



## Chapter 3a

# A Competitive Digital Communications Infrastructure

*"If Lord Reith was right in his assertion that the broadcasting system should be a mirror of the nation's conscience, then surely our ambition should be for a broadband system that is the engine of the nation's mind."*

Lord Carter CBE

**AMBITION: TO STRENGTHEN AND MODERNISE THE COUNTRY'S COMMUNICATIONS INFRASTRUCTURE, EQUIPPING THE UK TO COMPETE AND LEAD IN THE GLOBAL DIGITAL ECONOMY.**

1. The UK's communications infrastructure is a vital enabler for the country's society, economy, safety, security and well being. If we were to lose the use of a functioning communications infrastructure for any period of time, it is difficult to imagine many aspects of day-to-day life carrying on as usual. A sudden removal of communications would not only bring business and commerce to a halt, but also our traffic, public services, finance, energy supply and much of our personal interaction. Many of us spend more than half our day using one form or another of digital media, and this is only made possible by the infrastructure we take for granted.
2. For a quarter of a century the UK has applied a blend of Government intervention, independent regulation and competitive market forces, leading to the development of modern digital networks for TV, sound radio, the Internet and mobile phones/mobile data. Policies of the last 25 years have injected competition to the market and extracted value from the infrastructure. We have over this period seen significant investments in successive generations of mobile networks and the cable network. But in other infrastructures, and in particular the copper fixed telecoms network, the competitive market has delivered significant upgrades in performance, but not the massive investment required to redevelop the fundamentals of network infrastructure. In the case of broadband, realising the full value of the copper network cost tens of



millions of pounds of investment; replacing it with a fibre network will take billions. Investment of this order poses a new set of strategic challenges.

3. The lesson of the past is that regardless of policy success, we cannot afford to be complacent about the pace of technological change. Alone amongst all of the UK's key national infrastructures, our communications infrastructure finds itself in continuing and rapid technology evolution, in which the new generation already looks unambitious by the time is fully rolled out. The Integrated Services Digital Network (ISDN) promised the ultimate international goal in 1984 of two telephone lines and a 16 Kbps data link to every home. The Total Access Communications (TACS) mobile networks licensed in 1984 was viewed as the foundation of modern mobile communications, while the Videotex Services heralded as the last word in browsing for information. Not only were none of them the last word, they were not even the last generation of "modern" networks but the generation before. All have been overtaken.
4. For governments, the pursuit of the new generation requires prompt action and support for renewal. This is particularly important during periods of economic difficulty. A recent report by the Information, Technology and Innovation Foundation<sup>9</sup> points to the multiplier effect of investment in digital infrastructure on jobs, productivity, competitiveness and quality of life – in addition to the immediate impact on jobs of investment through engineering and construction. ITIF suggest that a nominal £15bn investment in ICT infrastructure would generate 700,000 jobs, of which 360,000 would be in small businesses. (Public investment would of course carry a cost for the economy, and other estimates put the jobs created somewhat lower).
5. Like our energy and transport infrastructures, small variations in the performance of our communications can have major ripple effects, and major economic costs. Like energy and transport, the demands upon the infrastructure are constantly growing and the challenge of coping with these demands will move from complex to critical if we fail to take the necessary action.
6. There is though a very positive story to be told about the benefits of new networks. Next generation mobile networks offer very high bandwidth broadband with seamless connectivity. Next generation fixed fibre and cable networks offer not just conventional high-definition video entertainment and games, but potentially more revolutionary benefits for our economy and society – telepresence, e-healthcare in the home and, for small and medium sized businesses, access to cloud computing (which substantially cuts hardware and application costs and allows much more rapid product and service innovation). And next generation broadcast will move us into a new era of interactivity and high definition services.
7. If we are to be a global leader in the development of digitally based applications, content and services we need leading edge networks over which to develop and

9 The UK's Digital Road to Recovery, Jonathan Liebenau, Robert Atkinson, Patrik Karrberg, Daniel Castro and Stephen Ezell, April 2009



distribute them. The pattern over the past 25 years has been the arrival of more advanced fixed and mobile networks at roughly 8-10 years intervals and it should come as no surprise that the next cycle is coming up fast. Now is “just in time” for the UK to be investing in the next generation of fixed and mobile networks. To deliver them will need a 21st Century blend of competitive market forces, independent regulation and forensic Government intervention.

8. This chapter sets out some of the current and future challenges for the different elements of the country’s infrastructure, our view of market developments, challenges and changes for regulation, and, where appropriate, the Government’s role in securing our ambition of world-leading networks. By necessity it is only a partial view of the different networks in the UK – a fuller account could run to several hundred pages.

### **FIXED TELECOMMUNICATIONS NETWORKS (BUSINESS AND CONSUMER)**

9. The fixed telecommunications network can be thought of in three distinct parts. At its apex sit the international links that connect the UK to the rest of the world. A massive up-grading of these connections with high capacity fibre optic cables took place over the period 1997-2000. In fact a substantial over-capacity was installed that has allowed the traffic on the Internet to explode without a bottleneck occurring. The competitive market is able to handle this international demand for the foreseeable future. That it can do so on the back of business investment undertaken a decade ago is a tribute to market deployment and must never be taken for granted either by users or the public authorities.
10. The next tier of our fixed telecommunications network is the trunk links between cities and towns down to the local BT telephone exchange (or cable head end in the case of Virgin Media). Over the same 1997-2000 period the links between all the main UK cities enjoyed a massive surge of investment in competitive optical fibre networks. But when the dotcom and telecommunications bubbles burst, this optical fibre investment understandably came to an abrupt halt, but at a point short of optically connecting the market towns in the shires and the smaller towns across the UK. This has left a legacy of a bottleneck between the local telephone exchange and the nearest connection to the optical fibre backbone networks for most UK towns. This link is sometimes referred to as ‘backhaul’ or “the middle-mile”. The lack of low cost capacity over the middle mile is often a major factor in congestion customers experience on the broadband Internet in busy periods.
11. The third tier is the local telephone network that links individual homes and businesses. In 1989 the UK was unique in the whole of Europe in having a policy to encourage competitive local telephone networks. The vehicle for this was broadband cable TV networks. This resulted in a huge investment surge that also came to an end around 2000 – with around half the population having a choice of telephone network provider between BT and Virgin Media.



12. The areas of the country that are covered by the Virgin Media network already have local optical fibre rings that run through Virgin's street cabinets serving typically 500-1000 homes. Broadband coaxial cables then connect to individual homes. Coaxial cable can support 4 Gbps bandwidth on a shared basis. Virgin Media will this year extend its 50Mbps offering to all those homes able to access a cable service. Over the same areas BT has its network of copper wires but these run all the way from the local telephone exchange to homes, and the length of the copper wires limit bandwidth. BT's planned investment in 'fibre to the cabinet' will shorten these copper wire runs to allow much higher bandwidth.
13. The other half of the country is served nearly exclusively by BT's copper network as the only fixed network. Following Ofcom's Strategic Review of Telecoms in 2004/05, the 'natural monopoly' elements of BT's assets were placed into a separate business unit, Openreach. In addition Ofcom took action to make sure BT's competitors could offer retail broadband services over BT's copper wires (so-called local loop unbundling). This opportunity was seized by providers such as Carphone Warehouse and Sky who at their own risk have deployed exchange-based infrastructure investments.
14. As a result the country enjoys the benefits of a competitive first generation broadband market to drive up choice and service levels and drive down prices. However, as we look to move to the next generation of services, with higher data rates, increased symmetry and resilience and lower latency, the business case for investment is very different to the current generation – we are now talking about essentially replacing, rather than enhancing, the infrastructure. While the competitive threat of cable means that the case for upgrading the copper network to fibre is more easily made, the business case for investment in the other half of the country is challenging. In particular, the costs of deploying fibre rise steeply in the more rural areas – the final third.

## BUSINESS COMMUNICATIONS SERVICES

15. While the bulk of attention and public policy analysis (including in this report) is focused on domestic and small business consumers, the communications market for our medium to larger businesses is a quite distinct market. It is also an extremely important one. The availability of high-specification, resilient, bespoke communications services and managed private networks at competitive prices represent an important factor in the country's productivity as a knowledge economy and its attractiveness to inward investment. Global companies which rely on their communications services round the clock in turn rely on a vibrant market in business communications. Since these will be growing sectors in the global economy over the coming years, this makes it ever more vital to the UK's competitiveness that we dedicate attention and resource to ensuring that market stays competitive.
16. The distinct nature of the market is in part dictated by the nature of the end customer, who tends to be well informed and used to a bespoke service for



which they are able to negotiate down prices. Business telecoms is a diverse field, but typically providers supply a suite of mobile and fixed products, including high bandwidth point to point connections, Internet protocol virtual private networks, voice and data services management solutions.

17. While BT plc, through its Global Services division, is still the biggest network provider, alternate providers, with their own substantial infrastructure, have offered competitive services. The number of scale competitors in the UK has been reduced through consolidation in recent years. But the nature of the competition to BT has been enhanced. In particular, Cable & Wireless has in recent years successfully pursued a strategy of focusing on IP services for major corporates, while Colt is active in major cities around Europe. Contracts with Mobile operators, particularly with the advent of mobile broadband and high-speed file-sharing, are also an increasingly critical part of any knowledge-economy business's competitive edge in Digital Britain.
18. Importantly, like the domestic market, BT's major competitors often still depend on regulated access to wholesale BT products. Following the Strategic Review, Ofcom has reported a gradual shift from end-to-end wholesale products to access-only products which allow competitors to aggregate backhaul and thereby operate more efficiently at scale.
19. Much focus, whether of democratically-elected politicians or statutorily-appointed regulators accountable to Parliament, understandably rests on high-profile retail communications competition and the wholesale inputs to that competition. But the Government also recognizes the importance of the business communications market. It supports the measures that Ofcom has taken to improve the competitiveness of this market to date. It is as vital that we have a highly competitive business market as it is in the more publicly visible retail market. Additionally, there is a question as to whether the distinct needs of SMEs are fully being catered for by the market as currently composed. These are not challenges we can afford to be obscured by the focus on consumer markets.

## CONCLUSIONS

20. The UK can overall reasonably claim to have a satisfactory broadband infrastructure and market structure. It has been quite a journey. When the Internet started it was largely running on telephone modems delivering data at 14.4 Kbps. The bandwidth went up in jumps until, at 56/64 Kbps, the telephone modem had to give way to the broadband Internet (DSL over copper wires or Cable Modems over broadband cable networks). This allowed bandwidth to leap to an average of 512 Kbps by 2005 and have risen steadily to an average of 3.3Mbps today. It has taken us 20 years to get to this average bandwidth. However, challenges remain. There are three major issues for today: reliability of the middle mile, access to services, and universal availability.
21. First, the capacity of the network is strained by users' demands upon it, particularly "the middle mile" issue, which will become pressing as video rich



applications such as the i-Player become commonplace. Without action being taken it is possible that entire metro areas could suffer data 'brown outs'. Inevitably, this will feed through to user experience – and will have an economic cost. This is though primarily a challenge for network operators to boost capacity through investment and appropriate management of traffic flows rather than Government intervention.

22. Secondly, it is important to ensure that the focus on connectivity does not detract from the need to foster the services consumers value. Liberalisation of telecoms has seen service development become decoupled from network development, which allows for more dynamism and innovation. The fulcrum of this process is the world wide web, where millions of sites are available to every single user regardless of who provides the connection. It is important that we do not lose this dynamism as networks are built out, even as new business models are developed.
23. A vibrant digital economy requires that independent value-added services can be delivered across digital platforms. Where this applies to voice services (such as directory enquiries) this might require Ofcom to mandate wholesale connection rates for operators with significant market power, including where the provider is shifting from one technology to another. It might also require a more active regulatory approach to ensure that services such as directory enquiries are kept relevant to consumers' expectations, and we support moves in Europe to ensure that requirements can be put on a wider range of operators to provide directory information to DQ service providers.
24. Thirdly, there are various degrees of current generation broadband under-service. DSL 'not-spots' (no DSL service available at all) arise for homes connected to a small number of largely rural exchanges. As headline bandwidths on offer to consumers have increased, a further subset of homes, this time right across the country, have been left unable to access anything above a very basic service because of line length or other technical issues.
25. Research by the Communications Consumer Panel shows that broadband is at a tipping point. For many people it has become a round-the-clock reality – those who work in a highly connected environment all day often come home to a connected home. For those households who have it, broadband has become an essential utility as important as electricity, gas or voice telephony.
26. But for some of the country, without connectivity at work or at home either, broadband has moved from the point where it might confer an advantage (with accessible mobile broadband playing a role in connecting those who might not have fixed connections). Instead, we are moving into a world where not having broadband access creates social and economic disadvantage – whether it is for children keeping up with homework with their school peers, job opportunities increasingly advertised online-only, cheap goods and services online and access to information.



27. The Commission for Rural Communities has conducted research into the benefits of broadband to rural communities, and the dangers of exclusion, to be detailed in a forthcoming report. They suggest that Internet use for bandwidth continues to increase in rural areas at a faster rate than in urban areas, and that a host of other issues, most notably rural economic development, are bound up in broadband availability.
28. Access to broadband is also a necessary pre-condition for the development and delivery of an increasing range of public services online. Rising demand for public services and constraints on taxpayer finances make it imperative that we drive efficiencies in public service delivery. This is set out more fully in Chapter 8.
29. Taking these factors into account, in the Interim Report we committed for the first time to bringing broadband to within reach of all parts of the country, and stated we would consider minimum levels of service up to 2Mbps downstream.
30. Some responses to the Interim Digital Britain Report argued that the focus should not be on current generation broadband for everyone, but more rapid progress to next generation broadband for most. These are two quite distinct national undertakings. Universal availability of today's network essentially requires incremental upgrades of existing infrastructure and the costs are therefore limited to the hundreds of millions of pounds. Delivering tomorrow's network essentially involves installing a new network or networks, and the costs are in the billions.
31. The Government believe that both objectives are valid: the network of today available to everyone, and the network of tomorrow reaching a large proportion of the population. **We will therefore take action on two fronts. First, we will ensure delivery of the Universal Service Commitment at 2Mbps, and second we will take action separately to address the issue of next generation broadband availability.**

## The Universal Service Commitment (USC)

### WHAT DOES THE USC LOOK LIKE?

32. During the recent European Framework negotiations the UK has worked to secure amendments to the Universal Service Directive that permit national authorities to designate functional Internet access at bandwidths deemed appropriate to the market. When finalised, this will remove the previous constraint on Universal Service Obligations as being confined to narrowband connections and will provide a legislative underpinning for a redefinition of what we see in this country to be an appropriate minimum universal service.
33. Our analysis indicates that under existing conditions, and taking into account expected network developments, 11% of all lines are currently unable to deliver a 2Mbps service. Self-help consumer solutions, such as the iplate, will, we believe, reduce this number to around 7%. To address these remaining homes will require a mix of professionally assisted consumer home solutions, professional home engineered solutions, fixed network engineered solutions,



and wireless network engineered solutions (including satellite). The final mix of these solutions will be determined by the procurement process.

34. The gaps in current supply are widely dispersed across the UK, not only in rural areas, but significantly our analysis has revealed a lot of clustering, which should provide scope for efficient solutions to be applied. In many such cases a fibre to the street cabinet solution may well be the most economical. It will also benefit all others connected to those street cabinets whose connections today are over 2Mbps; they too will leapfrog to a next generation service up to 40Mbps. In these circumstances we estimate that **up to 1.5 million households, many of whom currently have little or no broadband availability, might be able to access next-generation super-fast broadband as a result of delivery of the Universal Service Commitment.**
35. The homes which will benefit from the USC are dispersed throughout the country, and are as prevalent in urban locations as they are in the countryside. The following map indicates the level of unavailability by area in Great Britain.

### UK Broadband Availability

Our analysis of broadband availability is as follows:

We estimate that today c.89% of homes can readily get a 2Mbps (or higher) broadband service from cable, ADSL or wireless means. This means that c.11%, or about 2.75m, homes cannot readily get a 2Mbps (or higher) broadband service today.

We believe the main reasons that prevent these 2.75m homes from getting a 2Mbps broadband service are:

- Problematic home wiring (c.1.9m homes);
- Random network effects (c.300k homes); and
- Telephone line too long (c.550k homes).

Having considered what the potential solutions might be, our initial conclusions are as follows:

- Home wiring problems resolved by market/self help (c.800k homes);
- Home wiring problems resolved under USC (c.1.1m homes);
- Random network effects resolved by special investigation (c.100k homes);
- Long telephone line resolved by FTTC upgrade (c.420k homes); and
- Residual random network effects and long lines resolved by wireless/satellite (c.330k homes).

The above figures are based on 100% take-up and can thus be scaled down according to any take-up assumption.

The following two maps indicate where the bad lines are most prevalent.



Figure 2: Percentage of bad lines due to length in Great Britain

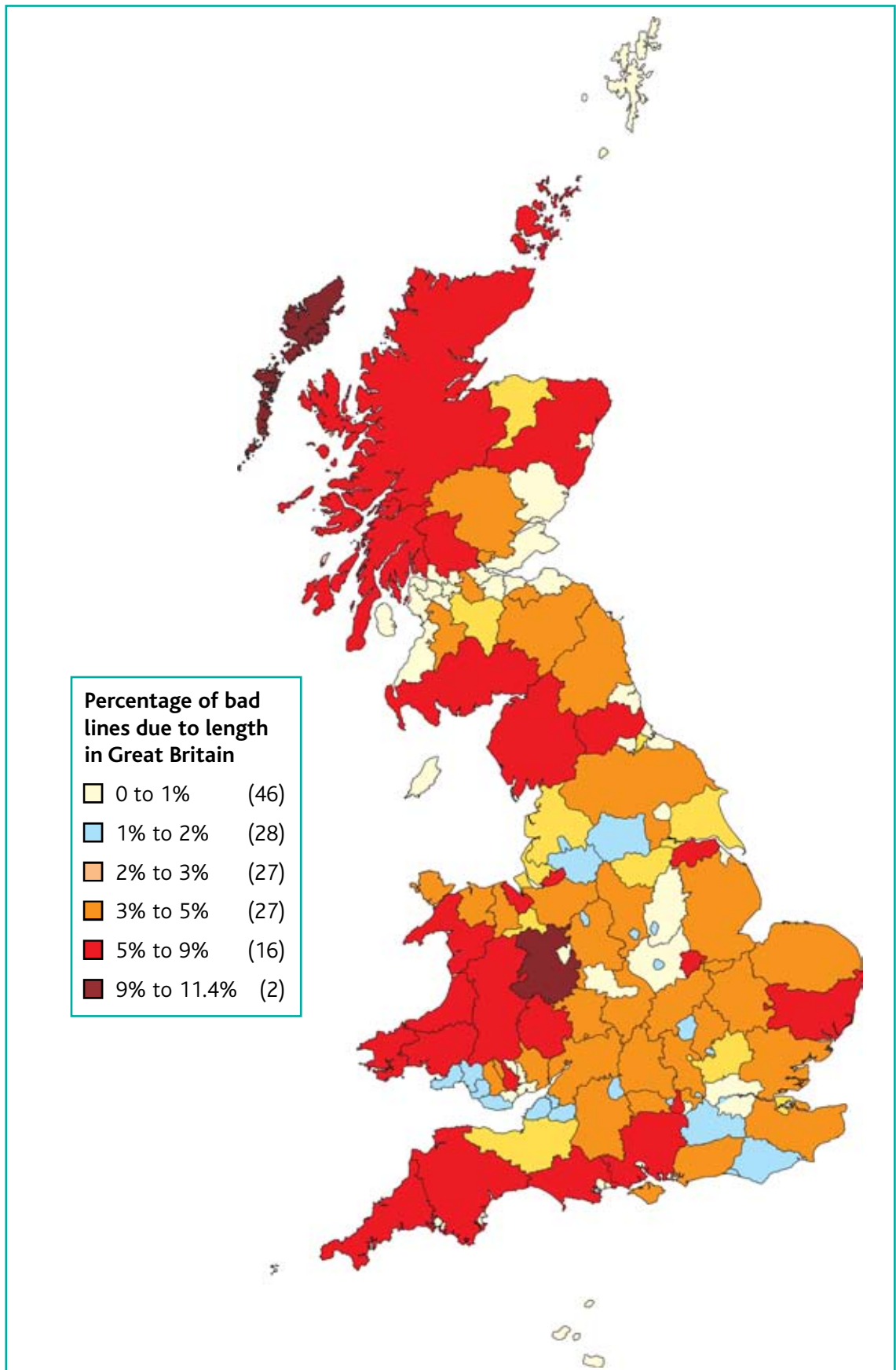
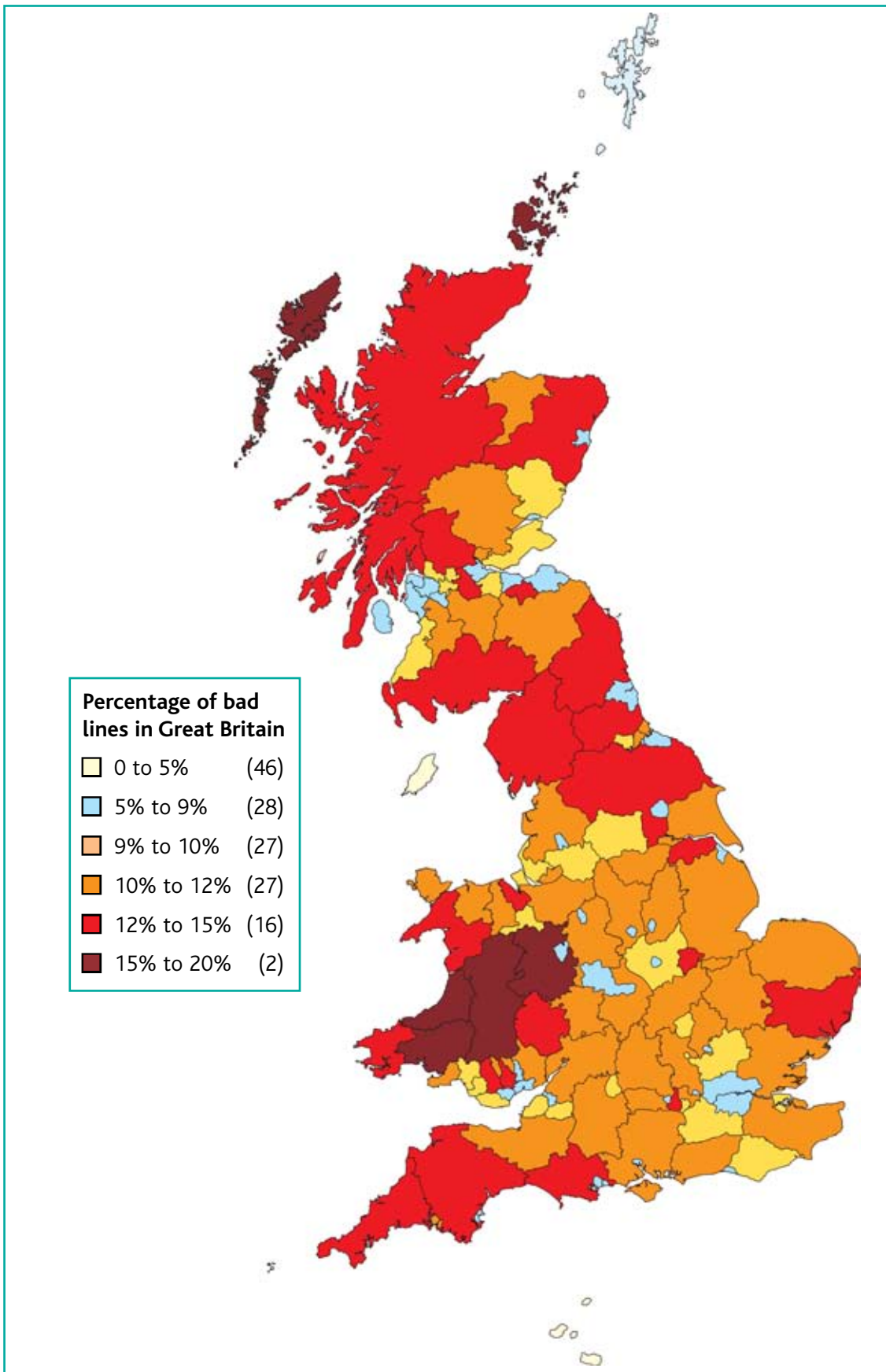


Figure 3: Percentage of bad lines in Great Britain



## THE FUNDING AND CONTRIBUTION STRUCTURE

36. In Budget 2009 the Chancellor of the Exchequer announced that
- “... the Government will pursue Universal Service in broadband, at a speed of 2 Megabits per second, by no later than 2012. This target will allow virtually everyone to experience the benefits of broadband, including the increasing delivery of public services online...The Government will consult with the BBC Trust on how the emerging underspend from the Digital Switchover Help Scheme can be drawn on to fund Universal Service and take-up. If necessary, the cost would also be met through additional funding mechanisms, as set out in the Digital Britain Interim Report”.
37. Discussions are underway with the BBC Trust and the BBC Executive about the practicalities and detailed timing of the release of the Digital Switchover Help Scheme underspend in ways that will ensure that Digital Switchover Help Scheme Ltd, which administers the help scheme, is adequately resourced to meet calls on the scheme in the later stages of digital switchover. In addition there will be a contribution from the BIS-Administered Strategic Investment Fund, announced in Budget 2009. The contribution from the Help Scheme underspend is time limited in that it will only be available until the end of the Switchover programme in 2012.

### Contributions to the Universal Broadband commitment

- 1) Digital Switchover Help Scheme underspend.
- 2) Strategic Investment Fund contribution. } £200m total\*
- 3) Competitive commercial pricing through tender contract and design.
- 4) Contribution in kind from private partners, e.g. extended investment plans to leverage other sources of funding.
- 5) Contribution from other public sector organisations in the Nations and Regions, including Strategic Health Authorities, Primary Care Trusts, Higher Education and Tertiary Education Institutes, e.g. investment in new applications, aggregation of bandwidth requirements.
- 6) Universal coverage of mobile broadband (this is covered in more detail below).

\*based on current estimates of Digital Switchover Help Scheme underspend

## DELIVERY PROCESS AND NEXT STEPS

38. Our priorities in determining the approach to delivery will be:
- 1) **Coverage** – 2Mbps to virtually every household in the UK (in addition, mobile will have a role to play in providing broadband coverage at different speeds, as set out later in this chapter).



- 2) **Provision** – Those currently unable to receive a service will be given priority.
  - 3) **Technology** – We should remain technology-neutral and look for the most cost effective means of delivering availability, while maximising wider network benefits (such as using next generation-compatible solutions where possible).
  - 4) **Competition** – Service competition should, as far as possible, be available across the country.
39. In designing the scheme to deliver universal broadband we will build on the lessons of the existing successful schemes in Scotland and Northern Ireland, where the devolved administrations have let contracts to fill in not spots.
40. **In order to ensure fast delivery, we will look to establish a delivery body – the Network Design and Procurement Group – at arm’s length from central Government.** The Network Design and Procurement Group will be responsible for structuring and running the procurement process, overseeing delivery, ensuring active stakeholder engagement, and accountability for the value for money use of the direct public contribution to the Universal Service Commitment.
41. As a first step we will by the end of October 2009 seek to recruit a CEO of that body with network, procurement, delivery and management skills. Detailed design of the procurement process will be left to the Network Design Procurement Group, but will need both to reflect regional and national differences in the existing market provision and seek benefits of scale and promote innovative market led solutions aimed toward delivering next generation broadband solutions wherever possible. To do this it will be necessary for the body to employ a range of strategic, business and technical competence, which will be supported by an advisory group containing representatives from the relevant, private, public and technical bodies. We will also discuss with the BBC Trust the structure which gives them appropriate visibility in the delivery process of the use being made of the Digital Switchover Help Scheme underspend. The BBC may well also have expertise which can be drawn upon in the delivery of the USC.

## Next Generation Broadband

42. Universal availability of today’s network is a necessary, but not sufficient step in delivering the sort of digital infrastructure we want for the UK. We also need to see tomorrow’s network available widely across the country in the coming years.



43. Like the UK, Governments around the world are grappling with what should be the right strategy for developing the next generation of broadband for all their citizens and businesses. Many countries view Next Generation Access Networks as important to international competitiveness. There are genuine negative consequences for a country still connected to the Internet at 14.4 Kbps today. In twenty years' time, countries still connected to the Internet at 3.3Mbps (or the 256 Kbps that characterises the up-link speeds for many consumers today) will similarly be left behind.
44. The new applications, services and businesses that such networks make possible will be likely to develop fastest in those countries earliest to adopt fibre. While we cannot predict with accuracy the full effects of a new network, we can note the productivity gains from first generation broadband.<sup>10</sup> It is not fanciful to imagine further gains from next generation broadband.
45. Within the past twelve months, the arguments for next generation development have been bolstered by the worsening economic situation, given broadband projects' potential role in creating a short term stimulus as well as strategic infrastructure. However, there are constraining factors on the desirability of widescale intervention to deliver next generation broadband. Governments need to be careful not to chill or displace private investment.
46. **Taking these factors into account, we have examined the likelihood of market-led investment throughout the country in this critical national infrastructure. We welcome the substantial investment already taking place, and are confident that the UK's competitive markets will provide the stimulus for further investment without any Government intervention, providing competitive coverage of superfast, next generation broadband for between half and two-thirds of the population.**
47. **Other developed economies are recognising the importance of investment in next generation broadband and, as we set out below, are pursuing different strategies to achieve this. In the UK we will achieve wide-scale next generation coverage first through market-led investment and, to a smaller degree, through targeted intervention.**

10 Lehr et al found that over the period 1998-2002, employment in communities with broadband grew 1 percentage point more than those without; a study for the European Commission estimates that broadband contributed an average of some 0.71% to EU GDP in 2006.



## Major international broadband developments since the interim Digital Britain Report

### *Finland*

In December 2008 the Finnish Government published a commitment that by 2010 a universal service of 1Mbps would be available to all Finnish residents. This commitment was technology neutral, and allowed for the delivery of the service through either fixed or wireless connection. The Finnish Parliament, has amended the Communications Market Act to put this universal service commitment on a legislative basis.

Through this commitment, and legislation, the Finnish government has committed to:

- The public telecommunications network being upgraded to allow a sufficient number of connections to information society services;
- A reasonable price for broadband services being ensured; and
- The State contribution to funding necessary for the measures being made available.

Recognising that the 2010 target of 1Mbps is only a stepping stone, the Finnish Government has a second target that by 31 December 2015 a network offering 100Mbps connection should be available throughout the country and that at least 99% of all households and businesses should have access to the network. This commitment is technology neutral, but commits the Government to ensuring that no one is more than 2km from the high speed network. What is currently unclear is how the last 2km will be provided as current proposals state that the subscriber is responsible for the connection to the cabinet.

### *UK*

The market has responded over the last year. Twelve months ago, Virgin Media were still in trial developments, BT had not even started their first trials. Today Virgin Media is able to offer 50Mbps bandwidth to 7 million homes and aim to complete roll-out to their current network footprint of 11 million homes by mid-Summer this year. They are now trialling a 200Mbps product. All Virgin Media customers are now being offered a 10Mbps DOCSIS connection with optional upgrades which consumers are adopting to 20Mbps or 50Mbps.

BT announced that it would advance its £1.5bn investment programme beyond the trials at Ebbsfleet, Muswell Hill and South Glamorgan to the first 500,000 homes covering a combination of metropolitan and rural areas. Responding to competition and since the uplift to Capital Allowances in Budget 2009 BT have announced deployment to an additional 500,000 homes, with the location of the next tranche of 1,000,000 homes expected to be announced this Autumn, to be enabled by Summer 2010.



**Germany**

In early 2009 the German Government outlined a broadband strategy with a basic service of 1Mbps to be rolled out by end 2010. By 2014, it aims to deliver a 50Mbps service to 75% of households, with public sector involvement where the market will not deliver (180m Euro has already been identified). The German Government has linked spectrum liberalisation at 900MHz to achieving wider coverage, and identified mediation between competing suppliers as crucial to lowering the costs of NGA deployment.

**USA**

As part of its economic stimulus (the American Recovery and Reinvestment Act), the US Government has allocated US\$7.2bn (£4.8bn) for broadband projects most of which will be distributed via grants, loans and loan guarantees. Of this, US\$4.7bn (£3.1bn) has been allocated to the National Telecoms and Information Administration (NTIA) to establish a Broadband Technology Opportunities Program (BTOP) with the aim of accelerating broadband development in un-served and under-served areas, creating jobs and providing public benefits.

Up to US\$350m (£234m) has been specifically earmarked for developing and maintaining state-wide broadband inventory maps, while US\$250m (£167m) has also been earmarked for programs that encourage sustainable adoption of broadband services. The Department of Agriculture's Rural Utilities Service (RUS) meanwhile will receive US\$2.5bn (£1.7bn) for its distance learning, telemedicine and rural broadband programme.

**Australia**

Following a request for proposals, the Australian Government took the decision to abandon its plans for a National Broadband Network using FTTC, based on a A\$4.7bn (£2.3bn) government subsidy. Given the economic downturn, doubts were held about whether those who had bid would be able to provide the levels of investment they initially indicated, and ultimately the Government's advisory board recommended that none of the proposals reflected value for money for the Australian taxpayer.

In its place, on 07 April the Government announced a A\$43bn (£21bn) FTTH project, to provide FTTH to 90% of Australian homes. The final 10% of homes, in rural areas, will be served by wireless technology delivering up to 12Mbps. This is an average of A\$5,500 (£2,700) per home passed.

The Government intends for this to be a joint venture with industry, but will retain majority ownership of the investment vehicle (allowing industry a maximum 49% share). The project will take 8 years to complete. Deployment will begin in Tasmania, which could be as early as July 2009.

Alongside this project, the Government is reviewing the legislative and regulatory framework for the telecoms sector in Australia.



### New Zealand

On 31 March, the Government issued a draft proposal titled the New Zealand Government’s Broadband Investment Initiative (see <http://www.med.govt.nz/upload/63958/Final-broadband-initiative-consultation-document.pdf> ). The Government requested comments and the consultation closed at the end of April.

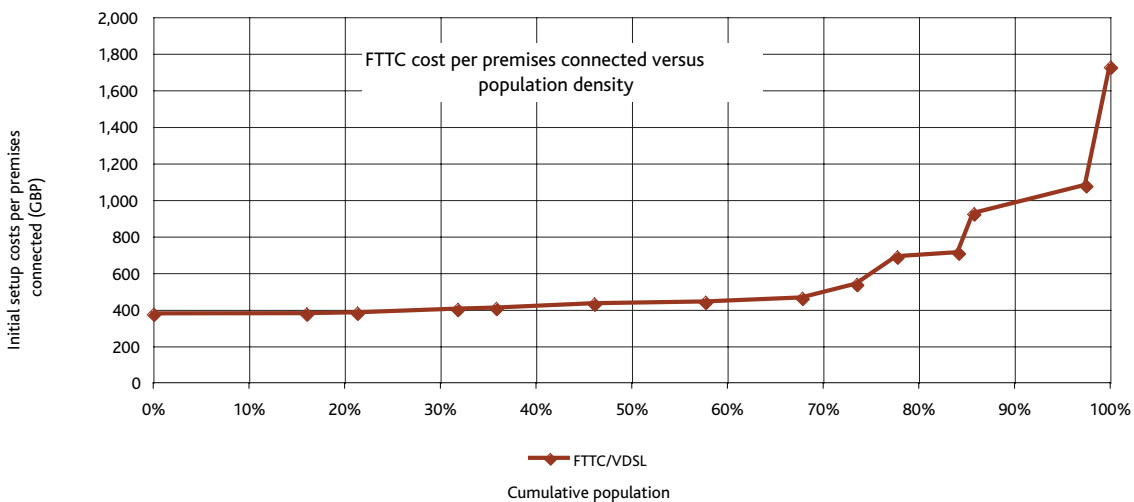
The Government is seeking to accelerate the deployment of FTTH to 75% of the population, and will provide investment of NZ\$1.5bn (£0.6bn), alongside industry investment. This equates to a government investment of NZ\$1300 (£500) per home passed.

It is anticipated that the first investment decisions will be taken in early 2010. New Zealand has already developed a broadband mapping service (see <http://www.broadbandmap.govt.nz/map/>), open to the public.

### PREVENTING A FUTURE FIBRE DIVIDE

- 48. Our expectation is that competitive, market-led investment in fibre will deliver next generation services to a significant proportion of the country. The following two graphs demonstrate the step changes in incremental rollout costs once fibre or new cable infrastructure deployment reaches 60-70% population coverage. They show the deployment costs of fibre-to-the-cabinet (FTTC) and fibre-to-the-home (FTTH).

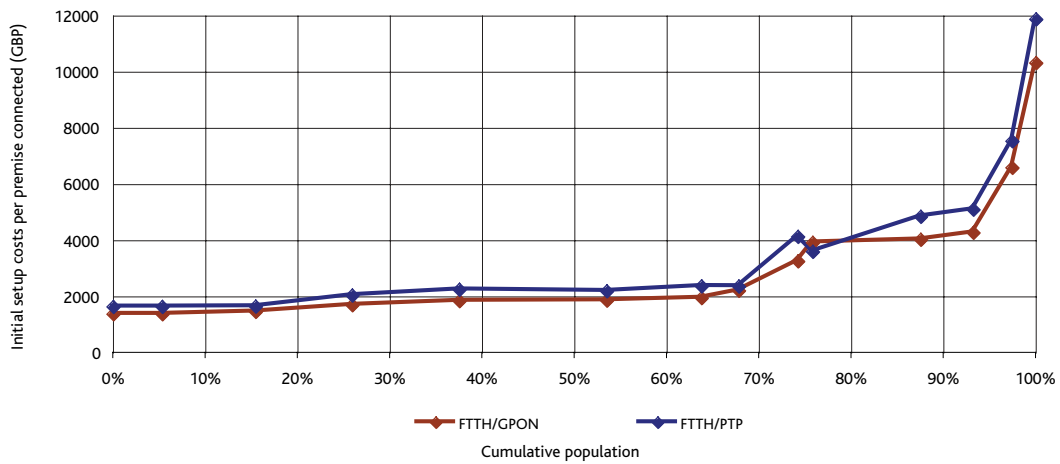
Figure 4



Source: Broadband Stakeholder Group



Figure 5



49. We welcome the significant investment by Virgin Media and BT plc's competitive response via its commitment to developing next generation broadband services. We can be confident, over time, of BT's investment leading to coverage matching the cable footprint and possibly extending to a certain proportion of the population beyond this. But we cannot ignore the emerging industry consensus that, despite this welcome investment and competition, the economics of next generation broadband deployment mean that there will remain up to a third of the country – both homes and small-to-medium-sized businesses – not served in the way that the rest of the country is by the fixed telecoms market.
50. At the same time, mobile will play an important role in developing alternative means of connectivity across much of the country. Next Generation Mobile services will offer substantially higher speeds and data rate capabilities than 3G. This will mark an acceleration in the trend of mobile networks being used more for data than voice traffic. As we outline below, Long Term Evolution (LTE) technology is capable of delivering a range of speeds up to 50Mbps in a competitive, multi-operator market. We will take the necessary steps to ensure spectrum is available for use and the market remains competitive. But here too, the costs of deployment rise in the final third of the country, meaning the investment required to install the density of base stations needed to support very high bandwidths becomes uneconomic. While we believe, therefore, that the market will deliver new higher mobile data rates to the final third of the country, this may not be at genuinely 'next generation' bandwidths.
51. In summary, given the expected rates of return it seems unlikely, particularly in a period when capital markets are severely constrained, that private investment or publicly available financing will provide the investment necessary to roll out NGA such that coverage can reach ADSL or mobile coverage levels.
52. **The increasingly widespread conclusion from industry and economic analysis is that there is no obvious means whereby the market, unaided,**



**will serve the final third of the population. We therefore propose a Final Third Project to deliver at least 90% coverage of Next Generation broadband for homes and businesses by 2017 (and, it is hoped, accelerate the expansion of the boundary of market provision from 50% to the two-thirds coverage level).**

53. The Final Third Project would need to focus resources on geographic areas where the market would not otherwise invest and to subsidise only that activity which contributes to next generation broadband deployment. For this reason we do not believe tax incentives for investment would be the best means of delivery. A form of targeted subsidy is likely to be more effective and deliver better value for money.

### THE NEXT GENERATION FUND

54. In order to generate the substantial funds needed to support such an undertaking, **the Government intends to propose a small general supplement on all fixed copper lines (that is, residential copper lines, the equivalent business analogue and ISDN2 lines and cable telephony lines) from 2010 for a Next Generation Fund. Such a model would be the communications sector equivalent of the Renewables Obligation, which is paid for through household and business energy bills to deliver an objective which the market otherwise would not. It would apply to fixed line rather than mobile because mobile operators already contribute with licence coverage requirements for mobile telephony and broadband.**
55. Such a supplement needs to be set against the historic fall in telecoms prices. Unlike all other utilities or, indeed media services, telecommunications prices have fallen significantly and steadily in real terms over many years. Today the UK retail telecommunications market is among the most competitive in Europe. Consumers enjoy either the lowest or among the lowest prices, depending on their usage patterns of any major European market. Indeed, many consumers pay no separate charge for broadband – it being included as a free element within a bundle of voice, line rental and pay television.
56. At wholesale level, the UK currently has the second cheapest prices in Europe for broadband only DSL, the third cheapest for voice and broadband DSL, and the fourth cheapest for voice line rental. ADSL prices for a 10MBps service can be as low as £5.99. The cost-based basket of wholesale prices for today's copper-network has fallen by £8 per line per year in real terms since 2005. Over the same period the retail price for combined voice and broadband has fallen by around £90 per annum in real terms.
57. Against that background, the Government believes that it is right to share a small part of that saving, and that a Next Generation Fund supplement of 50p per month on fixed lines represents a fair and sensible national investment to ensure that the overwhelming majority of the country can get access to next



generation broadband. Low income households – those on social telephony schemes – would be exempted.

58. Over time there has been modest fixed line to mobile-only substitution. Even so, a supplement of 50p per month can be expected to raise £150m-£175m a year for the Fund. This amount might be sufficient to make investment in connecting most of the Final Third by 2017 as commercially viable as connecting the first two thirds of the population.
59. **We envisage that the Next Generation Fund supplement would be collected by all fixed line operators, including cable. It would not be consolidated for accounting or tax purposes by those operators.** The amounts collected by the operators would be passed to Ofcom (in the way that spectrum AIP payments and commercial broadcasters' Additional Payments for their licences are collected) and placed in the Consolidated Fund.
60. **The Government envisages that the Network Design and Procurement Group responsible for delivering the Universal Service project would then hold tenders to which all operators (including cable) proposing to install a next generation service would be eligible, on a reverse auction basis to provide next generation broadband to the Final Third.**
61. **A key part of the programme will be to ensure a coherent framework for network designs, operating systems, common processes and regulatory requirements so the next generation access networks across the country work as effectively as possible for all parties. In particular, the networks need to offer all end users an optimum level of service quality and choice.**
62. **The Government will consult on the detailed design and implementation of such a measure in the normal way.**

#### OFCOM'S FOCUS AND PRIORITIES

63. Budget 2009 stated that 'in advance of the Digital Britain final report, the Government will review the powers and duties of Ofcom to ensure that it can strike the right balance between delivering competition and encouraging investment in the communications infrastructure'.
64. Since then the Government has reviewed this question and consulted Ofcom. Given the importance of communications infrastructure – television, radio, cable, mobile, fixed telecoms and others – we believe it is appropriate to reconsider Ofcom's duties in order to make it clear that part of their role is advise Government on the nation's infrastructure.
65. A competitive market for communications ensures that companies are able to compete fairly, and allows businesses and consumers to benefit from a broad range of service provision. Effective operation of competitive markets also has a role to play in driving economic growth, with lower costs helping to increase demand.



66. The Government has concluded that there is a case for broadening Ofcom’s primary statutory duties. For Britain to become a leading Information Society economy, and for our international competitiveness, we will need leading edge infrastructure. That will require a climate and a set of governmental and regulatory frameworks that are conducive to investment, while retaining a competitive market for consumers and business users. Ofcom needs to place the desirability of having a strong infrastructure, in the round, at the centre of its vision and strategy alongside its other core duties.
67. **The Government proposes to amend the Communications Act 2003 to make the promotion of investment in communications infrastructure one of Ofcom’s principal duties alongside the promotion of competition, to meet its overarching duties of securing the interests of citizens and consumers in the provision of communications services.**

#### OTHER MEANS OF SUPPORTING NEXT GENERATION BROADBAND DEPLOYMENT

68. There are a number of other means of aiding the rollout of next generation broadband, any or all of which could be carried out in addition to the measures outlined above. Following the Caio Review, we are already taking forward a number of policies.
- 1) Caio recommended that Government should look to produce guidelines for homebuilders to ensure they embed next generation broadband in their plans. The British Standards Institution (BSI) will be facilitating this process.
  - 2) Caio recommended relaxation of regulations on the installation of overhead lines to lower deployment costs. The Government wants to give communities the choice. We will therefore be consulting on the impact of any amendment to the Code by Summer 2009 and will seek to establish the level of demand for overhead deployment from communications providers.
  - 3) Caio highlighted the issue of non-domestic rates, where some concern remains over uncertain liabilities, or alleged discrimination. We have continued to address the uncertainty. The VOA has published guidance to help remove uncertainty about rates liabilities and will be working with consultants to provide greater clarity and modelling of liabilities.
69. Two other means of supporting rollout are support for localised projects and development of markets in access to existing infrastructure.

#### *Support for localised projects*

70. In the 2009 Budget, the Government supported capital investment in access, backhaul and core networks through a doubling of capital allowances. The Government also approved Yorkshire Digital Region, a £100m project which will both stimulate economic activity in South Yorkshire and provide a test-bed/ demonstrator of the potential for innovation and productivity improvement



from a cluster of super-fast broadband development. In Manchester, a tender has been issued to deliver a fibre-to-the-premises network to 500 businesses and 1000 homes in the Oxford Road area.

71. As we set out in the Interim Report, independent localised networks can, so long as they are constructed in an inter-operable fashion to allow services at scale across the country, play an important part in the development of our next generation broadband networks. We welcome the plans to provide greater cohesion to independent networks across the country.
72. **Localised and community network developments have a role to play in developing next generation broadband, and where we can we should look to support their capacity, scale and expertise. Work on standardisation and inter-operability between local networks has already commenced. The Government will provide further support through a £150,000 grant to support the Independent Networks Co-operative Association (INCA).**

#### *Development of wholesale markets in access to infrastructure*

73. In order to lower costs of deployment or market entry, network operators could utilise different forms of existing infrastructure.
74. *Firstly*, there is at present no wholesale offering over Virgin Media's network, a fact which BT and others have claimed is a factor limiting service innovation.
75. *Secondly*, in addition to the existing network access offered by BT, operators have shown some limited interest in using BT's ducts to deploy fibre. Ofcom have conducted a duct access study which showed a mixed picture<sup>11</sup>, suggesting duct access might play little immediate role in delivering next generation broadband.
76. *Thirdly*, other utility infrastructure might be used to lower rollout costs. The use of sewers for fibre deployment in Bournemouth and elsewhere has been well documented, although as yet this does not seem to have translated into commercial services.
77. *Fourthly*, it has been proposed several times, including by the Caio review, that next generation rollout would be helped by sharing of street-works to limit costs. We have investigated the potential for further sharing, and while the opportunities for massive cost reduction are limited by mismatches between the scope and timing of different utilities' plans, there is certainly scope for better working between utilities, including developing the existing industry body so that it is capable of facilitating joint working nationally and the more ambitious use of existing procedure.

11 Results of a small sample (817 chambers, 18206 duct ends and 76 street cabinets – 0.02% of Openreach's chambers) indicated that there is some spare, usable duct space, with more space available in the metro node to the exchange, than in the Exchange to street cabinet. 51% of duct ends had 42% of unoccupied space. Unoccupied space does not necessarily mean that the duct can be used – the duct could have collapsed somewhere along the section, or Openreach are keeping spare capacity in reserve (esp in the metro node) for future expansion. There may also be additional engineering rules that prevent the space being used (i.e. to limit disruption with other cables in the duct).



78. **Although the effects might immediately be marginal, there is still value in maximising the possibilities for alternative means of deployment of fibre. We therefore propose action in four areas:**
- 1) **The Government believes that, as demand for next generation services develop, commercially-based wholesale access to the cable network could benefit both the market and the consumer. At this embryonic stage of the market's development, regulatory action would be premature and market-led approaches to access are preferable. The Government will continue to monitor closely developments in this area.**
  - 2) **We are asking community broadband groups to provide evidence of where access to existing primary infrastructure or shared 'digs' could accelerate their deployment.**
  - 3) **We will investigate as part of the scheme design for the Next Generation Fund means of maximising the future potential commercial access to primary infrastructure.**
  - 4) **We will continue to work with utilities and public authorities to facilitate better use of existing mechanisms. By 2012 our goal is that information on all street works planned for 1-2 years ahead is made available to all those likely to work in the highway. We would like to move to a system in which all utilities offer to share works with other interested parties, with the option of enforcing a 'must offer' system if necessary.**
79. While commercial confidentiality might preclude a publicly available 'national map' there might be value in a comprehensive inventory of the UK's Ducts, Poles, Lit Fibre, Unlit Fibre, Used and Unused Wavelengths to establish the complete picture of what infrastructure is out there, what is actually being used, what is likely to be used and therefore what could be used for a future UK NGN rollout. The inventory could also include Utility installed Duct and Fibre. We return to this issue at the end of the chapter.

## Mobile Networks

80. Since 1984 the UK's mobile radio networks have gone through three revolutions. The first revolution lifted mobile radio from a minor added value service (starved of investment) to a major two player competitive industry in its own right. The second revolution (GSM) was in fact three simultaneous revolutions in one that saw the digitalisation of mobile radio, the transformation from a professional electronics market to a mass consumer market and the ability for consumers to be connected to a compatible mobile network in over 160 countries.
81. GSM brought with it the expansion of competition from 2 to 4 mobile network operators. This additional competition (Orange and T-Mobile) was made



- possible by the Government releasing new spectrum at 1800 MHz with compensations for the 1800 only operators (as there was insufficient room to accommodate them in the 900 MHz spectrum used by Vodafone and O2). The first generation (analogue) mobile networks were phased out and closed down.
82. The third revolution (3G) anticipated the rise in demand of multi-media services over mobile networks. GSM operates in only narrow 2x200 kHz wide radio channels whereas 3G uses 2x5MHz wide radio channels and improves the efficiency with which this spectrum was used. The Government led the way in making new spectrum available for 3G services at 2.1 GHz, encouraged the adoption of internationally harmonised technology and made it possible, through the introduction of a new entrant licence for a new operator (H3G) to add competitive energy in rolling out the new networks.
  83. Initially it took an enormous effort by the industry to get the 3G technology to deliver its multimedia promise but this was eventually accomplished with the arrival of the High Speed Data Packet Access (HSDPA) technology up-grade that is now used by all 5 UK mobile network operators to over 80% of the population with speeds up to 7.2Mbps.
  84. The five UK mobile operators (and a larger number of mobile virtual network operators) have competed vigorously to provide consumers and businesses, with excellent mobile services expressed in quality, price and customer support. But the last few years have posed significant challenges. Mobile radio has been a business based on premium payments for the convenience of voice and text on the move but much of that premium has now been regulated down through tighter controls imposed over mobile termination rates and international roaming charges; and on top of this also competed away at retail level by the operators themselves.
  85. The mobile network operators have been looking to the expansion of data services to compensate for the falling profits from voice and text messaging. The most significant of these data services is mobile broadband Internet access. This has created a pressing need to expand the capacity of mobile networks and the point is rapidly arriving where a combination of new technology running on new radio spectrum and operating in even wider radio channels (up to 2x20 MHz wide) will be needed.
  86. Coverage is another concern. The heart of the mobile radio promise is "mobility" across the entire country (and internationally). The period over which the GSM operators enjoyed high margins fuelled a surge of investment in GSM coverage well over the obligations imposed by the Government. Today there is near universal coverage of GSM and this has been important for regional development, of great value to those who live and work in semi-rural areas and almost everyone else who makes the occasional visits there.
  87. But the extensive coverage we now take for granted with GSM has not yet happened with 3G networks. Roughly 20% of the population do not have a choice of 3G network operator and the 90% who can access a 3G service have



limited in-building coverage. Around 10% of the population have no 3G service. The characteristics of 2.1 GHz radio spectrum allocated to 3G services has not helped as it has much shorter transmission ranges than lower frequency spectrum, say 900 MHz. Also the tighter margins of the mobile operators are forcing them to make tough choices between investing in more capacity in urban areas or extending 3G coverage to more rural areas.

88. For these reasons, if we eventually move to a phasing out of GSM networks in favour of the next generation, we might face the end of universal mobile coverage in the UK. There are strong public policy arguments for wishing to preserve very extensive coverage.

## Actions to maximise the potential of mobile and wireless

89. Already the limitations of the 3G technology are becoming clear. The 3G HSDPA upgrade provides a huge boost in bandwidth but it does not do this uniformly across the service area. Typically 10% of users (close to a base station) can achieve 75% of the peak data speeds (or better) but 50% of users (on the outer rim of radio cells) can only achieve 25% of the peak data speed (or less). This is a fundamental limit set by the nature of 3G technology and the availability of 5 MHz wide radio channels. The next revolution will be a technology that is able to achieve greater resilience at the edge of radio cells and work in much wider radio channels. The most likely such technology for national networks across Europe will be the Long Term Evolution (LTE) technology. It can deliver a headline speed of 50 Mb/s in a 2x10 MHz wide channel. Other technologies may emerge over dense urban areas, such as WiMAX, to serve particular customer segments.
90. There are benefits for the UK in being on the leading edge of the transition to mobile Next Generation Network technology:
- Consumers and businesses alike will prize the flexibility of “mobility” for much higher speed broadband Internet connections – as they have already demonstrated for other mobile services;
  - Mobile radio provides productivity gains to industry and commerce. Coupling together the power of the broadband Internet to the flexibility of very high speed mobile data links will be a significant tool for even greater efficiency gains in the economy;
  - The next generation of mobile phones are developing PC functionality. The mobile industry has shown extraordinary capacity to take complex technology and make it simple, reliable and very low cost. (It is one of the reasons why, in developing countries, mobile phones are prevalent and PC’s are not). Given time, low cost broadband mobile phones connected to the mobile broadband network have the best long term potential to ensure complete inclusion of all in the UK to the broadband Internet;



- The increasing move towards open standards and open platforms, such as Android and Symbian, not only will deliver operating benefits, but offers a real opportunity to content and application developers in the UK to become world leaders in this rapidly growing market; and
  - Inward investors are attracted to leading edge markets.
91. There is a role for Government intervention in releasing new radio spectrum for a rapid roll out of mobile “Long Term Evolution (LTE)” networks (requiring early release of the 800 MHz auction), ensuring the balance of radio spectrum holdings optimises network competition and extracting the best infrastructure deal for the country in terms of universal coverage.
  92. To enable that transition to high speed services, a key role of Government and the regulator is to ensure the availability of sufficient quantity at the right time of the right sort of wireless spectrum and to consider whether the imposition of standards is justified.
  93. There has been a trend for both governments and regulators to be “technology neutral” in respect of national infrastructures provided by the private sector. Technology neutrality does not mean the same as *laissez-faire*. The mobile sector has consistently benefited from quiet forms of industrial activism. In the case of first generation mobile radio networks, the mobile phones of UK consumers and business users stopped working beyond Dover. The freedom UK citizens enjoy where they can get off a plane in any one of 150 countries and their mobile phone automatically works came with internationally standardised GSM 2nd generation technology. EU governments gently nudged the EU market to a common 3rd generation technology by requiring companies to commit themselves to the technology they would use prior to the entry to the 3rd generation auctions. This tilted the balance of risks towards a standardised 3G technology and avoided the need to mandate it through regulation.
  94. The work done in the Digital Britain project shows an encouraging consensus amongst the incumbent mobile radio operators for the mobile broadband networks to be based upon either 3G technology or LTE. This does not preclude a new entrant using other technologies, such as WiMAX but in the highly competitive UK mobile radio market makes it is unlikely that such a new entrant would have the market power to de-stabilise the vital standardisation that underpins national and international mobile roaming for UK users. It therefore looks unnecessary to mandate the technology to be used for mobile Next Generation Networks.

## THE NEW CHALLENGES FOR THE UK MOBILE RADIO SECTOR

95. The Digital Britain Interim Report identified a complex set of new challenges now facing the Government, Ofcom and the mobile industry itself and proposed a Wireless Radio Spectrum Modernisation Programme. Five elements were identified including: establishing whether there could be a voluntary spectrum trading solution between the existing mobile network operators to



allow the seamless liberalisation of use of the existing 2G GSM; making more spectrum available through the release of the 2.6 GHz spectrum and the Digital Dividend 800MHz spectrum; greater investment certainty; allowing more network sharing and seeking a significant contribution to the proposed broadband universal service commitment.

96. On 13th February 2009 Ofcom published for consultation its proposals for an imposed solution to the specific issue of the 2G spectrum, which was to provide for the compulsory release of 2x 5MHz of spectrum shared between the two operators holding 2G spectrum in the 900MHz band. Subject to the outcome of the Digital Britain consultation that remains the reserve solution. Ofcom's proposals and process have been opposed by different operators on different grounds. As a consequence, the Government appointed an Independent Spectrum Broker to facilitate discussions on the possibilities for a voluntary or alternative solution to the 2G spectrum, and beyond, as an alternative to this reserve solution.
97. The report of the Independent Spectrum Broker was published on 13th May 2009. He concluded that developments affecting the mobile sector required a new approach to the issues being addressed and that there was a need for a comprehensive approach to resolving the future of mobile spectrum. At stake is the transition to Next Generation Mobile networks capable of delivering headline data rates of up to 100 Mbps (a data speed more associated with next generation fixed access).
98. What has crystallised out of his further work is that the Government and Ofcom are now faced with three important public policy priorities for the UK mobile radio market:
  - a. **Infrastructure:** expediting the transition to Next Generation Mobile;
  - b. **Competition:** sustaining competition in the UK market, leading to lower prices, choice and innovative services; and
  - c. **Universality:** increasing the availability of mobile broadband in general and enabling it to play an important role in achieving near-universal broadband.

These priorities are inter-linked but distinct. The central issue to resolve is their relative priority in the best long term interest of Digital Britain.

## THE INDEPENDENT SPECTRUM BROKER'S REPORT AND THE GOVERNMENT'S RESPONSE

99. The interim report identified a roadblock in the release of spectrum that was hindering progress towards a broadband mobile future.
100. This roadblock has its roots in the allocation of GSM spectrum. Initial spectrum allocation of 900 MHz took place in the 1980s in a time when spectrum was administratively allocated and the available spectrum was split between the two operators at the time, Vodafone and O2 (Cellnet). The allocation of



1800MHz spectrum, was also administratively allocated among four players, T-Mobile (One-2-One) and Orange having entered the UK market.

101. The allocation was asymmetrical, with T-Mobile and Orange receiving more 1800MHz spectrum than Vodafone and O2. Although 1800 spectrum is not as attractive as 900 spectrum<sup>12</sup> particularly for voice traffic, lower AIP and higher mobile termination rates applied to T-Mobile and Orange have provided some compensation for the higher costs associated with poorer propagation properties of the 1800 spectrum. In 1998 the UK moved to allocation of spectrum through auction, it was on that basis that spectrum at 2.1GHz (3G) was allocated. The development of greater network sharing, coupled with a significant investment programme, has enabled some of the operators in the 1800MHz band to achieve national voice coverage that is now broadly on a par with 900 spectrum operators, and in mobile broadband with greater capacity.
102. This imbalance in spectrum holdings and the differing views on the need to rebalance the holdings of 900MHz spectrum, along with disagreements on the cost and time required to achieving any refarming, have been central to the delays. In response the Government announced its Wireless Radio Spectrum Modernisation Programme to address this issue, among others. To assist in this process, the Government appointed the Independent Spectrum Broker.
103. In undertaking this role, the Independent Spectrum Broker (ISB) has come to a clear view that significant progress can only be achieved if a comprehensive solution is applied. He believes that:
  - There is real advantage to be gained for the UK in moving quickly to next generation mobile services;
  - The benefits of access to mobility at higher speeds, delivering new content and services will fall to consumers and business;
  - A solution will deliver increased mobile broadband in general and make a contribution to near universal broadband (see USC section, p.51); and
  - A solution can be found if the industry, regulator and Government assess the strategic objectives and focus on delivering these, rather than becoming mired in operational issues.
104. The ISB's report also explores the role of proportionate and limited safeguards to ensure that the move to next generation broadband maintains the competitive intensity in the UK market that consumers benefit from. The Government warmly welcomes the Independent Spectrum Broker's Report and endorses most of the Report's conclusions. **We will move to implement the ISB proposals in line with our response as set out below. In the event that the Government decides to direct Ofcom, the direction will be subject to consultation as required by statute.**

12 900MHz spectrum offers greater coverage and penetration than spectrum at higher frequencies, so the costs of rolling out a network are lower.



## Background

105. In deciding its response, the Government recognises that the alignment of the auction release of the 800MHz spectrum with the paired spectrum at 2.6GHz, along with the liberalisation of use of the 2G spectrum at 900MHz and 1800MHz, offers a unique opportunity for the prospect of competitive and early deployment of next generation mobile. Spectrum below 1GHz is ideal for widespread coverage for the new technology; spectrum between 1.8 and 2.6GHz is good for provision of high speed capacity in urban areas where usage will be most dense. Through a more comprehensive approach there is in principle sufficient spectrum for all of the existing operators, or indeed a new entrant, to acquire (or re-use) spectrum that can provide nation-wide next generation broadband networks from 2012. The UK has a vigorous mobile industry that already has in place a dense network of base stations. The UK is therefore once again positioned to be on the leading edge of a new mobile revolution.
106. The Independent Spectrum Broker's report identifies a set of proposals that he believes will best deliver against the policy objectives (summarised in the box below along with the Government response). Having had further discussions with the regulator and industry, the Government will expedite work to resolve the key questions through the Technical Arbitration Process (see below) that will support a final decision. However it is of the view that a solution based on the ISB proposals can be achieved and therefore is minded to implement the following integrated package:
- The immediate release of the WiMAX-suitable 2.6GHz unpaired TDD spectrum for auction;
  - The alignment of the 2.6GHz paired FDD spectrum and the 800MHz auctions (the 'Big Auction') at the earliest practicable date – the Government understands this to be mid 2010;
  - An overall spectrum cap of 2x65MHz of sub-3GHz spectrum for any operator participating in the 'Big Auction', for a specified period including TDD holdings. Any operator acquiring spectrum in excess of this cap must relinquish other spectrum in 2x5MHz blocks to remain within the cap. This cap to include existing TDD holdings;
  - An exchange of 900MHz spectrum by current holders for any acquisition of spectrum in the 800MHz auction, at a ratio to be determined;
  - A specified time period for the relinquishment of 900MHz or other spectrum released as a result of this exchange;
  - Taking steps to minimise any competitive distortion which emerges as a result of any time difference between the possibility to liberalise existing 2G spectrum holdings and the availability of the 800MHz spectrum;
  - Making indefinite the 3G Licence term in return for proper AIP from the end of that term and additional coverage obligations; and



- The alignment of AIP for liberalised 2G licences reflecting the full economic value of this spectrum.
107. At the centre of these proposals is a question on the rate of exchange of spectrum at 900MHz if the users of 900MHz (Vodafone and O2) decide to bid for spectrum at 800MHz. This issue is at the heart of the Technical Arbitration Process and to make the outcome acceptable to all parties (including new bidders for spectrum) a variety of approaches will need to be considered.
108. In considering its response, the Government has been mindful of the policy objectives that it set out in the interim Digital Britain report. In summary these are:
- Successful deployment of next generation mobile networks;
  - Maintenance of the competitive intensity in the UK market;
  - Maximising coverage of next generation networks; and
  - Liberalising use of current spectrum for 3G or next generation purposes.
- The Government's rationale for its response to each of the ISB's proposals is detailed below.

### Independent Spectrum Broker's Recommendations and Government Response

*1 Liberalising the 2G spectrum in the hands of the existing users to ensure that spectrum bands do not become fragmented and that decisions on which technologies to deploy are not rushed; but revising administrative incentive pricing<sup>13</sup> (AIP) to reflect the full economic value of this spectrum.*

**Government response:** The Government agrees that over fragmentation of sub 1GHZ spectrum is to be avoided and that liberalisation of the 900 spectrum in the hands of existing users is consistent with this approach. Ofcom has stated that it intends to revise AIP rates as soon as practicable after liberalisation to reflect the net economic benefits of liberalised 900.

*2 Re-aligning the upcoming mobile suitable spectrum auctions to provide operators greater certainty in building spectrum portfolios necessary to provide NGM services, through:*

- *a separate auction of the TDD 2.6GHz spectrum suitable for WiMAX services before the end of 2009; and*
- *co-ordinating the upcoming FDD suitable auctions at 2.6GHz and 800MHz to allow existing and new operators to build spectrum holdings in an integrated, strategic fashion.*

13 This is the charge applied to spectrum users who have not obtained spectrum at an auction, in order to incentivise efficient usage of spectrum



**Government response:** The Government agrees a more coordinated approach to the auctioning of these key blocks of spectrum is desirable to encourage the deployment of new services at the earliest opportunity and to provide the opportunity for existing operators or new entrants to acquire the right balance of spectrum holdings to achieve this. The Government also wishes to see early use of spectrum wherever possible, and on that basis would support the early auction by Ofcom of the TDD portion of the 2.6GHz spectrum

*3 Extending mobile broadband coverage, and eventually achieving near-universal coverage of mobile broadband, by:*

- *delivering near-universal access to NGM services by imposing regional coverage and access obligations on all three 2 x 10MHz blocks of the 800MHz. Each block would carry a basic national coverage obligation at a specified speed (say 2 Mbps) to be achieved by a specific date. Furthermore, each of the licences would carry greater coverage obligations, of perhaps 99% population coverage – as well as access obligations – at a specified speed in a specific geographic area of the UK to achieve near-universal coverage of NGM.*

*In the short-term operators extending 3G coverage in return for making the 3G licence term indefinite and allowing greater infrastructure sharing in rural areas.*

**Government response:** The variants set out in the ISB report and the issue of alignment of the spectrum auctions raise important policy issues. The ISB sets out his arguments to support his preference for option ii), i.e. three licences of 2x10MHz each. Having given due consideration to the options and the arguments for and against, the Government is of the view that option ii) would more likely deliver its policy goals. Clearly there are attractions in option iii), providing a 2x20MHz channel that would deliver a network capable of offering the highest speeds, but the lessening of competitive intensity that would result, even allowing for any access and coverage conditions that might be imposed, has led to a preference for option ii).

The Government believes that coverage and access requirements are important. It will more fully assess the costs and benefits of different levels of coverage requirement in parallel with the technical arbitration work.

*4 Encouraging balanced spectrum holdings and a competitive environment between operators by applying 'event-specific' spectrum caps to the combined 2.6GHz and 800MHz auction:*

- *by setting a temporary cap on overall mobile suitable FDD spectrum holdings per operator at 2 x 60MHz;*
- *by setting an additional temporary restriction on the current holders of sub-1GHz spectrum, so to obtain access to 800MHz spectrum they must give up an equivalent quantity of 900MHz spectrum.*

*These restrictions should expire perhaps one year after the date of the combined auction.*



**Government Response:** The Government believes that an overall spectrum cap is necessary, but considers that the cap should include holdings of TDD spectrum as well as FDD spectrum. Therefore, the Government proposes a revised overall spectrum cap of 2x65MHz of FDD equivalent spectrum sub-3GHz, where each holding of 1MHz of TDD spectrum shall count as 2x0.5MHz of FDD spectrum towards the overall cap.<sup>14</sup> This offers the right balance between giving companies the opportunity to acquire spectrum across different bands, without allowing any company, or companies, to acquire holdings that might constrain competition in the market overall. As proposed by the ISB, the cap should remain in place for a period of 1 year from the date of the combined auction of 800MHz and FDD suitable 2.6GHz.

Given the Government seeks a rebalancing of spectrum holdings, and that the propagation qualities of sub 1GHz spectrum allows more economic roll out of services, especially to rural areas, it accepts the rationale for putting in place a cap on this spectrum so as to allow additional operators to acquire spectrum.

The ISB proposes that holders of 900 spectrum, who wish to bid for 800 spectrum will be required to relinquish an amount of 900 spectrum. The ISB proposed that an equivalent amount be given up, in other words a one-for-one ratio, but acknowledged that there might be alternative approaches.

It has become clear during further discussions that there are widely differing views on what the appropriate ratio should be. These differing views reflect the disagreement about how costly refarming of 900 spectrum will be and how long it might take. This issue, and how the Government intends to deal with it, is discussed in more detail below.

The Government is of the view that there are potential benefits in a one-for-one swap. However it acknowledges that other ratios are conceivable, for example a three-for-four swap. The former would more easily allow any successful acquirer to cost effectively extend a network at speeds consistent with achieving a step up in current performance. This option also has the benefit of simplicity and offers the greater opportunity to rebalance spectrum holdings. The latter option might be more applicable if refarming 900 spectrum is so challenging to the current holders that competition with an operator deploying next generation mobile in acquired 800 spectrum is made more difficult. It is to inform the final choice of this ratio that the Government is seeking guiding technical arbitration on the refarming of 900 spectrum before taking a final view on the ratio. The technical arbitration process will also look at other ways of addressing these issues, for example how additional spectrum trades might impact on the appropriate ratio or the timing/duration of the refarming process.

14 As TDD holdings are unpaired spectrum, a 1MHz block of TDD is half the amount of spectrum as a 2 x 1MHz block of FDD (which has 1MHz for uplink and 1MHz for downlink). Therefore TDD spectrum would count as half the amount of equivalent FDD spectrum under this cap. For example, an operator possessing 2 x 40MHz of FDD and 5MHz of TDD would be judged to have 2 x 42.5MHz of spectrum for the purposes of the cap.



5 Action to increase the certainty to operators of the availability of sub-1GHz spectrum, including:

- Government supporting Ofcom in taking all practical measures to expedite the clearance of 800MHz; the extra costs incurred in accelerating the clearance of channels 61 and 62 of television usage and channel 69 of PMSE usage would also serve to increase the value of the spectrum at auction;
- achieving consensus on both the earliest date at which 800MHz will become available for NGM usage and the earliest date at which Vodafone and O2 will be able to deploy reformed 900MHz; and adapting my proposals as appropriate; and
- if 900MHz spectrum is easily reformed this might create a significant first mover advantage for the 900MHz operators. In this case some form of remedying measure might be necessary.

*If 900MHz is comparatively difficult to reform this might increase the necessity for the 900MHz operators to be able to gain easier access to 800MHz than I have proposed with the sub-1GHz cap.*

**Government response:** The Government is committed to the timely release of 800 spectrum and will work with Ofcom to understand and meet the technical challenges. It has already endorsed Ofcom's proposal setting out its plans to clear channels 61, 62 and 69. The Government will facilitate this re-planning and will meet the costs incurred by broadcasters and PMSE users as a result of these changes.

## WIRELESS SPECTRUM MODERNISATION PROGRAMME: NEXT STEPS

109. In addition to the position set out above, there are a number of points that require further and more detailed consideration. *Inter alia*, these include:
- 1) Detailed AIP payment structure on liberalisation of the 2G spectrum;
  - 2) Ensuring potential new entrants are appropriately incentivised to bid for spectrum;
  - 3) Timing between any 800 MHz acquisition and 900MHz release;
  - 4) Timing between 2G liberalisation and next generation spectrum access/ deployment capability;
  - 5) How long spectrum caps will be in place;
  - 6) The extent and the detail on delivering universal service obligations for new licences; and
  - 7) The role of 1800Mhz or other blocks of spectrum in addressing any impact on competition.



110. There is a need to address the central issue identified above around 900 MHz spectrum that has been the subject of considerable debate and diverging opinions. Essentially this relates to the ratio at which 900MHz spectrum is exchanged for 800MHz spectrum and this in turn relates to the timing and cost of 900MHz refarming – changing the use that this spectrum is being used for from GSM to UMTS technologies – and the availability of 800MHz.
111. This has been the subject of considerable debate with a range of differing opinions held by the regulator and the operators, some of whom have experience of refarming in other markets. By September, the Government will have an independently produced guiding technical arbitration on this issue (and the other issues of important detail mentioned above), paid for by an industry fund. This fund will be contributed by the MNOs and any other party that considers its commercial interests may be affected by the proposals. Subject to the findings, of the technical arbitration, the Government will move to implement the ISB proposals in line with its response.

#### **MOBILE'S CONTRIBUTION TO THE UNIVERSAL SERVICE COMMITMENT**

112. Universal broadband service delivery will be achieved through a mix of fixed and mobile, with mobile ideally placed to make a contribution to the universal service commitment.
113. It is clear though that in the near term mobile services may not be able to deliver a 2Mbps service and it may well be that 1 to 1.5Mbps is a more likely deliverable up to 2012. However for those households in not spots or not a lot spots, this would represent a welcome upgrade.
114. We should not lose sight of the success that 3G has been in recent years and the part it continues to play in delivering broadband services. Availability of HSPA services in the UK has reached 87%, ahead of many other leading nations including France, Germany, Japan and the US. The number of 3G users has risen to 12m in 2007 from virtually zero in 2002, and 17% of mobile users are now on 3G. Growth continues to be strong with dongle sales, a USB modem that plugs into a PC or laptop, continuing unabated. Over a million have been sold in the past year. New and innovative services are coming on stream, the provision of access to Skype is one recent development.
115. While acknowledging this progress, the Government:
- 1) Wants a universal coverage for mobile broadband that matches that of current GSM coverage (99%);
  - 2) Recognises that network sharing, reciprocal access, interconnection regimes are increasingly a means of assisting in achieving that coverage level;
  - 3) Will, as part of its integrated package, convert existing 3G licences from time limited to indefinite to give MNOs certainty in being able to plan to achieve these coverage requirements; and



- 4) Will look at AIP levels that take into account the contribution being made by the operators to universal service.
116. Looking ahead to next generation services, coverage levels should match that of GSM and 3G. Next generation mobile broadband will be an important component of a Digital Britain, and this is a further reason to support option ii) above, with the coverage and access obligations it would impose through each spectrum licence. On access, the Government anticipates that there would be reciprocal access arrangements between operators. This might include network sharing in the final section of the network.

### Broadband Universal Service Commitment – Relationship with Mobile

Following extensive work by the mobile radio companies in cooperation with Ofcom five facts have emerged:

- 1 Where BT's DSL cannot deliver 2Mbps to a location, mobile networks may be able to serve this location in time (whether this applies in all cases cannot easily be quantified at this stage);
- 2 Between now and 2012 the number of such locations is likely to increase as the mobile operators continue to roll out 3G coverage;
- 3 Whilst the Government objective of 2Mbps is a stretch for the 3G technology the near universal roll out of some 3G networks will guarantee 1-1.5Mbps availability across a range of current broadband "not-spots";
- 4 Broadband mobile networks could deliver considerably higher data rates in the future (beyond 2012) if they were able to operate in much wider radio channels – with 2x20 MHz wide radio channels at least quadrupling the mobile radio cell edge data rate – but this improvement requires mobile Next Generation Network technology; and
- 5 The mobile networks (3G and Next Generation Networks) could significantly extend their reach, at lower cost, if they used radio spectrum located below 1 GHz.

This last point indicates how precious spectrum below 1 GHz is in being able to provide broadband coverage at much lower cost to the last 10% of the UK population. But this last 10% of the population is well dispersed and it is not a viable market on its own.

### OTHER WIRELESS INFRASTRUCTURE

117. In this respect, a number of companies have argued that the so-called wireless white spaces (interleaved spectrum) provide an opportunity for exciting new wireless services such as enhanced wi-fi in the UK. These have potential in rural areas to deliver broadband connectivity.
118. The USA has in principle sanctioned use of white spaces – although in practice no-one has been given the green light for services in that spectrum yet.



Ofcom's Digital Dividend Review statement in 2007 said that use would be allowed in interleaved spectrum if they did not cause interference to licensed products.

119. Ofcom has just concluded a consultation on how this might work operationally, based on licence-exemption for devices meeting certain criteria. They would either need to be cognitive/spectrum sensing devices, devices working off geo-location databases or beacon driven.
120. There is broad agreement that the opportunities offered by cognitive devices should be further explored, although there are concerns about the scope for interference to licensed users operating in and around the interleaved spectrum and ongoing questions about technical constraints. Whilst recognising those concerns, the Government also believes that there are significant opportunities for innovative services to be delivered, that would further the achievement of Digital Britain.
121. **The Government will therefore encourage Ofcom to carry out the necessary technical work and testing to establish the parameters for use and will support Ofcom to achieve the international harmonisation that is required.**
122. Satellite data and broadcast services are also important parts of the nation's communications infrastructure. Market data on use of satellite services is not widely collected at national level in the UK, but the imminent Space Innovation and Growth Team will take steps to address this. Satellite communications services take several forms, including:
  - Private business networks (VSAT) to a dish about 1m diameter;
  - Direct to home broadband Internet to a dish less than 1m diameter;
  - Direct to home broadcast of TV to a dish less than 1m diameter (*UK Freesat, German TV, French TV, Aljazeera, etc. etc. and Sky*);
  - Content distribution to UK TV networks (*Freeview, cable and IPTV*);
  - International trunk telephony and sub-sea cable back-up;
  - Direct to handset global positioning services (*SatNav*), or Traditional global mobile communications (*Maritime, Aeronautical, Military*);
  - Global mobile voice communications direct to handsets (*news reporting, emergency services*);
  - Personal global mobile broadband services direct to laptops;
  - Satellite imagery and environmental monitoring (*Google Earth, Weather forecasting, land management*);
  - Satnav, which has swiftly become a pervasive and popular technology in this country; and
  - Various military uses.



123. A communications satellite usually employs carefully designed bespoke antennas to direct the signals to (or from) the specific coverage area which may be as small as a country such as the UK or one third of the Earth's surface. European transponder demand is dominated by pay-TV with more countries introducing platforms and existing platforms contemplating new services based on digital PVRs and HDTV. Other services, especially private business networks, are often supported by broadcast satellites. Arqiva leases satellite capacity to distribute the digital TV and radio signals to its terrestrial transmitter stations.

## TRANSPORT COMMUNICATIONS

124. In seeking ubiquitous mobile coverage, there is a need to address notable gaps in coverage, such as the transport networks. Measures announced last year by the European Commission has paved the way for mobile services to be accessible on pan-European flights, but there has been a failure to provide reliable and consistent broadband mobile coverage over the length of UK main railway lines and there is a near total mobile coverage blackout over the Central London section of the London Underground, including even large stations. Although rail travellers can currently enjoy wireless connectivity, service across the network as a whole is variable in performance and availability.
125. Some progress is being made in expanding the commercial provision of higher band width services across the rail network, but these services may not be uniformly available. **The Government is therefore considering how best it might support the availability of these services in a cost-effective manner – one option is to make the provision of high speed broadband services part of the rail franchise requirements for train operators or to integrate the requirement to provide mobile broadband services into the next Network Rail control period funding.** Further discussions will also be held with Network Rail to ease access to Network Rail land for commercially based services.
126. **On the underground, the London Olympics in 2012, which will be the most digital Olympics in history, seems a particularly good reason for the Mobile Network Operators to work with the Mayor of London to provide and fund solutions to take the initiative to improve the broadband mobile access for mobile customers travelling by Tube – including the huge influx of international visitors to the London Olympics. If regulatory or other similar constraints turn out to be a barrier the Government is willing to address these.**



## Telecommunications and Climate Change

Telecommunications is a green technology. It displaces the need to travel for face-to-face meetings. Mobile radio is now indispensable for efficient fleet management. A significant development in this area was the Government's announcement in October 2008 of its intention to mandate a roll-out of smart meters to all households, with an indicative timetable for completion of end 2020. Smart meters will help consumers to change their energy habits – enabling them to monitor and reduce their energy consumption – and will provide a stepping stone to the smart grids of the future.

Telecommunications networks also consume energy. A typical UK mobile radio operator's network consumes over 400 GW-h per years and produces 200,000 tons of carbon emission per year (Source O2 2005). On the other hand when this energy consumption is spread across the number of UK mobile users it has been estimated that the annual CO2 footprint of the average mobile subscriber is around 25kg – which is comparable to driving an average car on the motorway for one hour (Source: Ericsson).

The Government is committed to a low carbon economy, with a legally binding target to reduce carbon emissions.

For the mobile radio industry the most direct contribution the Government can make is to be more supportive of infrastructure sharing where traffic levels are light (as set out in the Interim Report) and ensure that next Generation Mobile Networks provide universal coverage so as to provide conditions for earlier generation mobile networks to be phased out much more quickly.

Now is the time to send out a strong signal to innovative UK companies that there will be sizeable market opportunities for innovations and products that save energy in telecommunications networks. For example a small innovative UK company in Nottingham called 4energy is trialling an alternative to conventional air conditioning for keeping telecommunications equipment rooms from over heating in the Summer. A number of UK Universities are collaborating with mobile radio operators and leading manufacturers in a research programme called "Green Radio" run by the UK Mobile Virtual Centre of Excellence – with the objective of securing 100 fold reduction in energy requirements for delivering high speed data services.

We support these moves to develop energy-efficient equipment, and encourage industry and consumers to seek ways to reduce the environmental impact of digital technology.

Where public funds are used to procure equipment under this project, the Government will take proper account of sustainability and energy efficiency criteria, whilst minimising whole life costs.



# Broadcasting Networks

## Television

127. The UK is well served by its TV broadcasting networks with universal coverage of digital satellite broadcasting, digital terrestrial TV driving out towards universal coverage and cable TV covering 50% of the population. These three networks offer both a competitive choice but also their own unique attributes and particularly taking into account the services that have been lined up behind each means of delivery.
128. Digital satellite broadcasting provides the most comprehensive geographic coverage. In addition to alternative providers of free-to-view satellite services, there is a strong pay-TV platform offering by BSkyB Ltd which has driven innovation in storage, navigation and high-definition, and in bundling its 'home-hub' consumer proposition combining video with broadband and voice telephony. Cable similarly offers a bundle of services including pay TV but also offers on-demand services to the TV set. Both provide a huge choice of TV channels. Free-to-air digital terrestrial broadcasting offers access at a low set up cost to a number of channels with a wide range of reception equipment available now, and, we expect, leading-edge high-definition capability from early 2010.
129. There are no current major infrastructure issues for cable or satellite TV distribution and other less strategic issues remain with the capabilities of the private sector to resolve. Terrestrial TV distribution on the other hand still provides a huge challenge (and opportunity) for Government, Ofcom and the industry to accomplish the Digital TV switchover.
130. Between 2008 and 2012, analogue channels broadcast from more than a thousand transmitter sites are being switched off, region by region, and replaced with digital TV services. The programme is off to a good start, and on track for successful delivery.
131. High definition transmissions offer much clearer TV pictures on very large home TV screens. These services have already started on UK satellite and cable TV networks. From the end of 2009 onwards, digital terrestrial TV networks will include the potential for High Definition transmissions without the need for allocating extra spectrum as a result of Ofcom's innovative work to introduce HD onto the terrestrial network within existing capacity.
132. Another missing infrastructure link for digital terrestrial TV is a return path for interactive services – a capability already provided on satellite, DSL and cable networks.
133. In the interim report we said that equipment with a return path should become an option in the Help Scheme and that we would consider at what point and at what cost the standard offer provided by the Digital Television Switchover Help



Scheme could have a return path capability. Since then Industry has agreed an open standard for a return path on the terrestrial platform – the MHEG interaction channel – and equipment should be available by early 2010. The BBC’s proposal for Canvas is also intended to bring on-demand viewing to television sets.

134. The Help Scheme already issues an open invitation for the supply in each region of services from alternative providers (those not selected for the standard offer). To date every region has had at least one alternative provider offering equipment including a return path – we expect this to continue and we will encourage additional providers to offer to supply such equipment through the Help Scheme.
135. The standard offer must be able to deliver access to free-to-view digital television services in the most cost effective way and comply with all the core receiver requirements designed to ensure usability of help scheme equipment. To date there is not equipment available on the general market that makes it simple for everyone eligible for assistance under the Help Scheme to access the basic TV services, and also provides an easy way of accessing video on demand. We believe it is still premature therefore to set a date for changing the core receiver requirements for the Help Scheme. But we will keep this under review, particularly in light of the development of the Canvas proposal. Once the return path technology is successfully deployed on the terrestrial platform as well as the satellite platform, it will be possible to take a more detailed view of the costs and implications for the objectives of the Help Scheme.

### Digital Switchover so far

Digital TV switchover is the process of converting the UK’s terrestrial television system to digital. Between 2008 and 2012, analogue channels broadcast from more than a thousand transmitter sites are being switched off, region by region, and replaced with digital TV services.

Switchover was successfully completed in the Copeland area of Cumbria, including the town of Whitehaven, in late 2007. In November 2008 the Scottish Borders, served by the Selkirk transmitter group, became the next area to switch. In both cases switchover was trouble-free for the vast majority.

Following a comprehensive communications campaign in the preceding year there was near-universal awareness of what was happening, and what you needed to do. Two weeks after switchover every home surveyed had converted their main set to digital, and 87% had converted every TV in their home. The local response was positive, with residents describing being ‘well prepared’ for the digital switchover, which they felt has been widely and successfully communicated and publicised’ (Source: Other Lines of Enquiry). Almost 90% said they had received sufficient information and advice.



Some digital terrestrial TV viewers did struggle with re-tuning, and 2% of households required help. Awareness of the need to re-tune, and understanding of how to do it will no doubt continue to be a feature of the whole switchover programme, and the life of the DTT platform beyond.

Following the Stockland Hill switchover, 1.5% of UK homes had completed the switch to digital (in Copeland, Scottish Borders and in April 2009 at the Beacon Hill transmitter group in West Country). A further 4.6 million will switch by the end of 2009, including more than 3 million homes in Granada, taking the total to 18%. The path to a fully digital terrestrial TV system in 2012 will see a very significant increase in the frequency and scale of switchovers, with some risks along the way, such as the impact poor weather could have on the transmitter engineering programme. Nevertheless, the programme is off to a good start, and on track for successful delivery.

Digital UK is the independent, not-for-profit organisation to lead the implementation of the switchover. The company was founded in April 2005 and is jointly owned by the UK’s public service broadcasters (BBC, ITV, Channel 4, Five, S4C and Teletext) and commercial multiplex operators SDN and Arqiva. Digital UK co-ordinates the technical process, including the engineering plan to convert each TV transmitter in the UK to digital, and aims to make the public’s experience of switchover as simple as possible by providing clear, impartial advice on what people need to do to prepare for the move to digital TV. It also works with industry, including electrical manufacturers and retailers, and the digital TV platforms, and engages with the housing sector where communal systems may need to be upgraded. The Digital Switchover Help Scheme has been set up by the BBC through an agreement with the Government to offer eligible people help to make the switch on one of their TV sets, and works closely with Digital UK. People are eligible if they are aged 75 years or more, or have lived in a care home for six months or more, or if they are registered blind or partially sighted. Also eligible are people who get (or could get) attendance or constant attendance allowance, mobility supplement, or disability living allowance. Most people will contribute £40 to the cost of the scheme. For those eligible people who are receiving income support, the Help Scheme is provided free.

The switchover programme will proceed as follows

Border	2007-08
Granada	2009
West Country	2009
Wales	2009-10
Channel Islands	2010
West, STV North	2010
STV (Central Scotland)	2010-11
Central, Anglia, Yorkshire	2011
London, Meridian, Tyne Tees & Ulster	2012



## RADIO

136. Sound radio remains an essential component of public mass entertainment and information. It has found its natural space for consumers alongside TV services and particularly during times when a picture is a positive distraction (and even more for the visually impaired). The most widely diffused and used networks uses analogue FM technology in the 88-108 MHz frequency spectrum – providing both BBC and Commercial national and local radio services.
137. The move to digital radio began in earnest in 1998 when the Radio Authority licensed the first DAB Multiplex. DAB sets have sold well and receiver prices have recently hit the key price points that make them an attractive consumer purchase. However, in the subsequent decade radio has developed distribution models across a number of digital media (satellite, DTT, IP) but has not developed its own dedicated digital platform to a robust national standard.
138. In part this is because of the difficulty in deriving sufficient new revenue from the DAB platform: the relatively low DAB audiences have made broadcasters cautious in funding the widest possible choice of radio channels over DAB and extending the coverage of DAB networks to match that of FM broadcasts. The financial pressures the commercial sound radio broadcasters now find themselves under is a further complication.
139. This is a barrier to the full development of a dedicated digital platform for radio and a public policy issue for the Government. We address this and the future of radio as a dedicated medium in the next Chapter.

## Data centres

140. All of the information on the global Internet, whether for commerce, industry or consumer consumption, has to be stored somewhere in digital form on servers. This is the function of the Data centres. They are a crucial part of the underlying infrastructure and a vital foundation block of much of the digital economy.
141. These data centres can be operated by the owner of the digital content themselves or outsourced to a third party provider. Some of these third party data centres have become major Internet hubs or home to a significant proportion of the UK's most online intensive organisations – both Government and enterprise.
142. London is the largest data centre market in Europe and a location for international businesses looking to expand into Europe.



### What is a Data Centre?

Data centres house computer systems, server and network infrastructure and associated storage platforms. Many organisations operate their own data centres in house. However, as the role of computer systems and network services becomes ever more critical to the success and growth of the economy, many organizations are looking to third party providers to support their expanding data centre requirements. Data centre operators can provide highly secure and resilient environments for the outsourcing of all or part of the hosting and management of organizations technical, web and IT infrastructure to ensure these systems remain 'always-on'.

Outsourced data centres come in all shapes and sizes. They range from carrier-owned – such as those operated by BT, to so-called 'carrier-neutral' – such as those operated by UK-based European data centre specialists such as TelecityGroup. Typically, carrier-owned data centres are built to house the servers and networks of the carrier, or network-provider's equipment and those of its customers. Carrier-neutral data centres usually offer access to a much wider range of connectivity providers, all of which have built their networks into the data centre thus creating Internet 'hubs'; physical locations where network operators and ISPs can exchange traffic with each other and with content providers and other organisations whose systems are also hosted in the data centre. These types of data centres differ from the in-house, proprietary data centres in being able to offer much higher levels of connectivity, and are home to a significant proportion of the UK's most online-intensive organisations – both Government and enterprise.

143. The current demand for highly-connected data centres in the UK points to constraints in supply which is of concern as these facilities can take up to two years to build from initial inception. The private sector needs to look beyond the current recession since the up-turn in the economy will not be the only driver of expanding demand – the quantity of information to be stored continues to rise exponentially across the world.
144. Storage technology is almost in a continuous state of revolution and this, together with the state of the telecommunications networks, can impact where it is most economic to store data. The most appropriate Government and Ofcom action is to ensure competitive pressure continues to drive down the price of long distance transmission.

### Monitoring the National Communications Infrastructure

145. This report emphasises the increasing importance of communications infrastructure, and the need for Government and regulator to take a broad view of the nation's needs and gaps. Our intended amendment to Ofcom's duties will give it a first order requirement to look at investment in infrastructure.



Building on this, we are asking Ofcom to maintain a close and ongoing assessment of the overall communications infrastructure.

146. **We will ensure the Board of Ofcom has a statutory obligation to write as necessary to the Government alerting Secretaries of State<sup>15</sup> to any matters of high concern regarding developments affecting the communications infrastructure and in any event to write every two years giving an assessment of the UK's communications infrastructure.**
147. Examples of matters which we will require Ofcom to keep under review include:
- 1) Availability/coverage of the major communications platforms, to include fixed telecoms, cable, mobile, broadcasting and other platforms including core, backhaul, spectrum usage and access network capability;
  - 2) An assessment for each of key indicators of reliability, resilience and security – e.g. downtime;
  - 3) Testing of resilience against emergency conditions (NB this report touches on matters of resilience in Chapter 7);
  - 4) Services on offer over each platform, including details of wholesale arrangements and service competition;
  - 5) International competitiveness index of UK network infrastructure; and
  - 6) Evidence of network failure-potential and priorities for strengthening (taking into account the report of the ECRG Chair).

15 In practice this letter will be sent to BIS, but the other interested departments will include DCMS, Home Office, MoD and the Cabinet Office



## CASE STUDY

### Hays

Hays PLC, a major UK employment services business, is investing £40 million to apply web-enabled technology to services matching employers and job-seekers.

The UK company believes it could transform the search process by creating a sophisticated database and online portal for would-be applicants.

Alistair Cox, Chief Executive, says: "At the moment the whole industry's use of the web is limited to online versions of print job ads. I want to put a much richer array of services on the web."

The investment is expected to deliver a double benefit to the group, increasing efficiency and reducing costs in back-office functions while creating a more effective matching capability for companies and potential recruits, thereby enhancing customers' experience.

Hays expects the system to remove much of the manual processing and data handling from what Mr Cox calls "match-making people for the right roles".

By automating that data collection, he also expects the two thirds of candidates described as "passive" job seekers to self-select their areas of interest, skills and eligibility for different types of employment, giving them access to a rich seam of information to allow them to better plan their careers.

"The £40 million investment will put in place a rich database repository which will be more current, relevant and searchable, enabling our consultants to spend more time on advisory services with their clients and candidates and less on administrative processing. It will also allow us to embrace the constantly evolving use of the web and future-proof our business as new models are invented. I can imagine a world where clients and candidates can use the Hays world for all of their needs around people and roles; a single repository for information, real-time updated data, online hiring requests and applications, straight-through and fully automated administrative processing, instant messaging and feedback", he adds.

Although there has already been significant risk capital invested in online recruitment – particularly in the US – Mr Cox argues that no-one has yet delivered a model to "take the market by storm". He believes that the UK could lead the way, exploiting the already relatively heavy online usage by jobseekers. The technology is also expected to be platform neutral, allowing users to access the company's web services via multiple platforms or devices.

The company fully expects the new system – due for completion next year – to deliver the efficiency implied in its name. It is called "One Touch".

