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DISCUSSION PAPER

NGN Enabling Environment

Comments are welcome and should be sent by 1 March 2007 to GSR07@itu.int

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ENABLING ENVIRONMENT

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TABLE OF CONTENTS

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This paper has been prepared by Janet Hernandez, Telecommunication Management Group (TMG), as an input document for the 2007 Global Symposium for Regulators (GSR), organized by the Telecommunication Development Bureau (BDT). The views expressed in this paper are those of the author and do not necessarily reflect the opinions of the ITU or its membership. Comments are welcome and should be sent to gsr07@itu.int by 1 March 2007.

1 Introduction

Today, the lines between traditional telecommunications services are blurred due to convergence in the ICT sector. The move to NGN constitutes the latest step in the road to convergence of the ICT sector, as it will essentially enable consumers to receive a wide range of services, including upgraded versions of existing services (*e.g.*, faster broadband services), as well as new services, all over a single, all IP-based network.

NGNs are defined by the ITU-T as packet-based networks able to provide services including telecommunication services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies. It offers unrestricted access by users to different service providers. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users.[2]

For wireline providers, the transition to NGN, both at the access and core level,[3] is being driven by various factors.

- Competitive pressure from traditional cable television providers offering "triple play" (i.e., voice, video, and data services) – as well as pressure from other new market players such as alternative providers, local governments and power companies – and by their ability to offer television over Internet Protocol (IPTV) is pushing wireline providers towards NGN.
- Expected cost savings associated with the economies of scope deriving from the integration of existing networks is a key driver for core NGN migration.
- From the access network perspective, investing in NGNs is expected to reduce the on-going operational cost of the copper local access networks since they allow for eliminating local exchanges, and thereby directly linking customer premises with the data switching capabilities higher up in the network architecture.
- The consumers demand for an ever increasing "need for speed", particularly in developed markets, has been a main driver for operators to upgrade existing networks and, particularly for the deployment of FTTx access infrastructures. In Japan, for example, operators are providing commercial offering of 100 Mbps in response to consumer demand for higher speeds.

Thus far, the debate regarding the appropriate regulatory framework for the NGN environment focused to a large extent in developed economies, such as Australia, Japan, Singapore, the United States, and some EU Member states, notably the United Kingdom, Germany, and the Netherlands. In these countries, issues such as extending existing *ex ante* access obligations to NGNs, IP-interconnection, and the universal services implications of IP-based services, particularly voice, have been at the center of the regulator's agendas on NGNs. Some developing economies, such as India, have also initiated consultations and are promoting public awareness of NGNs through various regulatory processes and initiatives.

For regulators, migration to the NGN world can be characterized by the following elements:

- Traditional market boundaries have become increasingly blurred in the presence of IP-enabled services and fixed-mobile convergence.
- Regulatory frameworks which generally were designed for a traditional circuit switched environment may not be equipped to address an IP-based environment where multiple services can be offered over a single platform.
- Access providers and network operators must make intensive investments in upgrading and building new infrastructures and are looking for regulatory certainty.
- New potentials for bottleneck structures and market dominance in the telecommunications industry can emerge.[4]

1.1 Bridging the digital divide

The creation of enabling environments for NGN deployment will be closely linked with addressing and bridging the digital divide. Despite dramatic increases in penetration in many developing countries, particularly via mobile network deployment, major disparities still remain in the areas of Internet, broadband, and 3G mobile penetration.[5] Indeed, globally, Asia, Europe and the Americas represent no less than 99 per cent of all broadband subscribers, the majority of which are in the wealthier countries of North America, Western Europe and Asia. According to the 2006 Millennium Goals Report, in 2004, by the end of 2004 there was a large digital divide separating developed and developing regions regarding Internet use, as over half the population in developed regions had access to the Internet, compared to 7 per cent in developing regions and less than 1 per cent in the 50 least developed countries.[6]

As pointed out by the Romanian regulator in the Consultation to the 2007 Global Symposium of Regulators, the shift towards NGNs will not happen overnight and will be dependent on country-specific conditions.[7] Nevertheless, NGN is increasingly becoming an important issue for both developed and developing countries.[8] Migration towards all IP-based environments, the deployment of the necessary access infrastructure, and the ability to offer consumers higher speeds and newer applications is expected to become, as mobile telephony currently is, a major driver in bridging the digital divide between the information rich and information poor countries. However, the shift towards an NGN world also creates concern for regulators regarding the digital divide within their own jurisdictions as a consequence of the economics of NGN deployment, particularly access networks, which initially will cover only densely populated areas.

1.2 NGN deployment in developing countries

Service providers in developing countries are aware of cost-saving efficiencies associated with NGNs, and in countries such as Brazil, India, the United Arab Emirates, and Vietnam, they have already announced plans to migrate to core NGNs. Similarly, in countries such as Argentina, Bangladesh, Bulgaria, Brazil, the Cayman Islands, Pakistan, Vietnam and Venezuela providers have also engaged in FTTx projects. At this stage, however, such projects are mostly concentrated in highly populated, high income areas.

Developing countries have certain advantages in the migration process towards NGN, and should leverage these advantages to create proper enabling environments for this transition.

- Compared to more developed telecommunication markets, service providers in developing countries generally have less baggage of legacy products in their core networks (*e.g.*, ISDN, IP, ATM, FR, and SHDS). This makes it easier for them to migrate to all IP-based systems, thus leapfrogging technologies and going to core NGNs straightaway.
- In the case of access networks, limited deployment and penetration of copper networks in particular, and the reduction of the costs of fibre, can also facilitate "greenfield" deployment of FTTx projects. Thus, they also will be able to leapfrog access technologies, where economically viable, and go directly to NGN access infrastructure. Similarly, in certain countries the lack of adoption or implementation of complex access-based *ex ante* regulations can be viewed as an advantage as they are confronted with fewer regulatory burdens and commitments to consider and/or maintain.

1.3 Way Forward

Regulators must see NGN deployment in its proper dimensions -- as a continuation of their broadband and convergence policies. Robust policies that promote both of these crucial objectives is a prerequisite, and in many cases mixes with, creating an enabling environment that will open the way for the migration to the new NGN world.

As noted in the World Summit on the Information Society (WSIS) Action Plan, "(g)overnments should foster a supportive, transparent, pro-competitive and predictable policy, legal and regulatory framework, which provides the appropriate incentives to investment and community development in the Information Society." This is of paramount importance for facilitating NGN deployment.[9] Regulators must provide operators with regulatory certainty that will permit them to incur the risks associated with NGN deployment, particularly the high upfront investments required. However, regulators should keep in mind that their role is not to provide incentives to make particular investments, but to ensure that incentives for efficient investment are not distorted, particularly as a result of disproportionate regulation.[10] Thus, regulators must strive to strike the appropriate balance between these objectives as they advance to the new world of NGNs.

2 Role of the Regulator in Transitioning to and Facilitating an NGN Environment

With the emergence of NGNs, regulators are faced with the issue of deciding whether to implement an *ex post* regulatory model, or maintain *ex ante* regulation. *Ex ante* regulation refers to the process of establishing specific rules and requirements to prevent anti-competitive or otherwise undesirable market activity by operators before it occurs. *Ex post* regulation, which relies primarily on competition law, by contrast calls for establishing few or no specific rules in advance, but applying regulatory measures to remedy a market failure or anti-competitive situation.

In certain countries, regulators have required incumbent operators to provide their competitors with mandatory access (i.e., local loop unbundling, bitstream or wholesale access and/or resale) to their networks (see Box 1). Now with the transition to NGN, the new question is whether these new IP-based networks, which will require significant investments by the incumbent operators, should be subject to the same access obligations currently being imposed. In considering this issue, regulators are assessing the level of competition in their markets to determine if a shift towards an *ex post* model could sustain existing levels of competition and enhance consumer welfare. On the other hand, regulators also are faced with determining if investment in NGNs leads to the emergence of new services and markets that should be free from existing *ex ante* regulation.

Box 1: Mechanisms to Promote Access-Based Competition

1) **Unbundling of the local loop**: This mechanism has two modalities: full unbundling or shared access. **Full unbundling** allows the services-based operator seeking access from the facilities-based operator to have management control over the copper pairs connecting a subscriber to the facilities-based operator's main distribution frame (MDF). The services-based operator seeking access can provide both voice and data services on the facilities-based operator's network. **Shared access** refers to an arrangement where the services-based operator has access to either voice or data transmission over the facilities-based operator's network. The services-based operator leases part of the copper pair spectrum while the facilities-based operator maintains control of the copper pair.

2) **Bit stream (or wholesale) access**: This involves the facilities-based operator installing high-speed access links to its customers and opening these links to its competitors (i.e., services-based operators). In this case, the services-based operator seeking access has no management control over the physical line and is not permitted to add any equipment to the network.

3) **Total Service Resale**: This allows a services-based provider to purchase the facilities-based operator's service at a wholesale discount, rebrand the service, and resell it to the consumer, allowing the services-based provider to build a customer base and obtain a retail sales margin over the wholesale rate.

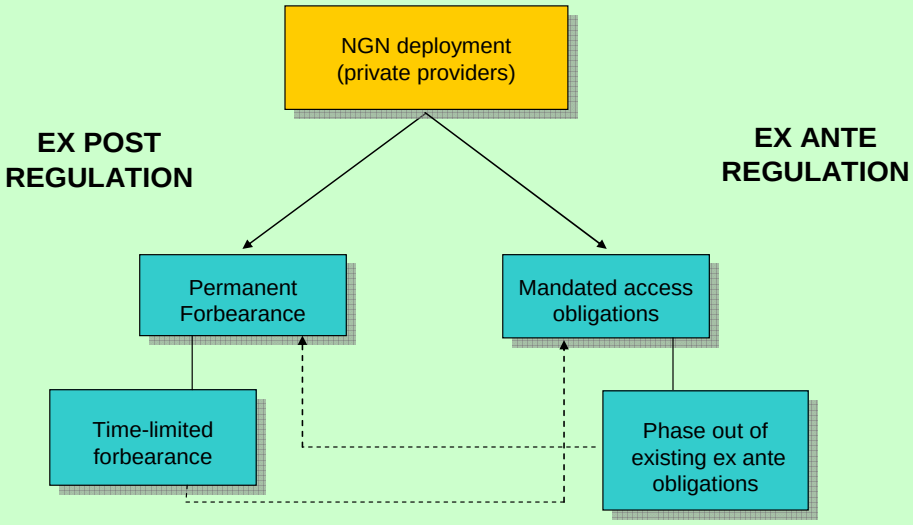
For example, in the EU, this debate has been particularly heated lately, where competition in retail electronic communications markets, specifically the broadband market, currently relies on mandatory wholesale access to carriers found to have significant market power (SMP). Under the EU regulatory framework, *ex ante* regulations that impose mandatory access to existing networks, however, must serve as an interim measure to ensure competition between services and options for the consumer until adequate infrastructure competition exists.[11] *Ex ante* regulation usually is imposed only after conducting a thorough market review under the EU Framework Directive. The process for market review is to define the relevant economic market(s), to assess competition in each market(s), in particular to assess whether any firms in that market have SMP, and to apply appropriate *ex ante* regulatory obligations for any firms found to have SMP. In addition, *ex ante* access and price regulation must be set up in such a way that it does not negatively influence investment incentives for market players and, if possible, promote companies to "ascend the investment ladder".[12]

Although in developing countries the regulatory issues related to migration to NGN may be at an earlier stage, regulators are also keenly aware of the relevance and regulatory concerns associated with the migration towards NGNs. We have seen much discussion and input related to NGN from contributions submitted by developing countries to the 2006 World Telecommunication Development Conference and the Telecommunications Forum at 2006 ITU Telecom World. Regulators such as TRAI of India, for example, have focused their effort on raising awareness of the benefits of NGNs for the market and consumers, as well as creating the necessary enabling environment for their deployment (*e.g.*, addressing issues such as licensing reform, and creating level playing field for competition). Most recently, numerous regulators have expressed their views and activities related to NGN in the Consultation to the Global Symposium for Regulators. For example, regulators in Costa Rica, Morocco, and Poland have indicated that they consider imposing access obligations to be a favorable mechanism to increase broadband penetration and future NGN take-up.[13]

2.1 Regulator's decision tree

With the transition to NGNs, regulators generally are faced with two primary options: extending current access obligations to the NGN world or permanently forbearing from doing so. However, some regulators have also opted to pursue transitional options towards either *ex ante* or *ex post* regulation by imposing forbearance in a time-limited manner or eliminating regulatory obligations in a phased-out fashion (Figure 1). These are extremely complex decisions, and there are advantages and disadvantages to each approach (Box 2).

Figure 1: Regulator's decision tree



In mature, access-intensive markets, where the regulatory environment has encouraged alternative/competitive providers over the past years to deploy their infrastructure to as many interconnection points as possible and allowed them to use incumbent's non-replicable assets from there to reach the end user, regulatory clarity is seen as vital. Without it, some argue that current and future investment as well as competition by alternative/competitive providers may be disrupted, as their investment decisions (e.g., on DSLAMs in an unbundled local loop (ULL) scenario) are highly dependent of the underlying dominant network provider's future plans. In the Netherlands, for example, OPTA has identified the lack of clarity and certainty regarding access alternatives in the wake of incumbent KPN's NGN migration as a factor for the lack of investment in DSL networks by alternative providers during the first semester of 2006.[14]

Because of this, rather than wait for regulatory intervention that may not suit their business interests, certain incumbent operators have taken a more pro-active stance and voluntarily agreed to certain measures regarding access to their proposed NGNs. For example, BT in the United Kingdom voluntarily agreed to allow third parties to access its NGN core network. Similarly, France Telecom,

has announced plans to allow rival operators to access its new FTTH systems to prevent regulatory intervention.

The appropriate course to pursue is dependent on country-specific conditions and the state of development of internal markets. However, regardless of what course a regulator pursues, it should keep in mind the need to create regulatory certainty for both incumbent and competing/alternative providers. Regulators must be mindful of the risks associated with NGN deployment so as not to stifle innovation. They must balance this goal with that of fostering robust, competitive markets. Although it is not necessarily the role of the regulator to protect investments made by competitive/alternative providers against market risks, in regulating NGNs it is important to consider the interests of existing competitive operators in ensuring the continued availability of and terms for current wholesale inputs to their products, during the lifetime of the assets in which they have invested. Similarly, suitable migration paths for existing infrastructure investments following the deployment of new technologies must be ensured.[15]

Box 2: Pros and cons of *Ex Post* and *Ex Ante* Regulatory Options

	Pros	Cons
Permanent forbearance	Avoids distorting investment incentives by eliminating price regulation as such regulation has the effect of capping positive returns of the NGN operator's investment, while leaving investors fully exposed should the investment be unsuccessful.	With the elimination of mandating an incumbent operator to offer competitors wholesale products, such products may not be available for competitors to purchase them. Thus, permanent forbearance may lead to markets where the only competition in future NGN services is between operators that own their own infrastructure to the end user's premises.
Time-limited forbearance or regulatory holiday	Delivers incentives to NGN operators of the future bottlenecks by offering them monopoly rents for a period of time, after which regulation would apply or be enforced to protect competition.	Creates uncertainty as the payback periods for NGN investments are long and time-limited forbearance (3 to 5 years) generally would not suffice to recoup them. In countries where access-based competition does exist, impact would likely exceed the forbearance period if NGN service competes with current services as current competitors would be severely affected in their ability to compete and it could take them many years to attain their current market standing.
Mandated access	Ensures continued progression of access-based competition models, allowing current competitors to use new NGN bottleneck facilities.	Incentives for efficient investment in NGN deployment may be distorted, and incumbent operators may abstain from committing to such deployment. Depending on the level of mandated network access, it may dampen competitors' incentives to invest in their own infrastructure.
Phase out of	As in the case of forbearance, it	Eliminating the requirement that

existing ex ante obligations	avoids distorting investment incentives; however, it allows the regulator more control over the process, as it is directed only at specific segments where inter-modal competition exists. If accompanied by the threat of reinstating *ex ante* regulation, it allows regulators to intervene where market forces cannot deliver effective inter-modal competition.	incumbent operators offer their competitors wholesale products runs the risk that such competition may not arise spontaneously. However, this may be remedied with the threat of *ex ante* regulation. As in the case of forbearance, the phasing out of existing *ex ante* regulations may lead to markets where the only competition in future NGN services is between operators that own their own infrastructure to the end user's premises.

Source: See Ofcom, Regulatory challenges posed by next generation access networks. Public discussion document. 23 November 2006, at p. 22-24.

2.2 Regulatory Checklist Regarding *Ex post* and *Ex ante* Regulation in an NGN Environment

In order to create enabling regulation for the transition towards an NGN environment, regulators are considering a variety of issues based on specific market conditions, particularly regarding how best to foster a competitive environment and what obstacles need to be addressed and remedied to sustain competition between incumbent operators and alternative/competitive providers.

Although there is no definitive list of issues and answers for regulators, particularly given the different market dynamics in each jurisdiction, the following is a checklist of issues (Box 3) that regulators should consider when deciding between opting for *ex post* or *ex ante* regulation as a means to usher in the transition to an NGN environment.

Box 3: Checklist of Issues Regarding *Ex Post* and *Ex Ante* Regulation

- Is there sufficient inter-modal competition?
- If so, is a phased-out policy needed to transition from an *ex ante* to an *ex post* regulatory environment?
- Is time-limited forbearance or a regulatory holiday necessary?
- Does a bottleneck situation need to be addressed?

2.2.1 *Is there sufficient inter-modal competition*?

In determining whether to impose *ex ante* regulation to NGN deployments, regulators are looking at whether sufficient inter-modal competition exists in the market (*i.e.*, if significant prospects exist for wide scale, competing end-to-end access infrastructure deployments that will provide competitive constraints to incumbent operators' ability to leverage any position of market power). If sufficient competition is found to exist, some regulators have opted to forbear from regulating NGNs. For example, regulators in the United States and Hong Kong, China have abstained from imposing access on FTTx deployments by incumbents (United States) or eliminated unbundled access obligations to incumbent's infrastructure altogether, albeit in a phased-out manner (Hong Kong, China). In both cases, regulators have relied on large scale deployment of competing networks (cable television in the United States and fibre in Hong Kong, China) and on inter-modal competition to keep incumbents in check, arguing that *ex post* competition law remedies would suffice to address any future problems that may arise.

Deciding whether to rely on inter-modal or intra-modal competition largely depends on the market structure and the policy objectives of the country. For example, in the United States, the regulator has acknowledged that unbundling can bring competition to markets faster than it might otherwise develop; however, it has decided that excessive network unbundling requirements tend to undermine the incentives of both incumbent/dominant providers and new entrants to invest in new facilities and deploy new technology. As such, and taking into account the levels of competition in the U.S. broadband market, the FCC has not imposed unbundled access obligations on FTTH infrastructure deployed to serve the U.S. mass market. (Box 4)

No clear-cut rule exists to determine at what stage of deployment sufficient competition exists. In the United Kingdom, Ofcom recently stated that the existence of cable TV networks that cover 45% of households is not evidence of sustainable, large scale end-to-end local access infrastructure competition in that country.[16] In Hong Kong, China, however, coverage of 53% of households by at least two access infrastructures was deemed sufficient to trigger forbearance of access regulations by OFTA.[17]

Box 4: Regulation of unbundled access to fibre loops in the United States

The Telecommunications Act of 1996[18] was designed, in part, to introduce competition into the local exchange market in the United States. Among the various requirements imposed to achieve this goal, few, if any, have spurred so much regulatory attention, industry effort, or litigation, as the requirement under section 251(c)(3). This provision requires incumbent local exchange carriers (ILEC) to make elements of their networks available on an unbundled basis to new entrants at cost-based rates.

Litigation associated with shaping current unbundled network elements (UNE) regulation in the United States has resulted in the ILECs narrowing the initial scope and reach of the FCC's UNE regulations.[19] In this context, one of the main drivers influencing the UNE regulatory landscape in the United States was, quite naturally, creating the right investment incentives to foster NGN roll-out, both by ILECs and new entrants. As a backdrop to this whole debate were the ILEC's arguments that initial FCC unbundling and sharing obligations, although innocuous to sunk investments (*i.e.*, legacy copper loops), dampened their incentives for new investment, such as DSL upgrades and fibre deployments.

The centerpiece of the FCC´s policy on unbundling of specific next generation access network elements for the provision of broadband services, particularly hybrid and fibre-to-the-home (FTTH) networks, is its *Triennial Review Order*. There, the FCC imposed clear limitations on unbundled access to NGN loops serving the mass market in the United States, declining to require incumbent LECs to provide unbundled access to their hybrid or FTTH loops for the provision of broadband services.[20] This decision was based on the FCC's recognition of robust broadband competition and increasing competition from inter-modal sources in the marketplace. FCC rules provide for the following with regard to next generation access infrastructure unbundling:

- For loops serving mass market customers, incumbent LECs need not unbundle either dark or lit fibre loops that extend to the customer's premises (FTTH loops) deployed in new build, or "greenfield," situations.[21]
- Where an FTTH loop is deployed in overbuild, or "brownfield," situations, incumbent LECs either must provide unbundled access to a 64 kbps transmission path over the fibre loop or unbundled access to a spare copper loop.[22]
- For hybrid copper/fibre loops, incumbent LECs need not unbundle the packet-switched capabilities of those loops, but must provide unbundled access to any TDM features, functions, and capabilities for requesting carriers seeking to provide broadband

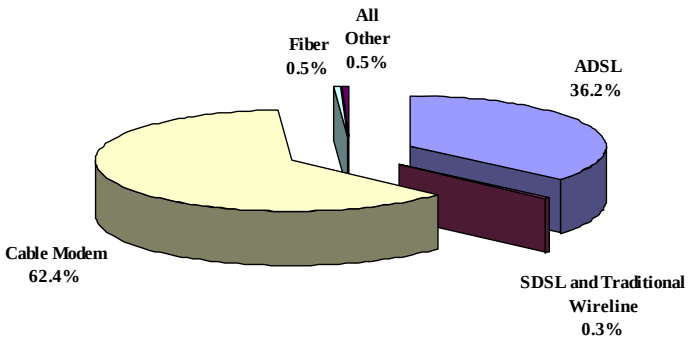
services.[23]

- When a requesting carrier seeks access to a hybrid loop to provide narrowband service, the incumbent LEC may provide either unbundled access to an entire hybrid loop capable of voice grade service using TDM technology or unbundled access to a spare copper loop.[24]

The FCC also has extended these rules to multiple dwelling units (MDUs) and concluded that FTTH rules apply to MDUs that are predominantly residential.[25]

Although cable modem continues to be the prevalent technology for delivery of advanced services in the United States, accounting for 62.4% of lines serving residential end users, with ADSL representing 36.2% and fibre 0.5% (Figure 2), the FCC's hands-off policy has clearly had a positive impact on FTTH line growth in the United States along with other factors, such as competitive pressure from cable television providers. Indeed, after the D.C. Circuit Court upheld the FCC rules in *USTA II*, fibre take-up and deployment has seen a year-to-year increase of over 540% (2004-2005) compared to an increase of only 32% and 74% in the previous two years respectively (2002-2004).[26]

Figure 2: U.S. Residential Advanced Services Lines by Technology as of December 31, 2005



Source: FCC, High-Speed Services for Internet Access: Status as of December 31, 2005

2.2.2 *If it is determined that sufficient competition exists, is a phase-out policy needed to transition from an ex ante to an ex post environment?*

If regulators find that sufficient competition exists, they may consider it necessary to eliminate certain regulatory obligations, but may opt to do so in a phased-out manner to avoid any major disruption in the marketplace. In Hong Kong, China, the regulator, OFTA, not only abstained from mandating access to fibre-based networks, but completely withdrew existing obligations from legacy, copper-based local loops. This was ordered in a phased-out manner and on a building-to-building basis and applies to buildings served by at least two competing self-built access networks (Box 5). Hong Kong China's policy, however, should be viewed in its proper context, mainly within the high urban concentration of its area where the entire population lives and works in less than 100,000 buildings and hence the costs associated with deploying overlapping access facilities to each customer's premise is significantly lower than in Europe or the United States.

Box 5: Elimination of Type II interconnection in Hong Kong, China

Hong Kong, China introduced unbundled access obligations, so called Type II interconnection, in 1995 with the objective of promoting the telecommunications industry, encouraging investment in networks, facilitating effective competition in the telecommunications market, and enhancing consumer choice.

In 2003, however, the government initiated a review of this policy, indicating that its continuation would only be justified "if the benefits from facilitating effective competition and enhancing consumer choice outweigh any potential detriment arising from dampening of incentives for investment in network infrastructure."[27]

In 2004, OFTA ordered withdrawal of Type II interconnection obligations subject to a phase-out period to be fully implemented by 30 June 2008.[28] The withdrawal would be implemented on a building-by-building basis and apply to buildings already connected to at least two self-built customer access networks; however, the withdrawal would be subject to a two-year transitional period to ensure no disruption of choice and service to consumers and a one-year "grandfather" period thereafter to protect the regulated interconnection terms (including charges) for lines connected before and during the transitional period. After the "grandfather" period, or 30 June 2008, whichever is earlier as the case may be, interconnection terms (including charges) should be subject to commercial negotiations between the carriers concerned.

OFTA indicated that liberalization had resulted in significant network roll-out by competitors, which at the time covered 53% of households in Hong Kong, China. Upon review of market conditions, it concluded, among other things, that:

- the absence of mandatory Type II interconnection was not necessarily found to be an impediment to market entry in areas with certain favorable conditions, nor was its availability necessarily a push towards reliance upon such a facility;[29]
- the availability of mandatory Type II interconnection may discourage investment in additional fibre-based alternative customer access networks to buildings, even if it is technically feasible and economically viable to do so.

OFTA, however, recognized the need to maintain the threat of *ex ante* regulation in such cases where facilities were determined to be non-replicable. Thus, under the "essential facilities" doctrine, OFTA reserved the authority to impose Type II interconnection after determining: (i) that the dominant operators' customer access network cannot be duplicated; and (ii) that refusal to allow access to that operators' customer access network will foreclose competition.[30]

Similarly, in France, as competitive conditions have evolved in the market and several operators are currently able to replicate SMP operator's resale services, the regulator is proposing that mandatory resale offerings are no longer needed and that *ex post* regulation is sufficient to maintain a competitive market with regards to wholesale broadband service resale.[31] France has followed the "investment ladder" policy in which wholesale broadband service offers are mandatory for SMP operators through different investment levels. Following the rationale of the proposed decision, if competition conditions in the market continue evolving, especially with the launch of NGN networks, ARCEP could continue phasing out other mandated wholesale broadband service obligations.

2.2.3 *Is time-limited forbearance or a regulatory holiday necessary?*

Prompted largely by requests from incumbent operators, certain regulators are considering whether to introduce time-limited forbearance policies, whereby the regulator commits to not mandate access to

NGNs, particularly their access component, for a pre-established period of time – say 3-5 years. After such period, regulation would either resume or begin to be enforced in such markets if dominance was determined via specific market analysis.[32]

This policy may significantly alter the existing competitive landscape in the communications sector, particularly in markets where access-based providers have made significant inroads into incumbents' market shares by benefiting from mandated wholesale access, specifically ULL and wholesale bitstream access. There is also a concern that regulatory holidays for NGNs, notably in instances where NGN services are a replacement for existing regulated broadband services, could hinder a competitors' ability to offer such services during the forbearance period. Moreover, this time lag might mean that it could take competitive/alternative providers several more years to recover, if at all, their current market position. From the incumbent's perspective, the length of the forbearance period might not be sufficient to recoup its investment. Hence, uncertainty over the impact of regulation on revenue streams after the forbearance period may impact a business case more than uncertainty in the early years.[33]

In 2005, TRAI proposed to the Government of India that to promote quick growth and create immediate competition in broadband services, nondiscriminatory ULL should be executed in a time bound manner for both shared unbundling and bitstream access. In order to address the possible disincentives this would bring about for new greenfield network deployments, TRAI proposed that new infrastructure (*i.e.*, infrastructure less than five years old) should not be unbundled. The Government of India, however, did not adopt TRAI's ULL recommendation.

In Germany, incumbent provider Deutsche Telekom (DT) has actively sought relief from extension of existing unbundling and wholesale obligations to its NGN infrastructure, strongly lobbying the German Government to award it "regulatory holidays" that it deems indispensable to recoup its investments. When the German regulator, BNetzA, initially agreed with DT, this created frictions with the EC, which expressed "serious doubts" regarding the exclusion of VDSL connections from the relevant market as defined by the regulator. Ultimately, the EC prevailed, and BNetzA imposed wholesale access obligations on DTs VDSL service (Box 6). However, DT remained firm in its objective and, as a consequence, the Government proposed, and the German Parliament approved, amendments to the Telecommunications Act that exempt "new and emerging markets" from regulation. In response the EC has indicated that it will sue to block the law granting DT the right to restrict a competitor's access to its fibre networks.[34]

Box 6: Bitstream access via VDSL infrastructure in Europe: the case of Germany

In August 2006, the regulator, BNetzA, imposed bitstream access obligations on all variants of incumbent DT's infrastructure, including ADSL2, ADSL2+, SDSL and VDSL.[35] This decision came after considerable controversy, as DT had vehemently opposed any *ex ante* regulation, instead seeking regulatory holidays and arguing that this was necessary to recoup investment costs incurred in updating its network to VDSL technology.[36] The EC strongly opposed this view from the outset, indicating in a recent letter to the German regulator that investment incurred by DT should be compensated, "*but cannot justify exclusion from the access obligation.*"[37]

The EC thus played a key role in this decision, as original draft measures notified by BNetzA on October 11, 2005 generally excluded bitstream access via VDSL connections from review of wholesale broadband access in Germany.[38] At the time, the German regulator argued that no

VDSL retail products were available, thus respective wholesale products could not be derived within the two-year period of the notified market analysis. The EC expressed serious doubts with BNetzA's determination, noting that at such time there was no indication that, within the timeframe of the forward looking assessment, VDSL retail products would differ substantially from those delivered over ADSL(2+) technology.[39]

Soon thereafter, BNetzA amended the notified draft measures to include bitstream access via VDSL connections within the wholesale bitstream access market,[40] and the EC withdrew its objections.[41] The EC emphasized that in case new retail services give rise to new derived wholesale markets – as they can not be provided over the existing wholesale products – then the corresponding new wholesale products should not be subject to inappropriate obligations. For this purpose, the EC further argued, the key is to establish lack of demand and supply-side substitutability before excluding the product from the market in question.[42] The EC argued that the costs incurred could not justify excluding DT's VDSL services from the access obligations. Investment costs to upgrade broadband networks to VDSL technology were to be recouped by setting appropriate access prices (including cost of capital).[43]

Thus, at the European level, the EC has been vehement in including NGN access infrastructure within the existing market definitions. The EC's position is that the use of more efficient technologies (such as FTTH) to provide currently regulated services does not alter the justification for regulation. Thus, if competitive conditions have not changed, the move to NGNs should not be seen as an opportunity to roll-back regulation on existing services.[44] In its recent Draft Recommendation, the EC emphasized the need to consider, on a case-by-case basis, the substitutability of services provided using the various access technologies (including FTTH and hybrid networks), thereby taking the principle of technology-neutral regulation as a starting point.[45]

2.2.4 *Is there a bottleneck situation that needs to be addressed?*

In some countries, such as the United Kingdom, Netherlands, United States, and Japan, among others, regulators have been initially faced with determining if NGNs, particularly access infrastructure (*i.e.*, FTTx networks), will become new enduring bottlenecks (*i.e.*, new non-replicable assets), and, if so, what regulatory policy should be adopted. This has become a particularly pressing issue for countries where competition has been based on mandated access (*e.g.*, ULL, wholesale bitstream, and resale) as they must determine the way forward and how, if at all, existing policies and regulations would be applied in the NGN world.

In the United Kingdom, Ofcom has acknowledged that the private sector is better suited to set the ground rules and standards to handle BT's migration towards an all IP-based core network -- 21st Century Network (21 CN). Nevertheless, Ofcom stepped in to usher the migration process, setting certain principles under which the transition would be conducted. (See Box 7). One of the priorities sought by Ofcom is that the deployment of BT's NGN does not foreclose competition, either by disrupting existing competitive businesses or preventing equality of access being provided in the future. In September 2005, BT agreed to undertakings to support these goals, including commitments to provide unbundled network access and other wholesale services, on an "equivalence of inputs" basis, and not to make design decisions that would foreclose specific product options without adequate consultation. [46]

The concept of "equivalence of inputs" is at the heart of Ofcom's efforts, and basically means that BT was compelled to take structural measures at the wholesale level to ensure the wholesale components and products it sells to itself are identical to those it sells to competitor providers. This policy is

precisely aimed at providing alternative/competitive providers with unbundled access to those elements of BT's network that represent enduring economic bottlenecks. Among these structural measures, BT effectively isolated elements including its local loop and the backhaul in a separate business unit (named Open Reach) that, although not structurally separated from BT, has been placed at arms length from the rest of the company.[47]

More recently, Ofcom has hinted at the need to establish mandatory access on future FTTx deployments in the United Kingdom, because they too might be seen as enduring economic bottlenecks. In this sense, Ofcom has indicated that it does not foresee widespread facilities-based competition in end-to-end wireline NGN access networks, and has invited comments on the way forward.[48]

Box 7: NGNs in the United Kingdom: Ofcom´s measures to ensure access to BT's 21 CN

Since 2005, BT has been heavily investing in its 21 CN project to replace all of its existing network platforms (PSTN, ISDN, IP, ATM, FR, SHDS, etc.) with a single unified IP platform. Starting in late November 2006, BT began to transfer the first customer lines to its 21 CN, a process expected to take several years to complete. Ofcom views this major change as the first instance in which the network of an incumbent operator accommodates competition from the outset.

Accordingly, Ofcom sees its role as ensuring that clarity exists as to the regulatory policy requirements necessary to support effective competition. However, it has indicated that it does not wish to become involved in the detailed design of BT's network. Because of this, Ofcom has emphasized industry-led processes to guide the transition. Ofcom has proposed the following key regulatory principles to guide its approach towards NGNs:

1. to promote competition at the deepest levels of infrastructure where it will be effective and sustainable;
2. to focus regulation to deliver equality of access beyond those levels;
3. as soon as competitive conditions allow, to withdraw from regulation at other levels;
4. to promote a favourable climate for efficient and timely investment and stimulate innovation, in particular by ensuring a consistent and transparent regulatory approach;
5. to accommodate varying regulatory solutions for different products and where appropriate, different geographies;
6. to create scope for market entry that could, over time, remove economic bottlenecks; and
7. in the wider communications value chain, unless there are enduring bottlenecks, adopt light-touch economic regulation based on competition law and the promotion of interoperability.

Ofcom views its challenge as establishing an appropriate balance between its role in providing regulatory certainty and the role of the market in determining the commercial outcome of NGN-based competition. For this purpose, it has recently undertaken two initiatives to deliver effective NGN-based competition:

- First, recognizing the need to provide greater certainty as to the nature of the *ex ante* competition regime associated with NGNs, Ofcom has proposed an approach to address the impact of IP-based convergence on existing market definitions, and on the associated significant market power (SMP) analysis and remedies.
- Second, Ofcom has also indicated the need to establish an industry body capable of providing a strong strategic vision for the access and interconnection arrangements required to support NGN-based competition.

In addition, Ofcom has recognized that a third line of work is required to consider consumer protection issues raised by the migration to NGNs.

Sources:
Ofcom, Next Generation Networks. Future arrangements for access and interconnection, Consultation 13 January 2005, available at www.ofcom.org.uk/consult/condocs/ngn/ngn.pdf
Ofcom, Next Generation Networks: Developing the regulatory framework, 7 March 2006, available at http://www.ofcom.org.uk/consult/condocs/nxgnfc/statement/ngnstatement.pdf

Similar issues are being addressed in the Netherlands, where the regulator, OPTA, has proposed the need for KPN, which is transitioning to an all-IP network, to offer a "fully fledged alternative" to its current access offers that guarantees connectivity between KPN and the networks of other providers in a way that adequately compensates for the modifications of current unbundled access offers.

In Japan, the country with the highest FTTH penetration in the world, the Ministry of Internal Affairs and Communications (MIC) has mandated access on fibre deployments by incumbents NTT East and NTT West. There, competitive pressure, particularly from electricity companies which have rolled-out their own infrastructure and aggressively engaged in price-based competition with incumbents, has been a major driver towards NGN migration and particularly for FTTH deployment.

In determining the appropriate regulatory framework for the migration to NGNs, regulators need to be aware of the delicate nature of their role in creating an enabling environment that balances both investment and competition incentives. If regulators opt for imposing access obligations, striking the right balance is key. If competitive/alternative providers perceive access prices to be high, they will be deterred from entry; while if such prices are perceived by the incumbent to be low, they might be deterred from deploying NGNs.

In fact, some regulators have been left "perplexed"[49] by the outcomes of their efforts to impose access on regulated prices to future NGN access facilities. Incumbents have reacted in different ways to such actions and not all have been willing to accept regulatory burdens on planned and yet to be deployed infrastructure. For example, disagreement with the ACCC over what the incumbent operator, Telstra, could charge rivals for access precipitated Telstra's unilateral decision, in August of 2006, to withdraw its plans to deploy a FTTN wireline network altogether. This project, proposed in late 2005, was initially slated to cover five major Australian cities, and then expand to the rest of the country.

3 Modifying the Legal and Regulatory Framework to Transition to an NGN World

Migration towards NGNs is a further step in the convergence of the ICT sector. As such, regulators will be faced with many of the same convergence-related issues they have been confronting to date, as well as with new NGN-specific concerns (*e.g.*, numbering, interconnection, universal service/access, etc.) The following checklist highlights a set of issues that regulators should consider when discussing possible changes to existing regulatory frameworks to facilitate NGN deployment. (Box 8)

Box 8: Checklist of issues regulators should consider for enabling NGN deployment

- Does the regulatory framework present any market entry barriers? Does it support full competition in the market and service providers to offer multiple services? Are there any services (*e.g.*, subscription television) restricted to a number of service providers?
- Does the current licensing framework facilitate the provision of different services over

different platforms (*i.e.*, technology neutrality)?
- Are VoIP and other IP-based services allowed? If so, are they regulated in equal conditions than traditional services or does IP-specific regulation exist?
- What are the regulatory policies for these new technologies and services with regard to numbering, spectrum, interconnection, universal service, and rights of ways and shared deployment?
- Does the regulatory framework promote diversification of access networks?
- Are institutional and structural changes of the regulatory authority required to address an NGN environment?
- Does the regulatory framework encourage and facilitate public (municipal) initiatives?

3.1 Market Barriers

In order to foster NGN deployment, regulators should look at their regulatory framework and seek to eliminate market entry barriers that may prevent or hinder new entrants from participating in the market. These restrictions may relate to exclusivity rights granted to an incumbent operator that outright bar entry, cross-ownership restrictions, excessively burdensome licensing and other requirements, and foreign investment restrictions. For example, in the United States, telecommunications operators have been deploying FTTx due to competitive pressure from traditional cable television providers that are offering triple play bundles. However, in some instances, they have encountered delays from local franchise authorities and been subject to unreasonable compensation requests to obtain the needed franchise to begin offering video services. Recently, the FCC has adopted rules that prohibit local franchise authorities from unreasonably refusing to award competitive franchises for the provision of cable services.[50]

In other countries, governments have sought to eliminate restrictions that prevented operators from offering certain services. For example, in Mexico, the Secretariat of Communications and Transport (SCT) issued a Convergence Agreement on 3 October 2006 eliminating existing restrictions preventing fixed telephony operators and subscription television operators (mostly cable operators, but also satellite television and MMDS operators) from entering each other's market and restricting their ability to offer triple play offerings. In order to avoid cross-subsidization, operators must implement accounts separation for fixed telephony and subscription television services. With the issuance of the Convergence Agreement, the incumbent operator, Telmex, now may offer cable services with certain restrictions and cable operators may use their network to provide local fixed telephony services (previously the SCT only permitted cable operators to indirectly provide local fixed telephony through a licensed fixed telephony operator).

3.2 Licensing

Licensing in the context of liberalized and convergent markets is increasingly seen as means of gate-keeping to control entry and, to some degree, as a tool for imposing regulatory obligations and ensuring implementation of policy objectives. Licensing regimes are thus required to evolve alongside markets and technologies to guarantee that they remain effective and beneficial for sector development. By remaining static in the context of convergence and NGN migration, licensing frameworks can become an obstacle to development in several ways:

- Preserving unnecessary, onerous and complicated licensing requirements can act as a barrier to market entry and hinder competition.

- Requiring operators seeking to offer multiple-service offers to obtain multiple licenses often with different fees, requirements, and geographic scope (i.e., national versus local or regional licenses) can limit competition and impede the deployment of new services to consumers.
- Maintaining outdated and irrelevant licensing classifications can hinder technological advancement and service development.
- Licensing classifications based on specific types of technologies can act as artificial barriers to the introduction of alternative new technologies.[51]

To avoid these pitfalls, licensing frameworks should be flexible and technology neutral. This was recognized by numerous regulators that submitted papers in the Consultation to the Global Symposium for Regulators. For example, Costa Rica, Jordan, Pakistan, Thailand, and Tunisia, noted that flexibility in licensing and allowing providers to offer multiple services is an important step to attract investment in NGNs.[52] In addition, Lithuania and Morocco emphasized the importance of a technology neutrality approach to address licensing in the transition towards NGN.[53] These attributes are vital for the transition towards an NGN world, characterized by the decoupling of service/application layer from the underlying infrastructure. This means that a service/application provider may have no relationship with the infrastructure provider and the carriage service provider and can be geographically separated from its customers. Similarly, in the NGN world all services/applications will constitute IP-based data packet transmissions, and hence will not fit in the traditional end-service categories with their corresponding specific licensing regimes.

Because of this, governments are reforming their licensing frameworks to allow for NGN service development and permit such operators to provide multiple services over the same infrastructure/network. For example, in Malaysia, the licensing framework was modified from a system of 31 different types of licenses to four technology-neutral licenses. Uganda also developed a new streamlined technology-neutral licensing regime that was implemented in January 2007. Under the regime, there are three categories of licences: (i) public service provider licence; (ii) capacity provider licence; (iii) special permission to construct; and (iv) general licence (see Box 9).[54]

Box 9: Uganda: New Licensing Regime

Type of License	Services Covered Under License
Public Service Provider Licence	**Category 1: Public Voice and Data** - Cellular, Fixed voice, GMPCS, Internet access (including IP telephony + Virtual Private Networks), Internet exchange services, Virtual Private Networks (VPNs) that are NOT provided over the Internet
	Category 2: Capacity Resale - (local and international), calling cards
Capacity Provider Licence	**Category 1:** Licensees already permitted to install infrastructure of the type they have already invested in, for example Internet Access Providers with wireless networks
	Category 2: Persons whose core business is not in telecommunications but who possess private communications facilities with surplus capacity and wish to resale this to third parties
	Category 3: New entrants in the Internet Access market operating their networks using the Industrial, Scientific and Medical frequency (ISM) band,

	e.g., 2.4GHz and 5.7GHz band
Special Permission to Construct	
General Licence	**Category 1**: Public Pay Communication Services (e.g., Internet Café, Payphones, telephone bureaus etc) **Category 2**: Private Networks

Source: Uganda Communications Commission, available at: http://www.ucc.co.ug/licensing/default.php

In addition, many governments are shifting to a unified authorization system, including Peru, Tanzania, and Nigeria, as well as the EU member states. Under the new Converged Licensing Framework, for example, the Tanzania Communications Regulatory Authority has recently issued a new type of licence that will allow licensees to provide a host of services, including payphone, Internet access, videoconferencing, voice, data, VoIP, and calling card services. Similarly, in 2005, Morocco issued technology neutral, unified licenses called "new generation licenses" that allow licensees to offer all fixed telecommunications services (i.e., voice, video and data), and to deploy the necessary wireline and wireless public networks.[55]

Other countries, where comprehensive licensing reform efforts have been unsuccessful, have opted to introduce specific reforms within their general legal framework designed to address the issues posed by IP-based services and their combined offer. This is the case of the recent draft "Regulation on Convergence" issued by the Ministry of Communications of Colombia, which proposes to licence all IP-based services and applications (*e.g.*, voice, video, data, etc) provided over any type of network as value added services.(Box 10)

Box 10: All IP-based service licensing reform in Colombia

Colombia's general telecommunications framework was adopted in the late 1980s and early 1990s and heavily relies on the traditional service-specific regulatory approach. Telecommunications services are grouped into: (i) basic services, which include both fixed and mobile telephony; (ii) broadcasting services; (iii) telematic services; (iv) value-added services; (v) auxiliary services; and (vi) special services.[56] In addition, specific laws regulating both fixed local switched telephony and cellular and Personal Communications Services (PCS) were passed in 1993 and 2000, creating service-specific frameworks for such services.[57]

This regulatory framework proved inflexible to address technological developments, particularly the emergence of IP-based services in Colombia. Thus, the Ministry of Communications initiated a consultation proceeding on a "Regulation on Convergence" which, among other things, such as a proposal to create a unified licence, expressly provides that IP-based services will be considered "value added" services under the existing regulations.[58]

Governments also are reducing the administrative burdens to obtain a licence by introducing registrations, notifications, and in certain instances, deregulation. For example, in the EU, operators seeking to offer services only need to file a notification with the national regulator listing the services

they seek to provide. Similarly, in Japan, all authorizations are conducted through a registration or notification process. If the operations involve a network of a large size or scale, a registration must be filed that requires approval by the regulator; but in all other instances, only a notification is necessary. In certain countries, the regulator has opted not to impose any authorization requirements for particular services. For example, in the United States, VoIP providers are not subject to any licensing requirements; however, they are subject to regulatory obligations if they are interconnected VoIP providers (see section C below).

3.3 VoIP specific regulation in an NGN world

Regulators are assessing the need to issue VoIP specific regulations and if this will facilitate the migration towards a NGN world, where IP-based applications, which include, but are not limited to voice, all coexist in the same decoupled applications layer of the network. In the last few years, voice has spearheaded the uptake of IP-based applications and services and is expected that this trend will continue at least for the foreseeable future. The erosion of traditional voice revenues of incumbent providers as a consequence of higher efficiency and lower costs of VoIP services has been one of the drivers of NGN migration plans and deployment by incumbent providers themselves around the world. VoIP is thus ceasing to be seen as a new disruptive technology in the marketplace as it penetrates the mainstream voice market. Moreover, whereas in certain countries VoIP services were generally exempt from most, if not all, regulatory obligations imposed on traditional voice providers (e.g., access to emergency service and universal service contributions), regulators are beginning to issue specific rules to accommodate VoIP's distinct functionalities (e.g., nomadicity of service).

In certain instances, regulation, or the lack thereof, has limited or hindered the development of VoIP. In Chile, for example, the lack of clarity on the regulatory treatment of VoIP services led the incumbent operator to block such services over broadband connections. Ultimately this triggered the intervention of the Competition Tribunal, which ordered such practices to be ceased.[59] In addition, the regulator, SUBTEL, has initiated a consultation on a draft VoIP regulation which, among other things, expressly classifies VoIP services as public telecommunications services and requires interested parties to secure the relevant concession. This move is intended to create legal certainty for the provision of VoIP services as a means to foster their deployment in the market place.[60]

In the United States, similar actions by an incumbent also prompted FCC action requiring it to cease blocking VoIP service over its network.[61] However, the FCC has yet to classify VoIP service as a telecommunications service or information service or to adopt general regulations for VoIP. Nevertheless, the FCC has changed its deregulatory approach towards these services, imposing obligations to accommodate legal wiretaps, contribute to universal service funding and provide emergency calls on interconnected VoIP providers (i.e., those that allow calls to or from traditional telephone lines/numbers).[62] In addition, the Commission recognized that in the transition to a broadband telecommunications market, it was duty-bound to preserve and promote the vibrant and open character of the Internet, fostering the creation, adoption and use of Internet broadband content, applications, services and attachments, and to ensure that consumers benefit from the innovation that comes from competition. As such, the FCC issued a set of network neutrality principles to guide its ongoing policymaking activities. In this sense, to encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet, consumers are entitled to:

- Access the lawful Internet content of their choice.
- Run applications and use services of their choice, subject to the needs of law enforcement.
- Connect their choice of legal devices that do not harm the network.

- Competition among network providers, application and service providers, and content providers.[63]

Regulators are realizing that traditional PSTN-oriented voice regulation does not always work for IP-based services and are increasingly finding the need to adopt specific VoIP regulations in light of the increasing role that the service is playing in the current telecommunications market. Clarity on the regulatory framework applicable to VoIP is generally seen by service providers as the first step towards a clear regulatory picture for NGN policy.

3.4 Numbering [64]

Numbering policies and regulations were originally developed to address traditional voice telephony services. As a result, numbering plans established different ranges for voice services and geographic areas (for fixed services). This differentiation had a twofold function: (i) informing end users of the charges of the calls and (ii) maintaining the interconnection cost structure based on services (i.e., mobile voice service vis-à-vis fixed voice service) and distance. Since this allowed subscribers to be reached by a unique combination of digits, numbering became an essential resource for telecommunications networks operators. However, with the advent of convergence and the migration towards IP-based NGN services, regulators are finding that modifications to such policies and regulations are necessary.

The increasing use of VoIP services has raised questions among regulators as to whether numbering resources should be assigned for VoIP and whether traditional telephone service operator obligations should be imposed on VoIP providers. Regulators have adopted a variety of solutions, ranging from allowing VoIP providers to use geographic numbers - provided they offer service under the traditional voice service regime, with the relevant obligations – to creating specific numbering ranges for VoIP - that take into account the special characteristics of the service, most notably its nomadic use. Some countries, such as Japan, Spain, and the United Kingdom, have combined both measures, and grant geographic numbers to VoIP providers if they operate under the traditional voice service regime, and specific number ranges if VoIP providers operate under the "information service" regime.

The ENUM initiative on electronic numbering is a further step in the process of numbering reform and seeks to address the shift from PSTN to all-IP networks, allowing for protocols that convert a telephone number from one world to the other.[65] This initiative establishes the possibility of introducing a fully neutral approach to numbering, simplifying numbering regulations, and addressing complexities resulting from all-IP environments. Essentially, by translating a PSTN number to an IP address, ENUM would make it easier to contact people through electronic means (*e.g.*, by linking the users' email, telephone number, fax and instant messenger address to a single number).

ENUM developments may potentially define the future direction of numbering policies. In addition, it may address some of the transparency concerns with VoIP, due to the mapping of PSTN numbers to "uniform resource locators" (URLs). ITU-T Study Group 2 and the Internet Architecture Board are working together in the implementation of ENUM. An interim procedure to administer the delegation of ENUM resources has been approved by the ITU-T Study Group 2.[66] User ENUM is currently in commercial operation in countries such as Austria, Poland, Romania, Germany, Netherlands, and Finland. Other countries including Australia, China, Japan, Republic of Korea, Sweden, and the United States have started ENUM trials.[67] Other regulators, such as the ANRT of Morocco, agree that access to NGN services by means of a unique identifier would be more efficient than the current mechanism; however, they question the maturity of existing alternatives to accomplish this in the near future. [68]

In addition, as NGNs will allow for ubiquitous communications both in fixed and mobile settings, addressing issues such as fixed to mobile convergence and inter-modal number portability is also relevant for regulators to enable the transition to NGNs. Number portability, the ability of a consumer to maintain the same telephone number when changing service providers, may be inter-modal (e.g., porting a number from a fixed to a mobile network or vice versa) or restricted to one type of network. For example, the United States has included geographically restricted inter-modal portability, meaning that a consumer may port among different types of networks within a limited geographical area. In Argentina, the telecommunications law allows inter-modal portability to be implemented by the regulator although it has not been adopted yet. Hong Kong, China and Japan are currently discussing whether to introduce inter-modality portability to address fixed to mobile convergence, and number portability potentially could be expanded to other services, such as VoIP.

3.5 Spectrum

As currently envisaged, NGNs are expected to deliver not only multiple services/applications over a single IP-based platform at higher data rates, but to allow for general mobility to accommodate the consistent and ubiquitous provision of such services/applications to end users. As such, the ITU-R has been working toward defining the framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000 for radio access networks.[69] The World Radiocommunications Conference of 2007 is expected to address future spectrum requirements for such systems.[70]

Systems beyond IMT-2000 are of particular interest for future NGN deployment supporting mobile applications. These systems may require new wireless access technologies, some of which are expected to be developed around the year 2010. It is anticipated that these technologies will be capable of supporting high data rates with high mobility - with target peak data rates of up to approximately 100 Mbit/s for high mobility (e.g. mobile access) and up to approximately 1 Gbit/s for low mobility (e.g., nomadic/local wireless access). In some countries, these technologies could be widely deployed around the year 2015.

Regulators should closely monitor the roll-out of technologies supporting systems beyond IMT-2000, and the developments of their internal mobile and broadband markets in order to make any necessary policy decisions to enable the future deployment of systems that will accommodate the seamless transition between fixed and mobile settings in an NGN environment.

3.6 Interconnection

The introduction of NGNs is challenging existing interconnection regulations that were designed primarily for PSTN networks and voice services. Traditionally, interconnection charges have been based on time and distance and follow the hierarchical structure of PSTN networks because these elements represented the cost structure of PSTN networks. However, NGNs are based on IP-architectures and allow the separation of functional levels of the network. This means that time and distance are irrelevant for NGNs' cost structure and access and service are no longer tied to one network. As a result, charges tend to be flat fees and service providers (e.g., VoIP and IPTV providers) will be able to offer their services to end users without owning a network to access them.

Numerous regulators currently are evaluating how to migrate to the NGN environment with minimum distortions for the market, while at the same time preventing any disruptions to competition. Among the issues of concern raised in some countries are maintaining the any-to-any interconnection principle

(i.e., ensuring end-to-end connectivity), defining different interconnection levels (i.e., access level and service level), ensuring non-discrimination among operators using NGN technical capabilities (e.g., quality of service and traffic prioritization), managing the impact caused by the reduction of interconnection points of the dominant operator's network, and defining charging principles under NGN cost structures (e.g., bill and keep, capacity-based or service-based charges).

Some regulators have introduced reforms into their interconnection regulatory frameworks to address the new IP and NGN environment. For instance, in the United Kingdom, Ofcom introduced the concept of "equivalence of inputs" for NGNs, which requires that when the cost is proportionate, the significant market power operator (i.e., BT) must make available to other operators at a wholesale level the same products and services it makes available to itself at the same price and using the same systems and processes. In other jurisdictions, such as Spain or Colombia, regulators have introduced capacity-based interconnection, which if not conceived initially for NGNs, addresses the cost structures derived from the IP-architecture environment. NGN interconnection issues are further discussed in the Global Symposium for Regulator's discussion paper on Interconnection.

3.7 Universal Service and Access

The transition towards NGNs also will challenge universal service and access[71] policies in various ways (e.g., sources of funding and the scope of obligations). As originally conceived, universal service was an obligation imposed on the monopoly telephony operator requiring operators to expand coverage to provide voice services in remote and underserved areas. PSTN operators typically cross-subsidized the cost of their universal service obligations with revenues derived from other services. With the introduction of competition and new technologies, regulators substituted this implicit cross-subsidization with a requirement that all or some operators contribute a percentage of their revenues to a universal service fund. However, the scope of such obligations remained focused primarily on voice services. The general objectives of universal service and access, which are expected to be maintained in the near future and onto the NGN world, are to provide for availability, affordability, and accessibility of services.[72]

The transition towards NGNs will be uneven from a geographical standpoint, since operators will likely deploy them, at least initially, in a country's more profitable areas. This trend is being seen with fibre deployment both in developed and developing countries, and will threaten to broaden the digital divide within countries, which already is causing concern for regulators in countries such as Japan and the United Kingdom. As such, universal service and access policies may need to be modified to address these asymmetries.

Moreover, the move towards NGNs will imply that voice traffic will migrate to IP networks hence threatening universal service and access funding models. Currently, many universal services funds are maintained by PSTN revenues from voice service. Regulators must determine whether IP-based services, notably VoIP, should be subject to universal service obligations. Most countries have not imposed universal service obligations on service operators using new technologies due to concerns that such obligations would inhibit the development of these players and their services. This trend, however, seems to be shifting as more traffic moves from PSTN networks to IP-based networks. Some developing countries that allow VoIP, including Mauritius, the Czech Republic, the Slovak Republic, and Venezuela, are subjecting VoIP operators to the universal service contribution regime. In the United States, the FCC has extended universal service contributions to interconnected VoIP providers although it has not formally classified the service as a "telecommunications service". In South Africa,

VoIP providers that offer service by virtue of their VANS licence must contribute to the universal service fund as a general telecommunications licence holder.

Similarly, as IP-based technologies proliferate, universal service and access policies in many countries have seen a shift to include both narrowband, and even broadband, within the scope of universal service obligations. For example, of the 93 countries that responded to the ITU's 2005 regulatory survey, 27 included narrowband Internet service in the universal service definition and 11 included high-speed Internet.[73] In the EU, form example, under the Universal Service Directive designated providers must provide "functional Internet access." This has been understood by regulators to mean narrowband connections. However, given the limited development of broadband markets in certain countries, some regulators have dismissed the current need to expand universal service/access obligations to broadband connections because it is not yet considered an essential service of social importance.[74]

3.8 Rights of way and shared deployment

One of the most significant costs associated with NGN deployment relates to excavating the necessary conduits and laying down the fiber for the access part of the network. This entails actual building costs (i.e., civil engineering costs) and generally requires securing numerous additional permits (e.g., building and digging permits and environmental permits). Thus, simplification of requirements, shared use of ducts and poles, as well as other possible solutions that reduce operator's costs are relevant steps in creating an enabling environment for NGNs.

Recognizing the constraints that some operators face in deploying networks, some regulators have sought to simplify the procedural requirements to secure rights of way in order to facilitate the roll-out of next generation access networks. In Japan, for example, the MIC plans to revise the "Guidelines for the Use of Infrastructure such as Telegraph Poles and Conduits Owned by Public Utilities" to facilitate and promote competitive carriers initiatives' to install their own FTTx network. These simplified procedures are expected to be in force in 2007.[75] In France, competitive broadband provider Illiad has announced FTTH deployments in Paris using municipally-owned ducts and sewers. Similar initiatives have been taken in the United States, where the government has issued recommendations to streamline procedures for granting "rights-of way" across federal lands in order to remove one barrier to deploying broadband technology.

In the Netherlands, OPTA has taken a different approach to reducing operator's costs associated with deployment, proposing the joint construction of fibre optic infrastructure by the incumbent and interested competitors. The proposal is that each party would lay their respective ducts into a gulley that has been jointly dug, hence reducing the digging costs. In addition, OPTA is considering imposing other possible arrangements, such as requiring operators to include an empty duct as standard procedure in any digging activities in order to sell it to third parties interested in deploying their own infrastructure.

3.9 Promotion of Diversification of Access Networks

Promoting diversification of access networks, such as wireless and cable television networks, also is a policy option being explored by regulators in developed and developing countries as a strategy to promote infrastructure deployment and increase broadband penetration and competition. In particular, the use of wireless technologies, allow for significant cost reduction in network deployment, hence facilitating broadband service provision as an initial step towards NGN deployment.

Thus, in Japan, the MIC has committed to actively promote the introduction of new wireless access technologies, such as high-speed wireless LAN systems in the 5GHz band and BWA systems using the 2.5 GHz band.[76] For the ANRT of Morocco, for example, encouraging the diversification of access networks, such as wireless systems, is seen as an initial step on the road to FTTx deployments.[77] In addition, India's TRAI has recommended regulatory measures directed at delicensing spectrum in the 5.1 GHz and 5.3 GHz bands and to earmark additional spectrum bands that are not in high usage for deployment of BWA networks.[78] Similarly, countries such as France, Germany, Portugal, Norway and the United States have granted BWA licences in the 3.5 GHz band, a trend also adopted in transitioning economies such as Bulgaria, Colombia, Ecuador, Honduras, and Jordan.

3.10 Institutional and Organizational Changes

There are three primary institutional designs for regulatory authorities with responsibility over the communications sector. The most prevalent model is the single-sector regulator whose sole function is to regulate the telecommunications sector (e.g., regulators in Botswana, Spain, and Peru). In addition, numerous regulators are multi-sector regulators with responsibility over various industry sectors typically considered to be public utilities (e.g., telecommunications, water, electricity and transportation), such as the regulators in Jamaica, Costa Rica, Germany, Latvia, and Panama.

In recent years, there has been an increase in converged regulators with responsibility over broadcasting, telecommunications, and information technology, commonly referred to as converged regulators. Today, such regulators are found in most EU countries, including Finland, Italy, and United Kingdom, as well as in Australia, Hong Kong China, Malawi, Malaysia, South Africa, and Tanzania. This trend is occurring because governments consider that these types of structures are better equipped to address convergent environments where different services are offered over the same platform. For the same reasons, this move will also benefit the transition to NGNs.

However, the term converged regulator is used broadly and defined in many different ways. For some, a converged regulator is a regulator with responsibility over all communications, including telecommunications, broadcasting, and information technology, as well as radio spectrum, such as the U.S. Federal Communications Commission which has had responsibility over these industries since its inception. In the United Kingdom and Australia, the regulator has these responsibilities as well, but as a result of certain institutional changes where the governments opted to combine responsibility over these industries under one umbrella agency. For example, in 2002, the UK government established Ofcom by merging five regulatory bodies into one, the Independent Television Commission, the Broadcasting Standards Commission, the Office of Telecommunications, the Radio Authority, and the Radiocommunications Agency. In 2005, the Australian Communications Authority and the Australian Broadcasting Authority were merged to form the Australian Communications and Media Authority which has responsibility over telecommunications, broadcasting, radiocommunications, and online content. In Hong Kong, China, the government has proposed to merge the Broadcasting Authority and Telecommunications Authority into a unified regulator called the Communications Authority through a comprehensive Communications Bill.[79]

Governments have identified various reasons for moving to a single regulator with responsibility over various industry sectors. By shifting regulatory responsibilities regarding the communications sector into one government agency, stakeholders have a one-stop-shop for resolving regulatory issues, resulting in greater consistency in regulatory approach and practice. In addition, certain operational efficiencies should result and greater resources may be available since the single regulator now has a

larger pool of experts with different expertise all under one roof that it could tap to deal with a wide variety of issues. Furthermore, less overlap and turf battles between government agencies would be the natural result of a single regulator. Operators find it easier to have to comply with only one regulatory authority and to address their issues in one place. Another benefit of having a converged regulator is that it better reflects the marketplace given that operators now offer triple and quadruple play offerings.

When considering whether to introduce an institutional or organizational change to facilitate NGN development, governments should assess the objectives that they are trying to achieve and then think about what functions are best placed under the converged regulator. In other words, will the regulator have responsibility over technical regulation and standards, spectrum management, licensing, consumer protection, economic regulation, and competition law enforcement? For example, in certain countries, the regulator has responsibility over broadcasting and telecommunications but may not have authority over consumer protection and competition issues which is the responsibility of other authorities, such as with CONATEL of Venezuela. Similarly, in Canada, spectrum matters are addressed by Industry Canada rather than by the Canadian Radio-television and Telecommunications Commission. In other instances, responsibility over broadcasting content may reside with a separate regulatory authority. In Singapore, IDA has responsibility over telecommunications and information technology matters, but the Media Development Authority licences over-the-air television and regulates content.

In addition, governments also need to consider the relationship between the telecommunications, broadcasting, and competition laws. Should the regulator have any responsibility over competition issues? Different countries take distinct approaches. In Australia, for example, the communications regulator has no authority over competition issues whereas in the United Kingdom, Ofcom has jurisdiction concurrently with the Office of Fair Trading. The issue of whether it will generally be subordinate to the competition authority with regard to telecommunications and broadcasting issues that include a competition element is important. For example, in Singapore, the regulator only has authority to the extent that such responsibility has not been granted to the Competition Commission. If the jurisdiction and responsibilities of these two authorities are not appropriately balanced, certain inefficiencies and jurisdictional debates may ensue.

3.11 Public (municipal) initiatives

Another route taken by certain governments, particularly by local governments, involves direct deployment and backing of next generation access and core network deployments via public/private partnerships. Municipally-sponsored FTTH projects are springing up across Europe, the United States, and Asia, with the goal of providing competing infrastructures that grant open access to competitive/alternative broadband service providers. Even some national regulators, such as Singapore's IDA with its Next Generation National Infocomm Infrastructure (Next Gen NII) project, are also getting involved in this type of initiatives (Box 11). In Amsterdam, for example, expected competition from Citynet, a municipal project, has prompted incumbent KPN's deployment of FTTH.[80]

Box 11: Singapore's Next Generation National Infocomm Infrastructure (Next Gen NII)

Announced by Singapore's Prime Minister in February 2006, the Next Gen NII, which comprises complementary wired and wireless networks, is intended to be Singapore's new digital super-highway for super-connectivity. The wired broadband network or Next Generation National Broadband Network (Next Gen NBN) will deliver ultra-high broadband symmetric speeds of 1Gbps and above, to all homes, offices and schools, while the Wireless Broadband Network (WBN) will offer pervasive connectivity around Singapore.

Next Gen NBN

The Next Gen NBN is envisaged as a carrier-neutral, totally-wired network. IDA has proposed this to be an open platform which supports multiple service providers in delivering multiple services to homes and offices. IDA expects the private sector to build, own and operate the NBN. However, IDA´s proposal calls for structural separation of the Operating Company[81] and the retail service providers (RSPs) to ensure that all RSPs are treated on an equitable basis in terms of pricing and contractual arrangements for equivalent services and volumes. The Government has indicated that will provide some funding to kick-start the project and to ensure that this ultra high-speed broadband service will be viable, affordable and sustainable for the longer term. The process to deploy the NBN was initiated with a Request-For-Concept (RFC) in March 2006, with a Request-For-Proposal (RFP) process taking place between June-December 2006. By early-2007, NBN will be awarded to private sector partner. The appointed operator is expected to complete at least 50 percent rollout within 3 years from the award, and to complete the project within 5 years.

WBN

To complement NBN, the government will first work with the private sector to accelerate the deployment of the WBN in key "catchment" areas (*i.e.*, places of interests, central business district, and town centers in the heartlands) and to offer wireless access at highly affordable rates under a Wireless Broadband Market Development (WBMD) Call-For-Collaboration (CFC). On October 10, 2006, IDA selected Cell Network Pte Ltd, QMAX Communications Pte Ltd and Singapore Telecommunications Ltd, for the CFC. These three operators are expected to launch initial commercial services of a wireless broadband network by January 2007 and to complete the project by year-end 2008.

Sources: IDA, Fact sheet: Next Generation National Infocomm Infrastructure, available at http://www.itu.int/osg/spu/ngn/documents/NGNII-Factsheet-060303-Singapore.pdf; IDA, Summary of Responses of Request-For-Concept for Next Generation National Broadband Network, August 15, 2006, available at http://www.ida.gov.sg/idaweb/doc/download/I3757/Summary_of_RFC_Responses.pdf; IDA, Wireless Broadband Market Development Call for Collaboration (CFC) home page, available at http://www.ida.gov.sg/idaweb/marketing/infopage.jsp?infopagecategory=factsheet:wireless&versionid=1&infopageid=I3764.

A key element of this trend is creating open access networks that will allow non-discriminatory access by multiple service providers to NGNs. However, not all municipal projects are open access networks. In the United States 32 municipality-led projects have been deployed, either directly or via municipally owned utility companies, but these networks are not generally designed as open networks.[82] An interesting exception is that of the Utah Telecommunication Open Infrastructure Agency (UTOPIA), a planned FTTH open infrastructure network (Box 12).

Box 12: UTOPIA: Open access municipal FTTH in the United States

UTOPIA was originally formed in 2002 by fourteen cities in the State of Utah located in the western United States. UTOPIA´s mission is to build and maintain a FTTH open infrastructure network. The project is funded by the sale of bonds which are guaranteed by 11 of the cities involved in the project. In 2004, 85$ million in bonds were sold to fund the first phase of construction (*i.e.*, laying down fibre for the six southern cities). The project is currently in its second phase, which involves rolling-out fibre in the five northern UTOPIA cities. To repay these bonds, UTOPIA will collect a wholesale fee from service provider based on the type of services the customer takes. If such revenues prove to be insufficient, however, the 11 guarantor cities will be required to honor UTOPIA´s bond commitments with monies levied form sales taxes which local referendums authorize them to collect. Currently, several small service providers such as MSTAR, Veracity Communications and X-Mission Internet, as well as large providers like AT&T, are offering voice, broadband and television services via UTOPIA'S network.

Sources: www.utopianet.org; Steve Cherry, A Broadband Utopia Continued, IEEE Spectrum Online, May 2006, available at http://www.spectrum.ieee.org/may06/3434/3

A concern expressed about municipal projects is that poorly targeted schemes may potentially result in considerable harm, particularly if the public intervention distorts commercial companies' incentives for efficient investment.[83] In many cases, governments must adopt legislation or regulations must be implemented to determine the scope of such projects, particularly so as to not affect private parties' incentives to invest. For example, in France (see Box 13), the Netherlands, and the United States, legislation was necessary for municipal projects to materialize. [84]

In addition, municipal project may face challenges from incumbent providers. In the United States, for example, incumbent providers have consistently used the courts and state legislatures to block municipal broadband projects, particularly those related to WiFi deployments.[85] At present, 14 states have enacted some sort of legislation restricting municipalities from offering telecommunications services, half of which apply to broadband.

Box 13: Enabling local governments to deploy next generation access networks in France

In June 2004, France amended the Territorial Collectivities Code[86] to expand municipalities' authority to promote and roll-out telecommunications infrastructure within their jurisdictions. Local governments now are allowed to deploy networks that they may operate themselves (i.e., acting as carrier's carrier) or outsource to private operators. In addition, municipalities are exceptionally entitled to serve end users directly under very specific circumstances.[87]

Municipalities must publish their projects to roll-out infrastructure in the official journal two months before starting operations and must also inform the regulator, ARCEP, of their projects. Local governments must adhere to principles of transparency, non-discrimination, and proportionality in their telecommunications activities. In addition, they must establish account separation for activities involving the telecommunications network.

In early 2006, ARCEP reported that French municipalities had shown interest in 1,480 municipal telecommunications networks projects, 380 of which foresaw the deployment of fibre optic networks, either FTTH or FTTC.[88]

4 Facilitating the Transition to a Pre-NGN and NGN World

It is important for governments to build in mechanisms for collaboration among regulators, policy makers and industry as they grapple with how best to address the transition to an NGN environment. Regulators in Costa Rica, the United Kingdom, and Lithuania have recognized that they should play a supervisory role rather than attempt to manage the migration to NGNs, as industry stakeholders, which better understand the requirements and possibilities of NGNs, are more likely to develop better solutions than regulators. The goal of such collaboration is to ensure that the regulatory framework is not so restrictive that it thwarts investment in NGN, and at the same time does not act too late to encourage competition. The involvement of stakeholders in the regulatory process can take a number of forms, including a consultative process, hearings, seminars, forums, community meetings, as well as establishing technology expert groups and industry-led groups.

Involving stakeholders in the regulatory process is an essential part of a regulator's decision-making process and provides abundant benefits. It enhances confidence in the regulator by providing

stakeholders an opportunity to voice their opinions on a regulatory issue, although the regulator may not ultimately agree with their position. It also increases consensus and support for regulatory decisions since the stakeholders have had an opportunity to participate in the process. Moreover, it provides an opportunity for stakeholders to provide input on the regulator's plan of action and allows for feedback from stakeholders with valuable insights into the sector given their day-to-day operations in the industry. Finally, obtaining input from stakeholders reinforces regulatory autonomy and accountability since it demonstrates to stakeholders that the regulator has decision-making power in the regulatory process.

4.1 Consultative Processes

Many countries have undertaken policy and regulatory initiatives related to NGN, IP-related issues, and convergence, including Australia, Germany, India, Japan, Mexico, Netherlands, Singapore, and the United Kingdom.

For example, in January 2006, TRAI of India issued a consultation paper seeking comments from stakeholders on NGN-related issues, such as the relevance and timing for transition to NGN, regulatory and technical issues, and migration-related requirements. In addition, it conducted Open House Discussions in the cities of Bangalore and Delhi to seek views of consumer organizations and other stakeholders. As a result, TRAI issued its recommendations in a document published in March of 2006, addressing among other issues, the need to enhance cross-industry and regulator collaboration in the transition towards NGNs.[89]

During May-June 2006, OPTA of the Netherlands sought comments from stakeholders regarding regulatory issues surrounding KPN's plans to migrate to NGN, an operation called All-IP by KPN.[90] In particular, the consultation was focused on "the relationship between All-IP and KPN's existing obligation to offer unbundled access to its access network." In October 2006, OPTA issued an All-IP Position Paper to inform and consult stakeholders about the policies it was proposing to adopt and the follow-up activities it was planning to undertake.[91]

In addition, some countries have also initiated less formal consultation processes. Ofcom, for example, issued a public discussion document in November 2006 entitled "Regulatory challenges posed by next generation access networks," in which it indicated its interest in obtaining stakeholders views and opinions. Although it did not initiate a formal consultation process, Ofcom indicated its interest in receiving written views from third parties to promote public discussion on the way forward regarding next generation access network deployment and regulation. In addition, Ofcom noted its intention to organize several seminars in 2007 to meet with stakeholders and discuss the issues presented by next generation access.

4.2 Public Awareness Campaigns

For some regulators, one of the first steps to addressing the transition to NGN has been to provide greater awareness about the issues related to NGNs and how they will impact the industry and consumers. For example, after conducting its consultation process, India's TRAI issued final recommendations that focused on the need to increase awareness about various aspects of NGN.[92] Among its recommendations were that (i) the government should arrange to organize some interactive workshops/seminars; (ii) a cross industry joint consultative group consisting of Telecom Engineering Centre (TEC) (the standards-setting organization in India), service providers, technical institutions, and vendors should be established to analyze NGN standards and their customization for national

requirement; (iii) TRAI should conduct a detailed consultation with stakeholders on the interconnection issues and QoS regulation for NGN; and (iv) an expert committee should be established.

In Australia, the regulator also has been keen about the importance of public awareness. In its VoIP Report, the ACMA included various recommendations regarding its obligations to promote consumer awareness regarding VoIP. In particular, ACMA decided to promote consumer awareness through toolkits and facts sheets about the differences between VoIP services and traditional circuit-switched telephony services and ways consumers can influence the performance of their VoIP service. In addition, providers were required to disclose to consumers the characteristics and limitations of any VoIP service they purchase in comparison to traditional circuit-switched telephony services.

4.3 Industry and Consultative Bodies

Various countries are establishing industry groups or expert groups to address the transition to NGN. These groups may be ad hoc or an existing consultative body comprised of several government agencies, industry representatives, and other interested parties. The role and functions of these consultative bodies vary, but they generally issue recommendations to the government addressing the need for changes in convergence legislation and/or regulation. The expectation is that such groups will benefit all stakeholders in the transition of the telecommunications industry to NGNs and will help to ensure a smooth transition for both industry and end-users. These consultative bodies are a valuable tool that provide a way to constantly review and monitor the transition to NGN, as well as the effects of convergence, and can provide first-hand contact with industry and other parties that deal with these issues directly.

For example, in the United Kingdom, Ofcom has established NGNuk, an independent NGN industry body, in order to create an improved framework for industry involvement (see Box 14). In addition, Australia has several consultative forums for the communications sector. For example, the Australian Communications Industry Forum (ACIF) implements and manages industry self-regulation. As part of its activities, it established the (NGN) Future Operations Group (NGN FOG) to discuss and analyze issues relating to NGN implementation. Similarly, in Mexico recently established a Convergence Committee comprised of the regulator, COFETEL, service providers, and industry experts. Recently, the regulator in India, TRAI, announced its intent to establish "NGN eCo" (NGN Expert Committee) to facilitate joint consultation between the regulator and consumers, industry players and policy makers. The Committee will address issues such as interconnection, QoS, awareness building and the migration timetable for NGN.

Some consultative groups are much larger in scope, such as in Japan, where the government recognized the importance of promoting industry-academia-government collaboration and established the Next Generation IP Network Promotion Forum in December 2005. The Forum consists of 211 members including universities, telecommunications carriers, manufacturers, and application production companies, led by the National Institute of Information and Communications Technology.

Moreover, in certain countries, the regulators have established expert groups to assist them with the preparation of reports and studies that are used as part of the consultation process. For example, in October 2005, the MIC in Japan established the "Study Group on a Framework for Competition Rules to Address the transition to IP-Based Networks" to address the migration towards NGNs and its regulatory implications. This group issued a report with a set of recommendations and principles to guide competition policies in the NGN world. The MIC adopted these recommendations and

formulated a road map for developing fair competition rules shortly after 2010 to further promote competition in telecommunications markets and secure user benefits.

Similarly, in Germany, the regulator created a Project Group, consisting of high-level telecommunications experts led by the head of the regulatory authority, to assist it with developing a report on the appropriate interconnection framework for IP-based networks. The Project Group's mandate was to act in an advisory capacity and not to make any legally binding decisions. The regulator subsequently initiated consultation with results expected in 2007. In addition to preparing the report, the Project Group's experts have given presentations that are accessible on the regulator's website, and the regulator has commissioned experts to prepare various studies.

Box 14: NGNuk: Background, justification, goals and current developments

In June 2005 Ofcom published a consultation entitled "Next Generation Networks: Further Consultation",[93] which proposed a series of policy principles and processes to support the development of NGNs in the United Kingdom. Ofcom's position is that it is inappropriate for it to manage the migration to NGN and that this is best left to BT and alternative providers which understand the requirements and possibilities of NGNs and therefore are likely to develop better solutions than Ofcom. Because of this, Ofcom instead sought to ensure that suitable industry-led processes were established and empowered to successfully implement this change in line with the policy principles proposed by Ofcom.

Figure 3. Ofcom's role in the move to NGNs

What	How
Help to identify and clarify potential regulatory issues early on	Consultation and ongoing dialogue with stakeholders
Establish clear governing policy rules to support NGN-based competition	Consultation and subsequent statement in conjunction with UK Enterprise Act consultation/Statement on Undertakings
Establish policy framework for consumer protection and information	Consultation and subsequent work on communication plan
Ensure appropriate industry-led processes are established	Consultation and ongoing discussions With stakeholders
Ensure industry-led processes stay on Track	Ongoing informal monitoring and dialogue With BT and other providers
Resolution of competition issues when industry processes fail	Formal market reviews and ex post competition powers as required
Updating ex ante regulatory framework to take account of NGNs	Ongoing programme of market reviews (e.g., updating market definitions, remedies and de-regulating as appropriate)

Source: Ofcom, Next Generation Networks: Further Consultation, at p. 10.

Ofcom proposed establishing an industry body to coordinate the UK telecommunications industry's transition to NGN core networks and engaged consultants to develop a more detailed proposal regarding the purpose and scope of the industry body, as well as the mechanics of its operation (*i.e.*, its membership, governance, funding, etc).[94] On this basis, in its report entitled "Next Generation Networks: Developing the regulatory framework"[95], Ofcom announced plans to establish NGNuk as an independent NGN industry body, with the purpose of creating an improved framework for industry engagement and focusing on three primary issues: IP

interconnect architecture; IP interconnect commercial model; and network intelligence interoperability.[96]

The role of the proposed body is not to provide a substitute for Ofcom's regulatory functions, but to ensure that there is a clear commercial vision led by industry for competition based on interconnected NGNs. This, Ofcom has argued, would allow for regulation to follow the market rather than lead it.[97]

NGNuk began its start-up phase on 1 April 2006 and its Constitution was agreed upon and signed on August 16 2006.[98] Following Ofcom's clear intention, the Executive NGNuk's members consist of electronic communications network providers with a demonstrable, substantial, network investment (whether existing or committed) in NGNs in the United Kingdom, with the clear intent to interconnect with other NGNs. Participating members reflect the wide range of NGN stakeholders with a bona fide and demonstrable intention to interconnect, use, or invest in NGNs in the United Kingdom.[99]

4.4 International Forums

International organizations such as the ITU, *info*Dev, INTUG, and OECD, as well as regional organizations and industry associations, such as APEC, APT, CITEL, CEPT, EU, ECTA, ETNO, and ETP are involved in NGN policy and regulatory initiatives through workshops, seminars, conferences, consultations, reports, and study groups. For example, the ITU has created the Next Generation Networks Global Standards Initiative (NGN-GSI) which focuses on developing the detailed standards necessary for NGN deployment to give service providers the means to offer the wide range of services expected to be delivered by NGNs. In collaboration with other bodies, NGN-GSI aims to harmonize different approaches to NGN architecture worldwide. In addition, it has established the NGN Focus Group under the banner of the NGN-GSI. Moreover, a number of ITU-T Study Groups are addressing questions related to NGN migration issues, particularly Study Group 1, as well as Study Groups 11, 12, 13, 15, 16 and 19. Similarly, the ITU Development Sector (ITU-D), is also focusing on NGNs through its programmes and study groups, in furtherance of the recent decisions of the World Telecommunication Development Conference.

Regulators should monitor these international developments regarding NGN-related issues, such as IP-interconnection, standardization, and numbering and, to the extent possible, should participate by attending meetings and providing input and comments into the process. Coordination and interaction with other regulators and entities that are confronting similar NGN transition issues are a useful tool and resource that should be fully utilized.

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[1] *See* ICT Regulation Toolkit, *info*Dev/ITU, available at http://www.ictregulationtoolkit.org/section/legal_regulation/impact_of_convergence/4_3_modifications_to_telecommunications_legislation_to_address_convergence/4_3_4_interconnection/.

[2] ITU-T Recommendation Y.2001.

[3] NGNs are composed of an access component and a core component. The access component of NGNs (or Next Generation access network), constitutes the evolution of existing access or distribution networks (local loops) with the deployment of new high-speed technologies, particularly fibre into the local loop. The core component constitutes the integration or convergence of existing backbone infrastructure (e.g. ATM, frame relay, X.25, ISDN, etc.) towards an integrated IP-based network, allowing for multiple service/applications capabilities and differentiated quality of service.

[4] See also Wey, Christian, Pio Baake and Sven Heitzler, Ruling the New and Emerging Markets in the Telecommunication Sector. Challenges: The Emergence of Next Generation Networks, ITU, 15 April 2006, available at http://www.itu.int/osg/spu/ngn/documents/Papers/Wey-060323-Prem-v1.1.pdf

[5] According to the 2006 Millennium Goals Report, in 2004, Africa added some 15 million new mobile phone subscribers. This figure is equivalent to the total number of fixed and mobile telephone subscribers on the continent in 1996. See UN, Millennium Development Goals Report 2006, at p. 25. Available at http://unstats.un.org/unsd/mdg/Resources/Static/Products/Progress2006/MDGReport2006.pdf

[6] *Id*.

[7] *See* Contribution of the National Regulatory for Communications Authority of Romania (ANRC) on the Economic and Regulatory Aspects Regarding the Migration to Next Generation Networks, available at http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR07/contributions/rom.pdf.

[8] *See* Keynote Speech by Mr. M H Au, Director-General, Office of the Telecommunications Authority, Hong Kong , People's Republic of China in the Session on "Next Generation Networks for Development: The Enabling Environment" on 7 December 2006, in the Telecommunications Development Symposium, ITU TELECOM WORLD 2006. Available at http://www.ofta.gov.hk/en/speech-presentation/2006/20061207.pdf

[9] *See* WSIS, Plan of Action. Document WSIS-03/GENEVA/DOC/5-E, 12 December 2003, Action Line C6. Available at http://www.itu.int/wsis/docs/geneva/official/poa.html#c6

[10] Ofcom, Regulatory challenges posed by next generation access networks. Public discussion document. 23 November 2006, at p. 16.

[11] Explanation to the recommendation of the European Commission of 11 February 2003 regarding relevant product and service market, Official Journal of the EC 203, L114/45, page 29.

[12] The investment ladder, or 'ladder of investment' is a theoretical concept based on the notion that competitors will roll out their networks gradually, first by simply reselling, then by purchasing wholesale broadband access, then acquiring unbundled access to the local loop, and finally deploying end user connections.

[13] *See* regulator's contributions to the 2007 Global Symposium for Regulators available at http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR07/consultation.html

[14] OPTA, KPN's Next Generation Network: All-IP. Position Paper, 3 October 2006 (OPTA/BO/2006/202771), at p. 8.

[15] Ofcom, Regulatory challenges posed by next generation access networks. Public discussion document. 23 November 2006, at p. 3.

[16] Ofcom, Regulatory challenges posed by next generation access networks. Public discussion document. 23 November 2006, at p. 22.

[17] OFTA, Review of Type II Interconnection Policy, July 2004, at p. 4.

[18] Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56. The 1996 Act amended the Communications Act of 1934, 47 U.S.C. § 151 *et seq.*

[19] Hence, we will not address it in depth here. For a complete account see FCC, In the Matter of *Unbundled Access to Network Elements; Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, WC Docket No. 04-313 and CC Docket No. 01-338, Order on Remand 18 FCC Rcd 16978, 17145, para. 6-19 (2005) (*Triennial Remand Order*).

[20] *Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers; Implementation of the Local Competition Provisions of the Telecommunications Act of 1996; Deployment of Wireline Services Offering Advanced Telecommunications Capability*, CC Docket Nos. 01-338, 96-98, 98-147, Report and Order and Order on Remand and Further Notice of Proposed Rulemaking, 18 FCC Rcd 16978, 17145, para. 200, 288 (2003) (*Triennial Review Order*). These rules were later upheld by the D.C. Circuit on March 2, 2004, in *USTA II* (359 F.3d at 564-76).

[21] Id. para. 275. "Greenfield" markets are those "which require entirely new construction of local loops (in addition to the deployment of the necessary switching and other network equipment) to serve new residential communities." Id. para. 227.

[22] Id. paras. 276-77. Overbuild or "brownfield" deployment refers to the situation in which "an incumbent LEC constructs fibre transmission facilities parallel to or in replacement of its existing copper plant." Id. para. 276.

[23] Id. paras. 288-89.

[24] Id. para. 296.

[25] *Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers; Implementation of the Local Competition Provisions of the Telecommunications Act of 1996; Deployment of Wireline Services Offering Advanced Telecommunications Capability* CC Docket Nos. 01-338, 96-98, 98-147, Order on Reconsideration, 18 FCC Rcd 16978, 17145, para. 4 (2004) (*Order on Reconsideration*).

[26] *See* FCC, High-Speed Services for Internet Access: Status as of December 31, 2005. July 2006. Available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-266596A1.pdf.

[27] OFTA, Review of Type II Interconnection Policy, July 2004, at p. 5. Available at http://www.ofta.gov.hk/en/report-paper-guide/paper/information/info20040706.pdf

[28] OFTA, supra note 22 at p. 5.

[29] In Hong Kong, China, Type II interconnection was only granted to the three new entrants in 1995, namely Hutchison Global Communications Limited (HGC), Wharf T&T Limited (Wharf T&T) and New World Telecommunications Limited (NWT), with the incumbent, PCCW-HKT Telephone Limited (PCCW-HKT), being forced to provide interconnection. Other competitors which entered the market starting from 2003, notably Hong Kong Broadband Network (HKBN), was not eligible for mandatory Type II interconnection and was required to build its network outright. In addition, OFTA observed that HGC was also building its fibre optic network steadily and was operating quite independent of the availability of mandatory Type II interconnection. Meanwhile, NWT and Wharf T&T relied more on Type II interconnection to roll-out their own services.

[30] OFTA, supra note 22 at p. 5.

[31] ARCEP, Notification a la Commission européenne du projet de décision proposant la levée de la régulation du marché des offres de gros d'accès large bande livrées au niveau national (December 2006) available at http://www.arcep.fr/uploads/tx_gspublication/proj-dec-12bis-comue-dec2006.pdf.

[32] *See* TRAI, Recommendations pertaining to Local Loop Unbundling at para 3.4.2.13 to 3.4.2.22.

See Ministry of Communications and Information Technology, Broadband Policy 2004. Available at http://www.dotindia.com/ntp/broadbandpolicy2004.htm. Also *see* TRAI, Letter to the Secretary of the Department of Telecommunications, Ministry of Communication and Information Technology, in re Broadband Policy 2004 - targets and achievement, F.No.2-2/2004-CN, November 3, 2005, Annex "A". Available at http://www.trai.gov.in/trai/upload/Recommendations/5/letter3nov05.pdf.

[33] Ofcom, Regulatory challenges posed by next generation access networks. Public discussion document. 23 November 2006, at p. 23.

[34] Statement from Martin Selmayr, spokesman for EU commissioner Viviane Reding, in German Parliament approves rules banning rivals from Deutsche Telekom's new network, International Herald Tribune, available at http://www.iht.com/articles/2006/12/15/business/telekom.php.

[35] *See* EC, letter of 21 August 2006, Case DE/2006/0457: Remedies relating to the Market for IP bitstream access with handover at IP level at different places in the network hierarchy, including HFC broadband access with handover at IP level. Comments pursuant to Article 7(3) of Directive 2002/21/EC (Framework Directive).

[36] VDSL access is generally offered over so-called "hybrid local loops" between the main distribution frame and the customer's premises. Hybrid local loops are lines partially consisting of fibre optic, either from the main distribution frame to the remote concentrator or to the street cabinet, whereas the part of the local loop leading into the premises of the end-user consists of copper.

[37] EC, *supra* note 1, at 4. (EC, letter of 21 August 2006).

[38] *See* EC, letter of 11 November 2005, Case DE/2005/0262: Wholesale Broadband Access. Opening Phase II investigation pursuant to Article 7 (4) of Directive 2002/21/EC (Framework Directive).

[39] EC, *supra* note 4, at 5. (EC, letter of 11 November 2005).

[40] *See* EC letter of 23 December 2005, Case DE/2005/0262: Wholesale Broadband Access in Germany. Withdrawal of serious doubts, at 4.

[41] *Id.* at 4.

[42] *Id.* at 5. However, in a more recent letter to the BNetzA, the Commission all but eliminated this possibility - with regards to VDSL - indicating that *"the question about the substitutability between bitstream access to VDSL connections and other forms of bitstream access should be answered positively from the outset."* EC, *supra* note 1, at 4. (EC, letter of 21 August 2006).

[43] *Id.*, at 4.

[44] *See* EC, Commission Staff Working Document. Public Consultation on a Draft Commission Recommendation on Relevant Product and Service Markets within the electronic communications sector susceptible to *ex ante* regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communication networks and services (Second edition), 28 June 2006, SEC(2006) 837, at p. 16. (Draft Recommendation)

[45] EC, supra note 38, at p. 28.

[46] *See* OFCOM, Final statements on the Strategic Review of Telecommunications, and undertakings in lieu of a reference under the Enterprise Act 2002, 22 September 2005, available at http://www.ofcom.org.uk/consult/condocs/statement_tsr/statement.pdf.

[47] See www.openreach.co.uk/orpg/home/home.do.

[48] Ofcom, Regulatory challenges posed by next generation access networks. Public discussion document. 23 November 2006.

[49] *See* ACCC 'perplexed' by Telstra decision on fibre-to-the-node investment, Press release, 7th August 2006. Available at: http://www.accc.gov.au/content/index.phtml/itemId/757949.

[50] FCC Adopts Rules to Ensure Reasonable Franchising Process for New Video Market Entrants. December 20, 2006. Available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-269111A1.pdf.

[51] *See also* Dale N. Hatfield and Eric Lie, *Why Licence?*, in Trends in Telecommunication Reform 2004/2005: Licencing in an Era of Convergence. ITU. P. 28.

[52] *See* regulator's contribution to the 2007 Global Symposium for Regulators available at http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR07/consultation.html.

[53] See ANRT, Response to the consultation in preparation for the 2007 Global Symposium for Regulators, available at http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR07/contributions/mrc.pdf

[54] Uganda Communications Commission, available at: http://www.ucc.co.ug/licensing/default.php.

[55] *See* Cahier des Charges de la licence nouvelle génération attribuée à Médi Telecom S.A. pour l'établissement et l'exploitation de réseaux publics de télécommunications au Royaume du Maroc, avalable at http://www.anrt.net.ma/fr/

[56] Article 27 of Decree-Law 1900 of August 19, 1990.

[57] *See* Law No. 142 of 1994 on Public Domiciliary Services (establishing the service categories of local and long distance basic public switched telephony); Law No. 37 of 1993, as amended (regulating mobile ceULLlar telephony services) and Law No. 555 of 2000 (regulating Personal Communications Services).

[58] Article 8 of the draft Regulation on Convergence.

[59] See Competition Tribunal, Decision Nº 45/2006 of 26 October 2006, available at http://www.tdlc.cl/db_images/sentencias/45411f978d854_Sentencia-45-2006.pdf.

[60] Available at http://www.subtel.cl/servlet/page?_pageid=58&_dad=portal30&_schema=PORTAL30.

[61] *Madison River Communications, LLC and affiliated companies* File No. EB-05-IH-0110, Order (2005). Available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-05-543A2.pdf.

[62] There is currently an ongoing proceeding regarding IP-Enabled services in order to determine what rules will apply to these services. *See* In the Matter of IP-Enabled Services, WC Docket No. 04-36.

[63] *Appropriate Framework for Broadband Access to the Internet over Wireline Facilities; Review of Regulatory Requirements for Incumbent LEC Broadband Telecommunications Services; Computer III Further Remand Proceedings: Bell Operating Company Provision of Enhanced Services; 1998 Biennial Regulatory Review – Review of Computer III and ONA Safeguards and Requirements; Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities; Internet Over Cable Declaratory Ruling; Appropriate Regulatory Treatment for Broadband Access to the Internet Over Cable Facilities* CC Docket Nos. 02-33, 01-337, 95-20, 98-10, GN Docket No. 00-185, CS Docket No. 02-52, Policy Statement, 18 FCC Rcd 16978, 17145, para. 4 (2005). Available at http://www.cdt.org/speech/net-neutrality/20050923fcc-appropriate-framework-nprm.pdf.

[64] *See* ICT Regulation Toolkit, *info*Dev/ITU, available at http://www.ictregulationtoolkit.org/section/legal_regulation/impact_of_convergence/4_3_modifications_to_telecommunications_legislation_to_address_convergence/4_3_4_interconnection/.

[65] ENUM resulted from the work of the ITU's Internet Engineering Task Force's (IETF's) Telephone Number Mapping working group. The working group was assigned with the task of defining a Domain Name System (DNS)-based architecture and protocols to map a PSTN telephone number to a Uniform Resource Locator (URL) through which a recipient could be contacted. For further details, see ITU-T Resolution 49, *available at* http://www.itu.int/dms_pub/itu-t/opb/res/T-RES-T.49-2004-PDF-E.pdf.

[66] *See* http://itu.int/ITU-T/inr/enum/procedures.html and http://www.itu.int/ITU-T/inr/enum/procedures-02.html.

[67] *See* http://www.itu.int/osg/spu/presentations/2004/enum-country-experiences-ftra-uganda-rs.pdf. For an example of an ENUM trial, *see also* http://www.enum.org/.

[68] *See* ANRT, Response to the consultation in preparation for the 2007 Global Symposium for Regulators, available at http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR07/contributions/mrc.pdf

[69] *See* Recommendation ITU-R M.1645.

[70] See Resolution 802 (WRC-03), resolves 1.4 (also referred to as Agenda item 1.4).

[71] "Although the terms "universal service" and "universal access" are closely related and are sometimes used interchangeably, they have different meanings. Universal service refers to the provision of telecommunications services to all households within a country, including those in rural and remote (high cost) locations. Universal access policies seek to increase access to telecommunications services on a shared basis, such as on a community or village-wide level. Universal access programs typically promote the installation of public payphones or public call offices in rural and remote villages or low-income urban areas with the aim of providing a basic and initial connection to the telecommunications network. While universal service may be a realistic policy objective in developed countries, universal access is a more feasible practical goal in many developing countries." Patrick Xavier, *What rules for universal service in an IP-enabled NGN environment?* ITU, April 15, 2006, p.4. Available at http://www.itu.int/osg/spu/ngn/documents/Papers/Xavier-060323-Fin-v1.pdf.

[72] Availability implies that the level and quality of service (including reliability) is the same wherever a person lives or works, so that residing in a high cost rural or remote area does not affect a person's ability to access communication services. Affordability is referred to the fact that maintaining and using the service does not place an unreasonable burden on consumers, particularly on vulnerable disadvantaged consumers. Accessibility means that people with disability can use the service. See Xavier, supra note 60 at p. 5.

[73] World Telecommunication Regulatory Database 2005.

[74] See Xavier, supra note 60, p. 8; Ofcom, *Review of the Universal Service Obligation," 10 January 2005. Available at http://www.ofcom.gov.org.uk.*

[75] *See* MIC, New Competition Promotion Program 2010, 19 September 2006, at. p. 2, available at http://www.soumu.go.jp/joho_tsusin/eng/pdf/060928_1.pdf.

[76] MIC, New Competition Promotion Program 2010, 19 September 2006, at. p. 3, available at http://www.soumu.go.jp/joho_tsusin/eng/pdf/060928_1.pdf.

[77] *See* ANRT, Response to the consultation in preparation for the 2007 Global Symposium for Regulators, available at http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR07/contributions/mrc.pdf

[78] TRAI, Recommendations on Issues Pertaining to Next Generation Networks (NGN), 20 March 2006, at p. 14. Available at http://www.trai.gov.in/trai/upload/Recommendations/47/recom20mar06.pdf.

[79] Consultation on the Establishment of a Communications Authority, Communications and Technology Branch, Commerce, Industry and Technology Bureau, March 2006.

[80] *See* www.citynet.nl.

[81] The Operating Company will be responsible for running the Network, providing bandwidth connectivity on a wholesale basis to RSPs that would compete with each other providing services to end-users.

[82] *See* Telecommunications Industry Association (TIA) and FTTH Council, U.S. Optical Fibre Communities – 2006, available at http://www.ftthcouncil.org/documents/959055.pdf. It is worth noting that there has been considerable increase in the number of communities served with FTTH in the United States during the past years. Data from 2005-2006 shows an increase of more than 135% on a year-to-year comparison, as the number of communities served in May of 2005 was 398. *See* Telecommunications Industry Association (TIA) and FTTH Council, U.S. Optical Fibre Communities – 2005, available at http://ftthcouncil.org/documents/213284.pdf.

[83] Ofcom, Regulatory challenges posed by next generation access networks. Public discussion document. 23 November 2006, at p. 19.

[84] *See* Randal C. Picker, *Who Should Regulate Entry into IPTV and Municipal Wireless?* John M. Olin Law & Economics Working Paper No. 308, University of Chicago Law School, September, 2006. Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=931495.

[85] For a recent reference to the legal landscape of municipal WiFi in the United States, *see* Federal trade Commission, Municipal Provision of Wireless Internet, Staff Report, September, 2006. Available at http://www.ftc.gov/os/2006/10/V060021municipalprovwirelessinternet.pdf.

[86] Code General de Collectivités Territoriales. Article L 1425.1, introduced by the Loi nº 2004-575 du 21 juin 2004 pour la confiance dans l'économie numérique.

[87] Municipalities can only serve end users directly if it is confirmed that private initiatives are insufficient to meet end user demand in their jurisdictions. To this end, local governments must conduct public offerings to enlist private operators that meet this demand. Only if this process is unsuccessful (*i.e.*, no private parties come forward to meet demand), and after duly notifying the French regulator, ARCEP, may local governments engage in the provision of end user services.

[88] Equipement des zones d'activité en infrastructures de télécommunications a haut et très haut débit. Guide pour les aménageurs et pour les collectivités. ARCEP. P. 14.

[89] *See* TRAI, supra note 66.

[90] Issue Paper KPN's Next Generation Network: All-IP dated 22 May 2006, reference: OPTA/BO/2006/201599.

[91] Position Paper KPN's Next Generation Network: All-IP dated 3 October 2006, reference: OPTA/BO/2006/202771.

[92] TRAI Recommendations, March 2006.

[93] Issued June 30, 2005.

[94] Spectrum Strategy Consultants, Ofcom. Scoping an NGN industry body. December 9, 2005. Available at http://www.ofcom.org.uk/consult/condocs/nxgnfc/ngn/.

[95] Issued March 7, 2006. Available at: http://www.ofcom.org.uk/consult/condocs/nxgnfc/statement/ngnstatement.pdf

[96] *Id.* at p. 8-9.

[97] *Id.* at p. 9.

[98] *See* NGNuk Constitution, available at: http://www.ngnuk.org.uk/docs/NGNuk_constitution_060816.pdf.

[99] *Id.* Sections 3.3.3 and 3.4.1.