

# NEXT GENERATION ACCESS NETWORKS AND MARKET STRUCTURE: ANNEX 1

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## NEXT GENERATION ACCESS NETWORKS AND MARKET STRUCTURE: ANNEX 1

This annex, for DSTI/ICCP/CISP(2010)5/FINAL, is based largely on material submitted by individual countries or drawn from the original outline document for this report.

The material has been drawn on for the main body of the report on approaches to NGA adopted in various countries in the main document. It was, however, considered that this information could act in a supplementary form.

### **Australia**

Australia opened its fixed line telecommunication market to full infrastructure competition in 1997. Prior to that time there had been a five year period during which a duopoly existed comprising the incumbent operator (Telstra) and the new entrant (Optus). Before this duopoly period there was no cable television network in Australia. But during the duopoly period, both Telstra and Optus built hybrid coaxial cable networks which provided end-to-end services. During this time Telstra's mobile wireless market was penetrated by two competitors (Optus, Vodafone) and eventually a fourth network operator (Hutchison 3 using 3G). Liberalisation of infrastructure competition also saw a number of smaller regional operators offering fixed line and fixed wireless services over their own networks.

During the 1990s when many incumbent operators were exiting the cable television market, either because of regulatory requirements or commercial decisions, Telstra entered the market. This was in response to Optus entering the telecommunications market to provide telecommunication and cable television services with its own infrastructure. This led to a situation in which both Telstra and Optus were frequently building coaxial cable networks down the same streets in Australia's largest cities. A key outcome was that Optus eventually ceased building out new coaxial cable infrastructure in the face of Telstra matching this infrastructure wherever it was built. This meant that new deployment, which may initially have happened at a faster pace, was eventually discontinued. At the same time, without infrastructure competition in other areas, Telstra was arguably under less competitive pressure to develop DSL or shift to fibre-to-the-home.

At present the market structure in Australia, whether for the traditional public switched telecommunication network and cable television or mobile and fixed wireless, could be described as one of end-to-end infrastructure competition. While acknowledging the benefits that have stemmed from market liberalisation in Australia, successive governments, and some stakeholders, have not been satisfied with the pace of development. This has been the case in both the geographic availability of fixed broadband infrastructure, particularly in rural areas, as well as the price and quality of service available.

In recent years this has led to several proposed initiatives aimed at influencing or fundamentally restructuring the provision of broadband. In 2007, for example, the then Australian government proposed using public funding to raise the delivery of high-speed services (12 Mbit/s) to 99% of the population. Following the change of government in 2007, the new government announced in 2009 that it would establish a new company, NBN Co Limited, to invest up to AUD 43 billion over eight years to roll out a

wholesale only fibre to the premises network. The specified goals are 93% 'fibre to the premises' coverage delivering speeds of 100 Mbit/s, with remaining coverage through wireless and satellite technologies offering speeds of at least 12 Mbit/s or more to people living in some rural or remote areas.

The Australian government has also introduced legislation with the objective of improving competition in the telecommunication sector, including during the transition to the full National Broadband Network (NBN) rollout. The Bill provides for stronger separation arrangements for Telstra, including a legislative framework for Telstra to voluntarily structurally separate by migrating its customer services to the National Broadband Network. The Bill also reforms the telecommunications-specific access and anti-competitive conduct regimes. The Bill passed and became law on 15 December 2010. The Government has also introduced bills to enshrine NBN Co's wholesale-only status and to ensure it will offer open and equivalent access to services into the future. An Implementation Study by KPMG and McKinsey commissioned by the government was released in May 2010.<sup>1</sup> The Study recommended that funding for the NBN project should be in two stages, with Government supporting the rollout period. On 20 December 2010, Government released the Statement of Expectations for NBN Co and the NBN Co Corporate Plan which estimates the NBN's total capital expenditure to be AUD35.9 billion, which is less than the original AUD43 billion estimate, in large part based on an infrastructure access agreement with Telstra. The Government expects to contribute AUD27.5 billion in equity for the rollout which will be undertaken over 9.5 years. NBN Co's expected rate of return is 7.04%, which compares favourably with the average 10 year bond rate (July 2009 to December 2010) of 5.39%. The NBN Co Corporate plan shows the Government can expect to recover all its funding costs with interest. NBN Co will provide uniform national wholesale prices, with an access price for its basic service of 12 mbps / 1 mbps across all technologies starting at AUD24 per month. NBN Co will be funded with Government equity until NBN Co has sufficient cash flows to support private sector debt without explicit Government support. Following completion of the rollout, the Government will consider the optimum capital structure for the company.

On 20 June 2010, Telstra and NBN Co announced that they had entered into a Financial Heads of Agreement. The transaction, if completed, would deliver to Telstra a post-tax net present value of approximately AUD 11 billion. The value attributed to transaction includes payment for the decommissioning of Telstra's copper network and cable broadband service, use of Telstra's infrastructure, and the value to Telstra of avoiding costs regarding certain regulatory obligations. As noted above, the agreement means that Australian taxpayers benefit because it reduces the overall cost of building the NBN, avoids unnecessary infrastructure duplication, will result in higher take-up rates and revenue for NBN Co, and a greater proportion of the NBN rollout will be underground, with less overhead cabling.

## **Canada**

Until the early 1990s Canada's telecommunications market was characterized by the regional monopolies of incumbent telephone carriers. Changes in regulation and the introduction of new legislation, such as the Telecommunications Act in 1993, have since facilitated competition. Canada's communications regulator, the Canadian Radio-television and Telecommunications Commission (CRTC), sequentially opened up market segments beginning with the long distance market in 1992, as well as the local telephony market and the retail Internet market in 1997.<sup>2</sup>

During this competitive transition, the CRTC set the regulatory conditions necessary to enable new entrants to operate and compete with the established incumbents. On the telephone side, the CRTC implemented local loop unbundling at cost-based rates in 1997, allowing small Internet service providers (ISPs) to install their equipment in incumbent-owned exchanges. This enabled small ISPs to connect to customers' premises via the incumbent local loop access network, thereby eliminating a significant bottleneck. On the cable side, the CRTC mandated third-party Internet access (TPIA) services in 1998 to provide small ISPs with access to the large incumbent cable operators' underlying facilities.

Initially, the large cable companies were leaders in the deployment of high-speed Internet facilities, while the incumbent telephone companies dominated the local and long-distance telephone markets. In 2005, the cable companies started to provide local telephone services, generally over a managed network, and by the end of 2007 they captured a noticeable portion of local residential lines, to become major competitors of the incumbent telephone companies in residential markets.

As the high-speed Internet access market has developed, cable leadership has continued. At present, the residential market is largely characterised by the competing broadband infrastructures of the telephone and cable companies, which combined accounted for 94% in 2009. To put the market situation into context, approximately 75% of Canadians had access to the wireline broadband infrastructure of a telephone company and to that of a cable company in 2009. In addition to these two facilities based providers, there are also smaller resellers who lease part of the telephone and cable companies networks in order to provide their own retail Internet products. While resellers make up a small share of the market at 6%, they add competitive pressure at the service level.

Technology has further enabled competition. For example, technological developments have allowed the cable companies to branch out from video services into voice and Internet services, making their offerings more comparable to those of the phone companies. Widespread deployment of DOCSIS 3.0 technology by the cable companies has facilitated broadband speeds in excess of 100 Megabits per second (Mbps), without the need to run fibre into the household. Although, in that regard some cable companies have also initiated limited fibre to the home (FTTH) trials. The telephone companies have started to respond to this competitive pressure with new investments in NGNs. FTTH overlay deployments have been initiated in a number of Canadian cities in addition to widespread plans for deployment of fibre-to-the-cabinet (FTTC). Technological developments are also enabling other facilities-based providers, such as wireless carriers, to deliver wireless broadband services that are becoming more accepted as wireline broadband substitutes. Although wireless services are less than perfect substitutes due to the higher prices and lower transmission speeds, some consumers still perceive them as complementary to wireline services.

Guided by the Government's direction to adopt a more market-based approach to regulation, in 2008 the CRTC conducted a wholesale regulatory review attempting to rationalise the existing framework which had grown in an *ad hoc* manner. Definitions of certain wholesale services were revised with about one-third of services deemed non-essential and subject to phase out over a period of 3-5 years.

A more recent regulatory proceeding, which concluded in 2010, considered how the wholesale regulatory framework should be applied on a forward looking basis. The fundamental issue considered was whether to extend or reduce mandated competitor access to the incumbent's next generation network (NGN) infrastructure in order to provide higher speed services. In arriving at a decision, the CRTC conducted an in-depth examination of the impact of mandating certain new wholesale alternatives on investment and competition, while keeping in mind the implications for symmetry with respect to the wholesale obligations of the large telephone and cable companies.

The CRTC concluded that a duopoly would not provide sufficient competition and took a number of steps to address this. On the telephone side, the CRTC extended wholesale obligations to include services provided over the telephone companies' FTTC facilities. On the cable side, the CRTC expanded wholesale obligations to include greater aggregation with fewer interconnection points for small ISPs. New regulatory proceedings have been initiated to set wholesale rates for both services. In addition, the CRTC examined other wholesale options, including sub-loop unbundling (requiring incumbent telephone companies to provide access to small ISPs at the cabinet), unbundling cable networks to provide dedicated capacity to small ISPs, and providing small ISPs with central office-based access where incumbent

telephone companies have deployed FTTC. Ultimately, these options were not adopted given either little interest from small ISPs or technical infeasibility. \*

## **Chile**

Chile's government is proposing legislation that would allow the creation of a wholesale network telecommunications infrastructure provider that would rent out that infrastructure to third parties<sup>3</sup> allowing them to concentrate solely on service provision. Incorporating an infrastructure operator would be a fundamental pillar in boosting competition in both the mobile telecommunications and digital TV markets. Today operators with infrastructure are all linked to a telecoms service concession licence. The government wanted to separate the two to encourage the construction of not only antennas but other types of infrastructure so that companies entering the market have the necessary resources to provide their service and so that competition develops based not on the level of technology of the infrastructure but on who offers the best service. The government pointed to the example of British Telecom which operates as two separate companies - as an infrastructure provider and as a telecommunication service provider. Chile's telecommunication minister has proposed new legislation that would enable the creation of a wholesale network provider in a bid to attract new market entrants. This would allow new players to focus solely on rolling out services, rather than having to deploy their own networks as well.

The legislation introduces a modification in Chile's telecommunication law to permit companies whose business focus is the management and construction of the infrastructure for telecommunication to become an authorised telecommunication company. This modification aims to solve a problem in the telecommunication law that permits only companies which offer telecommunication services to the final user, authorisation to deploy telecommunications infrastructure. With this modification the traditional telecommunication companies can focus their business on service provision only and not on infrastructure provision. At the same time, an infrastructure company can become a telecommunications company, focused on the efficient management of the infrastructure. Notably, a company named American Tower ([www.americantower.cl](http://www.americantower.cl)) has installed operations in Chile to develop this business.

## **Germany**

Germany's approach to the nexus of NGA investment, market structure and competition consists of several fundamental cornerstones.

*Priority for private investment and decentralised solutions:* Germany believes that the main share of NGA rollout can and should be achieved through private sector investment in a decentralised process driven by a variety of players. From an economic perspective, Germany says, a focus on private sector initiative appears preferable as it does not only deliver solutions which are better tailored to the preferences and needs of local communities, but also because private sector investment is typically superior in terms of investment efficiency. In particular, they suggest, it should be noted that the alleged benefit of massive public intervention with an apparently quicker rollout of a particular technology across a larger geographic area is politically tempting, but hardly socially optimal. In Germany's view, social optimality in connection with (NGA) investment rather requires a market-driven investment path and to some extent public support for broadband deployment in rural areas.

*Primary role of the public sector is to facilitate private investment:* As a result of the aforementioned considerations, the guiding principle of Germany's Federal Broadband Strategy is that the public sector should concentrate on creating conditions, which are conducive to private investment and limit direct intervention, *e.g.* through subsidies, to the necessary minimum. Germany adds, fostering private investment can be achieved *e. g.* by promoting the realisation of cost synergies through enabling the shared use of facilities such as ducts, poles etc. and by making available additional spectrum for wireless

broadband services. It also implies, they say, that if public funds are used, it should be in a way that does not discriminate between technologies or companies. The cable case has shown that the market benefits from competition. For almost two thirds of the German population, broadband connections with a downstream speed of 100 mbps plus will be available by no later than 2012. That puts additional pressure on the deployment of FttH and FttB.

- To enable Broadband connectivity with speeds of 50 mbps and more particularly in rural areas, Germany examines carefully several possibilities to finance the roll-out such as PPP, public funding, the involvement of all available funding banks including the EIB etc. In order to keep public involvement as low as possible, Germany currently runs a competition aiming at the financial support of regional broadband projects. Thereby projects that benefit to a high extent from existing ducts or other innovative ways to deploy broadband are preferred. The outcome of the competition will serve as a basis for further considerations on activities, necessary to ensure nationwide high speed broadband connectivity.
- To ensure sustaining open access, Germany started a broad discussion within the context of a newly built Next Generation Access Forum, chaired by the head of the national regulatory body. The Forum is dealing further with questions of interoperability, inhouse-cabling and Co-Investment. The NGA-Forum is to provide a final report by spring 2011.

Effective competition is a prerequisite for NGA investment: :

- Higher willingness-to-pay: Customers' higher willingness to pay for an improved service quality may yield higher profits and thus the expectation of increased willingness to pay remains a strong incentive to invest in NGA.
- Business stealing/pre-emption: A better service offering may convince subscribers to switch from one service provider to another and thus raise the market share of the investor (or help to defend market share). The magnitude of this effect is often a dominant factor behind many investments. A similar effect may arise when there are *e.g.*, customer switching costs and therefore there is some form of first-mover advantage. This may provide an incentive to pre-empt competitors with one's own investment.
- Operating cost savings: Lower operating costs of a new NGA can be an investment incentive in its own right.
- Initial asymmetries and past investments: Many NGA investments ultimately replace existing infrastructure and cannibalise the profits derived from the existing technology. This can represent a disincentive for those firms with significant past investments. Consequently, in a situation of ULL-competition, this link (all other things equal) might lower the incentive of the incumbent to upgrade its network, while for ULL-competitors the effect works in exactly the opposite direction.

For the first incentive mechanism to work it is clear that there needs to be some form of imperfect competition because investors need to have the chance to extract a sufficient share of the additional rents generated by the investment. However, without the threat of competitors or potential market entrants stealing business (second mechanism) and given the fact that there are past investments to capitalise on (fourth mechanism) it is likely that in many cases the best option for incumbents would be to do nothing. This makes it inevitably clear that too low a level of competition is highly detrimental and accordingly, a sufficient level of competitive intensity can even be considered a prerequisite for NGA investment.

Overall, it is plausible to assume that investment is maximised at some intermediate level of competition, an assertion which seems to be backed by empirical findings.

The investment behaviour observed in Germany confirms the validity of the different incentive mechanisms and provides support for the effectiveness of competition in stimulating investment. For example, to date it is almost exclusively the subsidiaries of local utility companies, which invest in FTTB or FTTH infrastructure. These investments do not seem to be in response or anticipation of a higher willingness to pay, but they are rather driven by the attempt to steal business from the incumbent and simultaneously save on access costs, which is sufficient for a profitable investment when allowing for the lower investment costs of these companies due to the synergies derived from the shared use of the already existing facilities of their core businesses. Likewise, Deutsche Telekom's network upgrading to VDSL for some 10 million households is likely to have been primarily a defensive investment to deter further market entry with new NGA technology and to fend off growing pressure from cable operators.

*Where economically viable, facility-based competition should be encouraged.* It is hardly disputed, Germany says, that in situations where the co-existence of more than one infrastructure can be economically sustained, consumers benefit from increased competition and welfare gains are also likely to materialise on an aggregate level. The German experience with the market entry of the cable operators about five years ago seems to support this view. Since then, there has been a significant decline in broadband prices and the continued dynamic growth of broadband penetration may also be to some extent attributable to this event, although the causes are admittedly difficult to trace.

## **Greece**

At the beginning of 2001, the period of exclusivity in the provision of fixed line voice telephony services in Greece expired for the incumbent telecommunications operator OTE. OTE first faced competition from alternative operators in 2004, three years after the full liberalisation of the Greek fixed line access market. The telecommunications market is regulated by an independent regulatory authority, the Hellenic Telecommunications and Post Commission (EETT). The Greek broadband market still lags behind most OECD countries both in terms of penetration and competitive dynamics. Along with the absence of alternative infrastructures, Greece transposed the EU telecommunication reform rules of 2002 only in 2006, which prevented EETT from implementing new regulations on local loop unbundling until that time.

Functional separation was first raised in Greece in 2006 by EETT. The Greek regulator proposed that OTE would be split if it continued to abuse its dominant position in the market. At a time when the regulator announced that the possibility of functional separation was being seriously considered, OTE was found to be a company with SMP in 12 of the 18 markets. In early 2009, the Greek government announced plans to pass two million homes following 7 years with fibre network in Athens, Thessaloniki and 50 other cities across Greece. The government proposed an open network model that will be run by a separate entity from the operators providing telecommunication services. In the process of the privatisation of OTE, Deutsche Telekom has acquired a stake of 30% in OTE, while the Greek government currently holds 20% of the OTE's stock. Given the current economic crisis and Deutsche Telekom's strong opposition to functional separation in its home market, it is unclear whether functional separation will be applied to OTE in the near future.

## **Hong Kong (China)**

Hong Kong (China) has a fully liberalised telecommunications market in which there is no preset limit on the number of licences issued or any deadline for submission of applications for licences for the provision of all types of telecommunications services in the territory. Competition was first introduced in



the fixed domestic telecommunications market in 1995 and the market was subsequently fully liberalised in 2003. The external telecommunications market was fully liberalised even earlier in 2000, following the early termination of the exclusive franchise of the incumbent operator in 1999. Today, Hong Kong, China, has one of the most competitive telecommunication markets in the world.

Hong Kong, China, has a population of around seven million and is one of the most densely populated areas of the world. Hong Kong, China's population density is far greater than those of Korea and the Netherlands, which have the highest density in the OECD area. While the gap narrows if a comparison is made with Seoul or Rotterdam, the population density of Hong Kong, China, is still the highest.

### ***Market Status***

Driven by the highly competitive market, network operators in Hong Kong, China, are dedicated to innovations and have every incentive to roll out broadband infrastructure with the most advanced and cost-effective technologies available in the market. They are now offering a multitude of broadband access alternatives with different technologies, including Digital Subscriber Line (DSL), Hybrid Fibre Coaxial, Fibre-to-the-Building (FTTB), Fibre-to-the-Home (FTTH) and mobile broadband, with connection speeds as high as 1 Gbps for ordinary consumers. Most network operators have already completed, or are in the process of, the migration to the Next Generation Network (NGN). The first NGN was rolled out in Hong Kong, China in 2002, and service operators are deploying these network platforms offering innovative applications and services including Voice-Over-IP (VoIP) and Internet Protocol Television (IPTV) services. The monthly subscriptions of broadband service at 100 Mbps and 1 Gbps offered by one fixed service operator are charged at USD13 and USD26 per month respectively, which are among the most affordable in the world. As of April 2010, there were 2.09 million registered broadband subscribers in Hong Kong, China representing a household broadband penetration rate of 82.1%. Around 85% of households in Hong Kong, China are now served by at least two self-built customer access networks established by the fixed network operators; and around 66% of households are served by at least three self-built customer access networks.

Broadband mobile services are also very popular in Hong Kong, China. All the 3G operators have deployed 3.5G services utilising High Speed Downlink Packet Access (HSDPA) technology which supports download at a speed of up to 21 Mbps. At present, about 43% of mobile subscribers are either 2.5G or 3G subscribers. In March 2009, mobile data usage in Hong Kong, China reached 875 Terabytes, or equivalent to each 2.5G or 3G service user consuming 128 megabytes per month. This is three times the usage of the same period in 2008. With the availability of more smartphones in the consumer market and affordable subscription rates, it is expected that mobile data usage in Hong Kong, China will continue to increase significantly.

### ***Broadband Strategy***

Consistent with the pro-market and pro-competition regulatory policy of Hong Kong, China, the investment and construction of telecommunications network infrastructure primarily rely on the business plans and commercial decisions of private investors. The Government has all along refrained from direct investment or any other forms of subsidy in network construction or in the provision of telecommunications services to the public. As the sector regulator, the Office of the Telecommunications Authority (OFTA) strives to create an enabling environment conducive to business investment while safeguarding the interest of the general public. In this regard, OFTA has all along put emphasis on a light-handed, market-driven regulatory approach that relies to the maximum extent on market force, establishing a clear, transparent and predictable regulatory framework, and creating a level playing field for all to participate fairly and effectively.

Today, with extensive and effective facility-based competition, Hong Kong, China is, in many ways, the most successful example of market-led NGA infrastructure deployment in the world. Network operators, out of their commercial decisions alone, continue to invest in broadband infrastructures and improve the level of service (most notably the broadband access speed) offered to customers. As in all countries that have had a rapid roll out of broadband networks, the key to success is efficient local access to customers. In this aspect, OFTA has undertaken a facilitating role and adopted a number of ongoing initiatives to further promote and expedite the development of broadband access infrastructure in Hong Kong, China. This includes ensuring appropriate equipment rooms and ducting facilities for telecommunications and broadcasting services in new buildings, co-ordinating all market players on their requirements for laying telecommunications facilities in new infrastructural development projects, introduction of a registration scheme for buildings with fibre-based access infrastructures, facilitating the extension of mobile broadband coverage, timely release of spectrum for the provision of mobile broadband services etc.

### **Ireland**

In ComReg's view the deployment of NGA in Ireland will require a multiple technology approach, with both wired (fibre and cable) and wireless services co-existing, particularly so in more dense urban areas where the business case is likely to be stronger. Given the demographics of rural areas, wireless services are more likely to have a stronger role to play than wired services. This position is consistent with the DCENR's position of seeking to encourage private sector investment in next generation broadband (NGB) through targeted government action and encouragement of multiple platforms. Signals to the contrary risk crowding out or delaying private sector led developments, which could ultimately serve to undermine the timing and coverage of NGB deployments.

### **Italy**

Italy completed its liberalisation of the telecommunication market in 1997. Until 1992, telecommunications services in Italy were provided either directly by the State through the ASST (Telephone Services State Agency) and the Posts and Telegraphs Administration (PT), or indirectly through several concessionaires such as SIP, ITALCABLE and TELEMAR. After a brief period of giving the management of all telecommunication services to the concessionaires, the Italian government merged all concessionaires into a single company, Telecom Italia (TI). Telecommunication services have been regulated by the national regulatory authority AGCOM (Autorità per le Garanzie nelle Comunicazioni) since 1997.

Italy was the first OECD country to implement what AGCOM described as "administrative separation", which was initiated to improve competition in the telecommunication market by guaranteeing non-discriminatory access to the incumbent's fixed network. In particular, Resolution No. 152/02/CONS introduced the separation of TI's wholesale staff from those working at the retail level (TI Wholesale and TI Retail), the creation of "ring-fences" and other regulatory tools such as criteria to verify the replicability of TI's retail offers (Resolution No. 152/02/CONS).

Competition concerns remained, however, following the implementation of the 2002 separation, and the market structure re-emerged as an issue. In fact, in the first round of market analysis, TI was found dominant in all fixed network access markets and hence, in May 2007, AGCOM started a public consultation (Res. No. 208/07/CONS) on the future regulation of TI's access network in the face of migration to NGA. The accompanying document contained an enquiry on the effectiveness of existing regulatory measures in addressing problems arising from the access network's bottleneck. This document emphasised that the local TI network still constituted an essential and not duplicable infrastructure and that access to it has been the issue of numerous and growing disputes between the incumbent and the

competitors. Indeed, there were numerous elements that led AGCOM to believe that the Italian market configuration needed a further regulatory measure regarding internal and external equal treatment in the access (the so-called “equality of access”) to TI’s local network, which could move the system away from the “regulation by litigation” situation and make it evolve toward a clearer separation of the incumbent’s activities.

In this context, AGCOM identified a number of solutions to guarantee effective competition in the provision of services and products based on TI’s fixed access network: *i)* integrate and strengthen the already imposed administrative separation measures; *ii)* functional separation of TI’s access network either by accepting binding undertakings by TI, or imposing an obligation under article 45 of the Italian Code; *iii)* structural separation of TI’s access network as the effect of an autonomous decision of TI. All participants in the consultation, except TI, highlighted the low level of competition especially in the access and broadband segments of the market. Participants also emphasised that previous regulatory measures were not sufficient to address these problems and requested the adoption of new instruments suitable to guarantee the effectiveness of the equal treatment principle. Most of the participants argued that the functional separation was the most appropriate instrument in order to address the above-mentioned problems.

The results of the consultation led AGCOM to believe that some additional regulatory measures were needed to guarantee and reinforce equal treatment in regard to access to TI’s local network. Subsequently, in July 2008, the incumbent proposed to AGCOM a set of undertakings aimed at enforcing the existing obligations imposed in 2002, intended to ensure non-discrimination in the provision of wholesale access network services. Law 248/2006 (Article 14bis), in fact, gave Italian NRA the power to accept undertakings by operators, both within infringement proceedings and within proceedings aimed at promoting competition in TLC markets.

AGCOM published TI’s undertakings to allow third parties to comment. In general, alternative operators affirmed that the undertakings were not sufficient to solve the competitive problems related to the access markets. The incumbent, on the other hand, contended that the undertakings were delivering a new model of operational separation providing equivalence of access and parity of treatment. After the public consultation and some requests for modifications from AGCOM, the undertakings were approved by AGCOM in December 2008. The logic of undertakings has been further strengthened by the evolution of the regulation of access markets. In fact, AGCOM adopted Resolution No. 731/09/CONS outlining the obligations for TI as SMP operator in all fixed network access markets and implementing as regulatory obligations some of the measures included in the undertakings.

The incumbent's voluntary undertakings, organised in 14 groups, are on track and their full operability will be achieved within 2010.

Non-discrimination and the equivalence of services provided is guaranteed through a set of rules, which:

- i).* Introduce a single delivery process for the orders of separated services coming from both TI’s retail functions and the alternative operators on a “first come first served” basis.
- ii).* Introduce an incentive system and a code of conduct for the staff of Open Access and TIWholesale.
- iii).* Introduce a monitoring system on separated services, based on the comparison between key performance indicators (KPIs) and objectives (KPOs), and related regular reports.
- iv).* Guarantee the transparency of TI’s access network quality and development plans.
- v).* Improve the transparency of economic conditions of access wholesale services.
- vi).* Clarify the functions, the structure and the operations of a Supervisory Board.

- vii). Guarantee the participation in both the adjudicatory body and the NGN Committee set up by AGCOM.
- viii). Ensure openness and transition towards TI's NGN.
- ix). Reduce the degree of litigation with the end users.
- x). Require AGCOM's approval of TI's structural changes that impact on the undertakings.

The new delivery process has been recently implemented and the migration of alternative operators to the new platform should be completed 2010. A Supervisory Board (with three members designated by AGCOM and two by the incumbent) monitors the implementation of the undertakings and sets and monitors KPIs, measuring the quality of the supply of wholesale services. The Board has already dealt with complaints and issued recommendations to the incumbent. Non-compliance with the undertakings would be reported by the Board to AGCOM and to the management of the incumbent, unless the incumbent brings the violation to an end within an agreed time frame, determined on a case-by-case basis.

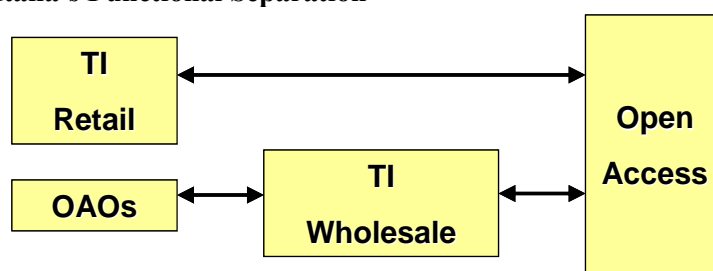
A Dispute Settlement Body, the Office of the Telecom Adjudicator (OTA Italia) is in charge of resolving the controversies of a technical operational character in relation to the services of access to the network. All alternative operators, as well as the incumbent, have subscribed to the OTA agreement.

The NGN committee is aimed at discussing and solving technical, economic and organisational problems that may arise during the transition to NGAN. Moreover, AGCOM has established a Working Group aimed at carrying out and co-ordinating the activities related to the monitoring of TI undertakings' implementation. Within this group several complaints filed by alternative operators on different aspects of the implementation of the incumbent's undertakings are also being addressed.

It has to be noted that undertakings apply also to all NGAN services provided that TI has SMP on them. In particular, according to the undertakings and to Resolution No. 731/09/CONS, TI will provide a reference offer (fair and reasonable prices) for the access to its ducts and dark fibre. Moreover, on the basis – *inter alia* – of the discussions within the NGN Committee, TI is to submit to AGCOM's approval a proposal of guidelines for the migration process towards NGAN and the phasing out of some TI local switches. In addition, in order to guarantee transparency, which is required also by European Union regulation, TI undertakes to release its new generation access network plan, which is to outline the percentage of new generation lines for each local exchange area and municipality, with reference to the homes reached actually or in the next two years, for which funds have been already allocated. In addition, it will include technical information on wholesale services, if any, which might become locally available on the new network platform.

One of the effects of the operational separation model to be verified concerns the promotion of competition in downstream markets, by implementing effective technical and economic "equality of output" conditions between TI's retail functions and OLOs, while removing, at the same time, possible competitive risk associated with the incumbent's vertical integration.

In particular, TI created the 'Open Access' unit to provide services of an equivalent type and quality to TI's retail and wholesale services units, which in turn interface with TI retail customers and competitive providers. The new unit was in charge of the passive elements of the copper and fibre access network and of local backhaul network (copper and fibre). TI's wholesale division continues to act as a "one-stop-shop" providing all wholesale services, including access network services such as local loop unbundling, to alternative operators. In this way, as Figure A1 illustrates, Open Access receives orders for access network services from both TI Wholesale (which serves alternative operators) and TI Retail.

**Figure A1. Telecom Italia's Functional Separation**

AGCOM is currently monitoring the implementation of TI's undertakings in order to assess their competitive impact on each specific relevant market, in order to determine whether to impose, maintain, amend or withdraw obligations, according to the provisions of the European regulatory framework.

Actually, it is reasonable to assume that the effects of the measures adopted by TI can be appreciated only in a reasonable amount of time. However, as an initial assessment, it can be noted that the dynamics of net adds seems to show an increase in infrastructure competition with a slow erosion in the access network market shares. It is difficult to precisely assess the causes of such effects; probably they derive in part from the single system for fault repairing and the better rules for contacting clients during the migration and the new governance system.

The effectiveness of implemented network separation models represents an essential step for the deployment of NGAN, whereas the costs of the deployment of such networks make impossible their duplication and the main principle must be: "one open network for all service providers". In this sense, the openness of wholesale broadband access, deriving from the chosen network separation model, together with the equivalence of access provided to alternative operators and to the downstream arm of the SMP operator, must be carefully verified, by NRA, in agreement with EU regulation.<sup>4</sup>

It should be noted that the Draft of the Recommendation refers generally to "equivalence of access" without specifying the precise model of equivalence. Hence, it implicitly recognises the validity of the Italian approach (equivalence of output). Besides, according to the Recommendation, in case of a positive evaluation of equivalence of access, "NRA can decide that mandatory cost orientation in the market of wholesale broadband access is not necessary"

The openness of the networks represents a fundamental concept also in case of co-investments to deploy NGA networks, such as the case of the operative project the Communications Department of the Italian Ministry of Economic Development is carrying on, in line with the European Digital Agenda.

The project is finalised to single out the "Greatest Common Denominator" of a NGA infrastructure, to be realized joining the efforts of all subjects participating in the project: Government, regions, institutional investors, national regulators and, of course, operators. Each of these subjects will have to bring its specific contribution to the global project, maybe simplifying the access to civil infrastructures already existing for public utilities (water; gas; energy; sewerage systems; etc.) or the realisation of new ones; or providing funds for the investments, or regulating the market or, finally, setting up the new networks. In such framework, the Government assures a relevant co-ordination at national level, in order to optimises resources and time scheduling. The project is going to be defined in order to guarantee, in the medium/long term, a full refunding of invested capital; with this aim, a parallel project to eliminate the Digital Divide will have to be completed, in order to increase the offer and the demand of Public Administration Services and to push the development of the networks.

The opportunity to also utilise European funds (structural funds or something similar) will also be attentively considered.

The Government is also carrying out further actions, at legislative levels, in order to create a favourable framework for broadband and NGN investments, besides the ones already set up in 2008, through Law 133/2008, aiming at facilitating the efforts of telecommunications service providers at a procedural and administrative level, simplifying authorisation formalities, reducing the costs of the installation of electronic communications networks and allowing service providers to use existing civil infrastructures and to lay the fibre underground on public property, without the need for any specific authorisation and on private property, without the prior consent of the owners.

In conclusion, the Italian approach is finalised to promote competition among telecommunication operators and the NGN development, shifting the focus from networks to infrastructures. In this framework, there should be a common infrastructure - cable, ducts, dark fibres, vertical optical cables, optical apparatus, etc.- upon which each operator can deploy its own network. This approach foresees a co-investment model finalised to an open and neutral infrastructure. The Government is co-ordinating the setting up of the common plan in order to get its maximum efficiency.

## **Japan**

### ***Outline of the current competition policy in Japan***

Since the Telecommunications Business Act of 1984 terminated the public monopoly, the government of Japan has been seeking to promote competition in the telecommunications market. The goal to protect users' benefits and develop telecommunications is unchanged from the traditional telephone era to the Internet/broadband era.

In the late 1990s, some economists argued that unbundling was helpful to facilitate competition in the local telecommunications market, and Japan adopted unbundling regulations at the earliest stage. The Ministry of Internal Affairs and Communications (MIC) established the unbundling regulations as early as 1997. These were "asymmetric regulations" of the telecommunications carriers "who possess exclusive bottleneck facilities, which provide other carriers with no other choice but to depend thereon" based on the article of the Telecommunications Business Act in addition to the interconnection regulation, which required each telecommunications carrier to interconnect its network at any technically and economically feasible point. The regulations imposed on such dominant carriers additional interconnection obligations, including setting standard interconnection points and cost-oriented interconnection rates in order to ensure interconnection between the dominant carriers and competitors on reasonable terms.

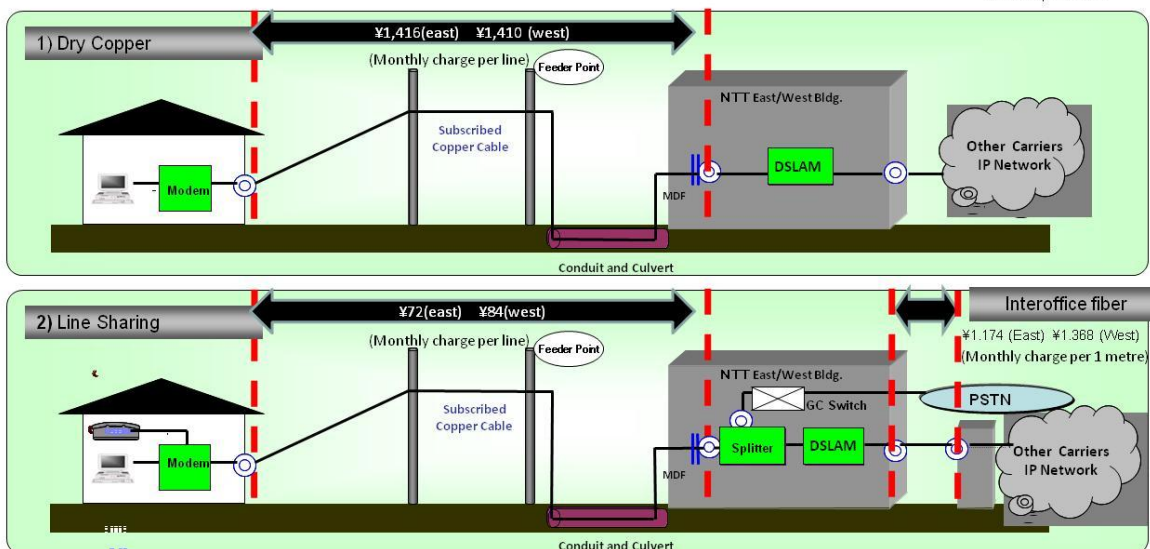
The main purpose of unbundling regulations in Japan has been to promote competition in the local telecommunications market because it was primarily expected to be the market for local and long-distance telephone services. The MIC included few Internet-related services in the scope of unbundling regulation at the first stage of this regulation in 1997.

The MIC has, however, constantly improved the unbundling regulations in order to catch up with dynamic changes in the telecommunications market. From 1999 to 2001, the scope of unbundling was expanded to include local loops and inter-office optical fiber lines in order to meet demands for broadband services.

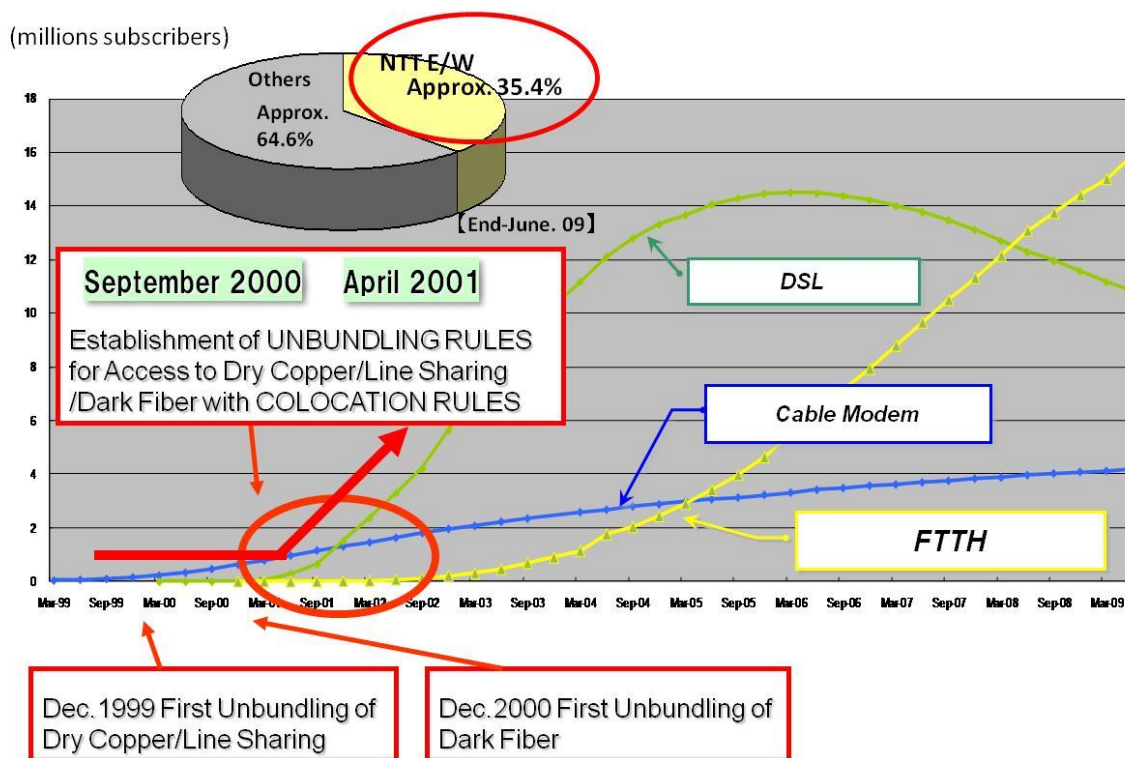
## Unbundling of Copper Local Loop

- There have been two ways of unbundling of Copper Local Loop both of which were introduced in 1999.
  - 1) Dry Copper (used solely for Competitive carriers uses)
  - 2) Line Sharing (used sharing with NTT who uses the line for providing PSTN service.)

[As of April 2010]



## Launch of DSL



In addition to unbundling, the MIC also established strong “collocation” rules in order to put unbundling into action. Under the collocation and unbundling regulations, the dominant carriers are required to provide not only local access but also collocation with competitive carriers. Collocation has played an essential role in competitors’ business because access does not make sense without proper installation of their facilities in the dominant carrier’s building even if access rates would be fair and reasonable.

Thus the MIC has vigorously improved unbundling regulations, finding that the local loops are natural monopolies while a healthy balance between facilities-based competition and services-based competition was being fairly maintained in the local telephone market.

### 2. Further initiatives in the Next-Generation-Access era

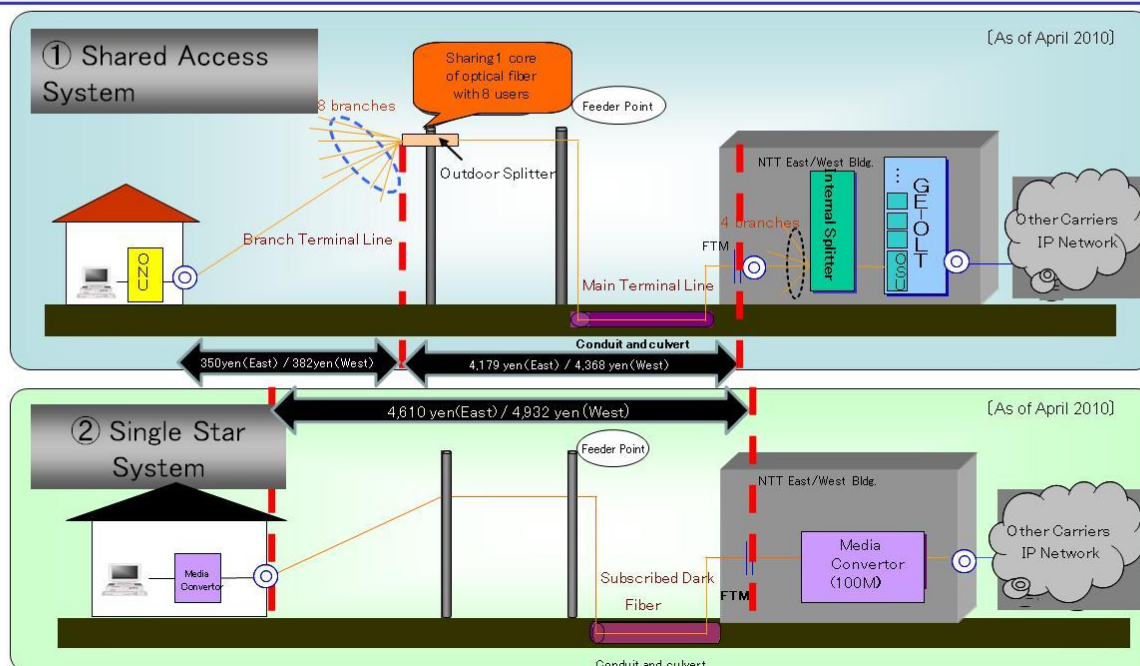
The Telecommunications Business Act covers the NGA within the scope of the unbundling regulations, because the MIC found that NGA constituted exclusive bottleneck facilities, which leave other carriers no choice but to depend thereon. NGA are divided in some unbundled elements and each element is included in the scope of the unbundling regulations.

The MIC decides the scope of unbundling regulation based on requests from competitive carriers and determines whether its interconnection with other telecommunications carriers’ telecommunications facilities is technically and economically feasible. This policy does not change even in the NGA era. However, the MIC also takes it into consideration that while Next-Generation Network is an integrated and centralised network, some elements in NGN have not been included from the scope of unbundling regulation. From this standpoint, the MIC includes central-office access functions, switching office access functions and Interconnection Gateway Switch access functions (access function for IP telephony) etc. within the scope of the unbundled regulations.



## Promotion of Service Competition (Unbundle of Subscribed Optical Fiber)

- There are currently two systems that provide subscribed optical fiber.
  - ① Shared Access System (Dividing 8 branches at outdoor splitter and connecting them to branch terminal line) <This is mainly for one-unit home>
  - ② Single Star System (Connecting to subscribed dark fiber) <This is mainly for condominium buildings and companies>
- In 2001, usage at a flat rate among carriers which includes the cost and fair profit became available due to unbundling of subscribed optical fiber in NTT East/West.



In addition, the MIC's Task Force for ICT Strategy in a Global Age found that it was necessary to promote competition and examine the status of the organisation of NTT East and West in its Final Report regarding the "New Broadband Super Highway" initiative on 14 December 2010.

The report stated that it was necessary to promote service-based competition, including a review of access charge for optical subscriber lines in addition to facility-based competition. In Japan, although more than 90% of households have access to ultra high-speed broadband, only a little more than 30% actually use it. Additionally, the FibreTo-The-Home (FTTH) market share of NTT EAST/WEST has grown (approximately 75%) continuously. Therefore, the report stated that it was extremely important to revitalise the FTTH market in the years to come by lowering the access charge for optical fiber subscriber lines. It also stated that it is appropriate to start discussing specific issues about reviews of calculation methods for interconnection charges starting in 2011, including the setting of interconnection charges per branch line of Passive Optical Network system.

The report also stated that compared with "Separation of equity links" or "Structural separation", promptly conducting the "Functional separation" of the NTT EAST/WEST holding department of bottleneck facilities would be most realistic and effective at this point based on the following comprehensive points of view:

Evaluation standpoint	Analysis
① Promotion of facility-based and service-based competition	<ul style="list-style-type: none"> <li>▪ Service-based competition makes progress as firewalls are disseminated.</li> <li>▪ The impact on facility-based competition is neutral for any form of organisation. However, the probability of monopolies in the infrastructure industry and decrease of facility-based competition may increase if the breakaway access company is given the special tasks of optical fiber deployment.</li> </ul>
② Securing of citizens' right to access	Securing the right to access is possible depending on the design of the universal service system in any corporate formation.
③ Response to global competition	<ul style="list-style-type: none"> <li>▪ Various factors such as financial strength, technological power, mobile power, etc. have an impact.</li> <li>▪ It is difficult to make a judgment based only on the corporate formation.</li> </ul>
④ Impact on the shareholders of NTT	<ul style="list-style-type: none"> <li>▪ It is also relevant that NTT EAST/WEST are in the phase of recouping their investment in the optical fibre networks.</li> <li>▪ It is presumed that the more the spin-off is advanced, the larger the impact on the current shareholders.</li> </ul>
⑤ Time and the cost for the realization	Functional separation may be implemented in the relative short term. Establishing a new company may take about 2 years from the time of passing the bill. Considerable spin-off costs are also expected to occur.
⑥ Promotion of restructuring the "New Broadband Super Highway"	<ul style="list-style-type: none"> <li>▪ It would be neutral for any corporate formation.</li> <li>▪ Obtaining investment incentives, etc. for optical fiber would be the issue if a new company were specialised in constructing infrastructure.</li> </ul>

The report stated that as far as implementing the functional separation was concerned, it was appropriate to create strict firewall rules in order to ensure equal opportunity of bottleneck facilities use, in reference to the activities of other industries such as firewall regulations set up against financial institutions, etc.

In this case, the current bottleneck-facilities scope (access networks and the transit networks which are installed integrally) shall be the basis of the discussion about facilities subject to firewall enhancement, because NGN is built integrally with optical subscriber lines, and they function together.

The specific method such as the physical separation of the holding department and usage department of bottleneck facilities, blocking the information strictly by limiting access over the information management systems, etc., and building systems and a feasible monitoring system to ensure appropriate competition should be discussed.

## New Zealand

From 2001 onwards successive New Zealand governments have taken a number of steps to increase competition. In that year a Telecommunications Commissioner was added to the Competition Commission to oversee sector-specific regulation. A particular concern for policy makers in introducing these reforms was the modest progress in the development and take up of broadband Internet access. With this in mind, the government undertook a review of the entire sector in 2005. As reforms were introduced, Telecom

New Zealand functionally separated its business into three separate units in March 2008. Since then Chorus, TNZ's separated unit, has become obliged to offer LLU services based on the EoI principle. New Zealand's model of functional separation has been analogous to the British concept of BT's Undertakings. It envisages separation of management, establishing new processes and procedures for provision of wholesale services, separation of IT systems as well as establishing an additional body – the Independent Oversight Group. Chorus employees have been provided with guidelines regarding EoI compliance, procedures for information flow and any other interactions with other TNZ divisions. They are to be remunerated according to the separated unit's performance - not the entire TNZ (KPMG, 2009).

In September 2009, the New Zealand government announced the development of a National Broadband Network. The NGN will be a fibre to premises network aiming to reach 75% of households within 10 years. The government will be investing up to USD 1 billion in open-access, dark-fibre infrastructure to accelerate the roll-out of the network offering downlink capacity of 100 Mbit/s and uplink speeds of at least 50 Mbit/s. Discussions are currently underway regarding the type of wholesale access that will be available on the network.

A new Crown-owned investment company ("Crown Fibre Holdings") has been established to carry out the government's partner selection process and manage public investment in the fibre networks. Crown Fibre Holdings and each partner establish commercial vehicles, a "Local Fibre Company" (LFC), to deploy fibre network infrastructure and provide access to dark fibre products and, optionally, certain active wholesale Layer 2 services. Tenders for the geographical areas covered by the network are to be issued for the private sector's participation in network construction including the link between the dark fibre backbone and individual premises. A broad array of firms are expected to bid for these contracts including electricity providers and Telecom New Zealand, which, according to press reports, is considering structural separation to enhance its chances in the tender.

## **Portugal**

### *Incentives for investment and innovation by all operators*

With regard to the promotion of investments, the government has been taking measures to ensure that according to the strategic guidelines approved in mid 2008, Portugal would have, by the end of 2010, one million users of NGN and that all basic and secondary schools and justice services would be connected to NGN, as well as all hospitals, health centers, universities and public networks of museums and libraries. In particular, the following measures must be highlighted:

- a) Celebration of a protocol, between the government and leading network operators, to promote NGN investment, creating a credit line of USD 1.2 billion (EUR 800 million), in exchange for the commitment of a private investment of a USD 1.4 billion (EUR 1 billion) and the connection of 1.5 million users to NGN.
- b) Attribution, following public tenders, of concessions related to NGN in rural areas in Portugal, covering circa 242 000 households with download speeds of circa 40 Mbps, contributing to the equality of opportunities for the rural population and to the promotion of employment and economic growth in rural areas.

Without prejudice to measures ensuring non-discriminatory provision of wholesale products, the regulator has taken a set of generic measures, including namely procedures related with market analysis and application of obligations upon SMP service providers, that guarantee a fair and predictable regulatory environment and stimulate investment.

*Actual and potential discrimination concerns in provision of wholesale and regulatory challenges*

As for the measures taken by the regulator one should highlight the following, which address specifically actual and potential discrimination concerns in the provision of wholesale products:

1. The imposition of the obligation, already in 2004, on the historic operator to implement a, then pioneering, Reference Offer of Access to Ducts, in conformity with the principles of non discrimination and cost orientation of costs. This strongly contributed to facilitate access to alternative operators and to avoid the undue duplication of infrastructures' costs, thus reducing the so-called "horizontal barrier" related with infrastructure's implementation, which represents circa 2/3 of the overall NGN costs.
2. The publication, in 2009, of revised rules to regulate access to buildings and of new rules to access blocks of buildings by network operators, with the purpose to decrease any possibility of emergence of monopolies at that level, to facilitate access and to decrease costs related with this so called "vertical barrier", which are also deemed significant.

In January 2009, ANACOM published its market analysis for *wholesale network infrastructure access at a fixed location and broadband access*, following which all obligations previously applicable related to bitstream access in competitive areas are now removed. In addition, in February 2009, ANACOM published its report and position regarding a public consultation on the regulatory approach to NGA, which foresaw the need to continue mandatory and open equivalent access to the historic operator' ducts, complemented (in non competitive areas or in competitive areas where there is no empty space in the ducts) with other measures such as access to fiber / dark fiber or some form of virtual bitstream access.

The government has addressed discrimination concerns with the publication of the Decree-Law nr 123/2009, of 21May, which widened and facilitated the access by network operators, in non-discriminatory conditions, to ducts, poles and other facilities installed in the public domain by entities such as municipalities, utilities and public companies, in parallel with a centralised information system keeping an updated record with descriptive and geo-referenced information of these public infrastructures suitable for the accommodation of electronic communications networks. Soon after, Decree-Law nr 258/2009 of the 25 September, revised the aforementioned framework to include the infrastructure which is in possession of, or operated, by electronic communications companies or by the entities in possession of infrastructure which is suitable for accommodating electronic communications networks. Therefore the main regulatory challenges are related to the promotion of healthy competition and of the interests the end users, namely:

- a) To guarantee that NGA are available in the whole of the national territory, ensuring digital inclusion.
- c) To ensure that, where necessary and where the state participates , even partially in NGA networks access is available, in line, namely, with the 2009 EC guidelines for the application of State aid rules in relation to rapid deployment of broadband networks.
- d) To guarantee adequate quality of service levels.
- e) To help consumers make informed and adequate decisions when comparing and choosing between services, which is increasingly difficult due to the proliferation of bundled offers with a high degree of diversity.
- f) To ensure that migration from traditional to NGA networks is transparent, timely and does not distort competition, especially with regard to those operators that have invested heavily in unbundling of the local loop.
- g) To decide whether vertical functional separation is a necessary condition or not to insure a fair and non discriminatory access to NGA networks<sup>5</sup>, namely in view of the evolution of the historic

operator's performance with regard to key performance indicators (where ANACOM has taken in 2009 a decision to promote transparency and non-discrimination)<sup>6</sup>.

#### *Costs and benefits for operators*

Costs for operators depend, on the type of technology, network topology and geographic area (dense urban, urban or rural) that is considered in NGA deployment. According to a publicly available study made by OVUM for ANACOM in 2008<sup>7</sup>, the cost per house passed with FTTH in rural areas may be more than three-fold its cost in dense urban areas<sup>8</sup>. Hence it is not likely that FTTH would develop in rural areas without the existence of public subsidies, thus contributing to the digital divide. The Portuguese government, following a public tender, awarded public subsidies for the construction of wholesale open access NGA in five areas, totalling 140 municipalities which did not have cable or alternative operator's infrastructure.

The higher CAPEX involved in the construction of NGA, namely FTTH GPON, are partially counter weighted by OPEX savings. For instance, the aforementioned study estimated that within a period of 10 years OPEX savings for a FTTH deployment would represent about 43% of the accumulated CAPEX in addition to other cost savings that might accrue to the incumbent operator from the sale of buildings – where legacy network's central offices are located which would no longer be necessary.

The development of NGA deployment might also be related to an increase in adoption of bundled offers in particular triple-play offers. For the operators these might represent scale and scope economies, resulting in cost savings relating to *e.g.* joint billing of services, customer service, lower churn (possibly due to higher transaction costs for the end-user in switching providers) and increased ARPU.

NGA networks might also pave the way for the provision of services with value added for the end-user and therefore enable higher margins for operators arising, for instance, from on line gaming, HDTV or 3DTV.

It is also evident that the possibility to offer electronic communications advanced services is a competitive advantage that tends to help an operator investing in NGA to gain market share.

#### *Business users and consumer outcomes*

As a result of the measures taken by the regulator and by the government, at the end of 2009, there were already 4 million houses<sup>9,10</sup> (including 212 000 non residential facilities) with NGA, of which circa 30% with FTTH/B and 70% with EuroDOCSIS 3.0. Bearing in mind that Portugal has 10.6 million inhabitants, Portugal therefore entered the ranking of countries with a household penetration of NGA access greater than 1%.

The swift growth of NGA deployment was influenced by the following factors:

- a) The spin-off, by the end of 2007, of the PSTN historic operator's undertaking which was providing pay TV (mostly via cable), which contributed to increased competition in 3 Play offers.
- b) The subsequent acquisition in 2008 by the aforementioned cable operator of regional operators, some of which were already investing in FTTH.
- c) The extensive deployment of EuroDOCSIS 3.0 by this and other leading cable operators.
- d) The initial roll-out of FTTH in early 2008 by one of the most active alternative service providers.

In the face of a high level of structural uncertainty it seems too early to point out quantitative assessments. Albeit the social and economic impact of this “revolution” has important spillover effects in terms of sectors such as health, social work, logistics, justice, security, energy and e-government, promoting info-inclusion and also the development of other services and technologies that can be supported by these more intelligent networks, such as cybernetics, nanotechnologies, cognitive computation, RFID and others, creating considerable direct and indirect employment opportunities, altering production modes (for instance expanding tele-working possibilities), stimulating economic growth (including the creation of an important number of qualified jobs, beyond temporary jobs related with the set up of infrastructure) and fostering innovation.

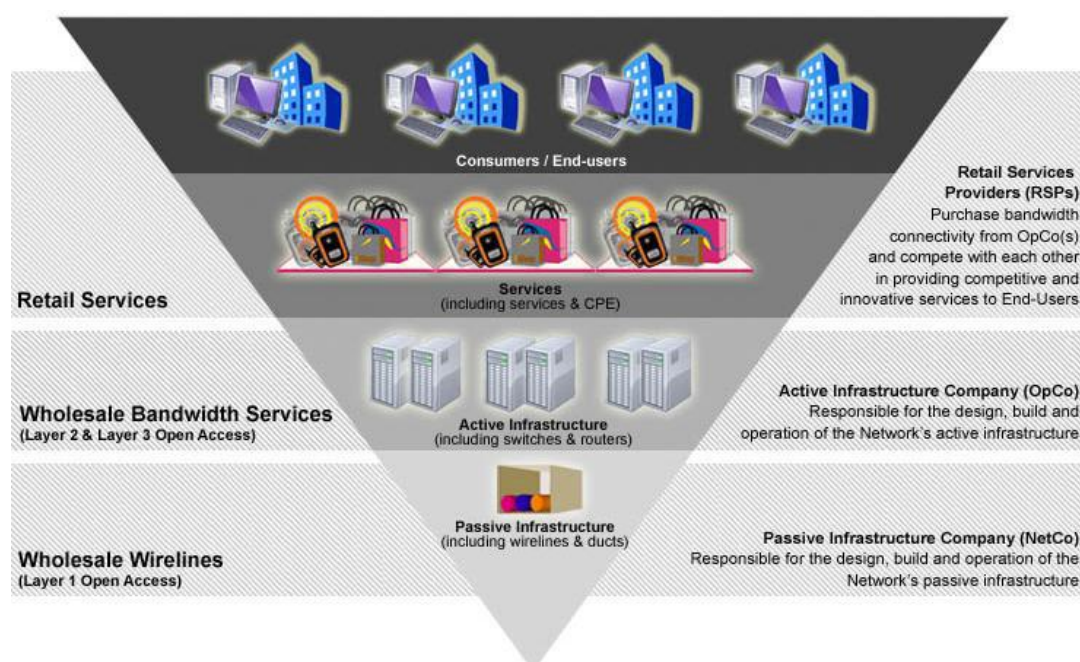
It is also true that NGN will reduce carbon emissions, due to lower energy consumptions when compared to traditional networks (in Portugal, the historic operator expects to cut by half its energy consumption after full implementation of its FTTH network), but also due to its global effect on working and living conditions.

## **Singapore**

Singapore fully liberalised its telecommunication market in 2002. Today, there are over 45 Facilities-Based Operators (FBOs) and 1 000 Services-Based Operators (SBOs) offering a wide variety of telecom services to businesses and consumers. SingTel (Singapore Telecommunications Ltd), the incumbent operator prior to liberalisation, is designated as a Dominant Licensee<sup>11</sup> for its pervasive fixed-line infrastructure.

In 2006, the Singapore government launched the “Intelligent Nation 2015” (iN2015) masterplan, and announced plans for a Next Generation Nationwide Broadband Network (or Next Gen NBN) as well as a wireless broadband network called Wireless@SG, using investments from both public and private sources. The Next Gen NBN aims to provide broadband access speeds of up to 1 Gbit/s downstream, covering 95% of households and non-residential buildings by 2012. Conversely, the Wireless@SG project aims to extend broadband access beyond homes, schools and offices to cover public places/areas.

Policy makers decided that the government co-funded Next Gen NBN should be a vertically separated network. The Singapore regulator was of the view that, given the economic characteristics and possible business models in the NGN environment, there were three distinct layers: *i*) the ‘Retail Services Providers’ (RSP) layer comprising multiple small and large service providers competing to provide retail broadband-based services to businesses and consumers; *ii*) the ‘Operating Company’ (OpCo) layer in the middle, likely made up of a handful of operators installing active infrastructure such as routers and switches to provide wholesale bandwidth services to the RSPs; and *iii*) the ‘Network Company’ (NetCo) layer, likely made up of only a single operator given the high capital investments and significant economies of scale required to be viable, which will lay the passive infrastructure to all homes and businesses and lease the infrastructure to OpCos. With such a three-layer model (as illustrated in the diagram below), it is critical that the NetCo and OpCo provide “effective open access”<sup>12</sup> to the RSPs, so that there is vibrant competition at the RSP layer to drive service innovation, competitive prices and end-user adoption. Hence, in the tenders to select the NetCo and OpCo for the government co-funded Next Gen NBN infrastructure, the government decided to impose structural separation requirements in the NetCo licence and operational separation (otherwise known as functional separation) requirements in the OpCo licence. The structural and operational separation requirements were formulated through an extensive industry-engagement process, carried out through 2007, where the government conducted several industry dialogue sessions to seek views and input on the Next Gen NBN tender project scope and parameters.

**Figure A2. Three-layer structure in Next Gen NBN**

The Singapore government is providing grants of up to USD 543 million for the Next Gen NBN NetCo, and USD 181 million for the Next Gen NBN OpCo, respectively. In 2008, the OpenNet Consortium, formed by Axia NetMedia from Canada, SingTel, Singapore Press Holdings, and SP Telecommunications, was awarded the contract as the NetCo to construct the passive infrastructure. OpenNet aims to achieve its target of 95% coverage by mid-2012. Starting from 2013, OpenNet will be responsible for connecting fibre to households and business premises on request.

In 2009, Nucleus Connect, a wholly-owned subsidiary of Starhub (an existing FBO which provides fixed line telephone services, mobile services, broadband services, cable television and a wide variety of business telecommunications services), was awarded the OpCo contract. Nucleus Connect provides wholesale broadband services to downstream RSPs. It is deploying access technologies like Gigabit Passive Optical Network (GPON) to households. For non-residential premises, it will offer both GPON and Optical Ethernet. RSPs are expected to purchase local connectivity from Nucleus Connect in order to provide retail services. For example, Internet Service Providers (ISPs) can purchase Nucleus Connect's local connectivity service and bundle this together with international capacity to provide Internet access services.

Given its obligation under the structural separation requirements, OpenNet cannot have effective control over the management and operating decisions of downstream operators and vice versa. On the other hand, Nucleus Connect is required to be operationally separated from other operators, including StarHub's retail business divisions or StarHub affiliates. Its operational separation obligations include the requirements to operate on a standalone basis from StarHub's retail divisions and affiliates and the provision of equivalence of inputs to all downstream operators. Except for OpenNet and Nucleus Connect, any operator, including SingTel and Starhub, can act as RSPs.

The price of fibre connection by OpenNet and the wholesale price by Nucleus Connect are regulated. For households, OpenNet charges USD 11 per month for each residential fibre connection. Non-residential fibre connection is priced at USD 36 per month. With these charges set, Nucleus Connect has also announced that its wholesale price is USD 15 per month for a 100 Mbit/s residential end-user connection,

and USD 88 for a 1Gbit/s residential end-user connection. For non-residential premises, such as offices and schools, Nucleus Connect will offer a wholesale price of USD 54 per month for a 100 Mbit/s connection. Enterprise users who have more demanding requirements can opt for a 1Gbps connection at USD 614 per month. The final prices for end users will be set by the RSPs.

Singapore's Next Gen Nationwide Broadband Network (NGNBN) officially began commercial operations in September 2010.<sup>13</sup> OpenNet, Singapore's Optical Fibre Network Company, which is now offering commercial dark fibre leases, said that to date, the optical fibre cable rollout has already passed through 30% of households and non-residential buildings in Singapore. Nucleus Connect, which is responsible for designing, building and operating the active portion of Singapore's NGNBN, announced the first five Retail Service Providers (RSPs) which will go live on the network: LGA, M1, Singtel, StarHub and SuperInternet. Nucleus Connect is installing GPON and Optical Ethernet equipment for the last mile connection. The company said businesses and home owners can look forward to pervasive, competitively-priced, broadband speeds of up to 1 Gbps. Some of the initial services expected from these RSPs include ultra-speed Internet access, IPTV, HD video surveillance and HD digital signage applications.

## Spain

In February 2009, Spain's telecommunication regulator, Comisión del Mercado de las Telecomunicaciones (CMT), adopted its decision on the market analysis of markets 4 and 5, *i.e.* the provision of access to the incumbent's infrastructure, including its ducts, and wholesale broadband access (bitstream) to the local loop of the incumbent (whether based on legacy copper or new fibre rollouts up to a speed of 30 Mb/s). According to the decision, in a context of high uncertainty in new networks roll out and where most Member States have decided to exclude optical fibre accesses from relevant market definition and regulation, CMT opted for a technologically neutral approach. As CMT explained, the capacity threshold in the regulation would provide appropriate incentives to invest, maintaining, at the same time, the competitive level achieved in the provision of mass market broadband services in Spain. In fact, almost two years after this notification, penetration of connections above 30 Mbit/s is very low and this market segment is not controlled by Telefónica.

In order to complete these measures and ensure a sustainable competition in the long run, based on the existence of alternative access infrastructures, CMT also imposed symmetric obligations regarding in-house wiring, whereby the first operator deploying fibre in a building has to meet access requests from other operators, thus advancing the provisions included in the new regulatory framework. Regarding the development and practical implementation of these obligations, a reference offer for access to the incumbent's infrastructures and ducts (MARCo) has been defined by the incumbent and revised by CMT, and a new enhanced bitstream service (based on a layer 2 ethernet approach) has been defined, which will allow alternative operators maximum flexibility and independence from the incumbent when defining their broadband access offers for NGA infrastructure, thus allowing efficient competition even in areas where infrastructure-based competition is not a viable option. Alternative operators are already making use of the duct access reference offer, which includes a comprehensive database containing information about incumbent's infrastructure and ducts.

Spain's regulatory approach to Next Generation Access Networks (NGAs) has, according to the European Community Framework the two-folded objective of incentivising the investment in the deployment of NGAs and fostering competition, with a focus on promoting sustainable competition for the benefit of end users. These objectives guide specific initiatives undertaken in three areas: normative measures, financial support to NGAs and regulatory actions.



### *Normative measures*

In September 2008 the Ministry for Industry Tourism and Trade established the Commission for the Deployment of Ultra Fast Access Infrastructures (CADIAU) to promote a debate with all the interested parties and propose adequate normative measures in order to facilitate the deployment of NGAs. Two main initiatives have resulted from these activities: the revision of the existing regulation on Common Telecommunications Infrastructures in Buildings, and a draft regulation on telecom infrastructures in railways and public roads.

#### *Common telecommunications infrastructures in buildings*

In 1998 Spain adopted a regulation guaranteeing that any new multiple-dwelling building will be equipped with a common telecommunications infrastructure which shall include:

- An MATV system comprising aerial, amplifiers and the distribution elements granting access to all terrestrial TV channels authorised in the location of the building. It shall distribute these channels simultaneously via two 2GHz coax, so the system could be easily upgraded to a SMATV allowing the residents to choose between two different satellite TV platforms.
- Pre-installed telephony in-house wiring and linking all the apartments to the basement of the building, where a distribution panel shall be located allowing competing telephony operators to connect individual apartments to their networks.
- Two cabinets (one in the top of the building, the second in the basement), equipped with power and lighting, to host telecommunication equipments (including, but not exclusively, the telephony distribution panel and the MATV/SMATV equipment)
- Two networks of ducts connecting the telecommunication cabinets to the apartments, with tree topology from the upper cabinet and star topology from the lower cabinet. The MATV system and the telephony wiring will use them but the ducts shall be dimensioned so they can also host other telecom networks (*e.g.* LMDS or HFC-CATV)

Note that all these elements are part of the building in terms of ownership, including the pre-installed telephony wiring, so the NTP is located in the lower telecommunication cabinet. The specification of the minimum technical requirements for all these elements was reviewed in 2003 and a new revision is underway to take account of the evolution of networks and services (*i.e.* NGAs and DTT). To that end, a new Decree is being drafted to include provisions regarding:

- The inclusion in new buildings of specific infrastructures (ducts) according to the access networks (*i.e.* cable, fiber, copper) existing in the area where the building is located.
- In case of fibre, two individual fibers shall link the lower cabinet with each apartment
- The in-house wiring will be replaced by structured cabling, so to improve the bandwidth available in each household.
- The MATV system shall be adapted for the reception and distribution of DTT.

Since the adoption of this regulation building activity has been quite intense in Spain, so presently over 20% of households are equipped with Common Telecommunication Infrastructures, easing the deployments of the last segment of NGAs to an important part of the population, as it will be sufficient for operators to connect its networks to the basement of the building (once the forthcoming regulation enters in

force) or to deploy them over the available space in the ducts (for buildings built under the original regulation).

### ***Draft regulation on infrastructure in new road and railways***

Works on new railways and road infrastructures have a high cost on their own, so it is possible to build in parallel, at a marginal cost, telecommunication infrastructures supporting the deployment of new broadband networks. Furthermore, adequate spaces will be reserved along these infrastructures to facilitate the installation of mobile base stations, so to ensure adequate coverage of mobile communications. The draft Decree will guarantee that all new project roads or railways built by the National Government will include adequate ducts for the deployment of broadband networks as well as specific facilities (space and energy) for the installation of mobile base stations. A standard capacity dimensioning for the facilities will be defined according to the different typologies of projects, however the operators will be allowed to consult each individual project before its formal adoption, so they can express their views on the capacity of specific facilities considered in the project compared to their needs.

### ***Making new spectrum available for mobile services***

With the objective of expanding the present coverage of mobile networks while allowing the provision of wireless broadband services to all the citizens, a number of measures will be adopted from 2011 intended to define a stable framework for spectrum regulation extending till 2030.

These will include the re-allocation of the GSM and DCS-1800 bands, so allowing the use of 3G technologies, and the re-ordering of the existing licences and available spectrum in these bands. Furthermore, a total of 310 MHz will be assigned in 1H 2011 out of which 250 MHz will be new spectrum made available for mobile and wireless communications in the 790-862 MHz and 2.6 GHz sub-bands. It means increasing by 70% the available spectrum for these services. The 2.6 GHz band is already available, and the Digital Dividend band (790-862 MHz) will be available by 1st January 2015 at the latest.

### ***State aid to support NGA and broadband deployment***

In 2005 Spain adopted the Plan Avanza as the umbrella strategy for the advancement of the Information Society (IS). Its first Action Plan identified a number of objectives reflecting both the technological and socio-economic dimensions necessary for consolidating the knowledge economy in Spain, as well as the need to converge with other EU member countries in key IS dimensions. One of them was to close the Digital Divide to improve quality of life for citizens by ensuring equitable and universal access to ICT infrastructures (in particular, mobile networks, broadband Internet and digital terrestrial television), as well as to increase take-up of digital public services.

This objective was in the focus of the PEBA project (National Program for Broadband Deployment in Rural and Isolated Areas) implemented between 2005 and 2008, aiming to expand the availability of broadband services. With a total budget of EUR90 million, the main outcome to reach 99% of population with broadband coverage (compared to 82% in 2005), meaning that over 8 million people gained broadband coverage under the programme.

## **Sweden**

In Sweden, besides the incumbent TeliaSonera there are several fibre networks providing access to long distance fibre or capacity between cities and regions. Here the central Government through the National Grid (Affärsverket svenska kraftnät) and the National Traffic Administration are the large owners of fibre infrastructure. The market is considered to be competitive and has therefore been unregulated since 2006.

The part of the fibre infrastructure requiring most investment is the access network. When investing in local fibre access networks, the incumbent TeliaSonera has an advantage, as it already has a foot in almost every city and village in the country due to the ownership of the copper network. During the last ten years, TeliaSonera has made large investments in local fibre networks, often in co-operation with other broadband providers. TeliaSonera has a market share of around 45% of the total fibre infrastructure in Sweden.

Many municipal city networks and housing companies (owned by the municipality) have also made large investments in fibre networks. The housing companies deploy fibre networks in order to offer the residents more advanced services, raise the value of the property and gain control of the infrastructure. The municipal city networks have a fibre-based infrastructure locally, and the networks may cover municipal service points, businesses and residents. In 2008 around 25-30% of the total fibre infrastructure was owned by the city networks. Sweden has around 150 city networks, both small and large. Examples of successful city networks are Stokab in Stockholm, SÄKOM in Säffle, UmeNet in Umeå, and Skånet in south Sweden.

In 2009 Sweden had 4,255 million broadband subscribers on the market. Of these 687 000 subscriptions were fibre or fibre-LAN connections, *i.e.* 16% of the broadband market. Large players are: Telenor 27%, TeliaSonera 15%, Bredband2 11%, Bahnhof 8% and Tele2 6%.

### ***Access network regulation***

In May 2010 the Swedish Post and Telecom Agency (PTS) took new SMP-decisions for the broadband markets; network infrastructure access and bitstream access. The new decisions replaced the ones issued in 2004.

Access to copper and fibre in the local access networks: In 2010, PTS issued an SMP-decision on the newly defined market for network infrastructure access, which includes access to copper access networks as well as fibre access networks. TeliaSonera was considered having significant market power (SMP) due to a market share of approx. 80% on copper and fibre access. TeliaSonera was obliged to provide access to its copper and fibre access networks on non-discriminatory conditions. In order to prevent legal uncertainty, the regulator has described the meaning of each obligation in detail. Previous NRA decisions on access regulation have been challenged in court for not being detailed enough. On the other hand, regulation should not be more heavy-handed than necessary and should allow scope for commercial agreements.

Among the obligations imposed on TeliaSonera are an obligation to provide access to copper (LLU) and fibre (dark fibre) infrastructure in the access network. TeliaSonera shall keep a cost oriented price for access to physical network infrastructure. The cost is calculated by the use of a cost model (LRIC) produced by PTS. TeliaSonera shall apply terms and conditions that are non-discriminatory. Hence, TeliaSonera shall apply equivalent conditions in equivalent circumstances and not discriminate in favour of its own subsidiaries or partners.

*Price calculation.* The prices for physical access should be based on Long Run Incremental Cost, LRIC, with a sufficient Weighted Average Cost of Capital, WACC, added, including an applicable risk estimate. Calculating prices with this method gives the incumbent a reasonable return on investment from the physical networks, without allowing for any of the excess profits that could arise as an effect of market dominance. It also stimulates investment in competing parallel fibre networks where this may be commercially viable. The most important factor is however that a reasonable price for network access will encourage competing broadband providers to invest in the equipment necessary for connecting to the local access networks, and in the core parts of competing broadband infrastructures. In this way, infrastructure based competition will emerge. For those operators unable to reach the economies of scale required for

physical access, bitstream access should be provided at a price based on LRIC + WACC + an economic margin.

### ***Final remarks***

Market outcomes so far have been positive overall. Prices are generally low and availability relatively good, if not universal. There is a substantial degree of competition and NGA investment, but not everywhere, all the time. Sweden's approach in addressing actual and potential discrimination concerns in the provision of wholesale products needs to evolve, based on experiences of the operator's previous interaction and outcomes in courts. The focus is now on NGA networks. The regulator's ambition is to tread carefully and not impose more regulation than strictly necessary to achieve competition and investment objectives. Regulatory costs, not least in terms of administrative costs for all operators, must not be ignored. However, the overall experience is that competition in this complex area often needs a push, but that competitive pressure is the most powerful investment and growth generator.

### **Switzerland**

Switzerland has taken a substantially different approach to other countries that have performed well in regard to broadband deployment. Switzerland relied primarily on inter-platform competition between the incumbent telecommunications company that offers DSL and cable companies. Notably, unlike the majority of its European neighbours, Switzerland does not impose local loop unbundling. The modification of the Telecommunications Act (TCA), which entered into force in 2007, provides indeed this measure, but it is limited to twisted metallic pairs, *i.e.* the legacy network of the historic operator. Moreover, Switzerland applies an *ex-post* system. It means that the regulator (ComCom) lays down the conditions for access to the equipment and services of the provider which is dominant in the relevant market only if the players in the market have not been able to agree within the statutory framework and one party applies for regulation.

Switzerland has been moving towards an innovative strategy for sharing the costs and risks of deploying next generation networks for the country. A co-operative approach to deploying fibre directly to homes providing subscribers with access to multiple service providers through multi-fibre infrastructure has been adopted. This strategy stems from Swisscom's response to competition both from cable company upgrades and from the municipal utilities' investments in building fibre-to-the-home networks.

Although optical fibre connections are not as widespread as in other European countries, Swisscom already operates a network with optical fibre lines, although this network usually ends at street cabinets (FTTC). However, a number of local power utilities — mostly (but not exclusively) owned by municipalities and cantons — have announced plans to invest in fibre-to-the-home (FTTH) networks. These relatively small power companies are becoming new participants in the broadband market and have challenged Swisscom, which, in response, announced plans in 2008 to bring fibre to 100 000 homes by the end of 2009 along with large investments in fibre-to-the-home networks over the next six years.

The strategic rationale for the small power companies moving into this market is multi-faceted. One of the main reasons put forward is that power companies are facing the challenge of maintaining client loyalty in a liberalised and therefore increasingly competitive energy market environment, where consumers will be able to switch easily from one provider to another. Such advanced services in combination with increased user choice require a reliable and high-quality communication infrastructure in order to monitor and manage the customer relationship, often referred to as "smart metering." In addition, power companies often have the technical expertise at hand to deploy such networks, since they already maintain their own broadband networks between power plants. Further, the conduits that bring power lines to homes often have enough space remaining to accommodate additional fibre cable. These various factors

result in low market entry costs for power companies. Also, the broadband business is similar to their core business and therefore recognized by the utility companies as an attractive opportunity. Finally, the ownership structure of many of the power companies matters significantly. Cities and municipalities, which are often owners or shareholders of such companies, view open access telecommunications infrastructure as a key factor for the attractiveness of their location.

In addition to these developments, ComCom launched a series of fibre-to-the-home roundtable talks to co-ordinate plans of potential investors, broadband providers, and other interest groups. By October 2009, the participants of the roundtables had agreed on technical standards to deploy new multi-fibre into buildings, which will make it easy for customers to switch providers and will ensure that different network and service providers can reach customers.

WiMAX plays no role in the Swiss broadband market. Only one company holds a licence (Callix) and no mobile WiMAX service has been launched up to now. Swisscom decided in 2008 to use satellite connection for universal access services rather than WiMAX.

Satellite Connections (Eutelsat) are used to provide broadband connections to remote areas that cannot be served with DSL or cable networks. The market share of this technology within Switzerland is small, and, with DSL coverage of about 98%, the situation is unlikely to change in the near future.

At the end of 2006, ComCom awarded Swisscom a 10-year universal service licence. The licence contains, among other things, the obligation to provide broadband connections to all households and serve all geographic areas of Switzerland. The minimum transmission rate is set to 600/100kbits/s and a maximum price was set at CHF 69 per month (excluding VAT). This price cap covers not only the broadband connection but also a voice channel, a telephone number and an entry in the public telephone directory. However, the consequences of this obligation are quite limited because the broadband network already reaches 98% of Swiss households. The universal service obligation does not stipulate any specific requirements for access technologies. In January 2009, the broadband market share of Swisscom was 51.9%, representing more than twice the share of its closest competitor, Cablecom (19.0%). Sunrise, the third operator, had a market share of 9.2%.

As mentioned earlier, new players are currently entering the Swiss market, as local power providers start to invest in fiber-to-the-home networks. As a result of this increased competition, Swisscom announced at the end of 2008 investments of over USD 2.64 billion in fiber-to-the-home connections over the next six years ("Fibre Suisse"). Swisscom's multi-fibre strategy is based on the deployment of four fibres to each home. One of these fibres would be used by Swisscom itself, the other three could be bought or rented by other providers. Consequently, Swisscom was looking for co-operation to swap fibres and to divide investment costs. Up to now, Swisscom has signed a cooperation agreement with several utilities (e.g. in Basel, Bern, Zurich, Lausanne, Geneva, St. Gallen, ...). Both partners will share the cost of investments. Four fibres will be laid per household. Each partner will receive one fibre for their sole use and the others will be assigned as required or made available to other companies prepared to invest in them. The multi-fibre network is expected to reduce Swisscom's deployment costs and possibly to protect its market share. According to some experts, the multi-fibre approach taken by Swisscom may even help the company to avoid regulation as it offers non-discriminatory access to competitors.

Although Switzerland is not a member of the European Union, the regulation of the Swiss telecommunications market is influenced by the European Union telecommunications framework. The legislative framework is intended to allow effective competition in the provision of telecommunications services and to ensure that a reliable universal service is provided, at affordable prices, for all sections of the population in all parts of the country. The most important law governing the telecommunications market is the Telecommunications Act (TCA) and the corresponding Ordinance on Telecommunications

Services (OTS). Since its amendment in 2007, key elements of the TCA regime include local loop unbundling and an *ex-post* mechanism to set prices for network access. According to this *ex-post* approach, which is a target of considerable criticism, ComCom is only permitted to intervene in response to a respective request by a telecom company and under the condition that negotiations between the relevant competitors have failed for three months. The TCA establishes ComCom as the independent regulator for the Swiss telecommunications market<sup>14</sup>.

Optical fibre networks are not within the scope of Switzerland's Telecommunications Act (TCA) and has therefore been unregulated. In light of this regulatory vacuum, ComCom has taken on the role of a facilitator, in addition to the role of a regulator, and has recently organized a series of fibre-to-the-home roundtables to explore soft-law approaches to standardize and coordinate the roll-out of additional fibre infrastructure among the different stakeholders.

Some experts are calling for another amendment of the TCA to correct for deficiencies that they claim lead to uncertainty on the market and result in a sub-optimal environment for future investments. According to critics of the current regime, the reliance on *ex-post* regulatory mechanisms prevents regulators from taking the necessary steps to ensure a well functioning market. Moreover, they assert that the regulations should be technology-neutral. For example, ComCom is currently unable to intervene and impose solutions to market problems related to fibre networks.

The struggle over local loop unbundling dragged on for many years before Swisscom was ultimately forced to open its copper wire to its competitors. Today, a newer version of the same debate is underway regarding further amendments to the TCA that would offer regulators expanded power to intervene in broadband markets, again pitting entrants against the incumbent. Swisscom seeks to avoid any further regulations. The disagreement over the practical and philosophical aspects of regulatory policy is occurring both in the marketplace and within government. On the one hand, ComCom is pushing for another amendment, whereas, on the other hand, the Federal Council argues that such a step would be premature in light of the fact that the TCA was amended in 2007. In the meantime, independent experts are calling for a public mandate. The outcome of this political debate is still open and hard to predict; no decisions have been made so far. Occupying the far side of the political landscape is an ongoing process characterized not by antagonism but by co-operation. These recent round-table discussions, facilitated by ComCom and bringing together the most important stakeholders, including Swisscom, seek to frame a co-ordinated approach to deploying the next generation of fiber-to-the-home networks that will offer excellent transmission rates and be open to multiple service providers.

Switzerland has not yet formulated a more explicit and detailed strategy on broadband infrastructure at the federal level. In September 2009, the Federal Council has nevertheless published its analysis of the telecommunications market, fulfilling the mandate issued to it by the Parliament. In this report, it gives a general overview of the challenges and possible solutions approaches, even if it comes to the conclusion that a revision of the law is not currently pressing. Overall, 70.8% of households in Switzerland have broadband access. The Swiss federal government does not directly invest in broadband infrastructure. The primary task of the government is to build a sound regulatory framework that creates incentives and favourable conditions for market development.

At the local level, by contrast, there have been several initiatives aimed at strengthening the country's broadband infrastructure. For instance, in a 2007 vote, the people of Zurich approved a public loan of over CHF 200 million to support the local power company in providing fiber-to-the-home to all households. Another example is St. Gallen, where voters approved by a wide majority a CHF 78 million investment to create a FTTH network structured as a public utility. Local initiatives such as these have had an impact on national-scale broadband deployment strategies and influenced Swisscom's plans to expand investments through a co-operative approach to FTTH deployment through the Fibre Suisse plan. At the same time,

several private-public partnerships were formed in some cities and villages in Switzerland, aimed at building open wireless networks (WLAN). The local utility provider owned by the City of St. Gallen, for example, invested about USD 150 000 in a local open wireless initiative.

## United Kingdom

Prior to 2005, the United Kingdom telecommunications market was characterised by strong service competition but relatively limited infrastructure competition in the wholesale broadband market. At the time of Ofcom's telecommunications strategic review (TSR), BT dominated the supply of telecommunications services, even though local access markets had been opened to competition in the 1990s. BT, the incumbent telecommunication operator, had Significant Market Power (SMP) in 14 wholesale markets and 16 retail markets. Ofcom's analysis was centered on evaluating the opportunities to develop effective and sustainable competition within the sector while taking investments in NGN into consideration. As Ofcom's review developed, discrimination emerged as a major issue. Many stakeholders in the review argued that BT was still able to favour its internal business over its external customers and this was regarded as the prime cause of the lack of effective competition in the potentially competitive downstream markets.

As a set of agreements and undertakings between Ofcom and BT, Openreach was launched in early 2006 as the first independent access service division in an OECD country. The newly separated part of BT was created to deliver installation and maintenance services on behalf of the United Kingdom's telephone and broadband services. With the launch of Openreach, alternative operators are provided a range of access and backhaul services on a non-discriminatory equivalence of input basis. In other words, all telecommunications providers including BT were to be provided with wholesale regulated products under the same timeframe, terms and conditions and using the same processes that respond to the principle of Equivalence of Input (EoI). Openreach has been offering the services of LLU, wholesale line rental (WLR), and a suite of ethernet access and backhaul services. Alongside EoI, the Equality of Access Board (EAB) has been established for monitoring, reporting and advising on BT's compliance with the Undertaking with a focus on EoI and the operation of Openreach.

In this model, the key features of the regulatory settlement are as follows:

- The requirement to provide 'equivalence' – the provision of the same wholesale product with the same quality, price, timeframe and conditions to BT and alternative providers.
- Functional separation of all bottleneck elements of the BT network into Openreach.
- The creation of a new EAB to oversee the implementation of the undertakings.
- Establishing 'Chinese walls', which preclude Openreach from exchanging confidential information with other parts of the BT group.

Five years since the Undertakings were agreed, the UK competitive landscape has been transformed.<sup>15</sup> While factors other than the Undertakings may have also played a role - ,such as decreases in wholesale charges for LLU, and the establishment of the Office of the Telecommunications Adjudicator tasked with facilitating the improvement of operational processes - there have been significant developments in the UK market:

- By June 2010, almost 6.8 million broadband connections were provided using LLU.
- Investment in LLU infrastructure means that over 84% of UK premises are now connected to an unbundled exchange (2011 exchanges by December 2009), with 70% of UK premises now having the choice of three or more LLU-based operators from which to take communications services.

- The effect of competition now means that nearly three quarters (73.0%) of retail broadband supply is offered to the market by competitors of BT.
- Residential consumers are benefiting from increased choice and lower prices with an, up to 8 Mbit/s, broadband service now available for as little as GBP6.49 per month (excluding introductory and special rate tariffs).
- In the voice market, there are now over 6 million Wholesale Line Rental (WLR) lines used to offer competing fixed voice services. Competition in the residential voice market has also seen consistent real terms reductions in the average cost of a fixed line call.

The EAB's 2010 annual report also indicates that Openreach has complied with the Undertakings relating to its operations and governance, although some breaches have occurred. BT is now in the process of deploying its NGA network and plans to deliver 66% coverage of households by 2015. Its deployment will be primarily based on fibre to the cabinet (FTTC) technology which will account for 75% of the total, the remainder being fibre to the premises (FTTP). Virgin Media has already upgraded its network and provides around 50% NGA coverage. Following agreement with Ofcom, BT's Openreach division will be the entity that provides wholesale NGA products on an equivalence basis. In October 2010, Ofcom required BT / Openreach to offer access:

- Its ducts and poles and VULA United Kingdom-wide.
- Sub-loop unbundling (SLU) nationwide.
- Wholesale access to its NGA network where it has built on the basis of virtual unbundled local access.



## NOTES

- <sup>1</sup> McKinsey-KPMG (2010), *National Broadband Network Implementation Study*. Available at: [http://www.dbcde.gov.au/nbn\\_implementation\\_study](http://www.dbcde.gov.au/nbn_implementation_study).
- <sup>2</sup> Canada Digital Economy Consultation paper (<http://de-en.gc.ca/consultation-paper/>) CRTC's wholesale high-speed access services proceeding (<http://www.crtc.gc.ca/eng/archive/2010/2010-632.htm>).
- <sup>3</sup> Nixon, P (2010), Government to encourage entrance of telecoms infrastructure operators - 12 August. *Business News Americas*. Available at [http://www.bnamericas.com/news/telecommunications/Government\\_to\\_encourage\\_entrance\\_of\\_telecoms\\_infrastructure\\_operators](http://www.bnamericas.com/news/telecommunications/Government_to_encourage_entrance_of_telecoms_infrastructure_operators)
- <sup>4</sup> According to the EU Recommendation on regulated access to Next Generation Access Networks (NGA), "where there is a proven track record that functional separation or similar arrangements have resulted in fully equivalent access to NGA networks by alternative operators and the downstream arm of the SMP operator, and where there are sufficient competitive constraints on the SMP operator's downstream arm, NRAs have more flexibility when designing remedies for wholesale broadband access. In particular, the price of the bitstream product could be left to the market."
- <sup>5</sup> An independent consultancy firm has developed, in 2009, an extensive study for ANACOM regarding vertical functional separation (available at [www.anacom.pt/render.jsp?contentId=968156&languageId=1](http://www.anacom.pt/render.jsp?contentId=968156&languageId=1)).
- <sup>6</sup> [www.anacom.pt/render.jsp?contentId=871940&languageId=1](http://www.anacom.pt/render.jsp?contentId=871940&languageId=1).
- <sup>7</sup> [www.anacom.pt/download.jsp?contentId=649200&fileId=595631&channel=graphic](http://www.anacom.pt/download.jsp?contentId=649200&fileId=595631&channel=graphic)
- <sup>8</sup> Available information both in Portugal and abroad confirms this assumption.
- <sup>9</sup> The provision of a given service by more than one operator in the same region implies the possibility of a given household being passed by more than one operator. It is estimated that this double-counting effect, considering EuroDOCSIS 3.0 together with FTTH/B, represents a maximum of 33% of the overall figure.
- <sup>10</sup> This number includes 0.2 million non-residential facilities.
- <sup>11</sup> In Singapore's competition framework for the telecommunication sector, a telecom operator will be designated as a Dominant Licensee if it operates facilities (used for the provision of telecom services) that are sufficiently costly and difficult to replicate, or if it has significant market power in any telecom market.
- <sup>12</sup> This refers to the offer of open access at all segments of the network (both passive under NetCo and active under the OpCo) providing connectivity on a wholesale basis at non-discriminatory and non-exclusive terms.
- <sup>13</sup> Poulus, T (2010), "Singapore on top with NBN, Australia's plans near standstill", 2 September CET.

- <sup>14</sup> Telecommunications Act (TCA) and Ordinance on Telecommunications Services (OTS), see: [www.admin.ch/ch/e/rs/7.html](http://www.admin.ch/ch/e/rs/7.html)
- <sup>15</sup> In March 2010 Ofcom published reviews of the wholesale local access (WLA) and wholesale broadband access (WBA) markets ([www.ofcom.org.uk/consult/condocs/wla/](http://www.ofcom.org.uk/consult/condocs/wla/) and [www.ofcom.org.uk/consult/condocs/wba/](http://www.ofcom.org.uk/consult/condocs/wba/)) These gave detailed assessments of the developments of these markets and consulted on market definition, market power determinations and remedies. In October 2010, Ofcom published, *Review of the wholesale local access market*. Statement on market definition, market power determinations and remedies. Statement 7 October. Available at: <http://stakeholders.ofcom.org.uk/consultations/wla/statement> The WBA market review was published on 3 December 2010: (<http://stakeholders.ofcom.org.uk/consultations/wba/wba-statement/>).