Commission for
Communications Regulation

Discussion Document

Next Generation Broadband in Ireland

Promoting the timely and efficient development of high speed broadband infrastructure and services

Document No:	**09/56**
Date:	**9 July, 2009**

Views on this discussion document are welcome. Interested parties should send their comments should be clearly marked:- "Reference: Submission re ComReg 09/56 Next Generation Broadband in Ireland" and sent by post, facsimile, e-mail, to arrive on or before 5pm on 21 August, 2009, to:

Ms. Marie Cussen
Commission for Communications Regulation
Irish Life Centre
Abbey Street
Freepost
Dublin 1
Ireland

Ph: +353-1-8049600 Fax: +353-1-804 9680
Email: marie.cussen@comreg.ie

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Foreword

Over the last two years we have seen a shift in Ireland's broadband landscape, with significantly enhanced roll-out of current generation broadband networks and a corresponding increase in the take-up of services. This has resulted in Ireland's relative position of household broadband penetration in the European Union (EU) moving from the bottom third to where it is now close to the EU average. In terms of business adoption of broadband, we are now ahead of the EU average. Service providers have been investing in their core network capabilities to ensure they can support Next Generation Broadband (NGB) services. NGB consists of very high speed services provided over access networks, typically running from multifunctional network nodes to consumers. These can be provided over fibre, coaxial copper cable, electricity lines, wireless technologies, or hybrid deployments of these technologies, such as combining fibre and copper. For the purpose of the discussion set out in this paper, NGB is characterised as providing consistently achieved download speeds at or above 25Mbit/s. Such speeds are largely beyond the capability of existing networks deployed in Ireland.

The increased demand for broadband services coupled with industry investments to date in their networks have created a promising platform from which Ireland can build in order to take advantage of the NGB networks now emerging onto the market. To place this into context, just as the introduction of mobile phones or the move from 'dial-up' Internet access to 'always on' broadband services heralded a significant change in our communications experience, so too will the advent of NGB networks. This will be of critical importance in enhancing Ireland's position as a location that supports the development of high-end ICT industries, and secures inward research and development and can make a significant contribution to our overall competitiveness.

In the years ahead, businesses and employees will be in a position to benefit from increasing flexibility in determining where, when and how work is carried out. This presents tremendous scope for enhanced productivity gains, addressing persistent socio-economic frictions related to commuting congestion and regional imbalances. Those companies that take advantage of the benefits of using NGB networks can expect a boost to their competitive positions relative to those companies that do not. Businesses that produce or make extensive use of digital media, with applications being developed in Ireland and sold across the Internet to consumers worldwide, can benefit from utilising NGB. Vital public services such as education and health will, in time, be transformed through improvements in distribution of information, utilisation of data and remote delivery of services outside of the classroom and the hospital or doctor's surgery. Consumers for their part will, at a time and place of their own choosing, be able to access an extensive range of innovative information, communication, entertainment and commercial services. From what we know today, these are likely to include high quality internet based video telephony, greater involvement in the creation and sharing of digital content through 'virtual worlds' and an increased scope for using information and communication technologies around the home to control items such as physical security, energy consumption and environmental control systems.

As with any major shift in technology, the full range of new NGB applications will only become visible over time and will more than likely be driven in response to developments in larger markets that offer more scale and potentially greater investment

returns. Applications development is unlikely to be driven by Irish consumer demand, however, the availability of NGB networks here could allow Ireland to become a hub within which the development of such applications could be fostered and contribute towards the development of Ireland's export led digital service oriented economy.

The timely roll-out of these NGB networks and the corresponding availability of the exciting new applications they can support should not be taken for granted. The costs involved, whether for wireline or wireless solutions will run to the hundreds of millions of euros[1]. Such costs must be considered at a time when companies and consumers alike are retrenching. Furthermore, our low density demography makes the economics of widespread deployment of NGB networks quite challenging, with the cost increasing sharply in low population density locations. While we can see in some other European countries such as the Netherlands and the UK how market forces, and particularly competition between the principal telecoms company and a rival cable operator, is driving deployment of NGB networks, such competitive tensions have not so far been significantly prevalent in the Irish market. Market forces, with effective regulation, can in time bring about the introduction of NGB in Ireland, but there is a real question as to whether this will happen in a sufficiently timely fashion to satisfy Ireland's 'smart economy' needs, and to fully capture for the country the social and economic advantages likely to flow from an earlier NGB adoption.

From a technology neutral position, this paper provides perspectives on the range of policy, technical and regulatory issues which can support a timely and efficient move towards the increased availability of next generation broadband services in the market. Recognising the importance of competition across all technology platforms, the significant part played by industry in developing first generation broadband networks and the need to encourage efficient investments in networks, this ComReg discussion paper, within the context of Government policy and the legislative framework, sets out the regulatory levers available to ComReg which can influence next generation broadband developments and the circumstances within which such regulatory options may be appropriate. In this regard, ComReg welcomes the publication by the Minister for Communications, Energy and Natural Resources of the paper "Next Generation Broadband: Gateway to a Knowledge Ireland"[2] which sets out the policy framework for development in this area.

At the end of each Section of this paper, ComReg poses a series of questions and invites views from all stakeholders on the analysis and issues presented. The views received will, in the context of stimulating effective competition, promoting investment and innovation, feed into the assessment as to whether and how specific regulatory measures can support the timely and efficient provision of NGB networks and services. I encourage all interested parties to join the debate.

Alex Chisholm
Commissioner

[1] For instance, according to the Yankee Group's report - Fibre to the World: A State of the Union Report on FTTH, December 2008 - refers to various studies that estimate costs at between €300 per dwelling for dense urban multi-dwelling units with pre-existing infrastructure and more than €1,000 per dwelling in less dense areas and single-dwelling units.

[2] See DCENR website www.dcenr.gov.ie or Here

1 Executive Summary

1.1 This discussion paper aims to provide an informed assessment on the potential for the development of Next Generation Broadband (NGB) services in Ireland. In doing so, the paper examines the position from a number of perspectives namely,

- What is NGB and why does it matter from wider economic, business and consumer perspectives?
- The situation with respect to current broadband provision in Ireland, the changing patterns of consumer use and the likelihood of market led NGB network developments
- How NGB provision and demand has occurred in a range of European and other countries, and the policy approaches and/or market led initiatives that have had an impact in this regard.
- The range of factors which can either act to enable or inhibit NGB developments, including issues such as Government policy and the costs of NGB deployments.
- The degree to which regulation can influence NGB development in Ireland and the initiatives that are being or could be taken by ComReg to support its growth in a way that supports effective competition in the market.

1.2 At the end of each Section, a series of questions are posed on which feedback is invited from stakeholders and which will be used by ComReg to inform its future activities.

Next Generation Broadband – What is it and why does it matter?

1.3 NGB refers to the provision of very high speed broadband services over an access network consisting of a transmission medium between the consumer and a multi-service access node[3] (note that current generation broadband is discussed in Section 3). A NGB access network can utilise fibre, coaxial cable, twisted copper (i.e. a telephone line), power lines, wireless platforms (utilising radio spectrum), or hybrid deployments of these infrastructures, such as combining fibre and copper. For the purpose of this discussion paper NGB is defined as operating at consistently achieved download speeds at or above 25Mbit/s. Additionally, NGB services would also offer an improved balance between download and upload speeds in order to support the likely increase in consumer generated internet based content.

1.4 The Department of Communications, Energy and Natural Resources' (DCENR) paper "Next Generation Broadband: Gateway to a Knowledge Ireland"[4] identifies high speed broadband services as being critical in attaining the Government's twin goals of becoming a 'Smart Economy' and a 'Knowledge Society'.

1.5 The technologies and services associated with NGB are widely seen to have high capability for businesses, public sector customers and consumers and also to offer potentially very exciting socio-economic spin-offs, notably in the areas of industrial productivity, export of high value-added services, improved provision of key public

[3] NGB networks will typically employ nodes which act as gateways to the 'core' network. Unlike traditional networks which have individual network elements to support individual services, the NGB nodes have the capability to support a wide range of services/technologies and therefore offer improved functionality and network efficiencies.

[4] See DCENR website www.dcenr.gov.ie or Here

services such as health and education, and better management of policy goals such as a sustainable environmental considerations.

1.6 The benefits are, as yet, unproven and there are significant costs and risks associated with developing NGB networks today, given uncertainty of consumer demand and the many competing demands for capital in an already constrained economic environment. On the cost side, various studies, estimate that FTTx[5] costs at between €300 per dwelling for dense urban multi-dwelling units with pre-existing infrastructure and more than €1,000 per dwelling in less dense areas and single-dwelling units. Equally, it must be recognised that the costs of NGB deployment (whatever technology is used to provide it) will be significantly more expensive for those regions of the country that are less densely populated.

Broadband Developments in Ireland

1.7 In Ireland today there are over 1.27 million broadband subscribers, having grown 6% between Q4 2008 and Q1 2009 and representing an increase of 28.2% over the last year. Ireland's multi-platform broadband infrastructure today is well developed – with broadband available across a variety of wired and wireless platforms. Ireland's broadband position has greatly improved over the last two years, and while we should not be complacent, today it is broadly comparable to EU norms in terms of capability, coverage and take-up.

1.8 Irish consumer patterns of Internet usage are changing, with more frequent and longer 'visits' to web-sites, greater demands for symmetrical broadband speeds, and a far higher proportion of video in the mix of traffic carried by networks. This trend is likely to persist with growth in bandwidth intensive applications such as, for example, RTE's online catch-up service[6] which makes programmes which have previously been shown on television available for online viewing for a limited period.

1.9 Notwithstanding the progress on current generation broadband, and Eircom's and other operators' development of an advanced fibre-based next generation core networks[7], we have barely begun to see the deployment of NGB access networks. In regard to both wireless and wireline technologies, trials have been conducted in Ireland of the NGB access technologies (respectively, LTE/WiMax, VDSL/FTTH) but no telecoms operator has yet committed to invest in substantial roll-out. Plans appear more advanced in the cable sector, with the cable operator, UPC, having announced its intention to launch high speed cable services in 2010 (based on DOCSIS 3-0); however the current footprint for broadband enabled cable is only around 35% of households in Ireland. Hence, based on the known development plans of service providers and current economic conditions, we may not see substantial roll-out of NGB across the market for the next 3 to 5 years. At a time when other countries are developing their next generation broadband infrastructure, such a scenario would open up a gap between Ireland's capabilities in this regard and those of other comparator countries in the EU and beyond. Ultimately, the actual or potential threat of competition across infrastructure platforms in Ireland is likely to influence operator NGB roll-out decisions

[5] FTTx is a terms used to describe a range of fibre deployment architectures, including Fibre to the Home/Building (FTTH/B), Fibre to the Cabinet/Node (FTTC/N).

[6] See RTE website www.rte.ie or HERE

[7] The core network can be described the highest aggregation layer in a network (the access layer being the lowest and closest to the customer) over which several services (such as voice, data and multimedia applications) share bandwidth.

and, while ComReg expects that competition in the provision of NGB services will occur, it may not do so within the timeframes required to influence significant NGB roll-out across the market in the next 3 to 5 years. During this time and, in the network transition that follows, Local Loop Unbundling will be a key enabler of competition at the infrastructure and product innovation levels and ComReg remains committed to its effective and efficient operation within the market.

International Approaches on Next Generation Broadband

1.10 In considering how best to advance the development of NGB in Ireland a range of supportive NGB approaches that have been adopted at Government and regulatory levels both within the EU and beyond have been examined. These approaches provide some insight into the range of options that could be applied in Ireland should the circumstances be right. At a Government level, such initiatives have included direct Government investment in the development of infrastructure, applications and services (including e-health, e-education); demand aggregation policies and requiring open access to in-building wiring to facilitate access by service providers. Market-oriented approaches include regulatory measures focussed on opening up access to dominant operator's NGB networks (including access to fibre, ducts etc.); dominant operators themselves opening up their networks thereby eliciting a different regulatory response; and companies entering into joint ventures in order to share risks associated with the large scale capital investments required to build NGB networks.

1.11 On 22 June, 2009 the Department of Communications, Energy and Natural Resources (DCENR) published its NGB paper "Next Generation Broadband: Gateway to a Knowledge Ireland"[8] which sets out the policy framework for Next Generation Broadband development. Government measures announced within the broader policy objectives include the creation of a 'One-Stop-Shop' which will provide a single point of contact for gaining access to government owned duct infrastructure on commercial terms, thereby reducing the costs of fibre roll-out; requirements to install open-access fibre connections in all new premises, where practicable; and building on existing collaborative initiatives to support the transition to Next Generation Broadband, a Task Force is to be formed comprising industry, Government and ComReg with a view to ensuring that the development of Next Generation Broadband in Ireland will meet the demands of Ireland's Smart Economy.

Next Generation Broadband Enablers and Inhibitors

1.12 There are a range of factors which can either enable or inhibit the roll-out of NGB networks. Issues affecting market certainty relate to the uncertainty of consumer demand for NGB and how this impacts the business case for rolling out such networks; uncertainty as to the availability of advanced services that depend on NGB and in turn drive consumer demand; uncertainty regarding the strength of interaction between competing infrastructures, in particular, whether the arrival of wireless NGB technologies could strand any fibre based NGB investments (where these are made); Companies investing or contemplating investing in NGB are expected to react to the aforementioned uncertainties and some investors may see 'doing nothing' as the best option until there is further clarity as to how these issues will progress. Competition and the threat of competitors making crucial investments first, can also drive companies to commit to investment in NGB. From a fixed network perspective, this competitive threat tends to emerge in circumstances where there is a well developed cable network

[8] See DCENR website www.dcenr.gov.ie or Here

operator that is already making NGB investments. While UPC has been investing significantly in its cable network in Ireland, cable infrastructure has a limited footprint (as we have noted) and hence the potential emergence of competitive tension may not drive a competitor response to deliver NGB in the short to medium term.

1.13 Demand aggregation, particularly at Government department, state body and other institutional levels could help stimulate the roll-out of NGB infrastructure where there would not otherwise appear to be sufficient critical mass to underwrite the required investment, and where commercial operators are not able to address the demand themselves. There may also be a role for collaborative risk sharing approaches between communications firms in order to mitigate the business case risks, perhaps including prior commitment to capacity utilisation. Infrastructure sharing can lead to a more optimal outcome for NGB roll-out which can benefit consumers. However, such sharing arrangements cannot be at the expense of the need for an effectively competitive market place. Regulatory certainty can also play an important role in supporting efficient NGB investments, although the nature of any regulatory response from ComReg is, to some extent, dependent on how the market players themselves behave. A commercially-led wholesale model based on open access to NGB networks in a non-discriminatory manner would require a different regulatory response, with the nature of any regulatory oversight required being appropriately tailored to the situation. In the absence of a commercial approach, then much greater regulatory oversight would likely be required.

1.14 Government policy can also play a critical role in supporting the development of NGB and, in this regard (as we have noted) the DCENR has recently issued its final policy document "Next Generation Broadband: Gateway to a Knowledge Ireland". This document identifies several Government commitments to facilitate NGB deployments and includes the creation of a one-stop-shop to facilitate access to government owned duct infrastructure along with the establishment of a NGB Task Force.

1.15 Overall, industry, ComReg, the Government and other stakeholders have a role to play in seeking to address uncertainties that could lead to a more timely and efficient NGB roll-out outcome.

The Role of Regulation in Facilitating Next Generation Broadband Development in the Irish Market

1.16 ComReg is committed to playing its role in furthering the development of NGB networks. ComReg's approach is also to provide regulatory certainty to industry in order to ensure that Ireland will experience the timely, efficient and wide scale market led investment in NGB services. Within the context of the legislative framework and, without pre-determining any analysis of regulated markets, the key principles that will guide ComReg's regulatory approach include:

- providing a clear and predictable regulatory environment within which service providers contemplating NGB investments can operate
- adopting a technology neutral approach in considering NGB regulatory issues
- while taking account of collaborative industry approaches, promoting effective and sustainable competition at both the network and service levels through the application of appropriate regulatory remedies (where necessary)
- recognising uncertainty faced by all service providers in making efficient NGB investments and taking appropriate account of such risks.

1.17 There are a range of areas where ComReg activities can support NGB developments, with the nature of the regulatory approach applied being dependent on the response from Eircom (as an operator designated by ComReg as having Significant Market power) and, indeed, other industry players. These activities include:

- The continued implementation of the various NGB supportive spectrum initiatives under ComReg's spectrum management strategy. Current initiatives include consultations on a number of frequency bands such as the Digital Dividend, 900 MHz, 1800 MHz and 2300 MHz and the running of a competitive licensing process for the release of additional spectrum in the 3400-3800 MHz band.
- Engagement with the European Commission (EC) and the European Regulators' Group (ERG) in relation to the consultative process relating to the proposed EC recommendation on the regulation of NGB. Once finalised, ComReg will have due regard to the recommendation in seeking to provide regulatory certainty, and is promoting investment, competition and innovation in the development of NGB in the Irish market.
- Continuing to engage with Eircom and industry in relation to NGB network developments and to respond in a timely manner regarding the application of the regulatory framework where collaborative wholesale NGB access models emerge.
- Where wholesale prices are regulated and, in response to a suitable request from Eircom, to re-assess both the need for any premium for additional and quantifiable risks associated with NGB network investments and the level at which any premium may be set.
- Building on the proposed application of the regulatory principles for NGB as identified under the WPNIA[9] market analysis exercise, to progress the detailed implementation of remedies in a flexible manner having regard to, amongst other things, the nature of Eircom's approach to facilitating access to any proposed NGB network developments.
- Supporting collaborative industry initiatives that promote the sharing of infrastructure in a manner that does not undermine the promotion of competition, with any regulatory response being tailored as appropriate.
- Working with the DCENR to input to its NGB policy initiatives, where appropriate, including participation on its NGB Task Force.

[9] The Wholesale Physical Network Infrastructure Access market (WPNIA, formerly known as Local Loop Unbundling market) is one of two wholesale broadband markets identified as being susceptible to ex-ante regulation. See European Commission list of recommended markets here.

2 Next Generation Broadband – What is it and why does it matter?

What is Next Generation Broadband?

2.1 Just as the introduction of mobile phones or the move from 'dial-up' Internet access to 'always on' broadband services heralded a significant change in our communications experience, so too will the advent of Next Generation Broadband (NGB) services.

2.2 NGB refers to the provision of very high speed broadband services over an access network consisting of a transmission medium between the consumer and a multi-functional aggregation/access point. This aggregation/access point, in turn, connects to a high capacity backbone or 'core' network over which all broadband traffic is transported. A NGB access network can utilise fibre, coaxial cable, twisted copper (i.e. a telephone line), powerline, wireless platforms (utilising radio spectrum, either to a fixed or to a mobile location), or hybrid deployments of these infrastructures, such as combining fibre and copper. Different technologies[10] can then be deployed over these infrastructures to offer high speed broadband services and other capabilities.

2.3 For the purpose of this discussion paper and, having regard to Government policy, NGB is defined as having consistently achieved download speeds at or above 25Mbit/s. It would also appear necessary that any NGB broadband network should be capable of being scaled to handle even much higher and symmetrical broadband speeds, have the ability to provide differing quality of service standards on demand and offer low (if not no) contention[11] and low latency[12]. Consumers within a household should also be able to simultaneously share the broadband connection across a range of bandwidth intensive applications without compromising the quality of the connection. While this paper establishes an NGB definition for the purpose of contextualising the discussion, ComReg is not suggesting that download speeds of 25Mbit/s and above will (or will not) be adequate to meet customer's needs. It is up to the market to determine this through the interaction of suppliers seeking to meet consumer needs, and the market judgement of what is significant will evolve over time.

2.4 On the infrastructure side, all NGB networks, whether wired or wireless, are likely to require the deployment of fibre infrastructure deeper within the access network (and closer to the consumer). For wired networks this can involve fibre to the cabinet

[10] Examples of technologies include: Digital Subscriber Line (DSL or xDSL) which refers to a family of technologies that provides broadband over traditional copper telephone lines (the 'x' refers to the type of DSL which can include 'symmetric' or 'asymmetric' whereby the download speed is greater than the upload speed); DOCSIS or Data Over Cable Service Interface Specifications is the international standard that defines the communications and operation support interface requirements for a data over cable system. There are several standards, the most recent of which is 3.0 and is designed to support significant broadband download and upload capabilities; HSPA (High Speed Packet Access) is the family of enhanced 3G (third Generation) mobile broadband standards which allows the faster data transfer speeds. Current HSDPA deployments allow download speeds of up to 14.4Mbit/s while HSPA+ will allow download speeds of 21Mbit/s this year and evolve to 42Mbit/s in 2009.

[11] Contention refers to the maximum number of users that can share an available amount of bandwidth at a particular time. The higher the contention the greater the potential for a lower download speed to be experienced, especially at peak times. For example, in the case of a broadband product of 2Mbit/s with a contention of 10:1, up to 10 other users could be sharing the available bandwidth so that you could experience download speeds of 200Kbps.

[12] Latency is usually described in milliseconds (ms) and is the delay in transferring data to/from the consumer over the broadband network to/from the Internet. Latency can, for example, be affected by the type of network over which the signal is being carried, the number of processing steps within the network and associated systems, and consumer equipment such as a PC or modem. Latency can affect the use of real time applications such as video-conferencing and online gaming.

(FTTC)[13], fibre to the home (FTTH)[14] (using active electronics[15]) and, in the case of cable TV networks, hybrid fibre/coaxial infrastructure. For wireless networks, infrastructure build to support NGB services will require the building of fibre out to radio base stations which link directly to consumers.

2.5 NGB will require upgrading, not only of the transmission infrastructure, but also of the equipment connected to it (at both the aggregation/access point and the customer's premises). For example, in the case of a FTTC deployment VDSL2 could be required, and for a cable TV network an upgrade to the DOCSIS[16] 3.0 standard would be necessary. For next generation wireless broadband services, technologies such as WiMax[17] IEEE 802.16.m and LTE[18] (or "Long-Term Evolution"), are emerging technologies[19] that have the potential to provide NGB services.

2.6 An illustration of a current generation copper based broadband network and NGB wired and wireless network topologies are outlined in Figure 1 below.

[13] In a fibre to the cabinet (FTTC) deployment, active electronics are installed at the street cabinet, which is then connected to the exchange with a fibre link. The existing copper 'sub-loop' from the street cabinet to the customer's home is retained. In comparison to a DSL based deployment, the shorter copper loop (known as the 'sub-loop') in a FTTC scenario allows higher bandwidths to be provided to customers. However, it should be noted that the length and quality of the 'sub-loop' can significantly impact the bandwidth speed to me made available to the customer - as a consequence the bandwidth capabilities in a FTTC scenario will vary.

[14] A fibre to the home (FTTH) scenario (also known as Fibre to the Building/Premises) is similar to FTTC architecture except that the copper sub loop is replaced by fibre. The entire connection to the customer's home is fibre.

[15] Active electronics in a FTTC or FTTH network structure typically involve Very High Digital Subscriber Line (VDSL or VHDSL) technologies which are an extension of the DSL technology and provides for faster data transmission speeds of around 100 Mbit/s simultaneously in both the upstream and downstream directions. The maximum available bit rate is achieved at a range of about 300 meters.

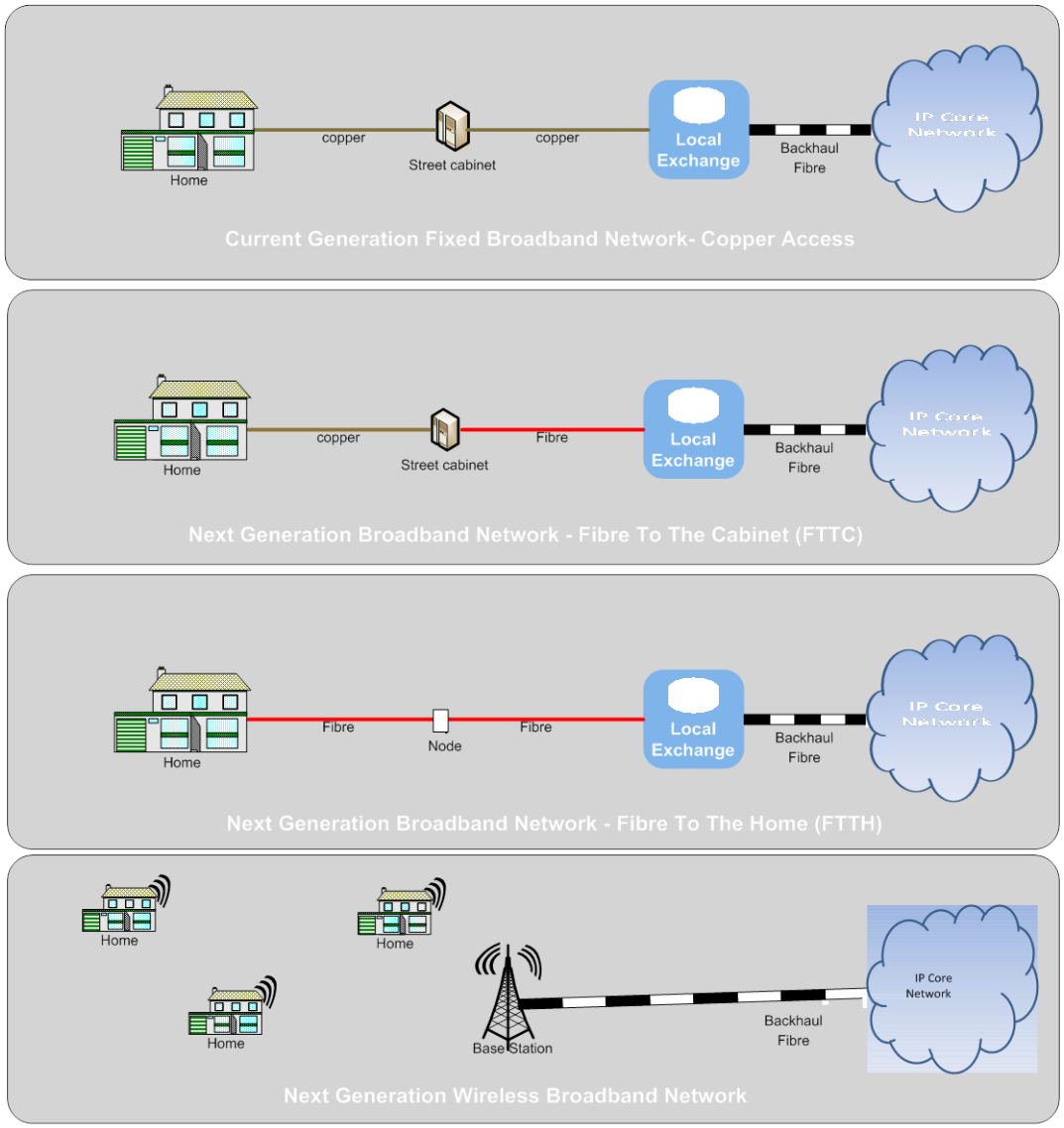
[16] Data Over Cable Service Interface Specifications is the international standard that defines the communications and operation support interface requirements for a data over cable system. There are several standards, the most recent of which is 3.0 and is designed to support significant broadband download and upload capabilities.

[17] WiMAX (Worldwide Interoperability for Microwave Access) and is a standards based telecommunications technology that allows the provision of wireless broadband services. The WiMax standards are usually expressed in the form IEEE 802.xx (where xx indicates the latest version of the standard). Each standard has different broadband service capabilities.

[18] LTE is the next technology/software standard that will used in association with the provision of mobile broadband services over Third Generation(3G) mobile networks. It will be available through 'Release 8' of the 3rd Generation Partnership Project (3GPP) whose role it is to which set globally applicable 3G system specifications.

[19] Initial trials of these technologies are currently being carried out in the global market and the first large scale deployments are expected to occur at the end of 2011 and into 2012. Such technologies, provided they are deployed under the right conditions, can have the same capability as next generation wired broadband technologies and may be a particularly good alternative to fixed wireline NGB in rural areas where subscriber densities are lower and fixed external antennas are used to maximize radio signal strength.

Figure 1: Examples of NGB network topologies



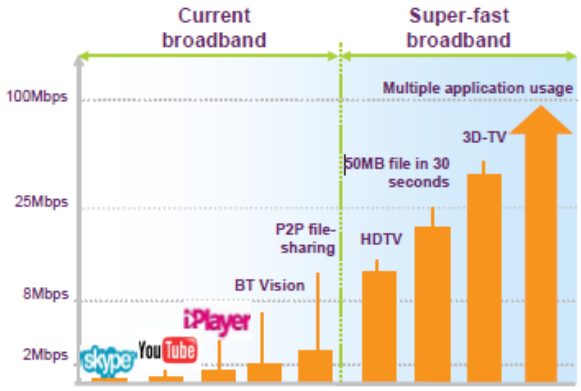
2.7 Without knowing in advance the type of services that people will want, and the resultant broadband speed and quality that these services will require, we must be cautious in defining now what is acceptable in terms of Next Generation Broadband (NGB). Like most products subject to technical change that are highly valued by consumers, broadband speeds and associated quality of service standards will be subject to continual improvement with the minimum standard that consumers find acceptable being raised over time. All of us can instantly view a car from a generation ago as a car, but few of us would find it acceptable in terms of the safety, comfort and reliability standards that we would all expect today.

2.8 A recent Ofcom[20] presentation delineated the line between current broadband and 'super-fast' broadband based on specific applications and content such as High Definition[21] television and this is set out in Figure 2 below.

[20] Presentation by Stuart McIntosh of Ofcom, Delivering super-fast broadband in the UK, 3 March 2009

[21] High-definition television (or HDTV) is a digital television broadcasting system that offers higher resolution than traditional analogue television systems.

Figure 2: Applications supported by Super Fast (NGB) broadband



Why does Next Generation Broadband matter?

2.9 The importance of high speed broadband in a national context should not be understated. NGB is a service that is utilised, not in its own right, but as a means of accessing and using applications and services which can directly impact and enrich the diverse range of consumer and business experiences. NGB services must therefore be viewed as an enabler, and not as an end in themselves.

2.10 To place this into context, households and businesses need electricity, not as an end in itself but as a means to use devices and services. So too is broadband required for households and businesses to accomplish tasks, work, play and be entertained. Over time, the use of electricity has expanded immeasurably as devices have been designed to use the available current to serve different needs. This process has incrementally changed the nature of work in the home, changed the way households organise themselves and freed up people for other activities including work outside the home[22]. Similar changes have occurred in the workplace.

2.11 However, unlike the issues associated with the provision of electricity which tended to focus on where and when it was to be provided, policy makers seeking to support NGB developments are faced with two further considerations, namely, what is NGB and how is it to be provided. There is an important role for the market itself in deciding how NGB should be defined and what technologies are likely to be the most economic in seeking to deploy it. As to where and when it will be available, this will, in the absence of any external stimulus, be largely driven by the competitive process.

2.12 The Department of Communications, Energy and Natural Resources' (DCENR) paper "Next Generation Broadband: Gateway to a Knowledge Ireland"[23] promotes the criticality of high speed broadband services in attaining the Government's twin goals of becoming a 'Smart Economy' and a 'Knowledge Society". In doing so, the DCENR has set out the policy framework for Next Generation Broadband development with the key objectives being the

- Promotion of private sector investment in Next Generation Broadband
- Targeted Government actions, where necessary

[22] See Greenwood et al, Engines of Liberation, *Review of Economic Studies*, Vol. 72(1): pages 109-133.

[23] See DCENR website www.dcenr.gov.ie or Here

- An optimal regulatory framework, including collaborative models of engagement among operators
- An innovative spectrum policy

2.13 It is worth highlighting the benefits that NGB can offer for the wider economy, for businesses and consumers.

Wider economic benefits of NGB

2.14 NGB networks are beginning to emerge in other countries and are providing the means for companies competing internationally to become more accessible to their customers and to operate in a more cost effective and efficient manner. It is important therefore, that Irish firms operating both domestically and internationally have access to these competitive advantages. The importance of NGB for Ireland's domestic and international competitiveness has already been diagnosed by Forfas[24].

2.15 The measurement of the direct and indirect benefits to society from the widespread availability and usage of broadband is complex. In this regard, there are difficulties in establishing clear statistical links between the use of broadband and the quantifiable benefits to society such as an increase in business productivity or profits, or a macroeconomic impact in terms of a measurable contribution to the wealth of an economy as a whole.

2.16 There have been a number of studies which have assessed the impact of broadband on GDP, including a study by Crandall and Jackson in 2001[25] which concluded that the eventual consumer benefit for 'universal diffusion' of broadband could be between US$300 billion and US$500 billion. However, most of these studies have measured the benefits of current-generation broadband and are predicated on hypothetical assumptions around contributions to GDP or employment. In addition, studies of the actual impact of NGB are not available given the fact that there is currently very little commercial deployment of next-generation broadband access networks and services.

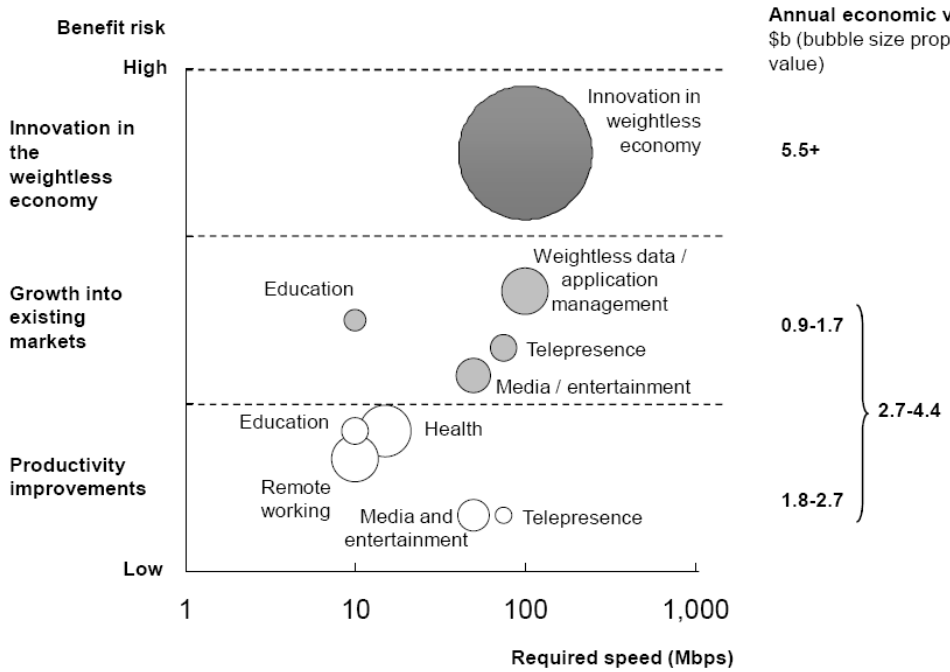
2.17 Nevertheless, a specific study[26] by the New Zealand Institute suggests that the economic benefits from widespread access to fast broadband would be in the range of $2.7 to $4.4 billion per annum from a combination of cost savings, productivity improvements (through the use of telepresence and telecommuting) and access to new opportunities (see Figure 3 below).

[24] Forfas response to Department of Communications, Energy and Natural Resources' consultation on Next Generation Broadband. See also www.dcenr.gov.ie and www.forfas.ie

[25] The $500 Billion Opportunity: The Potential Economic Benefit of Widespread Diffusion of Broadband Internet Access

[26] http://www.nzinstitute.org/Images/uploads/Broadband%20aspiration%20Sept%202007.pdf

Figure 3: Economic benefits of high-speed broadband deployment in New Zealand



Note: The topline estimate of the national economic benefit excludes the estimated innovation benefits because they are less certain than the growth and productivity benefits, and we are making conservative assumptions.

2.18 The UK's Broadband Stakeholder Group (BSG)[27] has demonstrated that measurable increases in the wider economic and social benefits of deploying next generation broadband include a reduction in transport congestion due to the opportunities of remote working, improved economic adaptability and resilience as a result of improved communications, increased social inclusion, scope for expanded trading of services and increased economic resilience due to improved supply chain management.

2.19 A recent LECG report[28] prepared for Nokia Siemens Networks set out the findings of an econometric investigation into the impact of broadband[29] on productivity growth in 15 OECD nations, 14 European nations and the United States. The econometric model that developed predicts that an increase of 1 percentage point (1 more broadband line per 100 individuals) in "medium or high ICT" countries, which includes Ireland, increases productivity by 0.1%. To place this into context, Ireland's per capita broadband penetration[30] as at December 2008 was 20.6. Every 1 percentage point increase on this figure would contribute an additional €189m to the economy, in terms of the spillover effects on productivity.

2.20 Notwithstanding the difficulties in quantifying the benefits that Irish society might glean from the widespread availability of NGB networks, some of the potential advantages for Ireland in terms of the competitiveness impact of the availability of high speed broadband networks include:

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[27] The BSG is the UK industry-government forum on broadband issues and strategy.

[28] Economic Impact of Broadband: An Empirical Study, February 2009. The report is available at www.connectivityscorecard.org or Here

[29] Note that "broadband" is measured in terms of the number of broadband lines per 100 population, however this was taken to be a r a proxy for the spread of high-speed networking into the wider economy.

[30] Source: OECD Broadband Portal. Note the figure has been calculated excluding mobile broadband.

- ***Promoting the growth of indigenous high value enterprise:*** The presence of NGB networks has the potential to foster the development of a high end export oriented digital services sector from within Ireland. This has been identified as one of the key objectives by the Government in its document, "Next Generation Broadband: Gateway to a Knowledge Ireland"[31] which sets out its policy framework for NGN Broadband development.
- ***Encouraging both domestic and inward investment:*** Those countries with NGB networks can attract new services and industries dependent on NGB (in advance of such networks becoming the norm elsewhere) which can create a digital industry microcosm which, in turn, attracts associated industries. It is for this very reason that cities such as Amsterdam (see Section 4) have taken steps to ensure that they provide a supportive test bed environment for advanced services.
- ***Supply chain efficiencies:*** High speed broadband networks allow companies to interact more quickly and in a richer manner with their suppliers and their consumers. Interactions between companies within a supply chain better enables them to react more quickly to product or market developments and streamline processes. It may also lead to a decentralisation of certain processes.
- ***Environmental efficiencies:*** Research carried out by the Fibre to the Home Council in Europe suggests that FTTH is a highly sustainable broadband technology, and can have a positive impact upon the environment within 15 years of initial deployments. On an individual subscriber basis, the use of FTTH and the applications enabled by it was found to save the equivalent – in carbon terms – of driving a car 4,600km per year.[32]
- ***Indirect benefits:*** NGB can facilitate increased remote working capabilities and could, for example, provide indirect benefits by lowering the level of traffic congestion and limiting unnecessary travel time. To get an idea of the potential for society to make substantial savings, various estimates of the cost of road congestion place a figure above €2bn per annum for Ireland[33]. Even reducing the costs of traffic congestion by half would have a substantial impact on welfare over the next decades. Over a ten year period, the potential savings on this measure could be many times the cost of rolling out a near ubiquitous very NGB network.
- ***Impacts on employment:*** A study carried out on behalf of the European Commission suggests that while there is some displacement or replacement of traditional manufacturing jobs in a high-tech economy powered by broadband, the overall impact of broadband on employment has been positive thus far, resulting in a net creation of over 100,000 jobs in Europe alone in 2006.[34]
- ***Facilitating changed methods of education:*** improvements in educational facilities will enable video based e-learning for home students and allow schools to pool teaching resources and budgets thereby maximising efficiencies.

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[31] See DCENR website www.dcenr.gov.ie or Here

[32] http://www.cohesive.uk.com/ftth_council/european_conference/pdf/Configurator_Launch-11.02.08.pdf

[33] See http://www.isme.ie/stg/public/download.php?site=site685&file=08239congestion.doc

[34] Micus (2008) The Impact of broadband on growth and productivity

- ***More efficient provision of healthcare services:*** the ability to carry out remote diagnostics and monitoring of patients; co-ordination and delivery of health care in designated centres; the ability to transfer files such as digitised patient records quickly and securely between hospitals.

2.21 Overall, the level of efficiencies that may be realised will, of course, depend on how Government (and its associated agencies), businesses, and society adapt to the presence of NGB networks. Those that exploit such networks to rationalise supply chains, facilitate smarter working and improved customer ordering can expect substantial savings. Businesses that make these changes will force others in their industry to adapt in order to be able to meet the new competitive challenge. Therefore, NGB networks, coupled with a strong desire to work smarter at a business/enterprise level could bring about substantial efficiencies.

Business and Consumer Benefits

2.22 Driven by growth in content and services, business and consumer adoption of the internet has grown and usage is maturing. Over 83%[35] of SMEs now have broadband internet access and are using[36] it for applications such as secure order management (51%), remote monitoring of business premises and video conferencing (15%). Given the critical role of SMEs within the Irish economy, along with their potential to drive innovation, the availability of NGB will be a crucial enabler to allow such businesses to develop and capitalise on opportunities that will arise as world economies begin to recover.

2.23 Consumers have moved beyond basic email and web browsing and search to embrace newer and more innovative social networking sites such as Bebo and Facebook, streaming media via YouTube and communications tools such as Skype and MSN, online commerce via eBay as well as reading of or creation of online weblogs or blogs. While it is important to recognise that the above applications and services can be delivered over current generation broadband networks, it is also worth noting that there are a number of services such as telepresence and high-definition video services which cannot be effectively used on existing broadband networks in Ireland and future development of other, even more advanced applications means that this trend could continue.

2.24 Broadly speaking, for businesses and other organisations, the move to NGB may offer benefits such as:

- An increased online market for goods and services, in Ireland and worldwide
- Access to a wider choice of suppliers and intermediaries
- Increased flexibility in determining how and where work gets done, including a greater ability for remote working (thereby reducing the dependency on cars and other modes of transport which can contribute to wider environmental goals)
- Ability to access ICT 'on demand', particularly through 'Cloud Computing[37]'

[35] See Central Statistics Office's Information Society Statistics Here

[36] SME & Corporate ICT Research for H1 2009 carried out on behalf of ComReg by Millward Brown IMS,

[37] Cloud (or Internet) computing refers to the dynamic availability of software and other resources are provided as a service over the Internet. For example, rather than owning software and the infrastructure necessary to run it (such as servers), users can access these services over the internet and tend only to pay for what they consume.

- Back-up of business critical information.
- Enhanced scope for data-driven business process improvements

2.25 The benefits for consumers from the availability of NGB services could include:

- Faster, more symmetrical download/upload speeds, lower latency and contention will enhance the overall consumer experience and enjoyment of content heavy and real-time applications/services.
- Access to public services in vital areas such as health, education and social welfare
- Wider choice of Internet-based services for information, education, entertainment and communication
- Ability to access multiple video streams[38] simultaneously,
- Music and video downloading, Peer-2-peer/social networking services, with enhanced video capabilities
- Improved e-commerce opportunities, enhanced by high quality Internet telephony, video, virtual presence
- New services to help manage households more efficiently and comfortably, including use of remote security and environmental controls.

Costs of NGB development

2.26 One must be cautious in seeking to estimate, the costs of developing a NGB network in isolation. It will depend on a number of variables which include the status of the existing network (if any), the size, prosperity and demography of the target market, access to capital, required investment returns etc. However, it is worthwhile noting the costs of NGB development elsewhere in order to give a context to the discussion within this paper.

2.27 In this regard, the Yankee Group[39], based on various studies, estimates FTTx[40] costs at between €300 per dwelling for dense urban multi-dwelling units with pre-existing infrastructure and more than €1,000 per dwelling in less dense areas and single-dwelling units. Looking at private sector led developments of NGB networks, **Table 1** shows the costs and a range of related FTTH developments in the USA, France, Norway and Japan.

[38] Facilitating the viewing of Internet-based versions/replays of conventional broadcast television programmes, and made-for-net video productions such as can be viewed on YouTube or Flickz

[39] Yankee Group, Fibre to the World: A State of the Union Report on FTTH. December 2008

[40] FTTx is a terms used to describe a range of fibre deployment architectures, including Fibre to the Home/Building (FTTH/B), Fibre to the Cabinet/Node (FTTC/N).

Table 1: Comparison of costs for private sector led deployments of NGB FTTH networks[41]

Operator	Homes passed	Homes taking fibre	ARPU[42]	Cost per premise	Payback Period
Verizon (USA)	12m	2.8m (27% take-up)	€98	€977	6.5 years
Orange (France)	500,000	23,000[43] (5% take-up)	€55	€500	34 years
Lyse (Norway)	160,000	104,000 (65% take-up)	€74	€2000	6 years
NTT (Japan)	43m	10.5m (24% take-up)	€43	€687	14 years

2.28 Some further high level information of NGB deployment costs is outlined in Table 2 below.

Table 2: Comparison of NGB deployment costs[44]

Country	Details
USA	Verizon, which is rolling out a FTTH network, aims to pass 18 million homes by 2010 as part of a US$23bn deployment. AT&T, which is rolling out a FTTN network (with FTTH for new build only), plans to reach 30m homes by the end of 2011 — one year later than previously planned – at a cost of approximately €8.5bn.
France	Iliad is planning to deploy fibre in Paris via a point-to-point FTTH architecture. The City of Paris has provided low cost access to the sewers and the overall cost is estimated to be around €1bn. At the end of 2007, Iliad had passed 240,000 homes with fibre. The operator Neuf is also offering FTTH in Paris (point-to-point) and a GPON[45] fibre offering in other cities, and reported 17,000 customers by the end of 2007. It plans to spend EUR 300m to pass 1m homes, and by end 2007 was reported to have passed 120,000.
UK	BT announced plans to build a superfast network covering 10m homes, about 40% of UK households, by 2012 at a cost of STG£1.5bn. BT's proposal involves running fibre optic cables to roadside cabinets (and direct to some premises), offering speeds starting at 40Mbit/s.
Spain	Telefonica's FTTC rollout (with some limited FTTH deployment) started in 2006 with target coverage of 40% of households by end-2009. NGB capital expenditure for 2008-2010 is reportedly €1bn.

[41] Yankee Group

[42] Average Revenue Per User (ARPU) figures based on all services provided over the fibre network.

[43] Estimated figure based on a variety of sources

[44] Yankee Group

[45] Gigabit Passive Optical Network (GPON) is where a single fibre is split using an optical device in order to provide service to multiple premises.

2.29 Overall, while the costs of NGB deployment differ to reflect local conditions and the nature of the deployment (both in terms of network topology and coverage), the expenditure involved can be significant. For existing buildings, FTTH will be more expensive than a FTTC deployment and tradeoffs between depth of coverage and network capabilities often have to be made. Equally so, for new buildings the cost of deploying FTTH is likely to be considerably less than that which would apply in seeking to serve existing buildings. In Ireland's case, FTTH solutions are likely to be deployed by existing providers in new build multi-tenancies and industrial park scenarios. However, it must be recognised that, the cost of NGB deployment (whatever technology is used to provide it) will be significantly more expensive for those regions of the country that are less densely populated (see further discussion on demography in Section 5).

Discussion and feedback

2.30 ComReg invites feedback from stakeholders and other interested parties on the analysis described above. We have described a view as to what constitutes NGB and why, from wider economic, business and consumer perspectives it matters. In advance of knowing what services are likely to emerge we must be cautious in seeking to determine now what NGB speeds will be required. However, given Government policy to place Ireland as a 'smart economy' and the identification of NGB as being critical to this goal, for the purpose of this discussion paper NGB is considered to operate at consistently achieved download speeds at or above 25Mbit/s.

2.31 The technologies and services associated with NGB are widely seen to have high capability for businesses, public sector customers and consumers, and also to offer potentially very exciting socio-economic spin-offs, notably in the areas of industrial productivity, export of high value-added services, improved provision of key public services, and better management of policy goals such as sustainable environmental considerations. However, the benefits are as yet, necessarily, unproven, and there are significant costs and risks associated with developing NGB networks today, in the face of uncertain demand and with many competing demands on capital.

Question 1: What speeds and other quality of service parameters will be demanded by businesses and consumers over the next 3 to 5 years? Please explain your reasoning. Do you believe the market itself will deliver these capabilities and within what timeframe?

Question 2: Do you consider that NGB network deployments can provide a socio-economic benefit? If so, who are likely to be the greatest beneficiaries and why? Should the policy framework explicitly favour the development of NGB in Ireland, and with what specific socio-economic goals in mind?

3 Broadband Developments in Ireland

Current broadband provision

3.1 Broadband adoption in Ireland stands at 1.27 million broadband subscribers[46]. Competition in the provision of broadband services is occurring across a number of technology platforms including wireless, cable and twisted copper (Digital Subscriber Line or DSL) based networks, with satellite broadband provision also occurring in a more limited context. While DSL[47], is the predominant broadband platform (approximately 54%), relative to other EU countries Ireland has a high proportion of Fixed Wireless Access (FWA) and mobile broadband subscriptions[48] (9% and 28% respectively), with cable[49] broadband being another popular choice (9%).

3.2 Driven by the differing capabilities of the above technologies, a range of broadband services at speeds of between 1Mbit/s to 24Mbit/s are present, however, services at the upper end of this scale tend only to be available in relatively few areas. The typical broadband speeds that are available tend to be in the 3Mbit/s to 9Mbit/s range, with actual speeds enjoyed again depending on location. The absence of the availability of current generation broadband services in certain geographic areas of the country is being addressed through the Government's National Broadband Scheme[50] (NBS). Large businesses can also avail of dedicated symmetrical capacity over leased lines, however, due to cost considerations their use by small businesses can be prohibitive.

Existing broadband networks

3.3 There has, and continues to be significant growth in the take up of broadband in the Irish market over the last number of years, showing that Irish consumers and businesses place a heavy emphasis on the presence of broadband services in their lives. While noting differences in the geographic availability of higher speed products, this demand is being largely met utilising a variety of infrastructure platforms. These platforms can in turn provide a base from which Next Generation Broadband networks can emerge.

3.4 These foundations are being laid, through a series of improvements by mobile and fixed broadband service providers[51] at the access and core network levels. The core network can be described as the highest aggregation layer in a network (the access layer being the lowest and closest to the customer) over which several services (such as voice, data and multimedia applications) share bandwidth. The core network is not directly connected to customers.

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[46] For further information on data in the broadband market please see ComReg's Irish Communications Market Quarterly Key Data Report – Q1 2009.

[47] Eircom had enabled 686 exchanges for DSL broadband by the end of 2008 supporting 1.4 million working lines and plans to enable a total of 917 exchanges by the end of 2009, See http://www.broadbandatoz.ie/

[48] 3G/HSDPA coverage was close to 85% of the population at the end of 2007. Source: IDATE

[49] UPC's network is capable of providing broadband to over 527,000 homes. See Silicon Republic article Here (May 2009)

[50] Details regarding the NBS are available on the Department of Communications, Energy and Natural Resources website Here. The NBS was awarded to 3 Ireland in December 2008 and will bring broadband services to 1028 Electoral Divisions throughout the country.

[51] Eircom, for example, have been engaged in upgrading its core network to an Next Generation Network architecture. This is occurring in Dublin and other parts of the country with the introduction of a number of IP based core, edge and aggregation sites with a high level of bandwidth capacity linking each site. Further details are available on Eircom wholesale's website Here and in a presentation by Eircom to IBEC Here.

3.5 Core network developments involve a migration of existing networks to flatter Internet Protocol[52] (IP) based networks capable of supporting large amounts of bandwidth, multiple access technologies and common services. Such changes offer benefits in terms of improved service quality and lower management overhead resulting in greater scope for lower operating costs. At the core network level, Eircom has previously highlighted its plans to invest in the core network using IP technology to increase capacity. Indeed, it has made a number of initial investments in next generation core networks. Eircom have largely completed the rollout of their next generation core network in the Dublin area and national rollout is scheduled for completion by June 2011.[53] Alternative operators, both fixed and wireless, should also benefit from increased capacity and reduced costs when accessing wholesale services reliant on these Eircom next generation core network developments.

3.6 In April of this year, we also saw Vodafone Ireland agree a €17 million 15-year deal with e|net[54], the company responsible for managing the Government's extensive fibre optic infrastructure, known as the Metropolitan Area Networks (MANs). e|net are to provide high capacity fibre optic connectivity to a large proportion of Vodafone Ireland's transmission sites which allow the company to deepen its mobile broadband capability and provide sufficient data capability to support its future roadmap of data products and services. A range of other companies are also using e|net's infrastructure to both deepen and bolster their core network capacity[55].

3.7 The above core network developments will support the development of NGB services in that they push fibre deeper into the network and closer to the customer. However, developments in the access network, in particular their capability to support NGB services, have been markedly different to core network developments.

3.8 Ireland currently has four mobile network operators who provide mobile broadband services on their 3G ('Third Generation') networks. Over time the capability of these networks and the related consumer devices have advanced and some of these mobile networks are now capable of supporting a 14.4 Mbit/s network carrier speed, while the more recent consumer devices (modems) support an 'up to' 7.2 Mbit/s functionality. While such speeds relate to the maximum theoretical throughput of the device, it should be noted that the average user speed tends to be lower. This is due to a number of factors including the signal quality and the number of simultaneous users accessing shared network resources[56].

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[52] IP or Internet Protocol is a standard controlling how data is transferred over a network.

[53] Eircom presentation on Next Generation Networks to the Joint Oireachtas Committee on Communications, Energy and Natural resources, March 2009. See Here.

[54] Details of the announcement with e|net are available Here

[55] The core networks of Ireland's mobile operators currently support both packet switched and circuit switched traffic. Voice services are primarily supported using circuit switched connections while data traffic is primarily supported using IP packet switched connections. As mobile communications networks evolve it is envisaged that there will be a shift towards Voice over IP (VoIP) services on an all-IP based core network. It is notable that the Long Term Evolution (LTE) standard, which will become available with Release 8 of the 3rd Generation Partnership Project (3GPP) standard, supports packet based services only.

[56] In 2008, based upon ComReg measurements and information from mobile operators, ComReg estimated that the average mobile broadband user speed ranged between 800 Kbps and 1.9 Mbit/s, notably lower than the maximum data rates of 3.6 Mbps or 7.2 Mbit/s. See page 41 of ComReg Document 08/104

3.9 Eircom provides broadband services directly to consumers through its retail arm. It is also obliged by a regulatory requirement to provide wholesale products to other operators to enable them to compete. Their products include Local Loop Unbundling (LLU)[57], where operators connect their own equipment to the copper loop which connects the consumer to the local exchange, and bitstream, whereby operators re-sell products provided over Eircom's own broadband network. LLU allows operators to differentiate their products from Eircom's and to set the speeds of the products they provide to consumers[58]. LLU products are being enhanced by industry so that they are more effective and efficient at an operational level. In parallel, ComReg is also consulting on proposed reductions in LLU wholesale charges of up to 25%[59].

3.10 In the context of current generation broadband provision, LLU is seen by ComReg as a key enabler of competition and offers the ability for service providers to offer high speed broadband products during the transition to an NGB environment. In this regard, ComReg is fully committed to ensuring that the work undertaken in supporting LLU to date continues. NGB developments involving either partial or full replacement of the copper loop (say through FTTC or FTTH) are likely to affect the manner in which LLU is provided. The issue of migration, whereby alternative operators can continue to provide retail services seamlessly while transitioning from one wholesale product to another, will be crucial in the transition to NGB.

3.11 Eircom, the largest provider of retail broadband services in the State, has a residential offering with download speeds of up to 7Mbit/s[60]. On the business side it offers a product at speeds up to 24Mbit/s[61]. In either case, (but particularly for the higher speed product) availability will be dependent on the underlying conditions of the copper infrastructure, the number of lines with pair gain systems[62] and the distance of the customer from the telephone exchange.

3.12 As far as cable networks are concerned, UPC has been engaged in a 3 year upgrade programme to update its coaxial cable infrastructure to a HFC network and on this basis, is providing broadband services with download speeds of up to 20Mbit/s. UPC's network is predominantly located in major urban centres and passes approximately 870,000 homes, of which approximately 527,000 are capable of receiving a broadband service[63].

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[57] LLU is a wholesale service provided by Eircom (pursuant to a regulatory requirement to do so) whereby it provides other operators with access to its exchanges and copper infrastructure between such exchanges and customers' premises (known as the 'local loop'). Other operators rent this local loop from Eircom and, by installing their own equipment in Eircom exchanges (by renting space and the use of facilities there) and connecting it to their own infrastructure, are able to offer competing broadband services over which they have full control (say in terms of products speeds and quality of service).

[58] Using LLU, BT Ireland, Magnet Networks and Smart Telecom, have made available products at 'up to' speeds of 24Mbit/s in a limed number of geographic locations.

[59] See ComReg Document 09/39, Further Consultation on Local Loop Unbundling ('LLU') and Sub Loop Unbundling ('SLU') Monthly Rental Charges, May 2009

[60] Source www.eircom.ie

[61] Source eircom's business website accessible through www.eircom.ie

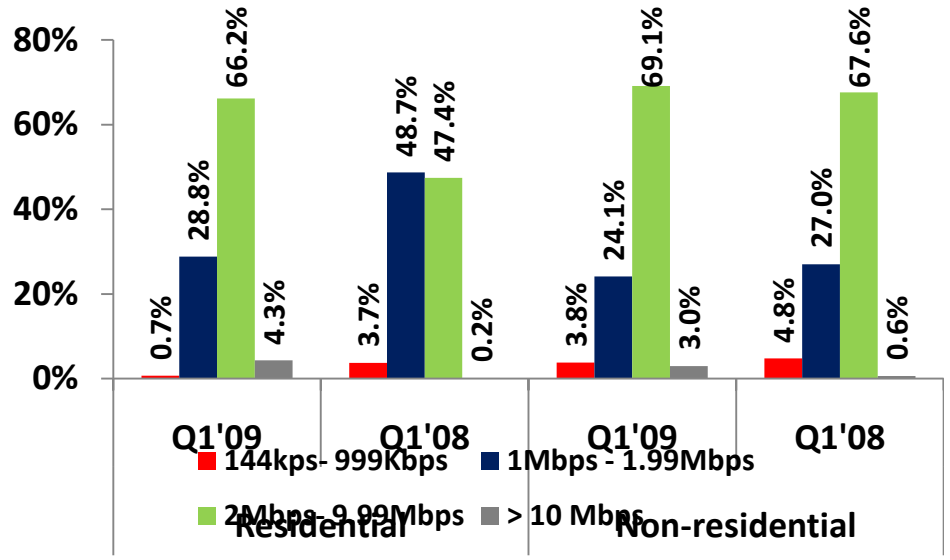
[62] Pair Gain technology or 'splitters' allow the frequencies carried over a single copper telephone line to be divided into multiple 'channels' for the purpose of providing access to two (or more) voice services. For example, a telephone line can be 'split' so that two subscribers can have their phone services provided over that single telephone line. The use of Pair Gain technology means that affected telephone lines cannot support a broadband service.

[63] See Silicon Republic article Here (May 2009)

Changing patterns of broadband usage

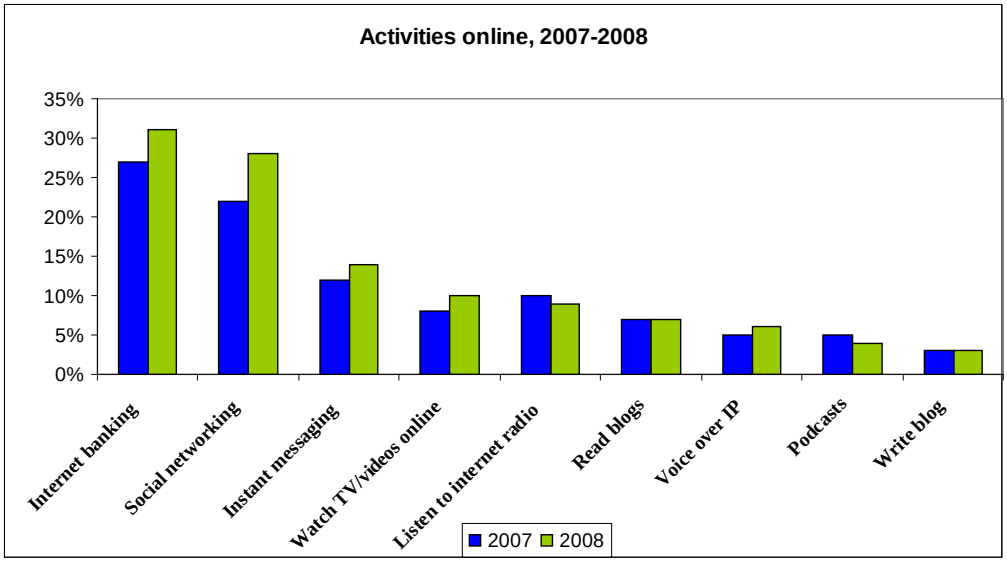
3.13 From a consumer perspective, there is an emerging trend of increased usage of higher speed broadband products. Some consumers can now avail of products which are almost 50 times faster than those first made available in the market in 2002. As shown in Figure 4 below, the typical broadband product speed used has increased, with 66.2% and 69.1% of residential and business consumers respectively, using products with speeds in the range 2Mbit/s to 9.99Mbit/s. The impact of more recent higher product speed offerings using current generation broadband infrastructure may further impact consumer usage patterns.

Figure 4: % Subscriptions to Different Broadband Speed Offers, Q1'08 - Q1'09[64]



3.14 JNIR Research[65] set out in Figure 5 also suggests that Irish consumers are becoming more sophisticated in terms of the activities they carry out online.

Figure 5: Online Activity in Ireland 2007 - 2008



[64] Source ComReg Quarterly Data Reports, Q1 2008 and Q1 2009

[65] Source: JNIR, offline Survey report, December 2007 and December 2008

3.15 This trend of greater use of higher speed broadband products and more sophisticated use will continue, particularly as services and applications requiring higher bandwidth become available and are utilised by consumers. In this regard, we have recently seen the launch by RTE of its online catch-up service[66] which makes programmes which have previously been shown on television available for online viewing for a limited period. As has been the experience in the UK with the BBC's iPlayer, this is likely to change consumers' usage patterns.

3.16 Equally so, service providers on some infrastructure platforms, notably broadband over copper telephone lines and cable TV networks, have started to make available higher speed broadband products to meet consumer demand[67]. However, such products are not yet widely available and tend only to be present in specific geographic areas, usually parts of main urban centres.

3.17 Consumer patterns of Internet usage are therefore changing, with more frequent and longer 'visits' to web-sites, more use of the 'uplink' side of the network, and a far higher proportion of video in the mix of traffic carried by networks.

Next generation broadband network developments

3.18 In the future it is envisaged that the data throughput speeds of the mobile wireless and fixed wireless networks will increase considerably compared to those currently available now. The 3GPP[68] ('Third Generation Partnership Project') has specified an evolution path for the 3G mobile communications standard that will see the peak downlink network speed evolve from 14.4 Mbit/s under the currently deployed HSPA[69] standard, to 42 Mbps under the evolved HSPA or HSPA+ standard[70] and to greater than 100 Mbit/s with the Long Term Evolution (LTE) standard. Likewise the IEEE[71] 802.16 working group has specified an evolution path towards higher data speeds for networks based upon the Worldwide Interoperability for Microwave Access or WiMAX standard. Peak downlink network speeds of 40 Mbit/s can be supported with the IEEE 802.16e standard while speeds greater than 100 Mbps can be supported by the IEEE 802.16m standard[72].

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[66] See RTE website HERE

[67] BT Ireland, Magnet Networks, Smart Telecom, UPC and, more recently Eircom, have made available products at 'up to' speeds of between 20Mbit/s and 24Mbit/s in a limed number of geographic locations.

[68] See http://www.3gpp.org/

[69] HSPA or High Speed Packet Access covers two mobile telephony protocols (High Speed Download Packed Access, or HSDPA, and High Speed Upload Packet Access, or HSUPA) that facilitate the transmission of higher broadband speeds over mobile networks. HSPA can provide maximum download speeds of up to 14.4 Mbit/s and upload speeds of 5.8. HSPA+ or Evolved HSPA can provide download speeds of up to 21 Mbit/s (increasing to download speeds of 42Mbit/s and upload speeds of 22 Mbit/s in 2009). In all cases, the speeds achieved will depend on, amongst other things, the distance of the user from the base station, the backhaul capacity at the base station and number of simultaneous users etc.

[70] The HSPA+ standard has already been established under Third Generation Partnership Project Standard Revision 8. See www.3gpp.com/Release-8. For further information on 3G please see "GSM/3G Network Update February 2009" on www.gsacom.com

[71] WiMAX (Worldwide Interoperability for Microwave Access) and is a standards based telecommunications technology that allows the provision of wireless broadband services. The WiMax standards are usually expressed in the form IEEE 802.xx (where xx indicates the latest version of the standard). Each standard has different broadband service capabilities.

[72] For further information please see the IEEE 802.16 Working Group on Broadband Wireless Access Standards

3.19 Globally, many operators are now taking steps to upgrade their networks to higher data speeds. In America, Clearwire, Sprint, Intel Capital, Comcast, Google, Time Warner Cable, and Bright House Networks have entered into an agreement to invest €3.2bn in a combined company, called Clearwire, to deploy a next generation mobile WiMAX nationwide network in the USA. Clearwire has already launched mobile WiMAX services in two markets and has a multi-year network build-out plan to deploy this service in other major metropolitan areas across the USA[73].

3.20 In relation to the HSPA+ and LTE standards, the world's first HSPA+ system was launched by Telstra in Australia on February 23rd 2009[74], initially supporting a peak downlink network data speed of 21 Mbps with plans to upgrade to 42 Mbit/s later in 2009. Since then, the Global mobile Suppliers Association (GSA) has reported[75] that three other operators (Mobilkom (Austria), CSL Limited (Hong Kong) and StarHub (Singapore) have also launched HSPA+ networks and another 24 operators are either testing the technology or have plans to deploy it in the near future. The Global mobile Suppliers Association (GSA) has also researched the LTE network deployment commitments of operators and globally it has identified 31 LTE network operator commitments[76]. The first LTE deployments are expected to be launched in 2010 in a number of high profile markets such as the USA and Japan. Further LTE launches are expected throughout 2011.

3.21 In terms of fixed NGB, Eircom has recently indicated[77] that it has completed Fibre To The Cabinet[78](FTTC) and Fibre To The Home[79] (FTTH) trials in Dundrum, Stillorgan and Sandyford in Dublin. According to Eircom, the cost of upgrading its access network to a FTTC solution at the top 65% of exchanges (covering about 1 million lines) would be between €400m to €500m. Eircom's estimates for its FTTH solution state that it could cost in excess of €2,000 per home to install FTTH in new build premises, and €2,500 per home for retro-fitting FTTH solutions into existing homes. Eircom's shareholders have concluded that the business case for rolling out Next Generation Access to the further 35 Dublin exchange areas previously planned is no longer valid. Indications from Eircom are that it has no immediate plans to invest any further sums in NGB at this time.

3.22 There have been no firm indications from alternative operators that they intend to increase substantially, either the number of exchanges at which they will utilise LLU or, the amount of FTTH/FTTB lines currently provided.

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[73] See details on Clearwire website Here

[74] See details on Telstra website Here

[75] See details on GSA website Here

[76] See details on GSA website Here

[77] Eircom presentation on Next Generation Networks to the Joint Oireachtas Committee on Communications, Energy and Natural resources, March 2009. See Here

[78] Current generation fixed broadband access deployments typically involve the installation of active electronics in the local telephone exchange. The copper telephone line then runs from the local exchange to the customers home (known as the 'local loop') via a street cabinet. In a fibre to the cabinet (FTTC) deployment, active electronics are installed at the street cabinet, with the copper between this point and the local telephone exchange (or other aggregation point) being replaced with a fibre link. The existing copper 'sub-loop' from the street cabinet to the customer's home is retained. The shorter copper 'sub-loop' in a FTTC scenario allows higher bandwidths to be provided to customers.

[79] A FTTH network deployment is similar to a FTTC scenario, however, the entire copper 'local loop' is replaced with a fibre link.

3.23 For cable based NGB, UPC recently announced[80] that it was investing €90m over the course of the next year with a view to continuing the physical upgrading of its cable infrastructure and intends to move to the DOCSIS 3.0 cable standard by the middle of 2010 which will then enable it to offer speeds of 120Mbit/s to consumers.

Next Generation Broadband: the prospects for Ireland

3.24 Given the known development plans of service providers and the evolution of technology standards, the potential exists for large-scale operator led investment in NGB services to emerge. Ultimately, the actual or potential threat of competition across (or indeed within platforms) is likely to drive operator NGB investment decisions. These threats may not be sufficient to lead to major NGB roll-out decisions now

3.25 Overall, apart from a few small scale and dispersed fibre deployments[81] by Magnet Networks and Smart Telecom and some copper based ADSL2+ deployments targeted at business consumers, the capabilities of existing broadband infrastructures and the technologies deployed over them in Ireland are not currently capable of providing NGB services above 24Mbit/s. However, a number of network enhancements, notably within the core network, have laid the foundations for the evolution of networks to support NGB services. Enhancements to existing access networks, either through a deeper deployment of fibre, coupled with an upgrading of the associated technologies utilised to deliver broadband over these networks, may lead in future to the emergence of NGB services.

3.26 Both fixed wireless and mobile wireless technology capabilities are developing, however, it is not yet clear when these future mobile wireless and fixed wireless network standards will be deployed in Ireland. In any event, it is likely to be 3 to 5 years before any substantial presence is felt. Their timing will depend upon many factors such as spectrum availability, the economic environment and availability of capital, the level of competition in the market and the maturity of the technology platforms (including availability of customer equipment). Indeed, in other counties delays of wireless network upgrades have been observed[82].

3.27 Cable based NGB investments are due to commence in 2010. However, coverage is likely to be focussed on main urban centres and due to the incremental nature of any roll-out the timing of the availability of services in these areas is also likely to be a consideration.

3.28 Overall, therefore, operators' development of NGB capabilities are very uncertain at this time and, based on current economic conditions and statements from industry players, Ireland may not see substantial roll-out of NGB networks for the next 3 to 5 years. It would appear that the deployment of fibre based NGB within the Irish market is most at risk, with no immediate plans for significant investment by eircom or other fixed line operators.

[80] See Silicon Republic articles Here (April 2009) and Here (May 2009).

[81] There were approximately 5,500 fibre subscriptions as at Q1 2009, representing approximately 0.43% of all broadband subscriptions.

[82] See article Here on Verizon LTE plans.

Discussion and feedback

3.29 ComReg invites feedback from stakeholders and other interested parties on the analysis above where we have described current broadband provision in Ireland along with potential future technology developments across broadband platforms.

3.30 With over 1.27M subscribers, Ireland's broadband infrastructure today is well developed, greatly improved on two years ago, and comparable in capability, coverage and take-up with EU norms. Broadband is available on a variety of technology platforms, including fixed line, fixed wireless, mobile, cable and satellite. Competition between firms using different technology platforms has spurred investment and extended consumer choice.

3.31 Notwithstanding the progress with first generation broadband, and operators' developments of advanced fibre-based core next generation networks, we have barely begun to deploy NGB networks in the access network, and based on current economic analysis and statements from industry players, we may not see substantial nationwide investment in these networks for the next 3 to 5 years. When substantial private investment does come, at least initially it is likely to be limited to the areas of greater population density where the economics of roll-out are more favourable.

Question 3: How important will cross-platform competition be to the development of NGB Networks? Do you consider that all broadband platforms are capable of supporting NGB? In what circumstances might some such platforms be more suitable than others in providing timely and efficient NGB?

Question 4: Do you consider that substantial (in both cost and coverage terms) private sector led investment in the development of NGB networks is likely over the next 3-5 years? If not, and should a gap occur in comparison to other European countries, what will be needed to encourage such private sector investment in Ireland?

4 International Approaches on Next Generation Broadband

Overview

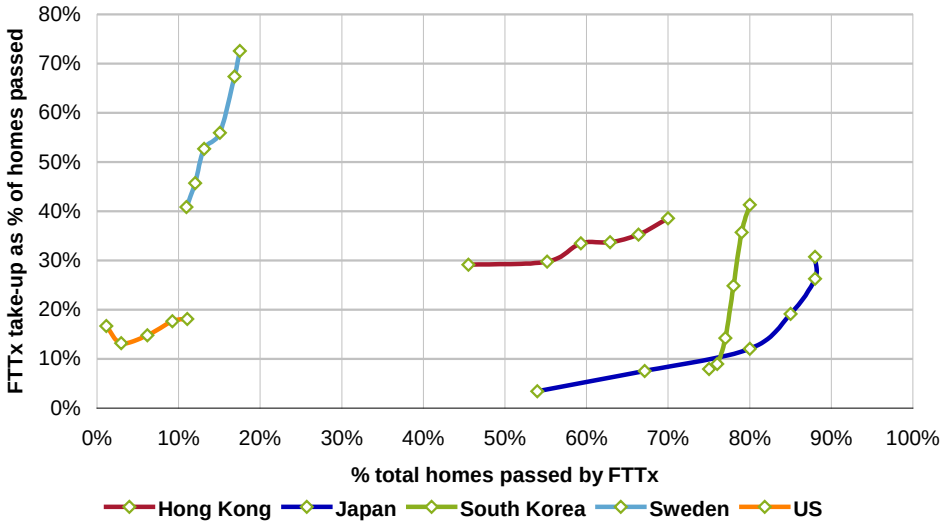
4.1 In considering how best to advance the development of NGB in Ireland, it is worth considering the range of approaches that have been adopted at Government and regulatory levels throughout the EU and wider global environment in order to assist the development of NGB infrastructure. This section highlights some of the Government and market led policy initiatives adopted, in particular, across those countries where high speed broadband infrastructure has developed or is developing. By highlighting these approaches it is not intended to specify what is appropriate in Ireland's case, but to indicate the range of options that could be applied should the circumstances be right.

4.2 Broadly speaking, interventions fall into the categories of

- Government (national and/or regional) intervention aimed at both stimulating high speed broadband infrastructure investment and development though direct/indirect financial assistance along with measures to encourage consumer demand.
- more market led approaches facilitated by the regulatory framework which seeks to develop competition, encourage efficient investment in infrastructure and ultimately let market dynamics decide.
- a combination of both the above approaches

4.3 There are a broad range of country experiences which contrast the differing approaches and outcomes with respect to NGB broadband interventions. Figure 6 highlights some of those countries where fibre has been rolled out, along with information on actual fibre subscriptions (for the period 2003 to mid 2008).

Figure 6: Country examples of fibre rollout and subscriptions[83]



[83] Source Analysys Mason

4.4 For example, in the case of Japan, (at mid June 2008) 88% of homes were passed by fibre with 30.7% of such homes subscribing. For the Republic of Korea, 80% of homes were passed by fibre with just over 41% of such homes subscribing. For Sweden, approximately 17% of homes were passed by fibre with just over 72% of such homes subscribing.

Direct Government interventions

4.5 Two of the more advanced countries within which high speed broadband has been made available are the Republic of Korea and Japan where an industrial policy approach has been adopted in supporting broadband development. According to the International Telecommunications Union (ITU), these two countries also rank as the top two countries in the Digital Opportunity Index[84], which reflect a broader measure of countries attitudes and adoption of Information and Communication Technology (ICT).

4.6 For European Governments, most tend to favour a more market led approach, although in some cases hybrid approaches have been adopted which couple direct government intervention and market led initiatives. Such hybrid approaches have been adopted by countries such as Denmark, Greece and Portugal.

4.7 Experiences in these countries are discussed below.

Republic of Korea / South Korea

4.8 The Republic of Korea has a household broadband penetration rate of approximately 90% and is often considered to be one of the most wired nations[85]. According to OECD data[86], the Republic of Korea has 32.8 broadband subscribers per 100 inhabitants as at December 2008. Of this figure 13.8 subscribers per 100 inhabitants have fibre based broadband access with the remaining 18.2 subscribers per 100 inhabitants accessing broadband via DSL and cable networks. Contributory factors to the growth in South Korea's high speed broadband infrastructure stems from the business environment, government policies and social factors. The South Korean government has been a key driver of broadband services, with policies of aggressive spending, not just on broadband (and related) infrastructure but also in services, applications and content development. As with other sectors, South Korea has adopted an industrial policy approach with respect to the development of its high speed broadband infrastructure and, to this end, has published a series of strategy initiatives over the course of a number of years which aim to place the country at the forefront of competitive economies with the aim of attracting inward investment and competing on the world stage. In March 1995, the Korean Government established its 'Korea Information Infrastructure' (KII) strategy with the aim of establishing a high-speed backbone network to every government and public entity. Completed ahead of schedule in 2006, Government investment is estimated at USD 800million. A number of parallel

[84] http://www.itu.int/ITU-D/ict/doi/index.html. The Digital Opportunity Index (DOI) is based on 11 ICT indicators, grouped in 3 clusters, namely, opportunity, infrastructure and utilization. The index ranges between 1 and 0, where 1 would be complete digital opportunity. The latest data is available from 2007 and Ireland is ranked in position number 31, with a DOI of 0.61.

[85] 92% of Korean households have a fixed line telephone. 81.9% of population resides in urban areas with a population density of 484 persons per square Km. Apartments account for 48% per cent of Korea's housing stock and provide dwelling for 40 per cent of its population. The average distance of a customer from a telephone exchange is 2.2 kilometres, with 95 per cent of customers within four kilometres, the target range of ADSL.

[86] See OECD broadband Portal Here

strategies were adopted[87] and in 2006 Korea issued its 'U-Korea Master Plan'[88]. The stated objective of the Ubiquitous (U) Korea Master Plan is "Transforming Korea into an advanced country by realising the world's first u-society based on world best u-infrastructure". Amongst the objectives are to build ubiquitous and seamless high speed communications networks (both wired and wireless) which are integrated into society and every day uses of applications and services. The focus is also on transforming work methods across the public and private sector within the continuing theme of improving national competitiveness.

Japan

4.9 Japan is one of the most developed and technologically advanced markets in the world, with over 90% of the country's households having at least one PC by 2007. Fibre based NGB access has been available since 2001 and today there are over 46.8 million homes passed with household penetration of 30.7%[89]. These developments have been driven by the Government's Ministry of Internal Affairs and Communication (MIC)[90], whose high speed broadband policy goals have evolved from its e-Japan[91] strategy in 2001 up to its current U-Japan[92] strategy. The strategy focus has evolved from the upgrading of wired broadband infrastructure to the aim of having ubiquitous NGB coverage by 2010, enhancing ICT use and improving the user environment.

4.10 The promotion of investment and competition are also two key aspects of the broadband strategy. The Government provides investment incentives in the form of tax relief, funding and loans and is examining legal measures to promote infrastructure improvement[93]. In parallel, regulation by MIC is focussed on opening up access to dominant providers networks and in this context, NTT DOCOMO (the incumbent which is part owned by the Japanese Government) is required to provide wholesale services on its copper and fibre based networks.

4.11 As evidenced from the experiences of the Republic of Korea and Japan, these Governments have adopted an industrial policy approach to stimulating fibre broadband developments, primarily aimed at invigorating the overall broadband sector in order to provide wider economic and social benefits. In doing so, there has been considerable expenditure in stimulating fibre based broadband. However, it is worth noting that the take up of these fibre services, to date, has not perhaps matched the level of expectations originally associated with this expenditure. More generally, the gap between the availability and take up of fibre services highlights one of the uncertainties faced by service providers contemplating investing in NGB networks.

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[87] Numerous policy/strategy documents have been issued which include e-Korea Vision in 2006, The Road to $20,000 GDP/capita [IT 839 Strategy],Broadband IT Korea Vision 2007,

[88] See U-Korea Master plan

[89] Source: Japanese Ministry of Internal Affairs and Communications , "Strategy for Achieving a Smart Ubiquitous Network Society", June 2009. See http://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/presentation/pdf/090609_1.pdf

[90] It should be noted that the MIC, apart from policy, also retains responsibility for the regulation of the communications sector.

[91] http://www.kantei.go.jp/foreign/it/network/0122full_e.html

[92] http://www.soumu.go.jp/menu_seisaku/ict/u-japan_en/index.html

[93] Current legal rules separate telecommunications and broadcasting environments which may have hindered the development of IPTV. The Japanese Government has proposed amending the law in 2011 with a view to promoting competition and encouraging new entrants.

New Zealand

4.12 On 31 March, 2009 the New Zealand Government announced its 'Broadband Investment Initiative[94] where, as part of its strategy to increase its global competitiveness, government investment of up to $(NZD)1.5billion[95] is being made available to front end the roll-out of NGB to 75% of New Zealanders. This funding is also to be supported by industry investment. A tiered range of broadband speeds is to be made available to a percentage of the population, for example, 40% to 60% of the population are to have download speeds of between 20Mbit/s and 30Mbit/s. This funding is also to be supported by industry investment. Within the first six years, the programme is to concentrate on priority broadband users such as businesses, schools and health services, along with green field developments and certain residential areas.

4.13 Fibre optic network infrastructure is to be deployed on an open access basis, with dark fibre[96] being made available on a wholesale basis to retail broadband providers. To achieve this, a Government-owned investment company ("Crown Fibre Investment Co") is being established.

4.14 In implementing the overall strategy, the Government has indicated that it will adopt a number of principles, which include neither discouraging, nor substituting for, private sector investment; avoiding entrenching the position, or 'lining the pockets', of existing broadband network providers; avoiding excessive infrastructure duplication; focussing on building new infrastructure, and not unduly preserving the 'legacy assets' of the past; and ensuring affordable broadband services.

4.15 Apart from the above, the strategy also focuses on complementary measures which include demand side initiatives in order to stimulate take-up of services offered over the new fibre network, and addressing issues regarding use of existing infrastructure such as ducting.

European Union Country Examples of Government Intervention

4.16 Insofar as EU countries are concerned, to date there have been relatively few examples of direct Government intervention in the form of financial support to facilitate NGB developments (market led approaches tend to be more prevalent and are discussed later in this section).

Denmark[97]

4.17 While NGB development in Denmark has largely been market led (see Section 4.30) it is worth noting that the Danish Government has promoted broadband uptake by means of a tax incentive introduced three years ago, whereby employers pay for their staff's broadband connections if the employees are working from home. Both employers and employees then get a direct deduction on their taxable income. This measure has been popular among employers with this being reflected in the fact that approximately 14% of broadband subscriptions purchased by businesses are being utilised in a home/domestic context.

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[94] New Zealand Government Broadband Investment Initiative

[95] A further $48 million (NZD) is being made available to support rural broadband.

[96] Dark fibre access refers to the leasing of physical fibre infrastructure only. The management of the bandwidth on this dark fibre achieved by placing active electronics on the infrastructure which conveys data through light pulses (at which point its considered 'lit' fibre)

[97] NGB in Denmark has largely been market led. See Section 4.30 for discussion on Denmark in this context.

Greece

4.18 In December, 2008 the Greek government announced that it intends to make available investment for the development of a €2.1 billion FTTH broadband deployment. One third of this investment (€700m) is to come from Government. Over the next seven years it is intended to reach 2 million homes with a 100Mbit/s service. These homes are located in the higher density cities of Athens and Thessaloniki as well as the next 50 largest cities and towns.

4.19 In return for co-funding from private sector bidders, the Government plans to create an open access network that will be managed by three geographically distinct public-private partnerships (PPPs) who will be granted 30 year licences. Prospective operators will be able to bid for a licence to operate in more than one area.

4.20 The 3 PPP contractors will each sell dark fibre services to service providers in their respective geographical areas. Service providers will deploy their own active equipment using the collocation facilities provided and, in principle, each will be able to connect any customer living in the homes passed by the new infrastructure.

4.21 The latest position is that the Government intends to publish a tender with a view to awarding licences to build and operate the network by June 2010.

Portugal

4.22 A Council of Minister's Resolution of 30 July 2008 adopted strategic guidelines in order to promote investment in next generation networks. The Portuguese Government strategy for investment in NGN and NGB includes:

- Enhancing confidence among market agents in order to ensure timely and efficient investment by:
  - promoting a model based on infrastructure competition and not only upon services competition; and
  - defining clear and transparent regulatory principles.
- Promoting a competitive communications market through the identification and removal of barriers in relation to:
  - access to ducts, poles and other critical infrastructure; and
  - vertical access in buildings.
- Guaranteeing access to innovative products and services through:
  - stimulating demand with the development of advanced solutions enabling the connection of all hospitals, health centres and secondary schools; and
  - promoting equal access of all citizens to innovative services, with especial attention to populations with special needs.

Market led approaches

4.23 In contrast to the experiences of Japan and the Republic of Korea (and some EU countries), national approaches across European countries to facilitating NGB tend not to have involved direct funding provision, but instead, have relied on enabling conditions in the market to facilitate efficient investment and competition to allow market dynamics to drive NGB investments (albeit noting some exceptions where hybrid approaches have been adopted).

4.24 A range of initiatives have been adopted at European Union, Government and national regulatory levels. Some of these approaches are highlighted below, with differences in approaches reflective of local markets and competitive conditions.

4.25 At a national level, the regulation of NGB within the context of wholesale broadband markets is at an early stage. Under the process established under European Law, communications regulators must examine a number of pre-defined markets (set by the European Commission) to assess whether or not these are competitive and, if not, to impose obligations on service providers found to have dominance in such markets. While National Regulatory Authorities (NRAs) are undertaking their analysis of markets[98] impacted by NGB developments, to date relatively few have completed their work in this area. One market of particular relevance is the market for Wholesale Physical Network Infrastructure Access (WPNIA, formerly the market for wholesale unbundled access). Competitive conditions in each country reflect whether fibre is deemed to fall into the WPNIA market and, if so, the nature of the regulatory obligations that are to apply. Where obligations have been imposed, examples include the following:

- access to duct infrastructure
- access to dark fibre/hybrid fibre-copper based access networks
- access to 'lit' fibre
- transparency obligations requiring the operator to publish any plans to upgrade its access networks to fibre based technology

European Level

4.26 At an EU Level, in August 2008 the European Commission commenced a consultation process regarding guidance for National Regulatory Authorities on appropriate regulatory responses for dealing with the roll-out of NGA (referred to in this paper as NGB) networks. The aim of this draft recommendation is to promote consistency in the regulatory remedies imposed by NRAs across the EU on SMP operators in wholesale broadband markets. This consultation has attracted a wide range of diverging views on the appropriateness of the approach proposed.

4.27 In the context of the European Commission's consultation, the European Regulators Group[99] (ERG) has set out its views[100] on an appropriate regulatory approach to NGA development. In summary, given the early stage of development, ERG considers that wholesale regulation should focus on the harmonisation of the principles of regulation. Rather than the development of new monopolies, the ERG's view is that regulation of NGA should continue to promote effective competition with regulatory certainty and transparency being seen as important in creating the appropriate conditions for efficient NGA investment.

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[98] Two of the markets identified by the European Commission include the market for Wholesale Physical network Infrastructure Access (WPNIA) and the Wholesale Broadband Access (WBA) market. These markets may be impacted by NGB developments.

[99] ERG was established under European Law in July 2002. It is comprised of the heads of the relevant national authorities in EU countries with responsibility for the regulation of the electronic communications sector. ERG acts as an interface between national authorities and the European Commission.

[100] ERG response to the EU Commission's consultation on its draft Recommendation on regulated access to NGA

4.28 On 12th June, 2009 the European Commission issued[101] their follow-up response to their original proposals and are consulting on this updated draft recommendation. Within this latest draft, it is recognised that the approach to regulating access (if at all) to NGB networks , including associated wholesale pricing, can differ depending on the particular circumstances of the way in which such networks are deployed. In this context, there is debate as to appropriate open access models in light of different NGB network deployment topologies and the impact on, for example, local loop unbundling.

4.29 Also at an EU level, on 19 May last the European Commission published[102] a consultation on guidelines which summarise the Commission's policy in applying the State aid rules of the Treaty to State measures that support (i) the deployment of traditional broadband networks and (ii) the rapid and timely roll-out of NGB networks. Within this paper the European Commission identifies types of public intervention that could occur where there is a market failure in the provision of NGB and the factors to which it will have regard in carrying out its State aid compatibility assessment.

Denmark

4.30 The Danish broadband market is one of the most advanced in the world in terms of per capita broadband penetration, with a penetration rate of 37.2%[103] by December 2008. 100% population coverage has been achieved by a combination of DSL, fixed wireless access, fibre and cable. Power companies have invested heavily in the roll-out of fibre to the home (FTTH) networks and have the bulk of fibre subscriptions at present. The number of fibre subscriptions was just over 202,000 fibre lines in December 2008, equivalent to 10% of all broadband connections. Analysys-Mason suggests that broadband penetration is high in Denmark due to high income levels, early deployment of DSL and a highly urbanised population.

4.31 TDC, the incumbent, has rolled out fibre to 60,000 homes over the past few years, although this fibre has not yet been lit as TDC indicates that demand for very high speed services is limited at present and is focussed on FTTC in the short term. TDC also owns the incumbent cable operator YouSee which is currently trialling DOCSIS 3.0 and plans to offer a commercial service by the end of 2009. A new initiative, called Dansk Fibernet, was launched in 2008 to promote FTTH deployment. It comprises a national certification scheme and a website that enables consumers to check fibre network coverage and directs them to their regional operator.

Finland

4.32 The Finnish broadband market, although relatively small in absolute terms, has high per capita broadband penetration of 30.7% [104](December 2008). Although total broadband penetration (including mobile broadband) has continued to increase, DSL subscriptions fell for the first time by 2.5% between 2007 and 2008 driven by a combination of migration to fibre, fixed wireless access, cable and mobile broadband. About 50% of fixed broadband connections are 2Mbit/s or below which is below the EU average of 60.8%.

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[101] Draft Commission recommendation on regulated access to Next Generation Access networks, 12 June 2009. See document Here

[102] Community Guidelines for the application of State aid rules in relation to rapid deployment of broadband networks, May 2009

[103] See OECD Broadband Portal Here

[104] Ibid

4.33 The incumbent, Sonera, is rolling out FTTB in 15 towns and cities and has upgraded its cable networks to DOCSIS 3.0. A range of alternative providers are also offering NGB services. Elisa offers FTTx in areas of Helsinki, and DNA are rolling out 100Mbit/s services this year by upgrading its cable networks and deploying fibre. Cable operator Welho launched DOCSIS 3.0 based services in August 2008. Municipal fibre provision is growing too. Nevertheless despite these deployments, take-up of very high speed broadband appears to be poor. According to the Finnish Ministry of Transport and Communications, only 1% of households in Finland subscribe to services with speeds of 100Mbit/s, even though they are available to more than a third of the country.

4.34 The Ministry of Transport and Communications' broadband strategy was issued in December 2008. According to this plan, connections of on average 1 Mbit/s would be part of the universal service as of 2010, and very high speed (100 Mbit/s) over fibre or cable should be available throughout the country from 2015. The Government suggests that the industry can achieve this target through ongoing network upgrades but has also pledged €11 million (US$14.3 million) a year for the period 2010-2015 to help operators reach the remaining 5% of the population. Government plans to partially subsidize the rollout appears to be targeted at preventing a 'digital divide' and will depend on whether the European Commission gives approval under state-aid rules. A decision is due in the summer of 2009.

Netherlands

4.35 The Dutch market is characterised by competition across a variety of broadband platforms which now include xDSL, FTTH, FTTC and cable broadband deployments. This has been driven through a combination of regulatory intervention to promote competition, investment by local communities (large and small scale) in FTTH deployments, the early roll-out of DSL based broadband by KPN (the incumbent) in 2005 and its move to now build a FTTH network (not to mention the competitive threat posed by very high cable broadband penetration).

4.36 In May 2008, Dutch operators KPN and Reggefiber agreed to enter a joint venture arrangement whereby they would merge their respective FTTH activities. Reggefiber FTTH, the name of the new entity, is 41% owned by KPN while Reggefiber holds the remaining 59%. Both companies have said the FTTH networks will remain open to other services providers. It was recently reported that the joint venture has run into finance difficulties and has called on the Dutch government to guarantee loans to help build the high-speed data network due to reluctance of foreign banks and investors to get involved. Reggefiber FTTH is now in talks with provincial and local governments in an effort to get them involved in the project.

4.37 As mentioned above, apart from opening up competition through regulatory intervention, there has also has been local municipality investment to support NGB roll-out. One such example is the Amsterdam city council's Citynet initiative whereby, together with investment from shareholders[105], it announced in December 2005 that it was commencing a fibre-to-the-home/premise deployment to deliver high-speed symmetrical broadband access. The project aims to reach 37,000 households in Amsterdam in the districts of Zeeburg, Osdorp and Oost-Watergraafsmeer (representing approximately 10% of Amsterdam).

[105] The infrastructure is owned by the partnership GNA, whose shareholders are the municipality of Amsterdam, two private investors (ING Real Estate and Reggefiber), and five subsidiaries of social housing corporations. Investment provided by these parties amounted to €18m with the estimated total cost of the project being €30m.

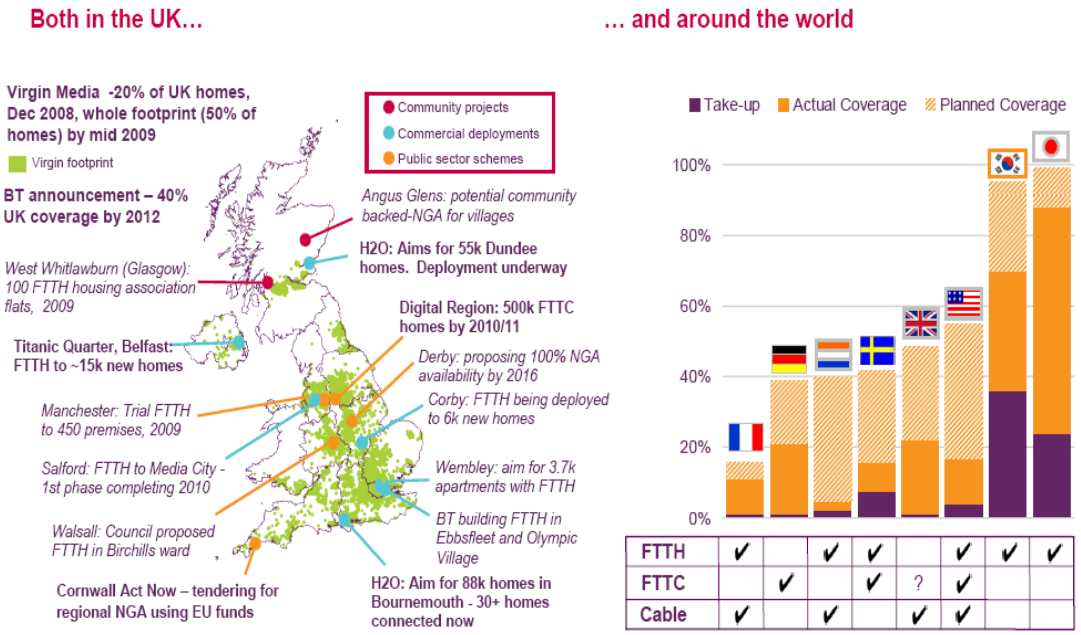
4.38 The network is managed by a separate company BBned[106], which acts as a wholesale operator providing open, non-discriminatory access to retail operators to offer TV, telephony and broadband internet access services. The services offered also compete with existing offers of cable and telecommunications companies such as KPN (the Dutch incumbent provider) and UPC (the incumbent cable provider).

4.39 The European Commission examined the project from a state aid perspective (and in the process also received a number of complaints from competing service providers) and following an investigation approved[107] the investment by the municipality of Amsterdam and other shareholders.

United Kingdom

4.40 The position with respect to the roll-out of NGB in the UK is illustrated in Figure 7. At present 20% of the UK's homes are passed by the Virgin Media cable network which is DOCSIS 3.0 enabled and this is expected to increase to 50% of homes by mid 2009. A number of community, commercial and public sector based schemes are also in train. BT has also announced its intention to have a FTTC deployment covering 40% of UK by 2012. In general, the market itself is already initiating steps towards the deployment of NGB networks, and Government and regulatory policy approaches, which are discussed below, are reflective of this.

Figure 7: Super High Speed Broadband in the UK[108]



4.41 In January, 2009 the UK government issued its interim Digital Britain Report[109] concerning the digital information and communications sector. In general, while seeking to remove barriers to competition, the Government encourages a market led

[106] BBNed is a private broadband operator, a subsidiary of Telecom Italia and was selected through a tender procedure.

[107] See European Commission State Aid Decision HERE

[108] Presentation by Ofcom to IIR Telecom Regulation conference, March 2009

[109] See Digital Britain Report

approach which relies on competition to deliver high speed broadband deployments. This approach is, in part, driven by the fact that operators are already rolling out NGB networks. Insofar as high speed broadband infrastructure is concerned, the highlighted objective in the Digital Britain Report is

- to upgrade and modernise digital wired and wireless networks so that Britain has infrastructure that enables it to remain globally competitive in the digital world. This is to be achieved through a series of actions which include
- the establishment of a Government-led strategy group to assess the necessary demand-side, supply-side and regulatory measures to underpin existing market-led investment plans; to remove barriers to the development of a wider wholesale market in access to ducts and other primary infrastructure;
- to consider whether public incentives have a part to play in enabling further next generation broadband deployment;
- the development of a Wireless Radio Spectrum Modernisation Programme consisting of a number of elements relating to the future use of 2G radio spectrum, availability of more radio spectrum suitable for next generation mobile services, provision of investment certainty for existing 3G operators and consideration of issues regarding the sharing of spectrum.

4.42 The final Digital Britain report[110] issued on 16 June, and amongst its recommendations are:

- to deliver universal 2Mbit/s broadband to all citizens by 2012. This is to be achieved via the availability of £STG 200 million and an open procurement/tender process.
- the creation of a Next Generation fund to finance the availability of NGB to the uneconomic areas of the country (estimated at approximately one third of the country). The fund, which will be based on a 50 pence levy per month on all fixed copper lines, will be available via a tender basis to any operator willing to deliver NGB in the designated areas.
- to pursue a number of spectrum initiatives to support mobile NGB roll-out, including a proposed extension to existing operators' Third Generation licences to indefinite rather than fixed terms; the timely release of additional spectrum.

4.43 On the 3rd March, 2009 Ofcom, the UK's communications regulator, also issued its report "Delivering Super Fast Broadband in the UK – Promoting Investment and Competition"[111]. The document outlines Ofcom's role in supporting rapid and widespread investment in superfast broadband and the continued, critical role of competition in meeting consumers' needs. This statement notes recent industry investment in high speed broadband and focuses largely on plans for private sector led investment. It prepares the ground to ensure the regulatory environment promotes private sector investment and competition to bring UK consumers into a new era of super-fast broadband by making sure existing regulation is relevant to rapidly changing market circumstances. In this regard, Ofcom recently issued a further report entitled

[110] See Digital Britain – Final Report, June 2009

[111] Delivering Super Fast Broadband in the UK – Promoting Investment and Competition, 3 March 2009

"New Build Investment Guidance on Telecoms Regulation"[112] where it sets out its approach to how telecoms regulation in the UK will apply to new build investment. The core principles that Ofcom intend to apply relate to making markets contestable for all players, maximising the potential for innovation, ensuring equivalence and reflecting risk in investment returns and providing regulatory certainty.

Summary of intervention strategies

4.44 As is evidenced by the country experiences above, a range of intervention strategies are possible to facilitate NGB developments. These are summarised in Table 3 below and it should be recognised that such strategies can be implemented at national, regional or more local levels.

Table 3: Summary of Adopted NGB intervention strategies across a range of countries

Government Led Approaches
• investment either in terms of funding (fully or co-financing) or loans for infrastructure development, in some cases in return for the creation of an open access network. • investment in applications/content development. • availability of tax relief's for private sector led investment • providing private sector with access to government owned infrastructure such as ducting, sewers etc. • opening up access to bottlenecks in privately owned infrastructure typically through legislation requiring open access to internal building wiring or amendment of building regulations to require necessary communications infrastructure is installed in newly built houses and is made available on an open access basis to any communications service provider • demand aggregation initiatives whereby communities are brought together to create the critical mass required to encourage private sector NGB development. • national certification schemes and public information campaigns to allow consumers to check fibre network coverage (and suppliers) in their area. • making certain government funded services available online (e-health, e-education) and encouraging similar private sector enterprises to do so
Market Led Approaches
• regulatory authorities generally facilitating the promotion of competition by opening up access to bottleneck infrastructures operated by dominant operators (such as ducting, dark/'lit' fibre) • regulatory authorities approaches on the level and type (if any) of wholesale pricing regulation taking into account the degree to which SMP players open up their networks • regulatory authorities examining if and how NGB risks can be factored into wholesale pricing of NGB services • companies themselves opening up their networks and providing services on a wholesale basis to other parties

[112] New Build Investment Guidance on Telecoms Regulation, May 2009

- companies (including local municipalities) entering into joint ventures to build networks in order to share the risks of making the required investments. Such networks are then opening up voluntarily to other parties on a wholesale basis and provide non-discriminatory access.

Discussion and feedback

4.45 ComReg invites feedback from stakeholders and other interested parties on the analysis above where we have described a range of Government, market led and hybrid approaches to facilitating NGB roll-out.

Question 5: In what circumstances would any of the above (or other) approaches be appropriate in stimulating NGB roll-out in Ireland? How might such interventions safeguard the development of competition?

5 Next Generation Broadband Enablers and Inhibitors

5.1 This section explores the ranges of factors which can either enable or inhibit the roll-out of NGB networks. Such factors principally impact market certainty (or uncertainty) and are driven by the inter-relationship of industry, Government and regulatory activities. The roles of these parties in facilitating NGB can be viewed in various ways but, in general, can be described as follows:

- the role of industry is to discover what goods and services consumers desire and to produce these in an efficient way
- the role of the regulator is to check that there are no market failures such as monopoly or anticompetitive practices, to take remedial action if it finds any, and to advise Government and assist in implementation, where appropriate
- the role of Government is to provide the policy framework within which the regulator acts, and to take such steps as it deems appropriate to bring about an outcome that it considers more socially desirable than what a competitive market would deliver.

5.2 Actions by these parties in the short term (either individually or collectively) will likely impact how the NGB landscape will look like over the next 3 to 5 years. For market-led investment in the development of NGB to actually occur, service providers need to be confident that there is sufficient consumer demand for high speed broadband services, to be sure that investment risk can be minimised (but not eliminated) and to be certain about the regulatory environment within which the existence of these networks will operate. Additionally, access to capital to fund the significant expenditure associated with the development of NGB networks is essential and all businesses are facing such challenges in the current global economic environment. The range of issues affecting NGB developments are discussed below.

Market certainty

5.3 There are many different sources of uncertainty which impact NGB development. Many such uncertainties faced by those contemplating investing in NGB networks are clearly not related to any positions that a sectoral regulator, such as ComReg, may take. Furthermore, they are exacerbated by current financial and economic conditions on global markets generally.

5.4 The first of these uncertainties lies in the unknown quantum of consumer demand for NGB services. A key element in any business case for investment in telecommunications networks and service provision is the prospective demand for any services offered. Consumer demand for NGB is a derived demand that relates to the bandwidth intensive services that can be delivered over the networks of the future. Absent the existence of such networks, there are reduced incentives to develop the next generation of services upon which consumers will place a high value. Moreover, the inherent tension between the network builders/owners and the service innovators (much of which remain unresolved) is such that the NGB development world may remain relatively static in the medium term.

5.5 A recent consumer survey by the Finnish regulator[113] found that almost three quarters of consumers with internet access state that a 1Mbit/s connection is sufficient even

[113] See Here for details on Finnish Survey.

though nearly half the country's households can access 40Mbit/s connections. We have also seen evidence of an NGB supply-demand gap in the experiences of Japan and South Korea. Notwithstanding the existence of an NGB network, these cases highlight that consumers will not necessarily use it unless they see a compelling need to do so. This need typically manifests itself in the desire to use a key service or application which requires NGB (a derived demand). Such uncertainty of demand and its impact on the business case is a key factor for an investor seeking to develop a NGB.

5.6 This lack of strong and predictable demand is a key challenge for broadband providers. In this environment broadband providers need to consider whether it is more cost effective and efficient to act, on the one hand, as a provider of broadband access only (a "dumb pipe" approach) or, on the other hand, as both a provider of broadband access and services/content/applications. In the latter case, this will typically be achieved through partnerships with content and application providers or to offer integrated packages of broadband access bundled with 'over-the-top' services such as IPTV, online videos and music, security and online storage to drive higher average revenue per user.

5.7 Uncertainty regarding the arrival of advanced services which will be delivered over NGB networks also impacts this demand issue. Whilst the supply of NGB networks is a local phenomenon, availability of such services will be predominantly driven by the global market. Once the global development of NGB networks reaches a certain critical mass, the incentives to develop advanced services will also be created. It is also probable that the existence of NGB networks will give companies located in certain geographic areas a competitive advantage as they begin to develop services to be provided over NGB networks.

5.8 Together, the intertwining of the uncertainties associated with both consumer demand and applications availability are accepted by many commentators to be the main reason why the roll out of NGB throughout the world is only tentatively emerging. Consumers may not see the value of adopting NGB services if they perceive that the current range of commonly-used applications such as email, web browsing/searching, online shopping and online banking does not necessitate their switching to a higher bandwidth service. On the other hand, network service providers do not want to invest the significant sums involved in developing their networks, unless they can be sure that consumer demand will bring in the necessary revenues to support such investments. Equally so, content and applications providers rely on both consumer demand for their services and the broadband network operators to provide the underlying infrastructure over which their services are delivered to consumers. This creates a circular dependency between content availability, user demand and network investment by industry – industry will not invest unless it is sure users will want to pay for services while users will not take up higher bandwidth services unless they see the benefits of doing so in terms of access to enhanced content and applications.

5.9 Another unresolved issue is the tri-partite relationship between the network owner, the end consumer and the suppliers of "over the top" services which are provided over the network. The NGB service provides a platform for the developers of services and the owners of content to sell their services to consumers. However, this creates a burden for the network (in terms of increasing use of bandwidth) and a potential disjoint between the quality of service that the consumer expects and that which can be delivered on a best efforts basis by the network provider. How does this get paid for? What, if any, is the contractual relationship between the access provider and the content

producer? What is the consumer's willingness to pay for the necessary network upgrades? Will consumers resist more complex pricing models? Will personalised advertising help bridge the gap? These uncertainties must also be addressed by any business making investments in NGB. The debate around these issues is often heated and vexed. However, in a different context, the firms that supply electricity to consumers gain year on year through increased electricity usage by consumers as more and more electrically dependent products are developed. Such a solution is a decentralised one - it allows consumers to add products to the network and firms to develop such products without any involvement of the network provider (providing the network capacity is there to meet such demand).

5.10 A further critical uncertainty exists as regards the strength of the competitive interaction between fixed line and wireless (both fixed wireless and mobile wireless) NGB solutions in the medium term. It is clear that fixed line broadband speed capabilities are currently above those of wireless networks. However, there may be a limit to how much speed any household will likely require (or be willing to pay for). In this respect, as wireless broadband capabilities increase in the future, wireless broadband providers may pose a threat to the fixed line broadband sector. This is even more so when we consider the size and the nature of the costs involved in developing such networks. Rolling out fixed line NGB networks is a very costly proposition. If, in a number of years time a good wireless substitute emerges (and is adequately deployed so that its functionality is maximised to meet user needs), then there is a risk that the investment in fixed line NGB access could be stranded.

5.11 This tension between fixed and wireless NGB solutions is not unrelated to the question of market definition within the context of the *ex-ante* market analysis and review process[114]. Within this process the question as to whether current generation (HSPA) mobile wireless broadband access can act as a substitute for fixed broadband access in the medium term is being considered. The preliminary view so far is that they are not in the same market today, but the possibility does nevertheless exist that they could be in the future.

5.12 How can we expect companies that are contemplating investment in NGB to react to the various uncertainties set out above? In the face of such uncertainty it is often better for investors to wait to see how the uncertainty unfolds before investing. Making a large irreversible investment decision under considerable uncertainty today is not very smart if much of this uncertainty will be resolved tomorrow. In technical terms, there is an 'option value' associated with having the opportunity to postpone the irreversible choice. Put the other way, companies may consider that they need to be compensated or be given a financial incentive to invest now in the face of such risks. Such risks did not arise in relation to NGN core network developments, as these investments would pay for themselves in terms of increased efficiencies across the network as a whole, within a reasonable period of time and without regard to when all the uncertainties outlined above would be resolved.

Competition

5.13 Another area that can impact market-led NGB investment relates to competition. Society has a large vested interest in competitive communications markets. Markets

[114] This is the process established under European Law according to which communications regulators must examine a number of pre-defined markets (set by the European Commission) to assess whether or not these are competitive and, if not, to impose obligations on service providers found to have dominance in such markets.

where companies have no guarantee that they will be able to retain customers are driven by competitive pressures to continually upgrade and improve their networks and services. It is only by such efforts that companies can ensure their long run survival. Companies themselves have the opposite interest and may strive to reduce the competitive threat (within the law) that they face in so far as they can. While a lot depends on the market power of the company in question, some forms of company response to the threat of competition are appropriate, while others can be 'abusive' in terms of their ability to inhibit competition, making society worse off both today and even more crucially in the future. ComReg's role as regulator and competition enforcer is to ensure that, if anything, the competitive dynamic is increased.

5.14 Competition, and the threat of competitors making crucial investments first, drives companies to front load investment decisions in NGB. In these circumstances, companies fear that they will cease to exist if their competitors make the NGB investments and consumers have a strong preference for their advanced services. In some instances, this fear over-rides the incentives to delay investment. This is because whilst there is a probability that the uncertainty will be resolved so as to 'strand' NGB investment that has already taken place to upgrade networks, the certainty that your business will have no future in the sector, if a competitor is making investments, drives companies on. This competitive tension is felt not only across the fixed and wireless broadband sectors, but also amongst competitors operating within the same sector.

5.15 With many operators having access to spectrum, the conditions of competition amongst wireless operators should be such that firms will race to be the first to offer services and hence bolster their market position. Others will follow as the demand for the new services becomes more mass market oriented. In this manner, we can expect that wireless solutions should be rolled out quite quickly, subject to sufficient spectrum being made available.

5.16 Concerns may arise in relation to wireless NGB in that the incentives for firms to share infrastructure[115], and perhaps spectrum, may see them co-ordinate their investment decisions. This could potentially weaken (or remove) incentives to get to the market first and can give rise to competition law concerns. Each case must be examined individually to assess such issues including how such co-operation could receive competition clearance, absent guarantees on, for example, early roll-out.

5.17 From a fixed network perspective, this competitive threat emerges in circumstances where there is a well developed cable network operator that is already making NGB investments. The steps taken by firms such as KPN in the Netherlands and Belgacom in Belgium have been responsive strategies to the actions of cable operators that (taken as a whole) have invested in their networks and have the ability to offer advanced NGB services (including well established content aggregation) to consumers.

5.18 It has to be accepted that the non-ubiquity of the cable network in Ireland and the need to make considerable investments in the network have, to date, considerably dulled the competitive threat posed to Eircom and other service providers. Nonetheless, recent steps to upgrade cable networks in Ireland may, in the future, raise the competitive tensions posed by cable broadband providers in certain geographic areas. This may force Eircom and other service providers to invest in the future but such an imperative does not appear to exist at present.

[115] Such incentives include lower operation costs and efficiencies gained through sharing of common infrastructure such as, for example, mast infrastructure.

5.19 In summary therefore, there should be good incentives for wireless and other operators to roll out networks capable of delivering wireless NGB, with the caveat that any need for infrastructure sharing does not give rise to competition concerns such as a co-ordinated decision to delay investment. To the degree that wireless services may become a substitute for fixed broadband in the future, then some competitive pressure may be exerted. However, many commentators do not see a future where the competitive constraint on fixed line broadband exerted by mobile wireless broadband is such that they can be seen to be in the same market. While future developments in this respect are uncertain, ComReg will continue to work to promote competition as this will inexorably add to the competitive dynamic as regards NGB.

Risk-sharing, investment and competition concerns

5.20 What emerges from the consideration of the risk relative to the likely benefits and costs (and how these can be captured) is that there may be a role for risk sharing both between communications firms but also with companies that expect to benefit from the ability to sell their services directly to consumers over NGB networks. This is not unique to the Irish situation, but can be said to apply, in a general sense, to NGB developments.

5.21 Of course, such actions cannot tackle the risks associated with the uncertainty of consumer demand, but can, nonetheless, significantly reduce others (such as different models for payment associated with access to the network) and allow others to be shared across a larger number of companies.

5.22 For any such co-operation to survive scrutiny from a competition law perspective, companies would likely need to agree to create an access company or model that would provide access to other parties on a transparent and equivalent basis to that provided by the access company to its own retail arm[116]. All firms would then be placed on an equal footing when seeking to address the retail market and those service providers that offered consumers better services would win out at the expense of others.

5.23 One such model is a joint ownership model whereby two or more parties agree to invest in, roll-out and jointly own the NGB infrastructure. In this way risk can be shared upfront and bring greater certainty to business models through improved cost efficiencies. Another model could be based on capacity usage commitments being made in advance of the rollout of NGB infrastructure. In this instance, no co-ownership is involved but operators can make binding commitments to use the infrastructure/capacity being rolled out by another operator in return for an indefeasible right of use at a price (which may or may not be regulated). Pricing could also differ depending on the level of commitment capacity utilisation. For the operator building the network, such an approach minimises uncertainty of demand and the risk of investment in assets being stranded through under use. For the operator making the commitment, the committed utilisation and associated expenditure can be treated as capital rather than current expenditure. An important protection would be the creation of a proper regime for capacity trading. This could lead to a reasonably competitive market emerging with such models having worked in other sectors and, to some degree, in communications markets.

[116] There are other models of access whereby the access network operator or operators do not operate in the retail market, but provide wholesale services to third parties on a transparent and non-discriminatory basis.

5.24 Of course, certain competition risks would exist but these could be managed in the normal manner under competition law, whereby, under the modernised competition rules that apply on an EU wide basis, companies have to satisfy themselves that their co-operation does not fall foul of competition rules. Oversight from an ex-ante regulatory basis would ensure general conformity with EU regulatory principles.

5.25 *Ex-ante* regulation on pricing may, in these circumstances, not be required. However, it would be naïve to believe that it could be completely dispensed with until such time as sustainable effective competition at both retail and wholesale levels emerged. Given the potential problems that could arise, ex-ante oversight undertaken by the regulator should help to ensure that the system operates in the public interest.

Regulatory risk

5.26 All market operators are subject to regulatory risk. For incumbents, this has two elements. First, will they be regulated? And if so, what form will this regulation take? For other authorised operators, the regulatory risks are the mirror image of the incumbents. For the owners of competing networks (actual and potential), the uncertainty relates to whether the fixed network incumbent would be regulated and, if so, what form this will take.

5.27 Dominant firms would obviously prefer to have complete freedom on whom to contract with and the terms of any such contract. Access seekers would prefer that the dominant firm had to negotiate with them in good faith and that the contract terms were such that they would not be inhibited as they compete with the vertically integrated firm. Access seekers would also prefer that failure to come to a mutually beneficial agreement would provoke a regulatory intervention.

5.28 Whether or not regulation is necessary can only be determined after the National Regulatory Authority (NRA) has carried out a relevant market analysis. Where this analysis finds that there is not effective competition and obligations must be imposed on dominant operators, NRAs have obligations under EU law[117] to take into account the risks taken in the initial investment when granting access. Although there may be different views on what this means in practice, it should give some comfort to dominant service providers if they find that their new access networks will be regulated.

5.29 ComReg does not see its role as acting on behalf of either side, but rather sees its role as protecting the wider public interest. In a world with networks already rolled out that are substantially depreciated, this translates into a strong desire to see competition introduced and nurtured, with appropriate investment incentives also falling within this context. As regards the rollout of NGB networks and guaranteeing competitive provision of services over these networks, ComReg has to balance the desire to see the networks rolled out in a timely fashion, with the potential that a new monopoly could be created (with all the attendant harm that this would bring to consumers and society generally).

5.30 In such a dynamic setting, ComReg must clearly modulate its response to market developments. If there is a significant danger of the old monopoly re-emerging, and the incumbent shows no sign of moving away from that mindset, then it would be important that ComReg maintain a heavy focus on competition.

[117] See Article 12(2)(c) and 13(1) of the Directive 2002/19/EC of the European Parliament and of the Council of 7 March 2002 on access to, and interconnection of, electronic communications networks and associated facilities (Access Directive)

5.31 However, if it becomes apparent that a new dynamic is emerging that has the support of the wider sector, then ComReg would have to respond in a way that would not inhibit such developments, whilst at the same time protecting ComReg's clear objectives of promoting effective competition, investment and innovation.

5.32 Heretofore, much of the discussion of how to regulate NGB has focused on an uplift in the Weighted Average Cost of Capital[118] (WACC) on a per project or an enterprise basis. This provides for a higher revenue stream for the investor without really re-distributing the risks amongst the players. Crucially, those seeking access to the regulated network would still be able to turn their back on the market if demand does not materialise, thereby leaving the incumbent to bear the entire investment risk.

5.33 Another way of dealing with the issue would be to require a menu of access options to be made available by the network operator to other players in the market. A low level of future purchase commitment through, say, month to month access (which carries a large inherent option value), carries a low level of risk for the purchasing service provider but does not provide any security for the network owner. In such a month to month scenario, the low level of risk sharing could be reflected in a higher monthly access charge. Additional charges could be reduced as firms take up longer term contracts (and hence take on more of the risk).

5.34 A developed series of access options is what one would expect in any properly functioning market. Such an outcome may result in a greater role for self enforcement with the nature of regulatory oversight required being appropriately tailored to the situation. Though not appearing to be the most likely of outcomes in the current dynamic, it is one that ComReg would clearly welcome and one that ComReg would see as both in the long-term interests of consumers and firms with an interest in the sector.

5.35 Failing the emergence of a richer set of commercial contracts, ComReg would be faced with the need to intervene to set access terms. Whether, this would go as far as setting price, would depend on the particular circumstances that had to be faced at that particular time. If controls on pricing were necessary, then a range of issues relating to WACC uplifts etc. also come into play.

Demography and other factors

5.36 It is also worth noting that a country's demographic situation can be a significant factor which impacts both the scale (what part of the country) and mix (what technology is deployed) of NGB network deployments. These, along with other factors below, have also been recognised by the European Regulator's Group (ERG)[119] as affecting the mixture of technologies to deliver NGB services.

- copper local loop and sub-loop lengths;
- customer density and dispersion;
- presence of multi-dwelling units, and

[118] The Weighted Average Cost of Capital ('WACC') provides a measure of the appropriate rate of return on capital or investment employed in the production of retail and wholesale services regulated services, as well as calculating the return on capital employed in the regulated accounts.

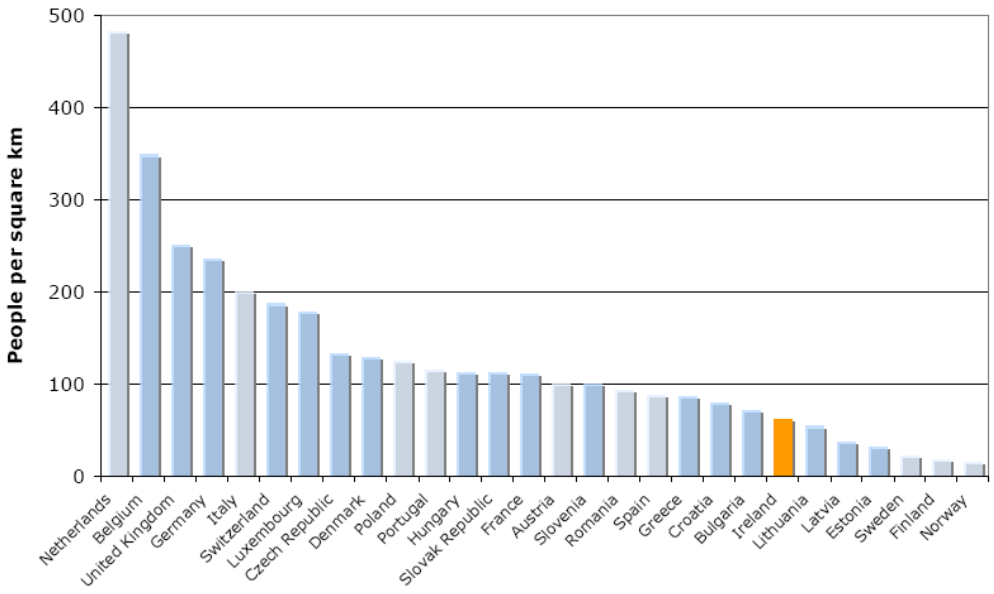
[119] See ERG Opinion on Regulatory Principles of NGA, 2007

- quality and topology of existing network architecture, in particular the number of street cabinets per MDF and available capacity of facilities such as ducts

5.37 It is population density that will drive the economic case for the provision of NGB, with the business case for rolling out such networks improving the greater the potential number of customers reached. Section 4 has already highlighted a number of country experiences with respect to NBG rollout. It is worth noting that, Japan, which has a fibre coverage of approximately 88% of all households, has 81.9% of its population residing in urban areas with a population density of 484 persons per square Km. In the Republic of Korea, where fibre coverage extends to approximately 80% of homes, apartments account for 48% per cent of the housing stock and provide dwelling for 40 per cent of its population.

5.38 In comparison to these and other countries, Ireland has a somewhat unique population density position. In summary, and as highlighted in Figure 8 below, with just 60 people per square kilometre, Ireland has a relatively low population density and sits in the lower quartile when compared with other countries. At 39%, a high proportion of our population live in rural areas[120].

Figure 8: Population density in Europe, 2007

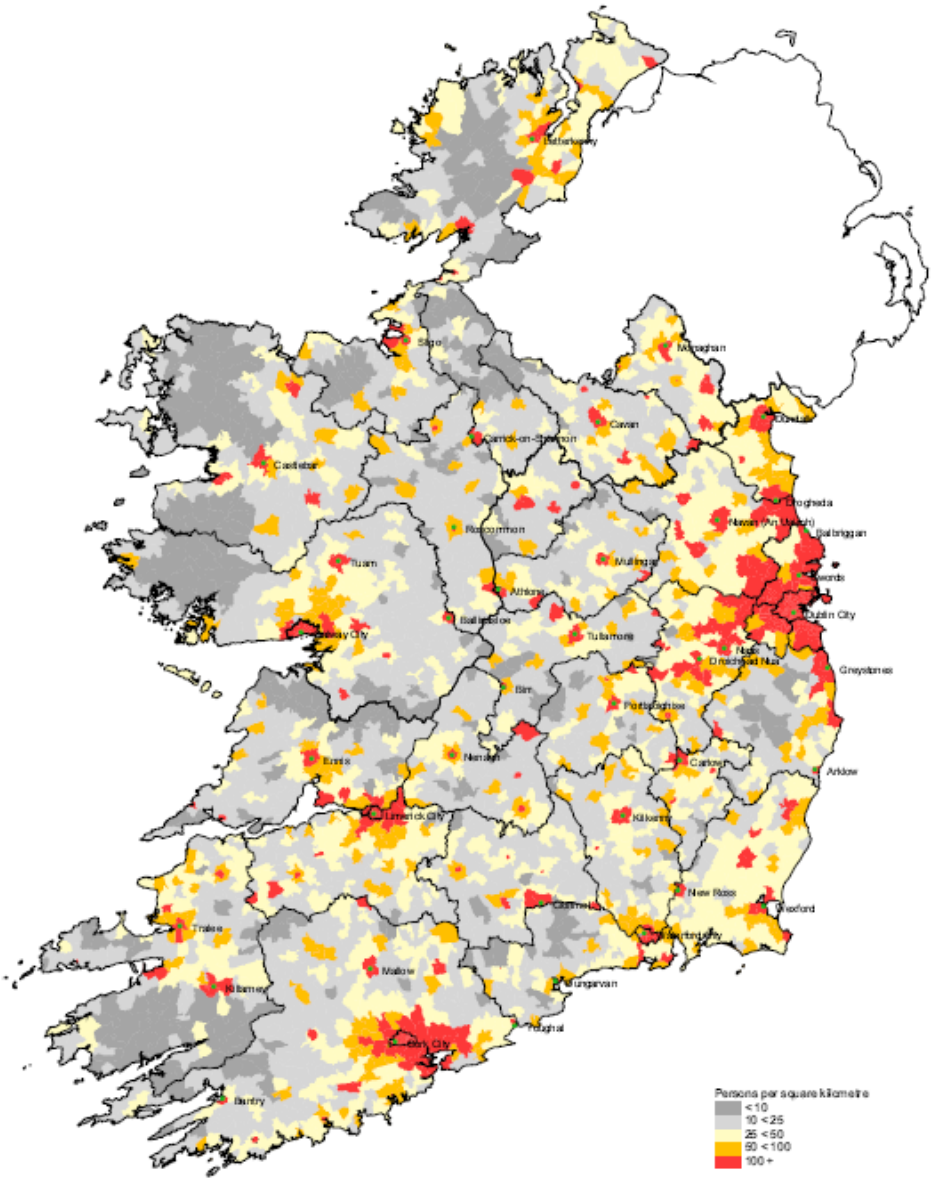


Source: World Development Indicators, 2007

5.39 Furthermore, looking specifically at the distribution of population within Ireland, as evidenced from Figure 9 below, population is largely concentrated in the major urban centres.

[120] Source: World Development Indicators 2007. In comparison, the UK has 206 persons per Km^2, with 10% located in rural areas with which there are 105 persons per Km^2; the Netherlands has 395 persons per Km^2, with 18% located in rural areas within which there are 250 persons per Km^2; Denmark has 126 persons per Km^2, with 14% located in rural areas within which there are 30 persons per Km^2;

Figure 9: Population Density in Electoral Divisions, 2006[121]



5.40 In terms of how NGB deployment may occur geographically, parallels can also be drawn from the experiences in relation to the provision of current generation broadband in Ireland where the market decided that certain areas of the country were uneconomic to serve (with broadband availability in these areas now being addressed under the National Broadband Scheme[122]). In an NGB context, a similar gap may emerge, but only when NGB roll out has occurred will it be possible to identify under served areas. Nevertheless, it is likely that NGB will only be economic in higher population density areas, with the mix of technologies being deployed reflecting differing population/building densities. At the relevant time, it may be a matter for Government to consider whether it would be appropriate for some form of State intervention to bridge persisting gaps.

[121] Source: Central Statistics Office. See Here

[122] See www.dcenr.gov.ie or HERE

Government policy

5.41 Government policy can also play a critical role in supporting the development of NGB which, in turn, can support broader Government policy objectives such as wider economic competitiveness.

5.42 Section 4 has already discussed a range of approaches that have been adopted by Governments in other countries, with specific measures set out in Section 4.44. In an Irish context, a Government policy paper on Next Generation Broadband was issued by the Department of Communications, Energy and Natural Resources (DCENR) in July 2008.[123] The document set out both a vision and a framework to facilitate private sector investment in next-generation broadband networks, as well as discussing whether there might be a need for public sector investment in provision of broadband. It also investigated ways in which government could be a driver of demand for next-generation broadband. On 22 June last, the DCENR issued the follow-up to its consultation document with the publication of its final policy document setting out its policy framework for NGN Broadband development[124].

5.43 The document, "Next Generation Broadband: Gateway to a Knowledge Ireland" identifies next generation broadband as a key enabler for the 'smart' economy to drive national and regional competitiveness. It then sets out a broad vision and framework to facilitate private sector investment in next-generation broadband networks, as well as discussing ways in which the government can intervene to help drive roll-out of next-generation broadband. The document identifies several key Government commitments to facilitate NGB deployments and take-up by consumers and enterprises including:

- Government investment to provide universal access to broadband by the end of 2010 including spend of €79.8m on the National Broadband Scheme (overall €435m in total has been earmarked for capital investment in telecoms related projects).
- By 2012, Ireland's broadband speeds will equal or exceed those in comparator EU regions.
- 100 Mbit/s per second broadband connectivity to be introduced to secondary schools on a phased basis.
- Major public infrastructure projects will have to install ducting at the construction phase. Government will establish a one stop shop to provide service providers with flexible and open access to existing and future ducting infrastructure.
- The DCENR is to develop necessary legal provisions on access to road ducting and legislation is expected to be introduced into the Dáil in June 2009[125]. Standards are to be developed that will require new premises to have open access fibre connections where practicable
- The DCENR also noted that ComReg intended to publish a paper on the regulatory framework for supporting investment in Next Generation Access Networks.

[123] See DCENR website www.dcenr.gov.ie with document available Here.

[124] See www.dcenr.gov.ie or Here

[125] Speech by Minister for Communications Energy and Natural resources to the Telecoms and Internet Federation, 22 May, 2009.

- The Government will continue to support allocation by ComReg of spectrum to encourage trialling and development of flexible new mobile technologies.
- Establishment by the Minister of a Task Force on Next Generation Broadband

5.44 ComReg will continue to support the DCENR's policy initiatives in the above areas.

Demand aggregation and user networks

5.45 Demand aggregation can be used by public-service institutions (e.g. libraries, schools, government services) both to create a critical mass to stimulate broadband provision and to provide a means of wielding public-sector buyer power to reduce the costs of NGB broadband service provision. Demand aggregation, particularly at Government department, state body and other institutional levels could help stimulate the roll-out of NGB infrastructure where there would not otherwise appear to be sufficient critical mass to underwrite the required investment, and where commercial operators are not able to address the demand themselves. Such initiatives have the effect of lowering the risk profile associated with service provider risk. In such a case there would be spill over benefits to all consumers and businesses within the relevant area, as they would also be potentially able to access broadband as a result of the infrastructure roll-out facilitated by the demand aggregation programme.

5.46 In the education sector, HEANET's extensive investment in a private super-fast dark fibre broadband network has enabled it to offer 10Gbit/s connections to third-level institutes and some primary and secondary schools nationwide as well as international gigabit links to international academic networks. This is an example of where demand aggregation has led to the provision of high speed broadband resulting in support for innovation, not only with regard to delivery of third-level education to students, but also in terms of facilitating commercialisation of academic research and development.

Application driven demand

5.47 As well as helping to aggregate demand, linking demand to specific applications and content which can only be delivered by high-speed broadband, can encourage consumer demand for advanced broadband capacity. There are indications that entertainment is one of the key early drivers of fibre deployments. Informa suggests that "operators see IPTV as a crucial service for FTTx."[126]

5.48 High speed broadband offers the potential to use a wide variety of new bandwidth intensive services, including services that require high upstream bandwidth. Some of the services which are associated with high speed broadband and are becoming increasingly popular have already been identified in Section 2 and include interactive online gaming, high definition TV, video on demand, home monitoring, video messaging and video conferencing, e-education and e-health.

5.49 Informa[127] has suggested that while applications and content that demand very high speed bandwidth are not widely available at present, there are some potential areas in which service providers could focus their research and development efforts in the short to medium term. Such applications include remote home-monitoring, storage and video-calling services. Two such applications are highlighted here:

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[126] "Fiber-to-the-x: Operators must look beyond their core cash cows to find the fiber pot of gold", Informa, 23rd October 2008

[127] Source: Informa UK Ltd 2008, Broadband Intelligence Centre

- **E-health**: Several initiatives allow elderly and vulnerable people to access e-care, while patients in remote areas can talk to healthcare professionals without leaving their homes. Several third parties offer these services in Scandinavia, while Deutsche Telekom is trialling a health monitoring service in its T-City 'city of the future' project in Friedrichshafen. Ovum has also carried out some research recently for the Fibre to the Home Council in Europe which looks at a number of healthcare initiatives over fibre in Sweden.[128]
- **Intelligent home networking**: BT claims that one of the main benefits of fibre will be in intelligent home networking, using some of the bandwidth provided by FTTx to deliver content around the home to different devices. Telekom Slovenjie in Slovenia is also working with a building company to ensure that new MDUs (multi-development units) are as conducive as possible to future home networks.

5.50 However, there is also an opportunity for Government departments and public agencies to develop unique and useful content and e-government services delivered over very high-speed broadband connections in the areas of e-education, e-health, e-planning, social services and e-tourism, to name but a few sectors.

5.51 Development of strong educational content, particularly using multimedia such as video streaming and HDTV, which supports the school curriculum and encourages more active engagement with learning technologies among children and their teachers will be crucial to ensure that the coming generations are fully conversant with broadband and see it as a key tool in their lives. In this regard, ComReg welcomes the National Council for Curriculum & Assessment (NCCA's) development of a framework for the use of ICT in schools.

5.52 The provision of broadband connectivity to schools has been a welcome development, although as a platform for the delivery of educational services it needs to be supported by the provision of appropriate content, equipment and training, and the capacity and speed of broadband access will need continuing evaluation.

5.53 The recent Digital Futures consultation by the Institute of European Affairs[129] suggests that the advent of broadband has enabled the development and diffusion of technologies such as social networks (Facebook, LinkedIn), wikis and blogs as well as facilitated greater use of e-commerce and online sales through channels such as eBay, thus generating strong consumer demand for and usage of broadband. The presence in Ireland of many of the key players in this space such as Google and Facebook provides excellent opportunities for research and development partnerships between indigenous companies in the digital media and content industry, broadband providers and software industries.

5.54 The rise of companies such as Skype and Google who, amongst other things, offer services as complements to or over the top of broadband access, indicates that innovation in the internet world is not found solely at the network layer. Consumers and businesses will use services that add value to their lives. New business models such as that of Apple's Applications Store allows developers and micro-enterprises to receive recurring revenues from applications and content without having to incur high development and advertising costs. Google Maps and Skype's internet calling services

[128] Ovum (2008). Fibre: the socio-economic benefits, research commissioned by the FTTH Council Europe and available at: http://www.ftthcouncil.eu/documents/studies/Socio-Economics_Study.pdf

[129] http://www.iiea.com/digital/report/interior.pdf

have demonstrated that they offer value for consumers and have in themselves driven demand for broadband. Similar models can be adopted and exploited by enterprises in Ireland, be they micro enterprises or SMEs, to both create employment and wealth in Ireland (thus creating incentives to invest in NGB) and also improve demand for NGB.

5.55 The integration of NGB applications such as high definition video conferencing and telepresence into businesses is an encouraging area of business innovation, as a means of enabling more environmentally-friendly and efficient ways of working, and thus boosting productivity.

5.56 However, there is evidence to suggest that once businesses embrace broadband, this enables new ways of working. Based on a survey of enterprises in Ireland, which was carried out in June 2007, the CSO[130] found that: "Enterprises who use broadband are more than three times as likely to have employees who e-work and they are also more than twice as likely to make purchases by the internet or EDI." In general, enterprises that use broadband show greater levels of e-business activity and higher degrees of integration of their ICT systems which can result in greater cost and process efficiencies.

5.57 Therefore, to stimulate increased usage and better integration of broadband into business processes, broadband providers and other ICT service providers could continue to focus on ways to increase levels of e-business intensity in Ireland, rather than merely selling broadband access to businesses. Government and state agencies also have a key role to play in developing innovative e-government services to businesses. In this regard, it is worth noting the Department of Finance's recent initiative[131] which requires all Government Departments, Offies, Agencies and non-commercial public bodies and authorities to, amongst other things,

- appoint an officer to liaise with the Department of Finance regarding all e-government matters
- consider the use of central operations where they enhance the provision of information to citizens and businesses
- develop a list of ongoing, planned and potential e-government projects and to develop plans for these
- ensure all e-government proposals and projects comply with the terms and conditions of ICT guidance as provided

5.58 The Government has also issued guidance[132] for IT and telecommunications expenditure on projects, systems and infrastructures in the public sector.

5.59 There have been some initiatives by industry in Ireland to drive development of new internet applications. Eircom's Web Innovation Funds scheme[133] is one way in which industry is exploring ways of stimulating development of next-generation internet services and applications. ComReg also notes the Telecommunications and Internet Federation's (TIF) commitment "to promote investment and innovation in NGNs through open communication among those involved in the telecoms industry in

[130] CSO. Information Society and Telecommunications 2007, available Here

[131] See Department of Finance circular 06/09: Arrangements for e-Government which is available Here

[132] See Department of Finance circular 02/09: Arrangements for e-Government which is available Here

[133] http://labs.Eircom.net/

Ireland".[134] Such a commitment could be extended to investigate the possibility of co-funding demand-side initiatives for NGB services.

Consumer engagement

5.60 Well-informed and empowered consumers are best able to engage with service providers and demand price, choice and quality. A broad range of stakeholders have a role in informing consumers about NGB developments and its benefits/costs. These include industry itself (including broadband providers and those relying on such networks to deliver their services), relevant Government departments, State agencies/institutions and consumer representative organisations.

5.61 ComReg, for its part, will continue to promote consumer awareness by providing accessible, appropriate information to consumers such as our price comparison website www.callcosts.ie. Informed consumers drive innovations by operators which in turn stimulate demand for NGB.[135] ComReg's role in this space is to inform consumers and thus create awareness of developments in the market by means of information notices and position papers that outline the potential of various new and developing technologies.

5.62 The task of regulation, generally speaking, is made easier if the market is well informed about the choices of technologies and services that are available to users and to network and service providers. Information on the current state of the market will continue to be provided through our market commentaries and consumer experience of broadband will continue to be explored via our regular user surveys. We will also continue to work with the broadband industry to improve the process of switching broadband provider. Consumer awareness of both advertised and actual speeds delivered by broadband providers is relatively poor in Ireland. ComReg's most recent consumer research in this area[136] found that half of all those consumers with broadband access did not know what contracted download speed they were paying for. In this respect, ComReg has provided information on speed testing software via its consumer website www.askcomreg.ie and is currently engaging with the industry regarding standards and information on broadband speeds.

5.63 There are a number of potential barriers which may impede consumer engagement with NGB products and services. As broadband adoption has increased and consumers have embraced such innovations as social media and networks, new policy and regulatory challenges are emerging relating to digital media literacy, online trust and confidence, security, privacy, network neutrality[137], piracy and cyber-crime.

5.64 The International Telecommunications Union's *Measuring the Information Society* (2009) and, in particular, its ICT development index[138] examines the level of advancement of information and communication technologies (ICTs) in more than 150 countries worldwide and compares progress made between 2002 and 2007. ICT

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[134] As set out in TIF's paper on Principles to inform the development of Next-generation Networks and Services"(October 2008)

[135] See section 5 of ComReg's Spectrum Strategy Statement 2008-2010.

[136] See ComReg's Consumer ICT Survey Q4 2008 Here

[137] UK regulator Ofcom has defined network neutrality as "A way of processing data which does not differentiate between different bits of data when they move through the network, so that all traffic and all services (e.g. voice calls, web browsing, gaming etc) are given equal treatment"

[138] See ITU's ICT Development Index 2009

development is examined across three main areas: ICT Readiness (infrastructure and access), ICT Use (take-up and usage) and ICT Capability (skills). Overall, Ireland is ranked 18th and is one of the countries that gained most during the period 2002 to 2007. However, on the ICT capability sub index Ireland ranks only 25th [139]. If Ireland is to maximise the impact of its overall ICT use, the area of skills development is one which may need to be addressed in parallel with a move to an NGB environment.

5.65 Another areas relates to t the potential for online identity theft, cyberbullying and fraud which has the potential to increase as consumers share ever-increasing amounts of personal data with social networks such as Bebo and Facebook, as well as e-commerce providers. The popularity of peer to peer networks coupled with the lack of sustainable business models to sell content such as online newspapers, music and video on the Internet has led to huge increases in sharing of pirated content. This, in turn, has led to reluctance on the part of content providers to share their content over broadband networks. The always-on nature of broadband also increases the security risks to users. Most of these issues are the responsibility of law enforcement agencies in Ireland. However, ComReg recognises that better consumer education and information can also help reduce these risks and will continue to provide relevant information via its websites and in consumer guides and other materials.

Discussion and feedback

5.66 ComReg invites feedback from stakeholders and other interested parties on the analysis above where we have described a range of NGB enablers and inhibitors. ComReg sees merit, at this time, in advancing a national debate on how we might look to accelerate deployment of NGB, over and above what the market looks likely to provide over the next 3 to 5 years. ComReg has the ability to influence some, but not all, of the NGB enablers and in the appropriate circumstances would be positively disposed to doing so.

Question 6: Do you consider that the issues identified are the main enablers and inhibitors of NGB developments or are other issues of greater relevance? Who are the key stakeholders who might be in a position to influence these issues and how might they best do so?

[139] While the figures to compile the rankings are based on adult literacy and secondary and tertiary enrolment (and are not specific to IT) they are used by the ITU as a proxy in the absence of comparable data for a large number of countries that would measure more specific ICT-related skills.

6 The Role of Regulation in Facilitating Next Generation Broadband Development in the Irish Market

6.1 As Section 5 has highlighted, there are numerous enablers and inhibitors of NGB, and by no means all of these relate to Government or regulatory activities. Section 4 has identified a number of markets for Government and regulatory intervention, drawn from experience in other countries. Section 3 has also described the position with respect to the provision of broadband in Ireland, along with some of the likely NGB developments by service providers. In light of the foregoing analysis, this section discusses the potential role that regulation can play in further facilitating NGB development.

Overview of ComReg's Regulatory Role

6.2 ComReg's approach is to provide regulatory certainty to industry in order to ensure that Ireland will experience timely and efficient wide scale, market led investment in NGB services. This is explicitly acknowledged in ComReg's Strategy Statement for 2008-2010[140] where one of its objectives is

> *"creating a supportive and predictable regulatory environment which enables industry and stakeholders to make informed decisions on future investment, roll-out and deployment of new technologies."*

6.3 From ComReg's perspective, it is important not only that regulation supports efficient investments in infrastructure development, but also that it facilitates the development of competition. ComReg's primary objectives[141] are to promote competition, to contribute to the development of the internal market, to promote the efficient management and use of radio spectrum[142] and to protect consumer interests.

6.4 Within this framework, a key objective of ComReg is to promote access to NGB (where warranted) in a way that promotes competition, innovation and efficient investment. A central tenet of the EU regulatory framework governing electronic communications is that competition is likely to be most effective where infrastructure investment is maximised. Service providers should, therefore, be encouraged to invest in the development of their own infrastructure, where it is efficient to do so. However, where infrastructure-based competition does not develop, regulation may be necessary to counter the adverse effects that a dominant service provider may exert in a relevant communications market. In such circumstances, regulation should promote the development of competition at the deepest practicable level within the network through appropriate levels of access regulation. Such access regulation not only requires a dominant service provider to provide wholesale access at various points within its network, but also requires those operators seeking wholesale access to make network investments of their own, where possible, rather than simply acting as resellers of services provided by a dominant service provider. Access regulation is typically effected by allowing competitors wholesale access to networks at a point or points as close as practical to the customer (in order to allow the competitor to utilise their own

[140] ComReg Strategy Statement for 2008-2010, ComReg Document 07/104

[141] ComReg's full objectives and functions are set out in the Communications Regulation Act, 2002

[142] See ComReg's Spectrum Management Strategy sets out ComReg's radio spectrum plans for the coming three years

infrastructure, where it exists).

6.5 This access based approach is often supported by a wholesale access pricing policy that encourages and incentivises infrastructure roll-out by alternative service providers. This is achieved by ensuring that prices for wholesale access prices are reflective of the level depth within the dominant service provider's network at which the wholesale access occurs. That is, the deeper (and closer to the customer) within the dominant service provider's network that the wholesale access occurs (and the more of its infrastructure that the alternative service provider has to employ) the lower the cost of wholesale access.

6.6 Where warranted, the achievement of the appropriate level of regulation necessary to ensure sustainable competition in a rapidly changing and dynamic sector such as electronic communications will be key to supporting the development of NGB. In this regard, ComReg has a range of regulatory tools available to it that can be applied in circumstances where a service provider is found to have Significant Market Power (SMP) in a relevant wholesale broadband market[143]. These tools include, for example, requiring access to the SMP operator's networks and/or the requirement to provide wholesale services, and setting requirements regarding the charges to access these networks/services.

6.7 The above objectives and functions are important guiding regulatory principles for ComReg, but they must be tailored to address the market situation faced by the regulator within the boundaries of European Law and Irish Law.

6.8 The main direct regulatory influences which can act as a positive driver for market led investment in the development of NGB networks are discussed below and include approaches on.

- Spectrum policy
- Regulation of access to networks of operators with Significant Market Power
- Regulation of the cost of access, including risk premium/risk reflective pricing where warranted
- Infrastructure sharing

6.9 However, it is important to emphasise that these regulatory influencers are but one driver of NGB developments and, in the absence of a confluence of the other drivers discussed in Section 5, are unlikely in themselves to be the solution to stimulating NGB investment.

Spectrum policy

6.10 Spectrum policy has and will continue to play a critical role in the provision of wireless and mobile broadband services in Ireland. Broadband services provided over radio spectrum currently accounts for 37%[144] of Ireland's broadband subscriptions and this percentage has been increasing over time.

6.11 Currently, Ireland's fixed wireless and mobile wireless broadband services are

[143] The European Commission has identified two broadband markets which are susceptible to ex-ante regulation, namely the Wholesale Broadband Access (WBA) market and the Wholesale Physical Network Infrastructure Access(WPNIA) market. See European Commission list of recommended markets here.

[144] See ComReg's Irish Communications Market Quarterly Key Data Report – Q1 2009

predominantly provided using two frequency bands, the 2100 MHz frequency band which is used to provide 3G mobile broadband services, and the 3400-3800 MHz frequency band which is used to provide fixed wireless broadband services under ComReg's Fixed Wireless Access Local Area (FWALA) licensing regime. Fixed wireless access is also provided in the 10.5 GHz and 26 GHz frequency bands, with the latter band also being used for backhaul in mobile networks. Equipment for 3G based technologies and WiMax are, for example, now being produced for deployment in other frequency bands (such as 3G services in the GSM 900 MHz band) and ComReg expects wireless broadband services to be provided over an increasing range of frequency bands in the future.

6.12 The next generation 3GPP LTE and WiMAX IEE 802.16m standards are being specified for a range of frequency bands. Looking at markets elsewhere, it is expected that Verizon Wireless in the USA will be the first to commercial deploy LTE in 2010 in the 700 MHz band. Other LTE deployments[145] are expected shortly afterwards in a number of frequency bands such as 2100 MHz (NTTDoCoMo in Japan), 2300 MHz (China Mobile) and 2600 MHz (TeliaSonera, Tele2 in Europe). ComReg is conscious of these global developments and ComReg's Spectrum Management Statement 2008 – 2010[146] has set out ComReg's strategy for making spectrum available to the market to meet this need.

6.13 ComReg's spectrum strategy has been devised in consultation with the industry and it outlines ComReg's plan for the release of additional spectrum to the market across various spectrum bands. This additional spectrum can facilitate the rollout of next generation wireless networks and provide consumers with higher speed broadband services. A number of these radio spectrum bands are below 1000MHz and, compared to the frequency bands currently used to provide mobile and wireless broadband services in Ireland, have good coverage propagation characteristics. The release of these frequencies will help to increase the geographic availability of broadband services throughout Ireland.

6.14 ComReg is currently implementing its Spectrum management strategy with a view to supporting competition in the provision of broadband services.

- In March 2009, ComReg issued its second consultation on the future use of the 900 MHz and 1800 MHz frequency bands which could be used for other services such as 3G and LTE[147]. This consultation has now closed and ComReg is considering the next steps in relation to these frequency bands.
- In March 2009, ComReg issued a consultation on the Digital Dividend in Ireland[148]. The consultation focuses on a number of key issues, including the option of clearing the 800 MHz (790-862 MHz) sub-band to accommodate uses other than broadcasting, exploring opportunities for sub-bands other than the 800 MHz sub-band, and the consideration of an innovation reserve within Ireland's

[145] See Global mobile Suppliers Association (GSA) website Here.

[146] See ComReg's Spectrum Strategy Statement 2008-2010

[147] See ComReg document, Liberalising the Future Use of the 900 MHz and 1800 MHz Spectrum Bands & Spectrum Release Options, March 2009

[148] See ComReg document Digital Dividend in Ireland - A new approach to spectrum use in the UHF Band, March 2009

digital dividend. This consultation is now closed and ComReg is considering the next steps.

- In April 2009, ComReg issued an information notice outlining the competitive licensing process associated with the release of additional spectrum in the 3400-3800 MHz band under the FWALA licensing regime[149]. The FWALA licensing regime currently services 116,461 broadband subscriptions, or 9.15% of Ireland's total broadband market[150] and the release of additional spectrum in this band will further help facilitate the development of wireless broadband services. ComReg is currently evaluating applications with a view to making licence offers by Q3 2009.
- ComReg has just issued a consultation on the release of spectrum in the 2300MHz band[151]. At the World Radiocommunication Conference 2007, this band was designated for use by IMT[152] allowing it to be used for mobile service. Globally, there has been significant interest in this band and Korea has already used this frequency band to deploy a variant of WiMax services under the Wibro brand, while China Mobile plans to deploy a significant LTE network in this band in 2011. The ComReg consultation discusses the future use of this band including options for release of spectrum to the market.

6.15 Through the above activities and, more generally through its spectrum strategy, ComReg will continue to facilitate the development of wireless based NGB services.

Open access to networks

6.16 ComReg is committed to playing its role in addressing potential uncertainties regarding risk sharing, investment and competition concerns to achieve effectively competitive NGB outcomes. One way in which ComReg can encourage efficient NGB investment decisions is through providing certainty regarding its approach to regulating access to networks of operators with Significant Market Power. Such regulation is primarily governed through the European regulatory framework which provides the basis for ComReg to intervene in broadband markets that are found not to be effectively competitive and to require dominant operators to provide appropriate levels of access to their networks.

6.17 As indicated earlier, the regulatory regime that could operate in a NGB environment can be flexible and could take into account issues such as the market dynamics and the degree to which competitive conditions are occurring naturally in the provision of open and non-discriminatory access to networks and services. A range of open access models and potential competition concerns[153] associated with them have already been discussed in a general sense in Section 5 (in the context of risk sharing) and, in an NGB context, such models include:

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[149] See ComReg document Releasing Channels E and J, and making spectrum in the 3.6 GHz – 3.8GHz band available for FWALA Licensing, April 2009

[150] See ComReg's Irish Communications Market Quarterly Key Data Report – Q1 2009

[151] See Consultation on Release of Spectrum in the 2300 – 2400 MHz band, ComReg Document 09/49

[152] IMT or International Mobile Telecommunications is a family of telecommunications standards for 3G networks as defined by the International telecommunications Union.

[153] Co-operation arrangements between parties need to be implemented in a way that does not give rise to anti-competitive co-ordinated effects

A. ownership models whereby access is provided on a wholesale basis only (thereby reducing incentives for discriminatory practices to occur through the favouring of a retail arm)

B. network owners which also operate in the retail market providing access on a non-discriminatory basis (along with other guarantees in relation to appropriate wholesale pricing so as not to give rise to any margin squeeze[154])

C. co-investment ownership models where only those parties that invest in the network gain access to it (subject to no SMP occurring).

6.18 Each of these NGB models (and their associated pricing conditions) may require a different response with regard to whether and how access regulation is applied, particularly where they are implemented in a way that eliminates competition concerns[155]. For example, where a service provider with Significant Market Power operating under scenario B provides a FTTH or FTTC network on an open access and non-discriminatory basis to alternative operators competing in the same retail market, this may then lead to a different regulatory response emerging that could result in greater freedom to set wholesale prices, subject to the application of an appropriate margin squeeze test. Similarly, an open access approach with each party having greater control over its own service could result in a different regulatory response. ComReg would assess the appropriateness of any proposed open access approach to ensure that it does not undermine competitive conditions.

6.19 ComReg is engaged in its review of the Wholesale Physical Network Infrastructure Access (WPNIA) Market which can be impacted by NGB developments and has set out is regulatory position in light of the current and expected market dynamic. ComReg has set out its preliminary view[156] that next generation access networks fall within the WPNIA market, and that Eircom should be designated as having SMP in this market. ComReg proposed that a range of regulatory obligations is imposed on Eircom, both with respect to its existing copper based local access network and also to deal with the potential impact of NGB developments (including fibre). ComReg's preliminary view is that the advent of NGB should not be allowed to lead to a restoration of monopoly conditions over the access network[157], given that the conditions of competition are expected to be the same where Eircom overlays or replicates its existing access network with fibre and NGB equipment.

6.20 The proposed approach to remedies in the WPNIA market analysis is specific in relation to current copper based services, with regard to both the obligations which will be imposed, and how the obligations will be implemented. In considering NGB

[154] A general description of a Margin squeeze is where the difference (or margin) between the price charged for access at the wholesale level and the retail prices charged by the network operator (who is also providing the wholesale access) is insufficient to allow an equally or more efficient third party operator to compete in the market.

[155] Issues such as the number of operators involved, the structure of any jointly controlled network or co-investment arrangements would need to be examined.

[156] See ComReg's Market review: Wholesale physical network infrastructure access (Market 4) - Response to ComReg Document 08/41 and Draft Decision

[157] Were there to be deployments of fibre infrastructure by Eircom in its access network, in the absence of competitive alternatives, there may be a continued risk of dominance in the access network. For example, in order to provide broadband, Eircom could move its equipment out of exchanges and into street cabinets located closer to end users. Cabinets are significantly smaller than exchanges and there is a risk that other operators wishing to compete with Eircom may not be allowed access to the respective cabinet.

services, the approach is specific only in terms of the principles of the obligation[158], but not in terms of their implementation. ComReg is aware that the business case for such investments is testing and investment funding is difficult to obtain in the current economic climate. Accordingly, while ComReg has clarified that it sees NGB as being subject to regulation, it nevertheless considers it prudent to be flexible in its detailed approach to regulation. Without prejudging any outcomes of the WPNIA market analysis exercise, the degree of intervention on NGB required will, in ComReg's view, depend to a large extent on the degree to which industry players, and Eircom in particular, approach the issue of wholesale access.

6.21 Work is already underway within ComReg in relation to its analysis of the Wholesale Broadband Access (WBA)[159] market and, if an operator is found to have dominance in this market, then similar issues in relation to regulation of access in this market may also arise.

6.22 If ComReg observes efficient and competitive conditions emerging in the deployment of NGB infrastructure and services, then this would clearly influence the adopted regulatory approach. ComReg would view the market led availability of open wholesale access, associated reasonable terms and a degree of industry consensus as indicators of the potential emergence of competitive conditions, with the need for and nature of any regulatory intervention being reduced accordingly. In order to precipitate any changed regulatory dynamic, this would clearly require any SMP operator to set out its intended approach with respect to the provision of wholesale services on its NGB network.

6.23 The approach proposed by ComReg in its WPNIA paper gives the greatest flexibility to the market to determine what products and services should be offered and on what basis, and offers the opportunity for NGB to be implemented following commercial negotiation. Provided this can be addressed in a manner which does not undermine competition, the position of consumers or indeed regulatory principles, a more flexible approach to the detailed application of the regulatory regime in an NGB context may be maintained. In this regard, it is always open to industry to approach ComReg with any proposal that it may have and these will be given due consideration on a case-by case basis.

6.24 ComReg will respond to any new industry dynamic that emerges and will provide further clarity regarding its regulatory approach to access in order to give investors confidence in the design of their business plans. In doing so, ComReg will have due regard to the European Commission's final[160] guidance for National Regulatory Authorities on appropriate regulatory responses for dealing with the roll-out of NGB networks.

6.25 ComReg also notes that the DCENR, in its policy paper, "Next Generation Broadband: Gateway to a Knowledge Ireland"[161] has indicated that it intends to build on existing

[158] Insofar as NGB remedies are concerned, ComReg has stated that these will include meeting reasonable requests for access, non-discrimination, transparency. See page 167-169 of ComReg's Market review: Wholesale physical network infrastructure access (Market 4) - Response to ComReg Document 08/41 and Draft Decision for the full list of proposed NGB obligations

[159] The WBA market is one of the six wholesale markets identified by the European Commission as possibly being subject to ex-ante regulation following an examination by National Regulatory Authorities.

[160] See discussion on European Commission's draft NGB recommendation in paragraph 4.26.

[161] See DCENR website www.dcenr.gov.ie or Here

collaborative initiatives to support the transition to NGB, and will form a Task Force, comprising industry, Government and ComReg to work collectively to ensure that the development of broadband will meet the demands of Ireland's Smart Economy. ComReg welcomes this initiative and looks forward to working with the DCENR and other stakeholders on the Task Force.

Wholesale access pricing and risk premium

6.26 One mechanism through which ComReg may influence the development of NGB networks is its regulatory response in relation to pricing for wholesale services[162] provided by SMP operators. To date, this has meant establishing the basis upon which prices are to be set and the setting of actual prices for access to Eircom's copper based wholesale broadband products such as Local Loop Unbundling and Bitstream.

6.27 Regulation of wholesale prices for NGB networks may only occur where first, access regulation of the dominant providers' networks is deemed necessary and, secondly, where access is mandated and wholesale price regulation is considered necessary and appropriate.

6.28 The emergence of NGB access options/models as discussed in paragraphs 6.17 and 6.18 can influence the nature of the regulatory pricing approach. For example, open and non-discriminatory access that ultimately leads to effective competition could result in greater freedom for industry to commercially agree wholesale prices subject to the application of an appropriate margin squeeze test in order to prevent any anti-competitive outcomes occurring. Another scenario which could emerge is where there are different access prices or option value pricing associated with upfront or long term volume commitments to purchase capacity on NGB networks. Such differential pricing need not necessarily be regarded as discriminatory and can, for instance, take account of whether the differential in prices appropriately reflects a reduction in the SMP operator's investment risk. Again, this would be subject to performing an appropriate margin squeeze test on competition grounds.

6.29 While some NGB pricing options that may emerge have been outlined above, it is also worth focusing on a scenario where, as is currently the case, detailed regulatory pricing requirements are set. In a regulated wholesale pricing scenario, ComReg has to establish what it considers to be an appropriate rate of return (known as the WACC[163]) that can be earned by Eircom in providing its regulated services. In doing so, ComReg must necessarily take into account the investment made by the operator and allow a reasonable rate of return on adequate capital employed, taking into account the risks involved.[164] ComReg is mindful that setting a WACC that is too low could make future investment unattractive to investors. Similarly, setting it too high would allow the regulated company to earn excessive returns at the expense of its wholesale and retail customers while also potentially distorting pricing signals to investors.

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[162] With the exception of retail narrowband access, PSTN and ISDN line rental, ComReg does not regulate retail prices

[163] The Weighted Average Cost of Capital ('WACC') provides a measure of the appropriate rate of return on capital or investment employed in the production of retail and wholesale services regulated services, as well as calculating the return on capital employed in the regulated accounts.

[164] According to Article 13 (1) of the Access Directive (2002/19/EC), National Regulatory Authorities ("NRAs") shall take into account the investment made by the operator and allow a reasonable rate of return on adequate capital employed, taking into account the risks involved.

6.30 ComReg has already indicated in its most recent review of Eircom's WACC[165] that, in principle, the existing WACC of 10.21% could be adjusted where appropriate to reflect the level of any additional systematic investment risk associated with particular fibre based NGB investment by Eircom[166]. A risk premium can be implemented in a number of different ways, including application of split rate WACCs and capital expenditure triggers.[167] While a differentiated WACC has the potential to improve incentives for investment by providing closer alignment of incentives with the underlying business risks, such an approach is likely to be warranted only where there is clear and compelling evidence of the existence of risk differentials between new and legacy investments[168].

6.31 ComReg is conscious that any approach that takes into account differential investment risk must not distort dynamic efficiency, such that it results in alternative operators and Eircom being less likely to make efficient NGB investments. ComReg also recognises that sustainable competition means that operators that have made efficient investments in building networks and launching competitive and innovative services, even where replicating the access network is not feasible, must make a return as well.

6.32 It is also worth noting that although, in principle, the potential riskier profile associated with certain NGB investments may be partially overcome by allowing for a risk premium on the WACC or, a differentiated WACC in setting prices for wholesale access, in practice, this may not be sufficient in itself to overcome the wide range of broader uncertainties associated with NGB investments. These broader uncertainties along with potential enablers such as risk and infrastructure sharing have already been identified in Section 5.

6.33 Eircom has so far made no positive commitment to the characteristics and size of the potential capital expenditure programme, if any, in NGB access (noting that investment has taken place in its core network) nor has it demonstrated what it sees as the additional risks that may be associated with such investments. ComReg has already indicated in its review of Eircom's WACC that it is open to re-assessing both the need for a risk premium for risky NGB network investments and the level at which that may be set. It is open to Eircom to present its case to ComReg in this regard and ComReg will examine each case on its merits.

6.34 Overall, therefore, the nature of the regulatory approach in relation to wholesale pricing for NGB services is dependent on decisions by Eircom (and other industry players) with regard to the timing and scale of its investment along with the nature of the proposed wholesale access model. In this regard, it is open to industry to present its proposals to ComReg who will examine each case on its merits. In doing so, ComReg

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[165] See ComReg document, Eircom's Cost of Capital, May 2008

[166] The European Commission draft recommendation on regulated access to NGA (referred to in this paper as NGB) networks, amongst other things, introduces the idea of a risk premium that would be linked to specific NGA projects.

[167] 'Split rate WACCs' are differential WACCs applied to different portions of the regulated business. 'Capital expenditure triggers' is a generic term for a regulatory measure that introduces financial rewards or penalties (or both) linked to the level and /or type of capital expenditure (capex) undertaken by the regulated company..

[168] Risks associated with legacy network investment have already been taken into account in Eircom's existing WACC while core infrastructure is generally considered to be self financing through cost-reductions due to the amalgamation of disparate technologies onto one alternative platform and as such do not attract a differentiated WACC.

will have due regard to the European Commission's final[169] guidance for National Regulatory Authorities on appropriate regulatory responses for dealing with the roll-out of NGB networks.

Infrastructure sharing

6.35 Infrastructure sharing and the issues around it have already been discussed in Section 5 in the context of risk sharing.

6.36 It is generally recognised that NGB infrastructure investments require significant capital outlay. Infrastructure sharing can provide one means thought which such costs can be lowered. The DCENR, in its policy paper, "Next Generation Broadband: Gateway to a Knowledge Ireland"[170] has recognised the critical role that State owned infrastructure can play in facilitating NGB developments. In this regard, the DCENR has committed to establish a 'one-stop shop' to provide service providers with flexible and open access to existing and future ducting infrastructure. An operational model for the one-stop-shop will be made available by the DCENR in the third quarter of 2009.

6.37 Against a background of considerable uncertainty, the potential for co-operation between service providers and other stakeholders in the area of shared infrastructure also exists to facilitate a more timely and cost effective NGB developments. While recognising that infrastructure sharing can play a role in reducing costs, increasing efficiencies and managing risk, there is a need to ensure that this does not occur at the expense of the competitive dynamic being contaminated. ComReg encourages operators to consider industry infrastructure sharing initiatives that would deliver NGB over the next few years and is open to assessing such initiatives so long as they are in line with ComReg's overall objectives, particularly the promotion of competition, and are implemented in a way that facilitates innovation and an ability for operators to differentiate their services. Properly set up and, if designed with the guarantees that ComReg sees as vital for the competitive process, the need for regulatory oversight would likely be greatly reduced. Such an outcome has the potential to represent a win-win situation for consumers and the industry.

6.38 In this regard, there have already been examples in the Irish market of infrastructure sharing. In 2002, as part of the 3G Licence Competition[171], the ODTR (now ComReg) indicated that it was keen to encourage sharing of radio transmission sites for 3G mobile and other radio-communication services, wherever possible, to ensure that innovative new services can be rolled out speedily and with a minimal environmental impact. It included a 3G site sharing code of practice[172] in the competition and stated that it was open to the wider sharing of infrastructure between operators in line with the infrastructure sharing guidance set out in the 3G Licence Competition[173].

6.39 Equally so, the potential exists under Section 57 of the Communications Regulation Act, 2002[174] for operators to negotiate agreements to share physical infrastructure with

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[169] See discussion on European Commission's draft NGB recommendation in paragraph 4.26.

[170] See DCENR website www.dcenr.gov.ie or Here

[171] See ComReg document "Four Licences to Provide 3G Services in Ireland - Information Notice"

[172] See ComReg Code of Practice on Sharing of Radio Sites, December 2007

[173] See section 4.4 of ComReg document "Four Licences to Provide 3G Services in Ireland - Information Notice"

[174] Communications Regulation Act, 2002, Number 20 of 2002.

other infrastructure providers. ComReg has the legal power to specify timeframes within which negotiations should take place, to intervene where there are disputes and to make decisions and impose conditions for infrastructure sharing.

6.40 Where access regulation (in the WPNIA market) is applied to an SMP operator's NGB network, the European regulatory framework also recognises that for the purpose of allowing alternative providers to deploy NGB networks, access to physical infrastructure such as ducts, manholes and poles may be required.

6.41 A range of case studies showing some infrastructure sharing approaches adopted elsewhere are set out below and present examples of models which could be adopted in an Irish context, always subject to satisfying competition considerations

Infrastructure Sharing Approaches - Case Studies

6.42 A number of country case studies examining some industry, government-led and regulatory approaches to infrastructure sharing are set out below.

France	
Problem identified	Major operators in France such as France Telecom, Neuf-Cegetel and Iliad, have all announced, or are in varying stages of deploying, FTTH networks in Paris and other large cities. In addition, some local authorities are also developing FTTH networks. There are regulatory concerns that there will be an emerging geographic monopoly, whereby the first operator to reach a building will lock in customers and displace competitors. Another risk is that too many operators will lay infrastructure and cause undue disruption.
Initiative	French regulator, ARCEP, believes it needs to open up France Telecom's ducts and make sure that the terminal part of the network is shared among operators. ARCEP's conclusion is that sharing the terminal part of the FTTH network would help to avoid these problems. In July, 2007 the regulator launched a consultation process on the issues associated with duct-sharing and sharing of FTTH terminating segments to customer premises. France Telecom published the terms under which other operators can access its duct infrastructure in September 2008, thereby satisfying the conditions of the market analysis carried out by ARCEP in July. The analysis required the incumbent to offer its rivals cost-oriented, non-discriminatory access to its ducts. In October, 2008 ARCEP published its final decision on how rival telecoms operators should share the last part of fibre networks that enter end-users' homes and businesses. The regulator suggests that operators reach what it terms "mutualisation agreements" with one another that will govern how they behave. ARCEP has also proposed that the in-building operator install additional fibres, onto which rival operators can splice their own connections.
Policy or legal issues	A major bill was passed by France's parliament in summer 2008 which introduced the principle of shared access to in-building fibre networks. The LME (Law of Modernization of

	the Economy) also states that from 2010 all new homes must be FTTH-ready. Some companies some such as France Telecom and SFR-Neuf Cegetel have signed separate cooperation agreements on fibre deployment and it is not clear how the ARCEP regulation on duct and fibre-sharing will affect these private agreements.
Technologies used	Fibre to the Home (35%), Fibre to the Building (65%)
Current status	The four operators rolling out fibre in France have agreed on a series of sites to test the feasibility of in-building wiring. The operators have come up with a list of 15 test sites covering 2,000 households. Tests are being run and will help regulator ARCEP determine the conditions under which in-building fibre should be shared.

Netherlands	
Problem identified	In response to strong cable competition in the Netherlands including deployment of very high-speed DOCSIS 3.0 broadband services by UPC, and in the face of declining fixed line subscriptions, the Dutch incumbent KPN wished to build a next-generation fibre access network to differentiate its services and compete with UPC for next-generation access and services. Initially it committed to FTTC/VDSL deployments which were delayed.
Initiative	In November 2007 KPN and investment house Reggefiber announced a joint venture called ReggefiberFTTH to deploy a new fibre-to-the-home network in the Netherlands, at a cost of about €4 billion (US$5.3 billion). Reggefibre will own the network, while KPN will provide services over it. The network will be available to other operators on a wholesale basis and the Dutch regulator approved the joint venture's wholesale pricing in November 2008. KPN is seeking a 41% share of the Reggefiber joint venture and has an option to increase its holding if Reggefiber reaches certain "milestones". Reggefiber is a builder and operator of networks rather than a service provider and has no retail customers.
Policy or legal issues	The Dutch competition authority (NMa) provisionally approved KPN and Reggefiber's joint venture in December 2008.
Technologies used	Fibre to the Home (90%), Fibre to the Building (10%)
Current status	KPN and Reggefiber are currently assessing all plans based on timing and location and are considering whether new investments can be justified commercially. This assessment is based on pilot schemes being run in 5 Dutch cities. This commercial evaluation is planned to be completed in the first half of 2009.

Australia	
Problem identified	Development of fibre infrastructure had stalled in Australia prior to 2008 as the incumbent Telstra, the previous government and the regulator discussed the regulation of next-generation infrastructure. Delivery of a national broadband network was a central campaign policy when Kevin Rudd's Labour party won Australia's 2007 election. In mid-2008, the government launched an invitation to tender for the allocation of US$4.5 billion of public funds for the construction of a FTTN network to reach 98% of the population. The tender specified that the winning bid would have to provide additional funds to an estimated US$8.5bn in total. A number of bids were received. In March 2009 the Australian Government decided to terminate the tender process on the basis of advice from an independent panel of experts which found that none of the proposals offered value for money.
Initiative	On the 7th of April 2009 the Australian government announced the building of an National Broadband Network to deliver: • Connections with speeds up to 100Mbp to homes and businesses in towns with a population of around 1,000 (90 percent of all Australian homes, schools and workplaces) • Next-generation wireless and next-generation satellites with speeds up to 12Mb to link all premises in regional, rural and remote Australia
Policy or legal issues	A new company will be established to oversee the project in partnership with the private sector. The government says it will be the majority shareholder of this company, but intends to sell down its interest within five years, after the network is built and fully operational. It is expected that a public-private investment of up to $AS43 billion over 8 years will be incurred to build the national broadband network. The public money component of the scheme is reportedly $AS21 billion. The Government's investment in the company will be funded through the Building Australia Fund and the issuance of Aussie Infrastructure Bonds (AIBs), which will provide an opportunity for households and institutions to invest in the national broadband network. The NBN will be provided on an open access basis to ensure that multiple service providers can gain wholesale access on request.

	Legislative change will be required to set out governance arrangements for the national broadband network company and to facilitate the rollout of fibre networks, including requiring greenfield developments to use FTTP technology from 1 July 2010.
Technologies used	Optical Fibre in urban areas (FTTP preferred to FTTN), wireless and satellite in rural areas
Current status	An Implementation study will be carried out in 2009 to fine-tune funding estimates. The NBN will begin in Tasmania, possibly in July, 2009 with full nationwide build out due to commence in early 2010. More information is available at http://www.minister.dbcde.gov.au/media/media_releases/2009/022

Sweden	
Problem identified	Mobile operators are assessing the business case for development of next-generation or 4G mobile networks based on Long-Term Evolution, as usage of their existing 3G /HSDPA networks increases due to growing consumer adoption of mobile broadband services. However, the costs to deploy an extensive nation-wide LTE network are high and competing technologies such as Wimax pose a challenge to mobile operators. One of the ways in which risk and costs can be minimised is for operators to strike infrastructure sharing deals with other operators.
Initiative	In April 2009, Swedish operators Telenor and Tele2 agreed to construct a joint[175] LTE network in Sweden, with plans to launch services at the end of 2010. The deal is based on a 50/50 venture and will commence in 2009. The operators will share both infrastructure and spectrum in both the 2.6Ghz and 900Mhz bands and expect 99% of the population to have access to the mobile Internet by 2013, at speeds up to 150Mbit/s in urban areas and 80Mbit/s in rural regions.
Policy or legal issues	Both Tele2 and Telenor were awarded[176] licences by the Swedish regulator in the 2.6Gz band in May 2008 and it is not clear if the regulator will need to amend the terms of these licences to reflect this new agreement. In March 2009, the regulator, the PTS, approved the deployment of mobile broadband services in the 900MHz band used for GSM and this was an important consideration in the companies' decision to create a joint venture.
Technologies	Long Term Evolution (LTE)

[175] The agreement being entered into by the companies is being examined from a competition law perspective.

[176] An appeal regarding the decision on the award was lodged before the administrative courts in April 2009.

used	
Current status	Nothing to report as the joint venture was only announced in April 2009.

Summary of ComReg's NGB regulatory principles and activities

6.43 Regulatory influencers are but one driver of NGB developments and are unlikely alone to be the solution to stimulating NGB investment. However, ComReg intends to play an active role in supporting NGB developments through the range of regulatory levers available to it directly and through supporting other initiatives.

6.44 Within the context of the legislative framework and, without pre-determining any analysis of regulated markets, the key principles that will guide ComReg's regulatory approach will include

- providing a clear and predictable regulatory environment within which service providers contemplating NGB investments can operate.
- adopting a technology neutral approach in considering NGB regulatory issues
- promoting effective and sustainable competition at both the network and service levels through the application of appropriate regulatory remedies (where necessary) that take into account collaborative industry approaches
- recognising uncertainty faced by all service providers in making efficient NGB investments and taking appropriate account of such risks in applying the regulatory framework.

6.45 While ComReg is unable to commit to specific regulatory outcomes outside the operation of the regulatory machinery within which it must act, the supportive objectives and activities that ComReg is taking or intends to undertake include:

- The continued implementation of the various NGB supportive spectrum initiatives under ComReg's spectrum management strategy. Current initiatives include consultations on a number of frequency bands such as the Digital Dividend, 900 MHz, 1800 MHz and 2300 MHz and the running of a competitive licensing process for the release of additional spectrum in the 3400-3800 MHz band.
- Engagement with the European Commission (EC) and the European Regulators' Group (ERG) in relation to the consultative process relating to the proposed EC recommendation on the regulation of NGB. Once finalised, ComReg will have due regard to the recommendation in seeking to provide regulatory certainty, and is promoting investment, competition and innovation in the development of NGB in the Irish market.
- Continuing to engage with Eircom and industry in relation to NGB network developments and to respond in a timely manner regarding the application of the regulatory framework where collaborative wholesale NGB access models emerge.
- Where wholesale prices are regulated and, in response to a request from Eircom, to re-assess both the need for any premium for additional and quantifiable risks associated with NGB network investments and the level at which any premium may be set.

- Building on the proposed application of the regulatory principles for NGB as identified under the WPNIA market analysis exercise, to progress the implementation of remedies in a flexible manner having regard to, amongst other things, the nature of Eircom's approach to facilitating access to any proposed NGB network developments.
- Supporting collaborative industry initiatives that promote the sharing of infrastructure in a manner that does not undermine the promotion of competition, with any regulatory response being tailored as appropriate.
- Working with the DCENR to input to its NGB policy initiatives, where appropriate, including participation on its NGB Task Force.

Discussion and feedback

6.46 ComReg has identified that a key objective is to create a supportive and predictable regulatory environment which enables industry and stakeholders to make informed decisions on future investment, roll-out and deployment of new technologies. In doing so, ComReg has identified a range of regulatory principles and activities where it can support NGB developments, with the nature of the regulatory approach applied or that could apply being dependent on the response from Eircom (as an SMP operator) or indeed other industry players.

Question 7: Are the areas identified the relevant tools available to ComReg for accelerating NGB investment in Ireland, or could other regulatory levers be as or more effective? What might be the impact of these activities on both the level and timing of NGB developments?

Question 8: Do you see a role for collaborative industry approaches in seeking to agree wholesale models for open access to SMP operator NGB networks? Will infrastructure sharing be critical for early deployment of NGB in Ireland? What do you see as being the appropriate regulatory response in such circumstances, particularly in light of the need to promote effective competition, innovation and incentivise investment?

Question 9: What role has the regulation of investment incentives such as wholesale pricing to play in stimulating the development of NGB networks?

Question 10: Is there a case for allowing a differentiated regulated rate of return for Eircom in relation to risky NGA investments, and would this in fact be effective in encouraging early and widespread development of NGB fixed line networks?

7 Next Steps

7.1 ComReg invites views from all stakeholders on the analysis and issues presented in this paper, and intends to take such feedback into consideration when framing its broader regulatory approach on NGB issues. To this end, ComReg has set out a series of questions at the end of each section. For ease of reference these questions are repeated below.

Section 2:Next Generation Broadband – What is it and why does it matter?

Question 1: What speeds and other quality of service parameters will be demanded by businesses and consumers over the next 3 to 5 years? Please explain your reasoning. Do you believe the market itself will deliver these capabilities, and within what timeframe?

Question 2: Do you agree that NGB network deployments can provide a socio-economic benefit? If so, who are likely to be the greatest beneficiaries and why? Should the policy framework explicitly favour the development of NGB in Ireland, and with what specific socio-economic goals in mind?

Section 3: Broadband Developments in Ireland

Question 3: How important will cross-platform competition be to the development of NGB Networks? Do you consider that all broadband platforms are capable of supporting NGB? In what circumstances might some such platforms be more suitable than others in providing timely and efficient NGB

Question 4: Do you consider that substantial (both in cost and coverage terms) private sector led investment in the development of NGB networks is likely over the next 3-5 years? If not, and should a gap occur in comparison to other European countries, what will be needed to encourage such private sector investment in Ireland?

Section 4: International Approaches on Next Generation Broadband

Question 5: In what circumstances would any of the above (or other) approaches be appropriate in stimulating NGB roll-out in Ireland? How might such interventions safeguard the development of competition?

Section 5: Next Generation Broadband Enablers and Inhibitors

Question 6: Do you consider that the issues identified are the main enablers and inhibitors of NGB developments or are other issues of greater relevance? Who are the key stakeholders who might be in a position to influence these issues and how might they best do so?

Section 6: The Role of Regulation in Facilitating Next Generation Broadband Development in the Irish Market

Question 7: Are the areas identified the relevant tools available to ComReg for accelerating NGB investment in Ireland, or could other regulatory levers be as or more effective? What might be the impact of these activities on both the level and timing of NGB developments?

Question 8: Do you see a role for collaborative industry approaches in seeking to agree wholesale models for open access to SMP operator NGB networks? Will infrastructure sharing be critical for early deployment of NGB in Ireland? What do you see as being the appropriate regulatory response in such circumstances, particularly in light of the need to promote effective competition, innovation and incentivise investment?

Question 9: What role has the regulation of investment incentives such as wholesale pricing to play in stimulating the development of NGB networks?

*Question10: Is there a case for allowing a differentiated regulated rate of return for Eircom in relation to risky NGA investments, and would this in fact be effective in encouraging early and widespread development of NGB fixed line networks***?**

7.2 Respondents should submit views in accordance with the instructions set out on the cover of this discussion document. Respondents should also be aware that all non-confidential responses to this discussion document will be published subject to the provisions of ComReg's guidelines on the treatment of confidential information[177].

[177] See ComReg document Guidelines on the treatment of confidential information, March 2005