now

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Dividend – offers real opportunities for wireless innovation... [In addition] Ofcom estimates that around 208 MHz of interleaved spectrum may become available. The future use of this spectrum will also form part of the Digital Dividend Review…"

[6] "Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions on accelerating the transition from analogue to digital broadcasting," COM(2005) 204, 24 May 2005, page 7 – available online at http://europa.eu.int/information_society/policy/ecomm/doc/info_centre/communic_reports/ switchover/com_2005_0204_f_en_acte.pdf

tops the list of such services. Therefore, regulatory barriers should be removed which force people to build Internet access networks in higher frequencies bands at higher cost and greater complexity.

- If Ofcom takes our suggestion, wireless broadband networks in the UHF spectrum will be a new market niche. Therefore, it will be necessary to encourage the development and distribution of new equipment to serve this niche. Nothing produces sustained innovation in radio technology, shortens time to market, permits more rapid upgrades, reduces financial risk in new product development or offers greater economies of scale than exemption from radio licencing. To the extent that these new wireless broadband networks are designed and deployed in ways that make "undue interference" unlikely, they should be eligible for licence exemption.

- The combination of lowered costs attributable to licence exemption and lowered costs due to UHF's superior propagation will make wireless Internet access networks in areas of low population density more commercially viable. That will reduce the need for state aid and increase the sustainability of such networks.

- We recommend the re-allocation of at least 24 MHz of fully cleared UHF spectrum for high-speed Internet access on a nationwide licence-exempt basis, with a higher power allowance in rural areas. However, we recognise that some public officials want to maximise the Digital Dividend's value at auction, and fully cleared contiguous spectrum is a more valuable commodity than non-continuous interleaved spectrum, particularly for mobile services. Therefore, if Ofcom decide to authorise licence-exempt WLAN use of interleaved spectrum, we will gladly participate in discussions with Ofcom and other stakeholders aimed at minimising the risk of "undue interference".

- An open global standard (IEEE 802.22) is being developed for license exempt broadband equipment to exploit interleaved TV spectrum without interfering with the primary users. The 802.22 workgroup may approve a "baseline proposal" as early as this month. Such a standard could facilitate the introduction of such systems in the UK, and ensure economies of scale in manufacturing.

These points are developed in more detail below.

1. Expanding broadband access to the Internet is the best use of the Digital Dividend

A flexible, affordable and universally accessible infrastructure for high-speed interactive electronic communications is now recognised as a catalyst to economic and social development. Such an infrastructure links people, knowledge, services, resources and devices in a myriad of productive ways and creates endless opportunities for fruitful relationships. All communications authorised by Ofcom benefit society, but the Internet is a special case. TCP/IP – the protocol suite that defines the Internet and makes it work – has proven to be the platform of choice for most digital communications and its use is still rapidly expanding.[7] The widespread

[7] British Telecom, for example, is replacing its circuit switched network – built at a cost of many billions of pounds – with a VoIP network known as 21CN. Strategy Analytics recently

adoption of TCP/IP facilitates "convergence," making multipurpose broadband networks the most cost-effective way to expand communications infrastructures. Some even see TCP/IP as a future model for radio frequency management.[8] More to the point, the Internet gives users unprecedented capabilities such as:

- the ability to find and access information stored almost anywhere in the world within seconds of the information being needed;
- the ability to self-publish information inexpensively and quickly for an audience that is potentially global;
- the ability to discover, collaborate and trade with others having a common interest without regard to their location or nationality.

Thus it is not surprising that the preface to the Government's *Digital Strategy* says, "And most important of all, we must make sure the whole of society can experience the benefits of the internet..."[9]

Many case studies describe the benefits of Internet connectivity. However, the roll-out of broadband networks on a national scale is recent enough that empirical data on the economic impacts are only now becoming available. Probably the most rigorous investigation yet reported is by Lehr, Osorio, Gillett and Sirbu (2005).[10] They found that "broadband enabled communities" in the United States typically had a 1 percent higher growth rate for employment between 1998 and 2002 than communities without broadband. Moreover, the rate of employment growth in "smaller, rural communities" was over 5 percent greater than in "matched" rural communities lacking broadband. "This is consistent with the view that broadband had an especially large impact in smaller, rural communities," note the researchers.[11] Meanwhile, the rate of new business establishments during the 1998-2002 period was 0.5 percent higher in broadband enabled areas, and the rental values of residential properties in broadband enabled areas were almost 7 percent higher than in areas without broadband.[12] "The results support the view that broadband access *does* enhance economic growth and performance, and that the assumed (and oft-touted) economic impacts of broadband are real and measurable."[13]

An earlier prospective study by the Centre for Economics & Business Research was

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reported that "US sales of IP-enabled devices in 2005 rose by over 500 percent... as consumers rushed to buy IP-enabled games consoles, entertainment PCs and digital video recorders... Consumer technology vendors who ignore the fundamental industry shift toward IP-enabled devices will be left behind..." (see http://www.strategyanalytics.com/press/PR00260.htm).

[8] "Will spectrum use see a net gain?" by Jon Crowcroft, *IT Week*, 16 January 2006 – available online at: http://www.itweek.co.uk/2148712.

[9] *Connecting the UK: The Digital Strategy,* Prime Minister's Strategy Unit and the Department of Trade and Industry, March 2005, page 3 – available online at http://www.strategy.gov.uk/downloads/work_areas/digital_strategy/report/pdf/digital_strategy.pdf

[10] "Measuring Broadband's Economic Impact" by William H. Lehr, Carlos A. Osorio, Sharon E. Gillett and Marvin A. Sirbu, presented at the 33rd Research Conference on Communication, Information, and Internet Policy, Arlington, Virginia, USA, 23-25 September 2005 – available online at http://itc.mit.edu/itel/docs/2005/MeasuringBB_EconImpact.pdf

[11] Lehr et al., page 13.

[12] Lehr et al., page 14.

[13] Lehr et al., page 16.

> "the first attempt to quantify rigorously the benefits of broadband internet to the UK economy. It shows that by 2015 the productivity benefits of broadband could result in UK Gross Domestic Product (GDP) being up to £21.9 billion higher than it would otherwise have been... Annual UK fixed investment will be around £8bn per annum higher than otherwise. Annual government borrowing will be reduced by around £13bn per annum... UK net exports will be £11 billion higher by 2015 as the economy becomes more productive, stimulating exports and reducing imports...
>
> "[The] estimated impact of broadband is probably less than that of the railways but of about the same order of magnitude as electricity..."[14]

2. Rural broadband produces significant economic and social benefits

REGION	Total Population	Rural Population
England [15]	50,093,100	9,510,000
Wales [16]	2,952,500	959,700
Scotland [17]	5,078,400	990,000
N. Ireland [18]	1,710,300	233,000
TOTAL	**59,834,300**	**11,692,700**

Approximately 11.7 million people live in the UK's rural areas (see table at right). Those living in rural areas near large cities tend to have higher incomes than city dwellers, while people living in sparely populated areas tend to be poorer, even in affluent regions. Thus there is a "digital divide" *within* rural populations, due to the fact that wired networks are likely to have unfavourable returns on investment in low-density areas because of the

[14] "The Economic Impact of a Competitive Market for Broadband" by Richard Greenwood, Sukhy Kullar, Douglas McWilliams, Mark Pragnell and Dominic Walley, Centre for Economics and Business Research Ltd., published by the Broadband Industry Group, November 2003, pages 1, 2, 6 and 28 – available online at http://www.bigfuture.org/cebr%20Final%20Report.pdf. The sentence about "net exports" is from the news release announcing the report; the report itself presents this data graphically.

[15] Total population figures for England, Wales, Scotland and Northern Ireland are for mid-2004 from "Population Estimates", UK National Statistics Office – available online at http://www.statistics.gov.uk/cci/nugget.asp?id=6; the estimate of England's rural population is from *The state of the countryside 2005,* Commission for Rural Communities, July 2005 – available online at http://www.ruralcommunities.gov.uk/ article.asp?aID=56&pID=2

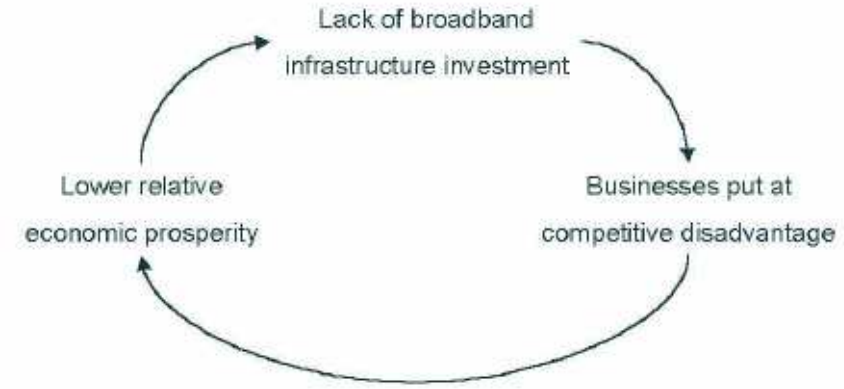
[16] The rural population estimate for Wales is from "Population Change and its Social Consequences in Rural Wales" by Mike Woods, presented at the Rural Economy and Society Study Group Seminar, Cardiff University, 12 December 2005 – available online at http://www.walesruralobservatory.org.uk/ reports/english/Presentations/2Popn%20and%20society_mike.pdf

[17] The rural population estimate for Scotland is based on "Rural Scotland Key Facts 2005: People and Communities, Services and Lifestyle, Economy and Enterprise", Scottish Executive Publications, 12 September 2005 – available online at http://www.scotland.gov.uk/Publications/ 2005/09/08115837/58393. Note that Scotland's definition of "rural" differs from England's.

[18] The rural population estimate for Northern Ireland is the sum of the populations said to be living in small towns, villages, hamlets, "intermediate settlements" and "open countryside". *Report of the Inter-Departmental Urban-Rural Definition Group: Statistical Classification and Delineation of Settlements*, Northern Ireland Statistics and Research Agency, February 2005 – available online at http://www.nisra.gov.uk/statistics/financeandpersonnel/DMB/ur_report.pdf

combination of higher installation costs per subscriber and a smaller and less affluent stock of potential customers. The scale of this problem is brought into focus by the observation that in England "97.3 per cent of all settlements (as defined by ODPM) are rural and 55 per cent of all settlements have a population of 200 or less."[19] The South West and West Midlands have the highest proportions of such small settlements in England, while Wales is the most rural part of the United Kingdom.

On the following page, two maps are reproduced side by side. The map of England on the left is from Defra and shows rural areas in the lowest productivity quartile (in red).[20] The map on the right is from Point Topic and shows broadband take-up as a percentage of population.[21] The lightest areas in the broadband map correspond to take rates of under 8.9 per cent for DSL and cable combined. The maps make it clear that areas of low productivity and areas of low broadband take-up coincide. Analysys describes this relationship as a "vicious circle":[22] We see it as a self-reinforcing spiral which can be broken by the expansion of broadband infrastructure.



In April 2002, BT launched the "ActNow" project in Cornwall – where broadband take-up was very low – to test the efficacy of DSL demand stimulation. A follow-up survey in 2004 measured the impact of broadband on the local economy. ActNow was successful in that the overall take rate reached 16.5 per cent – higher than the national average at that time. Twenty-five per cent of the SMEs that signed up for broadband said they saw economic benefits and hired additional staff: Some 1,200 jobs were created[23] and £39 million was added to Cornwall's GDP.[24] The profitability increase for ActNow SMEs was 28 per cent, compared to just 15 per cent for SMEs that did not sign up for broadband.[25]

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[19] *The state of the countryside 2005*, page 22.

[20] *Productivity in Rural England*, by the Rural Economics Unit, Department for Environment, Food and Rural Affairs, November 2005, page 61 – available online at http://www.defra.gov.uk/rural/ pdfs/research/productivity-rural-england.pdf

[21] "Broadband Analysis: New results show a deeper 'Digital Divide'", Point Topic, 18 January 2006 – available online at http://www.point-topic.com/content/dslanalysisBBUSDeepening DigitalDivide 060117.htm

[22] Quote and diagram from *Ubiquitous Broadband Infrastructure for Wales*, Analysys Ltd., July 2001, page 11 – available online at http://www.wda.co.uk/resources/broadband_complete.pdf

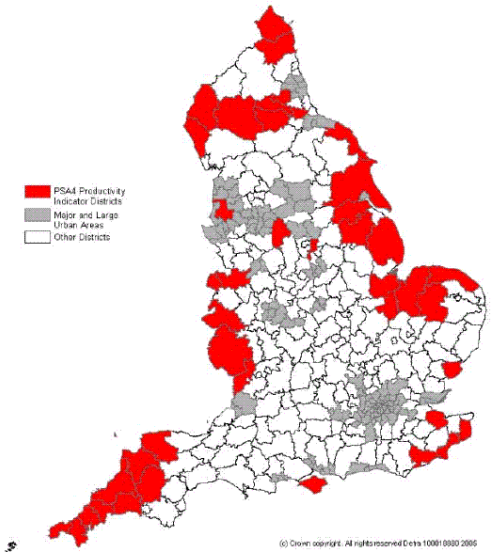
[23] *Sustainable development in broadband Britain* by the Forum for the Future (commissioned by BT), May 2004, page 7 – available online at http://www.btplc.com/Societyandenvironment/ PDF/BroadbandBT.pdf

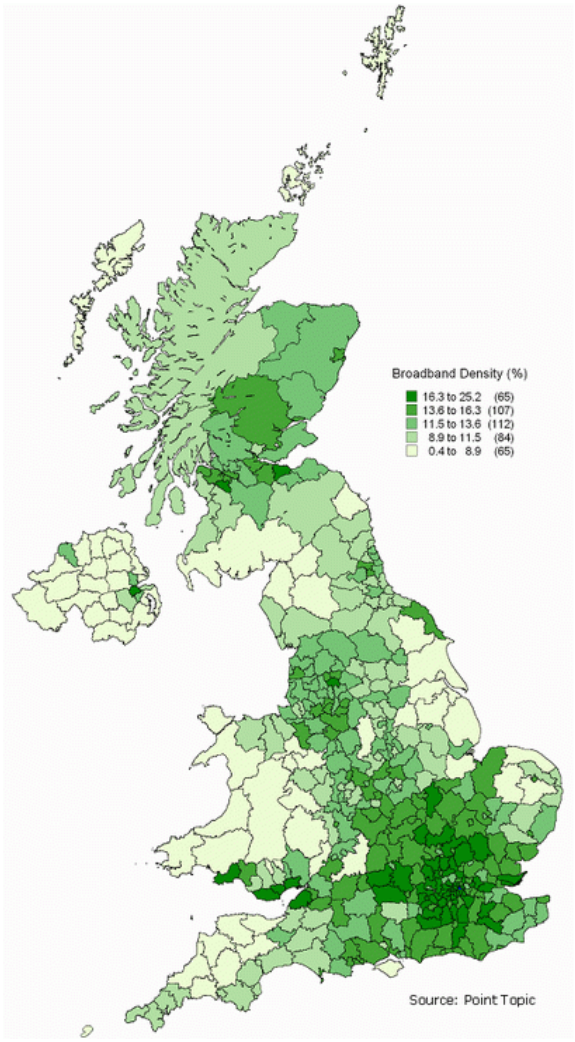
[24] *South West RDA News*, issue 2 (April 2005) – available online at http://www.southwestrda.org.uk/newsletters/regional-ict.htm

Below left: rural areas with the lowest productivity are shown in red (Defra, 2005)

Below right: white areas have the lowest rates of broadband take-up – under 8.9 per cent (Point Topic, 2006)

Figure 4.1: Defra's 42 PSA4 Productivity Indicator Districts





Approximately one million people in Wales (36 percent of the population) live in rural areas. In North Wales, a 2 Mbits/sec broadband net created last year by Deudraeth Cyf and Gaia Technologies "has already boosted business in 77 per cent of its commercial users... 90 per cent of businesses served by the new network admitted that they would no longer be able to do without the facility," *ITWales* reports.[26]

Wales' economy fell further behind the UK average in the 1990s, so economic regeneration is particularly important now. "Wireless internet provision – sometimes known as WiFi – is considered one of the most potent tools of economic regeneration", says a recent study of ways to improve broadband access in Mid Wales:

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[25] Except for the jobs and GDP increase data, all ActNow data in this paragraph are from "Achieving Broadband Britain: a Partnership model for enabling a Digital Networked Economy" by Trish Jones, presented at an OECD workshop on "Developing Broadband Access in Rural and Remote Areas", 25 October 2004 – available online at http://www.oecd.org/dataoecd/ 28/50/33864356.pdf

[26] "Broadband service wins approval in rural area", *ITWales*, 10 October 2005 – available online at http://www.itwales.com/799823.htm

> "The study, *WiFi For All*, argues that existing broadband services needed to become wireless in order to take the region forward... James Gibson-Watt, chairman of the Mid Wales Partnership's IT Working Group, said, '...The main feasible improvement to broadband service in the region would revolve around the implementation of a wireless infrastructure and service. This could potentially reach out to the currently unsatisfied population...'"[27]

Though DSL is widely available, its performance is not satisfactory in many parts of Wales, as Mr. Gibson-Watt indicates. In addition, "WiFi" should be understood, in the context of the Mid Wales study, as referring broadly to licence exempt wireless Internet access, rather than narrowly as the IEEE 802.11b standard implemented in the 2.4GHz band.

Data from Wales and Cornwall show broadband's concrete contributions to rural economies. A former chief of the Countryside Agency states the case more generally:

> "The Agency's work on 'Rural economies' has highlighted the importance of entrepreneurship and in-migration to rural communities. There are around a million enterprises in rural England, more businesses per head of population than in urban areas. This indicates significant entrepreneurial activity and a major contribution to 'Britain plc'. Incomers from urban areas set up two-thirds of new businesses in rural areas. There is real danger that lack of broadband coverage could stifle business innovation. It may encourage businesses to relocate from an area. It may discourage business locating into areas that don't have broadband. Many services are increasingly being delivered over the internet, for example tele-medicine and on-line training. With access to services already being a major issue in rural areas, being restricted to using these services through a modem would be very time consuming, and in some circumstances nigh on impossible. Furthermore lack of broadband may exacerbate the 'brain-drain' of younger talent into the cities as many young people view on-line gaming, music downloads and fast internet access generally, as a necessity. All in all, this could have serious consequences for the rural economy and the fabric of rural communities as a whole."[28]

The rural economy has moved beyond the industries traditionally based in the countryside: "farming, mining, and seaside tourism are no longer the major sources of employment in these areas. It is now the case that manufacturing and, in particular, the service sector provide more jobs and that rural areas now have a mix of employment sectors similar to England as a whole".[29] So there is no basis for the judgment that rural areas need high-speed internet any less than urban areas do. They need it more – to overcome the urban-rural "opportunity gap".

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[27] "Plea for free WiFi to boost net access in college town" by David Williamson, *Western Mail*, Cardiff, 30 December 2005 – available online at http://icwales.icnetwork.co.uk/0300business/0100news/tm_objectid=16531634&method=full&siteid=50082&headline=plea-for-free-wifi--to-boost-net-access-in-college-town------name_page.html

[28] "Chief Executive's Speech on Broadband in Rural Areas", The Countryside Agency, 22 September 2003 – available online at http://www.countryside.gov.uk/WhoWeAreAndWhatWeDo/whoWeAre/speeches_visits/speeches_jul_dec/CEOSpeech_broadband_22Sep03.asp

[29] *Productivity in Rural England*, page 9.

In the previous section we quoted a CEBR study which found the economic impact of broadband to be of "the same order of magnitude as electricity". What if a decision had been made in the 19th century that electricity was not needed in rural areas because farming is an outdoor activity and electricity's first common use was indoor lighting? Thinking of broadband in terms of faster browsing is like thinking of electricity in terms of better lighting. Electricity makes possible countless other activities that our ancestors could not imagine. Life without electricity now is inconceivable – or at least unpalatable – and that is so wherever one lives. Our descendants will undoubtedly say the same about broadband, as it, too, is an empowering platform for learning, creativity and wealth generation regardless of one's location. We fully support the Prime Minister's pledge to make broadband available by 2008 to every home in Britain that wants it.[30]

3. Wireless "hot zones" are appearing in cities across the UK, using sub-optimal configurations due to regulatory restrictions that can and should be lifted

Recent years have witnessed a steady stream of announcements about "hot zone" projects (clusters of overlapping WiFi "hotspots") in cities across the UK. This press release may be the climax of the trend:

> "The Cloud today announces a major initiative to deploy widespread wireless broadband networks in city centres throughout the UK. The plan to have 'clouds' of wireless broadband internet access over the UK's major centres of population, will begin with nine city centre areas. This is the first major initiative to bring coverage to multiple cities simultaneously since mobile phone networks were built in the early 90s and will allow more than 4m people to connect to the Internet without wires.... Hundreds of WiFi hotzones will be rolled out in the city centres of Edinburgh, Leeds, Manchester, Birmingham, Nottingham, Oxford, Cambridge, Liverpool and the three London Boroughs of Kensington and Chelsea, Camden and Islington. It is expected that more cities will also be announced throughout 2006..."[31]

We certainly endorse the proliferation of WiFi. But it is strange to observe a "last hundred feet" technology being used to blanket cities – like using fingernail-clippers to cut the backyard grass. Of course, the same can be said for rural deployments over even larger areas. People seem to love the idea of ubiquitous wireless Internet access so much that they are willing to tolerate implementations which are only marginally appropriate from an engineering perspective. It would make much more sense to allocate frequencies in the VHF or UHF band for city-wide broadband – not to mention rural broadband – with power allowances not measured in milliwatts.

Unlike higher frequencies, VHF and UHF emissions flow around hills, reach into valleys and pass through thick walls with little attenuation. Thus they are perfect for services that society wants to make ubiquitous. Early last century, most of these

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[30] "The opportunity society", a speech by Tony Blair at the Labour Party's annual conference, Brighton Centre, 28 September 2004 – text available online at http://www.labour.org.uk/index.php?id=news&ux_news_id=ac04tb

[31] "Major new initiative to bring wireless internet access to Britain's city centres announced," The Cloud (press release), 1 March 2006 – available online at http://www.thecloud.net/pr/news_view.asp?ID=361

frequencies were allocated to broadcasting, to achieve a kind of "analogue inclusion." It would be appropriate today to do the same for the purpose of "digital inclusion". Indeed, DTV broadcasters may argue this is why they deserve these frequencies. But now that we have the Internet – which simultaneously enables one-to-many, one-to-one, many-to-many, and any other communicative grouping from truly global to micro-local, according to each user's preference – broadcasting seems an extremely limited – and limiting – type of inclusion.

And yet some of the countries involved in the Regional Radio Conference for planning the digital terrestrial broadcasting service (RRC-06, Geneva, 15 May – 16 June 2006) say all frequencies released by the shut-off of analogue television must be retained for TV broadcasting[32] – despite the European Comission's urging that the possibility to introduce new electronic communication services in this part of the spectrum should be preserved. In our view it is the potential benefit to society of new uses in released spectrum which justifies the high cost of analogue/digital conversion. Without that, the large-scale market disruption and expense of conversion may not be justified. Unfortunately, the opportunity costs of foregoing other allocations in the terrestrial television band – such as broadband – are rarely considered in cost-benefit analyses of DTV – perhaps because that would undermine the case for allocating so much prime spectrum to DTV.[33]

Yet broadcasting is the incumbent service and we recognise the power – if not the fairness – of the "first come, first served" principle in the evolution of radio services. However, band sharing by broadcasters and wireless Internet service providers (WISPs) – without mutual interference – is practical today and we urge Ofcom to consider this option favourably. Of course, the safest way to share is to divide the band by frequency for different exclusive uses. But in any case, we urge the removal of regulatory barriers which force WISPs to build more complex Internet access networks in higher bands at higher cost because they are not authorised to use UHF.

4. There are limits to what DSL alone can offer

In 2001, the Government set a target of making the UK "the most extensive and competitive broadband market in the G7 by 2005".[34]

If one ignores other criteria like affordability, speed, freedom of choice among service providers and technology platforms, etc., the Government has approximated its goal of attaining the "most extensive" broadband market, thanks to British Telecom's basic DSL offer. Ovum's "International Broadband Market Comparisons" this year ranks the UK first in its Broadband Availability Index. However, Ovum puts the UK in third place in terms of competitiveness, and in fourth place for choice and price.[35]

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[32] This is discussed in more detail below.

[33] The "Cost-Benefit Analysis (CBA) of Digital Switchover" by economists in Department of Trade and Industry (DTI), the Department for Culture, Media and Sport, and the Radiocommunications Agency (May 2004) is particularly disappointing in this respect – available online at http://www.obercom.pt/2004/uploads/ficheiros/DTI_DCMS_An%C3%A1lise%20dos%20Custos%20e%20Benef%C3%ADcios%20do%20Switchover%20Digital_Fevereiro05.pdf.

[34] *UK online: the broadband future - An action plan to facilitate roll-out of higher bandwidth and broadband services*, Office of the e-Envoy, 13 February 2001 – available online at http://archive.cabinetoffice.gov.uk/e-envoy/reports-broadband/$file/index.htm

[35] "International Broadband Market Comparisons - Update June 2005," – available online at http://www.dti.gov.uk/industries/telecoms/pdf/International_Broadband_Report_Q12005.pdf

The Government's commitment to expanding the availability of broadband is laudable, but we must note that it shifted the goal posts. The original target had defined "broadband" as data speeds of greater than 2mbit/s.[36] Now broadband is defined simply as an "always on" connection. That makes comparisons with other countries misleading when they define broadband differently.[37] For example, relaxing the definition of broadband allowed the Government to announce in January 2006 that Northern Ireland is the first region in Europe to achieve "100% broadband access".[38] Under the original definition, broadband availability in Northern Ireland would still be close to zero.[39] More to the point, changing the definition of broadband made DSL a more politically attractive option.[40] Unfortunately, the UK's success in winning the international broadband statistics race came at the expense of the rural population, despite the fact that they were ostensibly beneficiaries of the race. Most of the people and businesses unable to get broadband at speeds faster than 2mbit/s live in rural areas.

Analysys notes that "the UK performs well in terms of the availability of 1 and 2 Mbit/s services, but is currently not matching the performance of other countries included in the study in terms of 4 and 8Mbit/s availability... [The] UK is towards the bottom of the rankings on the availability of symmetric broadband services..."[41]

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[36] *UK online: the broadband future*, page 3.

[37] "Oftel used a number of definitions before they settled on 'always on' and with speeds in excess of 128 kilobits per second (kb p/s).... This criterion was subsequently modified to 258 kb p/s. But more recently still, they have abandoned attempts to specify a speed and now define broadband as being always on, allowing voice and data services to be used simultaneously, and being faster than narrowband. This redefinition acknowledges that, because what constitutes broadband evolves over time, the speeds that may constitute broadband in one year will have ceased to do so in the future. However, it also means that, in the context where some countries have invested in infrastructure that can deliver speeds many times in excess of those available in the UK, international comparisons of, for example, the extent of roll-out or price, may not be on a like-for-like basis... Speeds being rolled out in a number of other countries are considerably in excess of even the [UK's] 512 kp p/s 'industry standard'... Average German and Dutch broadband speeds are 768 kb p/s; in Canada, 980 kb p/s; 1 to 2 mb p/s in the USA; and in Japan 12 mb p/s...." House of Commons, Trade and Industry Committee, *UK Broadband Market - Second Report of Session 2003–04, Volume 1,* 10 February 2004, pages 5-6 – available online at http://www.publications.parliament.uk/pa/cm200304/cmselect/cmtrdind/321/321.pdf

[38] "Northern Ireland First In Europe With 100% Broadband" Northern Ireland Executive news release, 16 January 2006 – available online at http://www.nics.gov.uk/press/eti/060116d-eti.htm

[39] The top DSL speed available in Northern Ireland was reported as 2 Mbit/s in *Sophisticated Broadband Services: Final Report for the Department of Trade and Industry,* Analysys Ltd., 11 June 2005, page 15 – available online at http://www.broadbanduk.org/reports/dti/DTI_final_report_20_05_05_Analysys.pdf.

[40] The Community Broadband Network says many wireless projects regard DSL's popularity as a symptom of "market failure... Their vision is of a network that can offer Korean levels of bandwidth, offering commercial and community content. ADSL cannot do this". *Springing Up All Over: A Report on Community Broadband Projects in the UK* by Malcolm Corbett, Lindsey Annison and Madeleine Cobb, CBN, March 2005, page 15 – available online at http://domain875611.sites.fasthosts.com/CBN/images/stories/documents/springingupreport.pdf

[41] *Sophisticated Broadband Services*, page iii. In Scotland, symmetric DSL is available to just 17% of business and residential sites, and in Wales to just 21% of sites, according to "Broadband Benchmark Update Q3: July-September 2005", Broadband Observatory Wales – available online at http://www.bbwo.org.uk/ broadband-2566. Symmetric broadband is necessary for applications like web-hosting, VoIP, video-conferencing and grid computing.

So when BT say "every UK exchange will be broadband enabled by the end of 2005"[42] and 99.6 percent of all UK homes and businesses will be "connected to a broadband enabled exchange,"[43] that does not mean the job is done:

- Rural telephone exchange areas are larger than urban telephone exchange areas, so rural customers are more likely to encounter DSL "reach" limitations. Thirteen per cent of the Country Land & Business Association's 40,000 members are reported to be more than 3.7 miles from their local telephone exchange, for example.[44] That means at least 5,200 rural businesses have minimal or no DSL service.

- DSL data speeds decrease sharply with distance from the exchange. BT no longer automatically reject all DSL applications from customers more than 3.7 miles from their exchange, but the services available beyond that limit are rarely more than 512kbits/s, if the customer can be served at all.

- Wires with high aluminium contents, which were installed as a cost-saving measure in the 1970s and 80s, are not suitable for DSL, and apparently there is no database showing where aluminium-rich wires are deployed. DSL also cannot traverse runs of optical fibre, and thinner (26 gauge) copper wire reduces DSL signal range.

- Some network components from the period when the telephone system was only obligated to carry the human voice impair or block DSL signals. In addition to DACS pair gain systems, such DSL impairers include "surge protectors, RFI filters, and in some networks, bridged taps and loading coils. Another intrinsic impairment is the condition of the cable infrastructure which exhibits faults such as split pairs, bunched pairs, leakage to ground, low insulation resistance, battery or earth contacts [or] high-resistance joints."[45] Identifying and dealing with such impairments cause delays and added costs in service roll-out. In some cases, a continuing need for a DSL defeating component like DACS takes precedence over demand for DSL.[46]

The following table is adapted from page 56 of the *State of the Countryside 2005*. The data are from 2004, so undoubtedly there has been some improvement. But in

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[42] "Blair promises total broadband coverage by 2008" by Steve Malone, *PCPro*, 29 September 2004 – available online at http://www.pcpro.co.uk/news/63938/blair-promises-total-broadband-coverage-by-2008.html

[43] "Delivering BT's 21st century network" by Paul Reynolds and Matt Bross, British Telecom presentation to industry analysts, 9 June 2004 – available online at http://www.btplc.com/News/Presentations/Industryanalystspresentations/21stCenturyNetwork.ppt

[44] "Countryside enjoys net gains" by S. A. Mathieson, *The Guardian*, 26 August 2004 – available online at http://technology.guardian.co.uk/online/story/0,3605,1290402,00.html

[45] *Report on the use of DSL Technology in the UK - Part 1: Interference Issues*, edited by Gavin Young and Rob Kirkby, Network Interoperability Consultative Committee DSL Task Group, September 1998, page 36 – available online at http://www.nicc.org.uk/nicc-public/Public/ reports/Intfr_i1.pdf.

[46] A resident of the Isle of Whithorn in Scotland, Liz Perrott, describes such a case in the Rural Community Gateway Forum (5 December 2005): apparently, 25 per cent of the homes in her village are paired with DACS, 20 additional homes are under construction, the local telephone exchange has no unused capacity, and so additional DACS must be installed, thus blocking ADSL for most of the villagers. See http://www.ruralgateway.org.uk/cgibin/item.cgi?id=880&d=132&f=46

Geographic availability of Broadband in 2004 (% of Residential Delivery Points)

AREA CLASSIFICATION		DSL availability	Cable availability
Sparse	Hamlet and isolated dwellings	30.0	0.1
	Village	33.4	0.0
	Town and fringe	63.5	0.1
	Urban >10K	91.7	0.0
Less sparse	Hamlet and isolated dwellings	75.4	4.2
	Village	71.9	3.1
	Town and fringe	87.8	15.7
	Urban >10K	99.4	60.3
England		95.2	50.4

villages in sparsely populated regions, broadband was said to be available to just 33.4 per cent of households, while England as a whole could claim over 95 per cent availability. Moreover, in less sparsely populated regions – constituting the rest of England (see the "Sparcity Map" below) – smaller settlements remain poorly served:

When one looks beyond availability to the actual broadband take rate, the picture is even less rosy. The UK ranks 13th among the OECD countries[47] and the take rate is particularly low in rural areas. According to Point Topic's latest analysis:

> "The broadband 'Digital Divide' – the gap between the haves and have-nots – is deeper than was thought and may be getting even deeper... *The ten [Local Authority areas] with the lowest [broadband] density are in the rural areas of Scotland, Northern Ireland and Wales – plus West Somerset [in South West England]* [emphasis added]... Point Topic's consumer research, based on 2,000 face-to-face interviews, showed that broadband density for poorer families is lower than had been assumed... Rural areas often have lower density than the suburbs even where broadband is equally available..."[48]

Sparcity map of England

[47] OECD Broadband Statistics, June 2005 – available online at http://www.oecd.org/document/16/0,2340,en_2649_34225_35526608_1_1_1_1,00.html

[48] "New results show a deeper Digital Divide: Point Topic analysis of broadband take-up," 18 January 2006 – available online at http://www.point-topic.com/content/dslanalysis/BBUSDeepeningDigitalDivide 060117.htm

Some have argued that the rural population's lack of awareness of the benefits of broadband is the main problem. But many studies have found that price is "the number one factor in determining the take-rate."[49] This is supported by Ovum's "International Broadband Market Comparisons", which notes in the June 2005 update that "Pricing has continued to improve in the UK... As a result, we have seen a substantial increase in the uptake of broadband services as they become more affordable to wider sections of society..."[50]

To bring the price of broadband down further in rural and dispersed communities – or better, to improve the speed-for-price – two barriers must be overcome: BT's market dominance and regulatory policies that raise the cost of alternative technologies.

We recognise that the Government's apparent preference for DSL results from policies of maximising broadband roll-out speed and "value for money" rather than from a decision to support DSL or BT specifically.[51] However, like all incumbent national fixed telephony operators, BT has the advantage of profound economies of scale and many ways to allocate its costs to achieve specific business outcomes. Last July Ofcom significantly expanded BT's financial data reporting obligations to enable better oversight of their product pricing.[52] That means Ofcom is only now acquiring the information needed to determine whether BT's prices accurately reflect their costs. The success of DSL-based offers in rural broadband procurements during recent years thus does not prove that DSL is the most cost effective solution for rural markets – only that BT's price offers have been lower than those of other bidders.

BT has acknowledged that DSL is not "economically viable" as a way to deliver broadband to sparsely populated areas.[53] The approximation of DSL universality which exists today is the result of about £1 billion of state aid, public-private partnerships and induced/aggregated demand from public services.[54] This enormous infusion of support[55] has had the effect of increasing BT's grip on the rural market at a time when telecommunications are supposed to be evolving toward greater

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[49] "Broadband Internet: The Power to Reconfigure Access" by William H. Dutton, Sharon Eisner Gillett, Lee W. McKnight and Malcolm Peltu, Forum Discussion Paper No. 1, Oxford Internet Institute, University of Oxford, August 2003, page 20 – available online at http://www.oii.ox.ac.uk/resources/publications/FD1.pdf

[50] "International Broadband Market Comparisons - Update June 2005," page 23.

[51] Government procurement tenders have generally not specified a particular vendor or broadband technology.

[52] See *Changes to BT's regulatory financial reporting framework: Final Statement and Notification*, Ofcom, 25 July 2005 – available online at http://ofcom.org.uk/consult/condocs/regfinch/.

[53] BT's chairman, Sir Christopher Bland, told the parliamentary select committee for Culture, Media and Sport that "it simply is not economically viable for BT to roll out ADSL to parts of Britain that are sparsely populated," Graeme Wearden reported in "Rural areas face 20-year wait for broadband", ZDNet UK, 5 February 2002 – available online at http://news.zdnet.co.uk/communications/0,39020336,2103764,00.htm

[54] "Broadband Procurement To Improve Efficiency and Effectiveness of Public Service Delivery" by Mike Gunston, UK Office of Government Commerce, presented at an OECD Broadband Workshop and WPIE Meeting, Paris, France (2-4 December 2002) – available online at http://www.positivelybroadband.org/library/downloads/Index_8e_Public%20Sector%20Broadband%20Procurement%20Study_UK.pdf

[55] We won't use the dreaded word "subsidy" even though much of the funding has clearly been that.

competition. It certainly raises questions about the sustainability of this access. Local loop unbundling may improve the situation eventually, but meanwhile, the proliferation of DSL beyond the "economically viable" exchanges is a distortion of the market, discouraging competition and investment in other channels. As the *Guardian* noted, "local ISPs are vulnerable to ADSL appearing at the local BT exchange, [making] wireless broadband a risky business."[56] Simply setting a DSL trigger can have dire consequences for the financing and development of alternative networks:

> "Many of the community broadband schemes that have sprung up around Britain could be scuppered by BT's decision to set thousands more ADSL trigger levels... [S]ome in the industry fear that community broadband activists may now find it much harder to get funding from a Regional Development Agency (RDA) or similar body to finance a solution in one of Britain's broadband backlogs if an ADSL target has now been set.
>
> "'It's an issue of perception. Once people hear that BT might roll out broadband in their area, they think everything is OK,' an informed source told ZDNet UK. "An area that was previously seen as being unviable for ADSL broadband by an RDA, and therefore suitable for funding to receive a community broadband project, may have that status reversed if it now has a BT trigger level assigned to its local exchange..."[57]

In yet another blow to competition – well-intentioned, perhaps, but showing the need to guard against a *de facto* monopoly replacing a *de jure* one – BT has begun offering wireless broadband "to small communities in rural and remote areas where it is not economical to provide DSL."[58]

In 2004 OECD cautioned against a pressurised rush to ubiquitous broadband which undermines the longer process of developing sustainable competition. OECD's experts marvelled at the large number of small, new and innovative WISPs targetting sparsely settled areas in the UK with low-cost, high-speed wireless services. We wonder what they would say now that many of these WISPs have been marginalised or pushed to the brink of ruin by BT's smothering embrace of broadband:

> "The main message for OECD policy makers is to give the market time to develop broadband access... A delay in the availability of service for rural users should not be taken to be an automatic sign of market failure.... The main objective for governments... should be to facilitate competitive entry in rural areas. This approach is likely to be far more conducive to the roll out of broadband availability than funding in the form of subsidies..."[59]

The UK *Digital Strategy* says much the same. So does Ofcom. And so do we:

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[56] S. A. Mathieson, "Countryside enjoys net gains"

[57] "BT trigger levels scupper community broadband" by Graeme Wearden, ZDNet, 25 November 2003 – available online at http://news.zdnet.co.uk/communications/broadband/0,39020342, 39118106,00.htm

[58] "BT Broadband Wireless Access 2004", British Telecom presentations archive – available online at http://www.btplc.com/News/Presentations/Generalpresentations/Wirelessaccess.htm

[59] Working Party on Telecommunications and Information Services Policies, *The Development of Broadband Access in Rural and Remote Areas*, Organisation for Economic Co-operation and Development (OECD), DSTI/ICCP/TISP(2003)7/Final (10 May 2004), page 9 – available online at http://www.oecd.org/document/43/0,2340,en_21571361_34590630_31718315_1_1_1_1,00.html.

> "Ofcom has a duty to ensure that a wide range of electronic communications services – including high speed data services – is available throughout the UK. Ofcom has indicated that by the end of 2007/8, its '*aim is to have encouraged the development of an environment in which there is much more competition and innovation in broadband networks and services'*."[60]

5. Wireless broadband is the most cost-effective Internet access solution for low-density settlements

The telecom industry's received wisdom seems to be that fixed wireless is a good broadband solution only for medium- and low-density clusters of 10-50 users.[61] For larger and more compact clusters, DSL subscriptions are supposedly cheaper, while satellites are said to be "ideal" for the dispersed and isolated.[62] That leaves a very small market, hemmed in by the availability and pricing of other media and by what is possible under current regulations.

We disagree with this assessment of wireless as deserving only a minor, gap-filling role in the provision of broadband access. The capital investment needed to create wireless broadband networks is usually less than that required for wired networks, it takes less time to deploy or reconfigure wireless, and wireless equipment prices are falling faster than the wired equivalents (30 per cent for wireless vs. 20 per cent for wired, between 2003 and 2005, according to Vetters[63]). Wireless also adds nomadic flexibility which has no counterpart in wired networks:

> "...wireless networks create an RF cloud. This means that a user does not need to be at their desk in the home or office, they could be sitting in a car in a lay-by connecting with a laptop or PDA. They could be in the local café... You could even be wandering through local fields and have access...This provides local mobility for access - to local resources as well as the Internet - something that has enormous and as yet unrealised potential..."[64]

BT has made great strides in reducing DSL activation costs in low-density areas, but large amounts of public aid are still needed to overcome the remaining cost burden. We question whether these projects provide the best value tor money.

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[60] *Connecting the UK: the Digital Strategy*, page 47.

[61] See, for example, "Broadband Access Solutions and Economics For Rural Areas" by Alcatel's Peter Vetters, presented at the European Commission's "eEurope Workshop on Broadband: Local and Regional Initiatives", Brussels, Belgium, 15 December 2003 – available online at http://europa.eu.int/information_society/eeurope/2005/doc/all_about/broadband/bb_regional/alcatel.ppt

[62] Satellite broadband's economic viability has been in doubt since the recent collapse and reorganisation of Aramiska, Europe's first two-way broadband satellite company. Former CEO Philippe Bodart blames BT: "The aggressive nature of the broadband rollout in the U.K. was a big factor...'I think the first signs that things were not great in the UK were when BT announced the availability of DSL/broadband around the country at a price of $35.60 to $53.40... From an economic perspective, this is when things started to go sour...'" "Aramiska Ex-CEO: Bleak Satellite Broadband Future", *TelecomWeb,* 3 February 2006 – available online at http://www.telecomweb.com/cgi/pub/tnd/tnd02030602.html

[63] Vetters, slide 13.

[64] "Springing up all over", page 14.

For example, the final 20 exchanges in the South West of England – serving 3050 households and businesses – are being upgraded now. SWERDA contributed £1.3 million to the project. BT said it is contributing, too, but has not said how much.[65] Nevertheless, if one assumes a take rate equal to the UK average (29 per cent, according to Ovum[66]), the investment per subscriber will be £1,470 – not including BT's contribution or the monthly cost of the service. (A lower take rate translates into a higher investment cost per subscriber.)

A few months ago, RDA Yorkshire Forward gave £2.2 million in public aid to DSL-enable the final 24 exchanges in Yorkshire. These serve 4,000 households and 800 businesses.[67] Again assuming a take rate of 29 per cent, the investment per subscriber is £1,580.

These capital costs are far above anything we have ever seen in studies of the cost of rural wireless networks.[68] According to the *Broadband Wireless Exchange* – a magazine serving the US WISP industry, "usually a wireless network can be built [in rural towns and outlying suburbs] that will provide high-speed wireless Internet connections to 25-50 users for under $15,000".[69] That is equivalent to £172 - £344 per user. Similarly, a tutorial on rural wireless in the 2003 edition of the ITU's annual survey of *Trends in Telecommunications Reform* notes that "networks for voice and high-bandwidth data can be deployed over hundreds of kilometres, at costs currently under USD50,000 Put another way, at per-subscriber costs approaching USD300 [£172] (and continuing to drop), communities in relatively rural and dispersed areas can receive voice and data connectivity".[70] A business plan developed by Charles Wu for a Wireless Internet Network Operators Group seminar in 2004 calculates the initial investment required for a more sophisticated system designed to serve 20,000 households at about $400,000 (£230,000).[71] If we assume a take rate of 10%, the cost is £115 per subscribing household.[72] A take rate of 29% brings the system cost per subscribing household down to £40. Wu estimates the system's total monthly operating cost as about £8,000 for 2,300 subscribers, or £3.50 per subscriber per month. (However, his estimate assumes US backhaul prices, which are lower than the UK's.)

If these estimates are even roughly accurate, why are WISPs not winning tenders for service to remote and sparsely populated regions of the UK? Why are they

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[65] "Bringing about the broadest benefit," (press release), South West Regional Development Authority, 23 February 2006 – available online at http://www.connectingsw.net/news/article.asp?NewsID=1258

[66] "International Broadband Market Comparisons – Update June 2005", Ovum, page 30.

[67] "Yorkshire boasts blanket broadband" by Tim Richardson, *The Register*, 5 January 2006 – available online at http://www.theregister.co.uk/2006/01/05/yorkshire_broadband/

[68] The contract price may also cover the installation of backhaul circuits. That would go a long way toward justifying these huge payments.

[69] "Do Wireless ISPs Provide a Good Return on Investment?", *Broadband Wireless Exchange Magazine*, 7 March 2005 – available online at http://www.bbwexchange.com/howto/2_wisps_bring_high-speed_internet_connections.asp

[70] "The Wireless Revolution and Universal Access" by Michael L. Best, chapter 7 of Trends in Telecommunications Reform 2003, International Telecommunication Union, 2003 – available online at http://itc.mit.edu/itel/docs/2003/michael_best.pdf

[71] Available as a spreadsheet at http://www.cwlab.com/financial/WISP-Finance-Detail.xls.

[72] Note that if we assume that BT's DSL offers in remote areas also do not capture the entire local broadband market, then the required capital investment per DSL subscriber is even higher.

struggling – and sometimes failing – in competition with BT's DSL offers? A full exploration of these questions is beyond the scope of this consultation, but a survey of 125 local wireless projects in the UK by the Community Broadband Network a year ago contains some answers: "78% cited Internet backhaul costs as an important or very important barrier" while 88% cited a lack of access to funding.[73]

So even when wireless networks cost less than DSL, evidently they don't cost *enough* less to overcome advantages like BT's easy access to capital and their ownership of backhaul circuits; the value of BT's name recognition among investors and customers; and BT's reputation among Regional Development Authorities as the least-risky choice for managing challenging broadband roll-out projects. Still, the cost of deploying wireless networks in rural settings could be substantially reduced by changing radio regulations so as to reduce the number of base stations needed to cover a given area. That would expand the number of situations where it is cost-effective to deploy wireless networks, and that will, in turn, give rural broadband customers more choice, higher access speeds and lower subscription costs.

As Ofcom says, "Existing technologies for providing broadband are either costly or inappropriate for remote rural communities. A solution could be wireless broadband access (WBA) operating at higher powers than currently permitted..."[74]

6. Ofcom already recognises that the limited coverage attainable with licence exempt equipment in rural areas is due to inappropriate regulation

Exemption from radio licencing is attractive to network developers because it eliminates spectrum access costs and increases flexibility. But it comes at the price of a low power allowance and thus limited coverage from each base station. Limited coverage means more base stations are needed to serve an area of given size. High-gain antennas can "stretch" signals in a particular direction, to make longer point-to-point links possible. But Ofcom's WLAN regulations respond to the problem of interference in higher-density deployments, which are common in urban areas. Spectrum conditions in the lower-density countryside are quite different and yet the rules are the same in both contexts.

Last year Ofcom indicated it was aware of this problem and had an idea to solve it:

> "In rural areas where less demand is predicted, we believe that we may be able to allow an increased range for licence-exempt use to reflect the lower probability of interference. For example, the coverage area might be scaled in inverse proportion to the relative population density... During 2005 we will conduct a detailed study into how this might be implemented... We will then consult on detailed proposals early in 2006..."[75]

A consortium led by Scientific Generics has been studying the consequences of higher power allowances for licence-exempt devices in rural areas under a Spectrum

[73] "Springing up all over", page 11.

[74] "Optimising the Use of Spectrum for License-Exempt Applications", Ofcom, available online at http://www.ofcom.org.uk/research/technology/overview/ese/exempt/

[75] *Spectrum Framework Review – Final Statement,* Ofcom, 28 June 2005, page 29 – available online at http://www.ofcom.org.uk/consult/condocs/sfr/sfr/sfr_statement

Efficiency Scheme grant.[76] Ofcom's Technology R&D Group launched a parallel programme "to establish a basis on which Ofcom can make a decision on whether to permit higher powers in the license exempt bands".[77] This programme is due to end soon so we cannot comment on its findings or recommendations. But we note that a consultation on higher power for licence exempt wireless in rural areas is in Ofcom's draft *Annual Plan* for 2006.[78] We recommend consideration of licence exempt operation at higher power in the "digital dividend" frequencies as part of that consultation.

7. WLANs operating in the UHF band cost less to build and operate than comparable networks using higher frequencies

In 2002, Wanichkorn and Sirbu analysed the costs of building and operating several different types of rural broadband access networks.[79] Their findings are relevant to the current consultation:

> "BFWA [broadband fixed wireless access at 2.6 GHz] is more cost effective than DSL and cable for density areas of less than 100 lines/square mile. In low-density areas of less than 5 lines/square mile, BFWA is the only viable choice to provide broadband services as costs [per subscriber] of DSL and cable networks are extremely high...
>
> "Our results show that the use of 700 MHz UHF spectrum instead of [2.6 GHz] further lowers costs especially in rural areas, because of the longer reach possible at 700 MHz... cell coverage radii of the systems operating at 700 MHz frequencies are more than 100% larger than of comparable systems operating at [2.6 GHz]. As a result, the required number of base stations is reduced by more than half..."[80]

Others report similar or even greater cost savings from the use of UHF for rural Internet access. In comments for Ofcom's Spectrum Framework Review, Microsoft said:

> "Lower frequencies with better propagation characteristics are simply better suited for creating cost-effective, robust wireless broadband. We have shown that a Wireless Internet Service Provider (WISP) using spectrum below 1GHz would need about 1/3 fewer base stations than, and about 50% of the capital investment of, a WISP using the 2.4GHz or the 5GHz bands. That, in turn,

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[76] "UK explores rural wireless broadband" by Melanie Reynolds, *Electronics Weekly,* 6 April 2005 – available online at http://www.electronicsweekly.com/Articles/2005/04/06/34829/UKexploresruralwirelessbroadband.htm

[77] "Optimising the Use of Spectrum for License-Exempt Applications" is the name of the Programme in the Enhancing Spectrum Efficiency research area.

[78] *Draft Annual Plan 2006/7,* Ofcom, paragraph 4.15 (page 19) – available online at http://www.ofcom.org.uk/consult/condocs/annual_plan2006/annual_plan200607/printversions/fullprint.pdf

[79] "The Role of Fixed Wireless Access Networks in the Deployment of Broadband Services and Competition in Local Telecommunications Markets: An Engineering, Economic, and Public Policy Analysis" by Kanchana Wanichkorn and Marvin Sirbu, MIT Programme on Internet & Telecoms Convergence, 2002, page 28 – available online at http://itc.mit.edu/itel/docs/2002/wanichkorn_sirbu.pdf

[80] Wanichkorn and Sirbu, page 23.

> could make all the difference in providing cost-effective broadband to unserved and underserved areas of the country. Also, indoor antennas are feasible in the UHF TV bands enabling a 'plug and play' solution, whereas at 2.4GHz or 5GHz professional installation is typically required..."[81]

While WiFi coverage is usually significantly less than1 km^2 and coverage of 5GHz emissions is even less[82], at 450-470 MHz "the average coverage area for nominal 25W ERP base stations is 860 km^2 for wide band systems..."[83]

8. The United States may soon authorise licence exempt WLAN use of frequencies in the terrestrial television band, creating a potentially large market with standards that could reduce costs and resolve design issues for similar equipment in the UK

Ofcom is surely aware of the consultations launched by the US Federal Communications Commission concerning licence exempt WLAN use of unassigned TV channels.[84] Nearly 400 comments have been filed in response to the consultations, all of them online at the FCC's website. They are a gold mine of information relevant to Ofcom's Digital Dividend Review, although the comments focus on whether and how WLANs can use interleaved spectrum without interference to broadcasters, rather than on options for redeploying nationally cleared channels.

Fierce opposition from TV broadcasters in the US has delayed the completion of this rulemaking. Given their strong feelings on this subject, one would expect the TV industry to put forward every conceivable technical argument and test result as convincingly as possible. Yet their arguments against band sharing with WLANs seem not to have convinced anyone outside the TV industry. Indeed, they have been publicly derided and refuted by some of the most respected radio engineers in the country.[85] In an unusual intervention, two groups of US Senators recently

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[81] "Consultation on Spectrum Framework Review – Microsoft Comments", page 7 – available online at http://www.ofcom.org.uk/consult/condocs/sfr/responses/microsoft.pdf

[82] When Ofcom released the 5.8 GHz band for use by WLANs under a "light licencing" regime, it was described as a boon to rural broadband. These frequencies are indeed good for point-to-point (infrastructural) links, but in point-to-multipoint mode, the penetration of walls and foliage is very poor and environmental obstacles create strong "radio shadows" making for spotty/uneven coverage. So the benefit to rural broadband is actually limited. The main value of 5.8 GHz may be in validating the "light licencing" approach, which could be extended to additional bands.

[83] *Final Report: National Autonomy in the use of spectrum in the UK – Part 2: Inputs to the Harmonisation Study* by Chris Davis, John Berry, Charles Chambers and Nick Kirkman, Quotient Associates Limited and ATDI Limited, March 2004, page 24 – available online at http://www.ofcom.org.uk/research/radiocomms/reports/framework/autonomy/part2.pdf

[84] "In the Matter of: Unlicensed Operation in the TV Broadcast Bands (ET Docket No. 04-186) and Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band (ET Docket No. 02-380)", US Federal Communications Commission, released 25 May2004 – the online index of comments received is at http://gullfoss2.fcc.gov/cgi-bin/websql/prod/ecfs/comsrch_v2.hts?ws_mode=retrieve_list&id_proceeding=04-186

[85] See, for example, the reply comments of the Intel Corp., the IEEE 802 Regulatory Relations Committee, the License Exempt Alliance, and the coalition formed by the New America Foundation, which also published "Reclaiming the Vast Wasteland: Why Unlicensed Use of the White Space in the TV Bands Will Not Cause Interference to DTV Viewers", by Michael J.

introduced legislation to force the FCC to authorise WLAN use of VHF/UHF channels within 6 months.[86] The FCC is not likely to ignore such expressions of Congressional sentiment.

We believe the responses to the FCC's consultation show that broadcasters' dire warnings about licence exempt WLANs inevitably disrupting TV transmissions are exaggerations and reliable preventative technical measures are available. The large number of comments submitted by the public also demonstrates enormous interest and pent-up demand for Internet access networks with wider-area coverage.

But the most important results of the FCC's rulemaking, so far as the UK is concerned, may be the launch of a standard-setting process under the auspices of the Institute of Electrical and Electronics Engineers (IEEE), and preparations for the production of UHF data networking equipment in the near future.

Work on the so-called IEEE 802.22 standard has already clarified some technical issues for non-interfering use of interleaved frequencies by unlicenced data networks.[87] According to an interim report to the FCC last June, the IEEE 802.22 workgroup on "Wireless Regional Area Networks" (WRANs) has reached consensus on some aspects of a model system which differs from the FCC proposal. The system they envision actually bears little resemblance to WiFi, which will probably disappoint many people. Among the features for interference prevention, which the IEEE 802.22 workgroup may propose as early as this month:

- "Base Station pre-programmed with disallowed channels based on pre-installation site survey/system engineering and with access to channel usage databases and manual over-ride for special temporary channel exclusion...
- "Master/Slave relationship between base station and CPEs - Base Station controls CPE frequency of operation, TX power, modulation, timing, etc...
- "Centralized cognitive radio approach to sensing/avoiding (protecting) incumbents to make system adaptive to changes in incumbent usage, environment, etc. (i.e., distributed sensing by all CPEs across the entire network cell w/centralized intelligence/control at the base station)...
- "There is a likelihood that IEEE 802.22 will develop a Recommended Practice for installation/deployment of... WRAN systems..."[88]

Marcus, Paul Kolodzy and Andrew Lippman, New America Foundation Issue Brief #17 (October 2005) – available online at http://www.newamerica.net/Download_Docs/pdfs/Doc_File_2635_1.pdf.

[86] See the press releases issued by the legislations' chief sponsors, available online at http://allen.senate.gov/?c=record&t=3&Record_ID=5531 and http://stevens.senate.gov/pr_detailed.cfm?prid=333

[87] It is important to note that the 802.22 standard will not be specific to the US market; it can also be used where other TV standards prevail. For a recent overview of the techniques the workgroup is considering for the prevention of interference to broadcasters, wireless microphones and other services, see "Primary User Protection in 802.22 Proposals" by Steve Shellhammer, 16 January 2006 – available online at http://www.ieee802.org/22/Meeting_documents/2006_Jan/22-06-0007-00-0000_Primary-User-Protection-in-802.22-Proposals.ppt

[88] "[Draft] FCC ex parte presentation on WRAN" by Carl R. Stevenson, 28 June 2005- available online at http://www.ieee802.org/19/arc/stds-802-19list/ppt00012.ppt

Completion of the standard in coming months could facilitate the introduction of such systems in the UK, although we would oppose making conformance to IEEE 802.22 mandatory. Our preference is for licence exempt use of *non-interleaved* spectrum.

We recommend that Ofcom allocate at least 24 MHz of fully cleared UHF spectrum for high-speed Internet access on a nationwide licence-exempt basis, with a higher power allowance in rural areas. Authorising cleared spectrum for broadband networks would eliminate the risk of such networks interfering with broadcasts.

However, we also recognise that some public officials want to maximise the Digital Dividend's value at auction, and fully cleared spectrum is a more valuable commodity than non-continuous interleaved spectrum, particularly for mobile services. Therefore, if Ofcom decide to authorise licence-exempt WLAN use of interleaved spectrum, we will gladly work with other stakeholders to define policies for minimising the risk of "undue interference" to the primary users of these frequencies.

Speaking of auctions, we agree with the Mid Wales Partnership's opposition to the use of auctions to award spectrum for rural fixed wireless networks. We well remember the disastrous auction in November 2000, when no bids were received for 21 of the 42 broadband licences, including the mainly rural regions of Wales, Somerset, Devon, Dorset, Hampshire, Berkshire, Essex, Kent, Surrey and Sussex.[89]

9. A minimum of spectrum should be allocated to DTV as it may soon be overtaken by other video delivery methods

We are not aware of any other services proposed for the "digital dividend" spectrum with benefits comparable to those of broadband Internet. Certainly not DTV. The few quantitative estimates we found of DTV's benefits are based on how much people are willing to pay for such services, or alternatively, how much the spectrum released by ending analogue terrestrial TV broadcasting might be worth if those frequencies are retained for DTV. Neither method of estimating value is entirely convincing, but the 2002 failure of ITV Digital and the subsequent success of FreeView suggest that viewers' willingness to pay for DTV programmes is limited.[90] Indeed, up to 20 per cent apparently think the cost of replacing their analogue reception systems with digital systems will be greater than the benefits: "Ofcom's projections suggest that digital take-up will level off at around 80 per cent of households. The market alone will not deliver switchover."[91]

Even senior managers in Ofcom and the TV industry acknowledge the accelerating erosion of television's preeminent position in modern culture. New media activities – videogames, the World Wide Web, virtual meetings in online chatrooms, mobile phones as portable multimedia hubs, etc. – are successfully luring people away from TV while new video delivery methods are emerging which increase viewers' options and control over what they watch, when, where and how they watch, and what they

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[89] "'Disastrous' auction leaves half UK without broadband" by Jane Wakefield, ZDNet UK,20 November 2000 – available online at http://news.zdnet.co.uk/hardware/emergingtech/0,39020357,2082680,00.htm

[90] ITV Digital was a paid-subscription service while Freeview is free-to-air.

[91] From the preface to *Driving Digital Switchover*, Ofcom, 4 April 2004 – available online at http://www.ofcom.org.uk/research/tv/reports/dsoind/dso_report/

can do with the content. The TV audience's all-too-familiar passivity and regimentation may soon be things of the past:

- "David Harrison, of UK communications regulator Ofcom warned that 'We need to recognise that conventional linear broadcasting is not the future'. Ofcom's head of broadcast and new media technology said... 'It will be completely broken by 2010. We need a new model... the real revolution comes when we've got true broadband everywhere".[92]

- "The worldwide broadband video market saw explosive growth in 2005... and it will continue to grow rapidly through the end of the decade... Both pay and ad-supported broadband video markets saw growth in excess of 100% year over year in 2005, driven by consumers' continuing increase in broadband video usage and by content owners' demand for alternative outlets... Advertisers are also pushing to increase their expenditure in this market because sought-after demographic groups such as young adults are spending more time online, instead of watching TV..."[93]

- "Web video has become new media's favorite new medium – since Apple Computer's iTunes online store began stocking vlogs, calling them video podcasts and making it easy to download them for free viewing on the new iPods... The rapid expansion in the number of vlogs and Web sites offering video podcasts strongly suggests how bored viewers are getting with standard commercial TV: a growing number of them are willing to seek out alternatives online, or just create one themselves... Just as videocassette recorders first made it possible to watch television shows when you wanted rather than when they were broadcast, podcasting allows you to have shows (audio or video) sent directly to your computer, portable players or TiVo box for viewing at your leisure... A site like Ms. Rule's Scratch Video, which has about 8,000 subscribers, suggests that it may soon be possible for video producers to distribute their programs directly through the Internet – and possibly even make a living doing it..."[94]

- "BBC director-general Mark Thompson has confirmed plans to launch the corporation's programmes on the internet next year. The BBC will allow UK web users to download and watch programmes using the interactive media player... Thompson said the MyBBCPlayer would also include a simulcast of BBC One or BBC Two. 'We believe that on-demand changes the terms of the debate, indeed that it will change what we mean by the word 'broadcasting'," said Thompson...."[95]

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[92] "IPTV World Forum conference report", informitv, 9 March 2005 – available online at http://informitv.com/articles/2005/03/09/iptvworldforum/

[93] "'Explosive Growth' of Broadband Video Worldwide", ABI Research, 8 December 2005 – available online at http://www.abiresearch.com/abiprdisplay.jsp?pressid=564

[94] "TV Stardom on $20 a Day" by Robert Mackey, *New York Times*, 11 December 2005 – available online at http://www.nytimes.com/2005/12/11/arts/television/11mack.html

[95] "MyBBCPlayer to offer programmes and channels", LovelaceMedia, 30 August 2005 – available online at http://www.dtg.org.uk/news/news.php?class=sectors&subclass=4&id=1111

- "Channel 4 is reportedly planning to allow viewers to watch all of its television output simultaneously on the internet...."[96] Their first audio podcast went online on 20 January 2006.[97]

- "Delivering the keynote speech at the Oxford Media Convention, the Channel 4 chief executive was more positive about the prospects for broadband, saying 'I believe the internet will become the next dominant medium and overtake traditional TV'..."'[98]

- "British Telecom (BT) said it is to launch a mobile phone TV service called BT Movio that will use the existing digital radio system to broadcast the signals to mobile phones by the end of the year.. Two-thirds of the pilot users said they would be prepared to upgrade their service to receive TV channels and pay £8 a month... Users of the service will be able to watch programs from channels such as Sky and ITV on their mobile phone, as well as able to listen up to 50 radio stations... With the introduction of BT's new service, customers will not have to buy expensive 3G phones to watch TV...."[99]

- "A free online service has been launched allowing public broadcasters, independent producers and ordinary computer users to distribute TV content over a peer-to-peer network. The Open Media Network has been created by Netscape browser pioneers Marc Andreessen and Mike Homer. They say the network will help lower bandwidth costs of those sharing content and will create a directory of programmes for users to search. It will also feature a payment system to allow publishers to charge for their content..."[100]

- "NTL, the largest broadband provider in the United Kingdom, will be testing the [BitTorrent] file-swapping service as a way to deliver video more cheaply than traditional downloads... The deal is the first public step forward for BitTorrent's hope to turn its technology, widely used for swapping illegal copies of video, into a tool used by movie studios and ISPs for legal services..."[101]

- "If I headed a commercial channel, what would worry me right now is the device my own company makes, which is beginning to revolutionise the way we watch television in this country: the PVR, Personal Video Recorder, essentially a set-top box incorporating a hard disc drive. Within 10 years PVRs will be as ubiquitous and as cheap as the DVD player is today... But why are they so revolutionary? One of the main reasons I own a PVR is so I can skip adverts. I haven't watched an ad spot for more than a year now.

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[96] "Channel 4 'to simulcast on broadband'," LovelaceMedia, 8 July 2005 – available online at http://www.dtg.org.uk/news/news.php?class=sectors&subclass=4&id=996

[97] Available online at http://www.channel4.com/news/podcasts/

[98] "Red button turns off Channel 4 chief", Informitv, 19 January 2006 – available online at http://informitv.com/articles/2006/01/19/redbuttonturns

[99] "BT Movio pushes 3G TV to the sideline," *3G Newsroom*, 12 January 2006 – available online at http://www.3gnewsroom.com/3g_news/jan_06/news_6591.shtml

[100] "TV P2P network launched", LovelaceMedia, 28 April 2005 – available online http://www.dtg.org.uk/news/news.php?class=sectors&subclass=4&id=841

[101] "BitTorrent to power ISP's video service" by John Borland, CNET News, 10 February 2006 – available online at http://news.com.com/BitTorrent+to+power+ISPs+video+service/2100-1025_3-6038269.html

Everybody is going to be doing the same soon. So in my view, advertising has had it, on television..."[102]

- "...real progress in deploying commercially viable IPTV service has been made in Asia with little fanfare or extensive press coverage. In July, Japan's Softbank launched BBTV, the operator's HDTV-quality 28-channel, 1,500-title video-on-demand IPTV service. Softbank is partnering BBTV with its industry-leading Yahoo! BB broadband and VoIP services, both of which have more than 4.5 million users, to offer the most compelling triple-play service offering in the world today. Similarly in China, operators are currently conducting large-scale commercial IPTV trials, some with more than 10,000 subscribers, in anticipation of commercial service deployments in the near future..."[103]

- "Watch TiVoToGo and Recorded Windows Media Center Edition (MCE) TV Shows on Your iPod, PlayStation Portable (PSP), or Other Mobile Devices with MyTV ToGo... Simply connect your mobile device, select the shows to take with you and MyTV ToGo will automatically detect the device, convert shows to the correct format, and copy them to your device..."[104]

The trend is clear: "user pull" is supplanting "broadcaster push". Video is becoming just another set of file formats, and full-time scheduled programme streams are being disaggregated as viewers elect to receive programmes individually. If advertisers and the public continue switching from broadcasts to broadband, as the above quotes indicate, then TV broadcasters may slide into a self-reinforcing cycle of shrinking audiences and declining revenues.

The proliferation of alternative and ad hoc channels for video distribution will gather momentum in the run-up to Digital Switchover. That makes it difficult to predict how much support the "broadcaster push" model will have after 2012. This model is assumed in the service definition of DTV. We believe interest in this model will continue to erode, so it would be unwise to reserve any more spectrum for DTV than the amount needed for already planned stations. Frequencies allocated for broadcasting in the past should not be treated as permanently "belonging" to broadcasters. UK law does not grant spectrum rights in perpetuity.

We must also point out that those who are licenced to broadcast have no right to take over nearby unassigned frequencies. Broadcast licences are essentially channel leases. A leaseholder may covet the empty flat next door, and may believe that a noisy neighbour would diminish the use-value of his flat. But that does not give a leaseholder the right to spread his occupancy to the flat next door, or to stop his landlord from leasing the next door flat to someone else.

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[102] "Advertising has had it, on television" by Sir Alan Sugar, from the book *The Next big Thing*, excerpted in the *BackChannelMedia Newsletter*, 7 November 2005 - available online at http://www.backchannelmedia.com/newsletter/story/3190660864/TELEVISION_THE_FUTURE_What_Wil.html

[103] "Making Very Large-Scale TVoIP Networks a Reality: Lessons Learned in China and Japan" by Brian Caskey, from the announcement of panel discussion planned for the IMS Global ComForum, London, 29 March 2006 – available online at http://www.iec.org/events/2006/ims/conference/d5.html

[104] "MyTV ToGo Version 3.0 Adds Support for TiVo Shows," Proxure Inc. press release, 2 January 2006 – available online from http://www.findarticles.com/p/articles/mi_m0EIN/is_2006_Jan_2/ai_n15978973

10. Ofcom should not allocate additional spectrum to TV broadcasters for them to develop interactive services

Broadcasters have been exploring interactive services for decades without generating viewer interest in anything more innovative than teletext. As Analysys noted in a recent report to the European Commission, "ITV Digital offered a variety of interactive services:

- "Internet access and email functionality;
- "sports interactivity, with viewers able to get statistics during football matches, scores from other matches and participate in quizzes and competitions;
- "entertainment programmes such as E4's Banzai are also accompanied by an interactive betting game.

> "However, interactive services had limited popularity. [Only about 8% of subscribers] used ITV Active, the platform's interactive service...."[105]

Kingston Interactive Television recently announced the demise of their service in Hull.[106] A few weeks earlier, Channel 4 decided to "to pull the plug on its 'red button' interactive television programming... 'It's not much loved or used by audiences, it's too expensive, and it has been rather overtaken by the opportunities offered by the internet and broadband'," said Channel 4's CEO.[107] Last year, Channel 9, Australia's most popular TV network "pulled the plug on its interactive service on free-to-air digital television..."[108]

We could go on like this, but the point is clear: broadcasting organisations have persistently failed to create successful interactive services. In any case, interactivity requires a reply channel, making wire-based delivery platforms (cable, optical fibre, DSL-over-copper) more appropriate for bi-directional communication than broadcast airwaves, which propagate only from transmitter to receiver.

11. Replacing equipment twice – which is necessary to introduce HDTV soon after DTV – imposes too much cost for too little benefit

Broadcasters are already pressurising Ofcom to reserve "digital dividend" frequencies for HDTV.[109] But we believe that asking broadcasters and the public to

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[105] *Annexes to Final Report for the European Commission: Public policy treatment of digital terrestrial television (DTT) in communication markets*, Analysys Ltd., 26 August 2005, page A-13 – available online at http://europa.eu.int/information_society/policy/ecomm/doc/info_centre/studies_ext_consult/dttv/annexes_to_final_report_on_dttv_for_ec260805.pdf

[106] "KiT pulls plug on pioneering broadband television service", Informitv, 22 February 2006 – available online at http://informitv.com/articles/2006/02/22/kitpullsplug/

[107] "Red button turns off Channel 4 chief", Informitv, 19 January 2006

[108] "Channel 9 cancels interactive television service", Digital Broadcasting Australia, 26 April 2005 – available online at http://informitv.com/articles/2005/04/26/channel9cancels/

[109] See, for example, "The Future of HDTV Broadcasting" by Graham Plumb, presented at the IEE Forum on "Broadcasting Spectrum: The Issues" 1 June 2005 in London – available online at http://www.iee.org/oncomms/pn/visualinformation/Graham%20Plumb.pdf

replace newly purchased DTV equipment in a further upgrade to HDTV will be much too costly for the marginal benefit of a clearer picture. Furthermore, some marketing experts warn having the two transitions close enough to overlap "may result in a level of consumer confusion the likes of which the consumer electronics industry has never experienced. This could lead to significant consumer backlash..."[110] Add in the fact that public acceptance of the "broadcaster push" model is rapidly fading, and it is difficult to avoid the conclusion that HDTV is an improvement coming too late to be a "must have" technology – like AM Stereo.

However, if strong public demand for HDTV emerges in future, there simply is not enough spectrum available in the VHF/UHF bands for simultaneous transmission of the same programming in both DTV and HDTV formats as is now being done for analogue and digital television. There may not even be enough VHF/UHF spectrum to accommodate the existing programme services after a future switchover to HDTV. It would be silly to start broadcasting HDTV in these bands if they could not accommodate a fully developed HDTV service later on.

For all these reasons, we think it would be unwise to reserve or allocate any UHF spectrum for HDTV until completion of the Digital Switchover, when broadcasters will have a clearer view of whether their resources and their audience will justify a further transition to HDTV. Increasing the interval between the DTV and HDTV transitions will also reduce confusion and resentment about premature replacement of equipment. No one yet knows whether HDTV can completely displace DTV, or must develop along-side DTV as a sub-genre like mobile TV, or if demand for HDTV will be too limited to support the cost of diffusion, as with the videodisk. When the level of take-up can be more accurately foreseen, then it will be possible to determine whether terrestrial radio transmission is appropriate. If the audience is limited, then cable, FTTH and satellite may be sufficient delivery options.

We agree with the skepticism recently expressed by Channel 4's CEO Andy Duncan: "It's really hard to see that by even 2020 HDTV is going to be in the majority of UK homes."[111]

12. Mobile TV should develop in a higher band

As for mobile television, we have already mentioned BT's Movio service. Movio demonstrates that it is possible to deliver a multi-channel service to existing handheld devices using the DAB allocation. However, if such a service becomes popular it may encounter network capacity constraints. In that case we would support either the Digital TV Group's proposal that "the UK develop DVB-H services based on L-Band"[112] (1452 -1492 MHz) or Alcatel's proposal to use 2170 – 2200 MHz in the S-Band for both terrestrial and satellite delivery of DVB-H.[113] Alcatel's proposal uses

[110] "Digital Television Marketing May Lead to Mass Market Confusion" by Paul Christ, Marketing Virtual Library, December 2005 – available online at http://www.knowthis.com/articles/marketing/confusion_with_hdtv.htm

[111] Keynote speech by Andy Duncan at the Oxford Media Convention, 19 January 2006 – webcast online at http://webcast.oii.ox.ac.uk/?view=Webcast&ID=20060117_121

[112] "Consultation Response – Spectrum Framework Review: Implementation Plan" Digital TV Group, 24 March 2005, page 4 – available online at http://www.dtg.org.uk/publications/responses/ofcom_spectrum_response.pdf

[113] "Alcatel Launches Global 'Unlimited Mobile TV for Mass Market' Project", Alcatel press release, 14 February – available at http://biz.yahoo.com/prnews/060214/uktu017.html?.v=32

spectrum adjacent to the 3G/UMTS band, which is convenient from an engineering perspective. On the other hand, we oppose use of the UHF band for DVB-H (which means we support the RPC1 interference envelope in planning for RRC-06). The S- and L-bands allow for more efficient reception with the shorter-length antennas appropriate for handheld devices.

13. The international framework for radio regulation is flexible enough for Ofcom to allocate part of the television broadcasting band to other services regardless of RRC-06's outcome

National Autonomy in the Use of Spectrum in the UK, [114] – an in-depth report commissioned by RA and delivered to Ofcom in 2004 – confirms that the UK can allocate frequencies tor different services than those specified by international regulations. So long as nonconforming assignments in the UK do not adversely affect stations in other countries, when the foreign stations are properly authorised and operating in conformance with ITU regulations, there is no problem.

If the nonconforming operations are on a "no interference, no protection" basis, apparently it is not even necessary to coordinate the allocations with other countries. The United States has taken advantage of this freedom for more than 60 years, creating bands for unlicenced short-range devices – like cordless phones, microwave overs and WiFi – before other countries had similar allocations. Their boldness produced huge new industries that now benefit billions of people around the world.

While Ofcom is open to "new uses" for the Digital Dividend frequencies, the UK must work within the results of RRC-06. RRC-06's aim is to produce a plan "optimized for broadcasting". It will not take a fresh look at what services could contribute most to society if allowed to use the frequencies previously allocated to terrestrial TV broadcasting. With such a myopic aim, RRC-06 might well decide that all frequencies now allocated to terrestrial television broadcasting are needed for national and local DTV programme services, HDTV, high power transmissions to support mobile TV reception indoors, etc. As François Rancy (director general of France's Agence National de Frequences) pointed out, "Harmonization of a specific part of the band for other uses is difficult to reconcile with the current planning concept, driven by optimisation of the new Plan for broadcasting... Harmonisation of any other use intended for mass market applications will be difficult..."[115]

In the run-up to RRC-06 many countries seem to have inflated their "national requirements" for DTV assignments to gain surplus frequency rights which can be traded or sacrificed in negotiations following the planning exercise. This makes it difficult to know which "national requirements" are real and which are just tactical padding – but the net effect is to make it impossible for RRC-06 to accommodate all the announced national requirements. And as EBU technical director Philip Laven warned, "If national requirements cannot be satisfied, how can there be a Digital

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[114] *National Autonomy in the use of Spectrum in the UK* by Quotient Associates Ltd. and ATDI Ltd., March 2004 – available online at http://www.ofcom.org.uk/research/radiocomms/reports/framework/autonomy/

[115] "Using the digital dividend after the analogue switch-off" by Francois Rancy, presented at a RegTP conference on "Flexibility in spectrum management" (Konigswinter, 5 July 2005) – available online at http://www.bundesnetzagentur.de/media/archive/2579.pdf

Dividend?"[116] We say, on the other hand, that *without a Digital Dividend, the high cost, disruption and effort of switching to DTV is probably not worthwhile.*

We can only hope that the UK – whose DTV requirements evidently can be satisfied with fewer channel assignments than broadcasters now have – will utilise its autonomy to release frequencies to services other than broadcasting, so that some of the "new uses" suggested in the Digital Dividend Review announcement can develop. Because they can operate on a "no interference, no protection" basis and are unlikely to interfere with any foreign stations, the services we support will probably not require international coordination. That should enable their authorisation regardless of RRC-06's outcome.

[116] Spoken comment at "Unlocking the digital dividend: RRC 06 and beyond" a conference organised by PolicyTracker in London, 6-7 March.

APPENDIX A – Organisational Members of Open Spectrum UK

Access to Broadband Campaign (ABC)
ABC exists to promote universal access and affordability of broadband in the UK. Recipient of the 2003 CNET Networks Award for Outstanding Contribution to UK Technology, with specific reference to the promotion of license-exempt wireless as a first mile broadband solution in remote and rural areas.
http://www.abcampaign.org.uk

Alston Cybermoor
A community wireless network in rural Cumbria, Alston Cybermoor is an exemplar of the Broadband Britain funded pilot projects using license-exempt 802.11 wireless broadband technology to promote regional economic development. Alston Cybermoor was formed in 2002 and is constituted as an Industrial and Provident Society.Widespread community support has led to over 30% take up of the broadband service, and innovative local services have been developed including an online channel for community produced digital content.
http://www.cybermoor.org

Arwain.net
A community wireless network based in Cardiff, Arwain was formed in the summer of 2001 and officially launched in October 2002 by Andrew Davies, AM, Economic Development Minister and e-Minister for the Welsh Assembly Government 2. Arwain is constituted as a non-profit company, and is engaged in a number of social regeneration projects in south Wales.
http://www.arwain.net

Boundless
Boundless is a broadband co-operative established during 2004 in the London Borough of Lewisham which presents a self-provisioned wireless mesh network, a high speed network optimisation of broadband resources across the residential, small business, educational, cultural and digital media communities. It draws on the Consume.net3 proposition and a wealth of local experience.
http://boundless.coop

Community Broadband Network (CBN)
Founded in 2003 with funding from DTI, DEFRA, Countryside Agency, Co-operative Action and Cisco, the Community Broadband Network seeks to provide a support network for community broadband projects across the UK. Constituted as a cooperative for the benefit of local broadband projects, CBN provides expert advice and supports the development of joint services. A recent survey by CBN identified local broadband initiatives in over 550 towns and villages in the UK, the vast majority using license-exempt spectrum to deliver their services.
http://www.broadband-uk.coop

Foundation for Information Policy Research
The Foundation for Information Policy Research is an independent body that studies the interaction between information technology and society. Its goal is to identify technical developments with significant social impact, commission and undertake research into public policy alternatives, and promote public understanding and dialogue between technologists and policy-makers in the UK and Europe.
http://www.fipr.org

GreenNet
GreenNet Ltd is a UK-based Internet Service provider that has been supporting community networking for peace, the environment, gender equality and social justice, through the use of Information Communication Technologies (ICTs), for the last 18 years. It is wholly owned by its parent charity, The GreenNet Educational Trust (registered charity no.1037080).
http://www.gn.apc.org

Informal
Informal is a UK registered non-profit organisation formed in 2001, which provides a framework for collaborative research focussed upon social development and technology. Recent engagements have included community wireless networking and wireless freenetworks in both the developed and the developing world. Informal has recently published a survey of license-exempt wireless network usage in London.4
http://informal.org.uk

Open Spectrum Foundation
Registered in Amsterdam as a nonprofit civil society organisation, Stichting Open Spectrum's goal is to increase license-exempt access to the radio spectrum in all countries of the world.
http://www.openspectrum.info

Wireless London
Wireless London is a non-profit umbrella group that promotes the growth of London's vibrant and pioneering Free Networks. Working with architects, city planners, artists, technologists and the creative industries, Wireless London makes the case for Free Networks as a future urban infrastructure for London - a civic technology that privileges community learning, investment and interest. Wireless London is a strategic project funded by the Arts Council of England.
http://wirelesslondon.info