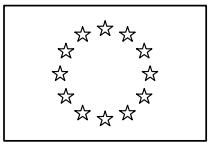

COMMISSION OF THE EUROPEAN COMMUNITIES

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Accompanying document to the

Draft

COMMISSION RECOMMENDATION

on regulated access to Next Generation Access Networks (NGA)

{C(2010) 6223}

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EXECUTIVE SUMMARY

Next generation access networks (NGAs) for telecommunications and very high-speed broadband have the potential to drive economic growth, create jobs and stimulate innovation across Europe. For this reason, investment in optical fibre networks is a key ingredient for the Commission's *European Digital Agenda*, which in turn is a cornerstone of the *EU2020* strategy for smart, sustainable and inclusive growth.

The EU regulatory framework *inter alia* requires national regulatory authorities (NRAs) to encourage efficient investment and promote competition. When the latter is not effective, regulatory measures aiming to address market failure can be imposed on dominant firms by NRAs, after conducting a thorough market review in accordance with *Article 7* of Directive 2002/21/EC.

Today the deployment of NGAs in the EU is still at a relatively early stage of development. However, an increasing number of NRAs have begun to consider questions of regulated access to NGAs as part of their regular market reviews, and there is a growing number of regulatory measures notified to the Commission in this regard. Based on the scrutiny of measures by the Commission, there is the clear danger that without general Commission guidance – the baseline scenario for the purposes of this paper – regulatory approaches in the single market will diverge, creating distortions of competition through inconsistent regulation as well as uncertainty for investing undertakings.

The basic problem the Recommendation thus seeks to tackle is to bring consistency to NRAs' decisions, thereby creating regulatory certainty for undertakings, so as to ensure timely and efficient investment in NGAs throughout the EU single market while fostering competition in the market for broadband services.

Building on two public consultations and views of key stakeholders, three different policy responses are indentified in this paper. The first would involve drastic regulatory reform, consisting of forbearance and *a priori* exclusion of remedies. The second would consist in resisting any adjustment of the specific rules governing the present regime of *ex ante* regulation. The third would represent a response favouring the imposition of access obligations duly adjusted to take account of investment risk.

The paper concludes that a policy response focussed on designing and imposing access obligations appropriately adjusted for investment risk is the superior option. Recommending such policy response would not only manage to avert the regulatory uncertainty caused by inconsistent regulation in the single market, but would have significant further benefits in terms of competition and investment, for both incumbent and alternative operators, and ultimately in terms of welfare for EU consumers.

MODIFICATIONS FOLLOWING THE OPINIONS OF THE IMPACT ASSESSMENT BOARD

In response to the suggestions of the Impact Assessment Board (opinions dated 16 April 2010 and 6 May 2010) the following changes have been introduced in the text of the draft report.

A baseline scenario has been added, setting out how the problems of *ex ante* regulation in the transition from copper to fibre networks would evolve in the absence of guidance by means of a Commission Recommendation. Furthermore, the report now contains a more thorough

analysis of the content of the Recommendation, setting out in more detail the range of remedies available to national regulatory authorities and the way they could be applied in an NGA setting.

The different views of key stakeholders have now been included, and it is shown how these views have been taken into account by the Recommendation. In addition, clearer explanations have been provided as to the impacts of the various options on competition and investment, and, specifically, as to how incumbent and alternative operators would be affected.

To make the report more accessible to non-expert readers, key concepts (such as the ladder investment or the toolbox of remedies) have been explained, the description of options has been separated from their assessment, a glossary has been added and selected explanatory charts and tables have been integrated into the text. Finally, a few technical changes have been made in response to the Board's comments (material on previous internal consultations as well as on the issues of subsidiarity, proportionality and the legal basis).

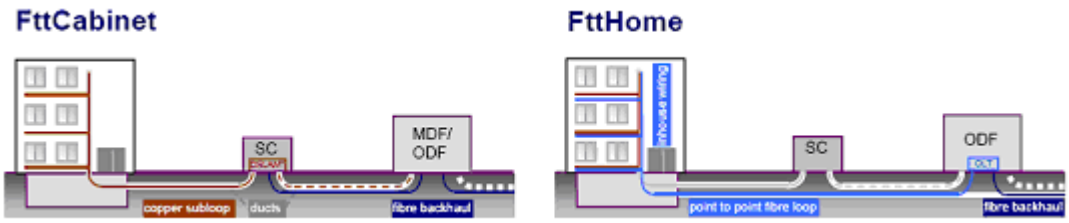
INTRODUCTION

This staff working paper accompanies the Commission's draft Recommendation on regulated access to Next Generation Access networks (NGA), which intends to give guidance to EU national regulatory authorities (NRAs) on the future design of regulatory remedies concerning NGAs. The task of the present paper is to explain key issues and policy responses, and ultimately to defend the adequacy and proportionality of the solution proposed.

NGAs can be defined as access networks which consist wholly or in part of optical elements, and which are capable of delivering broadband access services with enhanced characteristics, when compared to those provided over already existing networks[1]. In recent years, in the face of increased competition, providers of electronic communications services in the EU single market – such as telecommunications or cable TV companies – have begun to upgrade or replace parts of their legacy access infrastructure with NGAs. NGA networks are capable of offering a various range of enhanced broadband services, encompassing voice, very high-speed internet connectivity, and both linear and non-linear high definition audiovisual content.

The NGA Recommendation concerns regulatory reactions to the roll-out of optical fibre networks to the street cabinet (Fibre-to-the-node FTTN / VDSL) or all the way to the end customer (Fibre-to-the-home FTTH).

Figure 1: Fibre-to-the-node and cabinet (FTTN) vs. Fibre-to-the-home (FTTH)



An increasing number of NRAs have begun to consider questions of regulated access to NGAs as part of their regular market reviews, and there is a growing number of regulatory measures notified to the Commission in this regard. Based on the scrutiny of measures by the Commission, there is the clear danger that without general Commission guidance – the baseline scenario for the purposes of this paper – regulatory approaches in the single market will diverge, creating inconsistency of regulation and uncertainty for investing undertakings.

In its March 2009 conclusions the European Council recalled the fundamental role of telecommunications and broadband development in terms of EU investment, job creation and overall economic recovery, and invited the Commission to develop a European broadband strategy in close cooperation with stakeholders. The NGA Recommendation forms part of that strategy. The Commission's strategy also includes the *Community Guidelines for the application of State aid rules in relation to rapid deployment of broadband networks*[2]

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1 Existing networks are in most cases based on copper or co-axial technologies (e.g. cable TV) and are now gradually being upgraded to NGAs via Fibre-to-the-Node/Very-high-datarate-Digital-Subscriber-Line (FTTN/VDSL) or Fibre-to-the-Home/Fibre-to-the-Building (FTTH/B) - point-to-point or point-to-multipoint - deployments (See Annex II) or via the upgrade to EuroDOCSIS 3.0 combined with some deployment of fibre closer to the end-user in the case of co-axial-based networks.

2 OJ C 235, 30.9.2009, p.7.

(including for NGAs), which aims at giving Member States and public authorities guidance to ensure that their plans for state funding are compliant with the EU's State aid rules. Finally the forthcoming *European Digital Agenda* will knit together existing initiatives with new actions.

This staff working paper reflects the existing Commission case-work, according to the provisions under *Article 7* of Directive 2002/21/EC (Framework Directive), arguments and evidence submitted to the Commission in response to two public consultations in 2008 and 2009, and is further based on sources as referenced in the bibliographical annex.

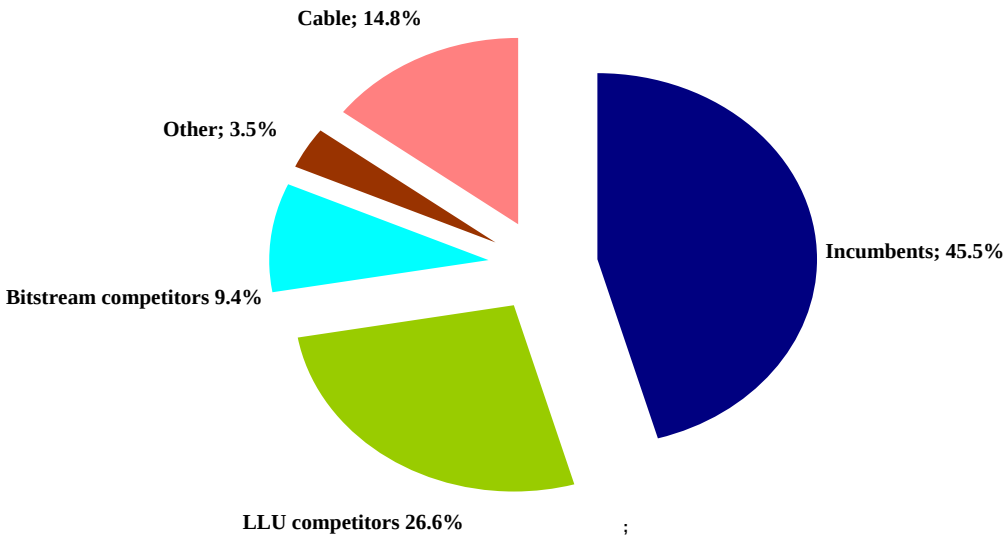
1. MARKET STRUCTURE AND REGULATORY FRAMEWORK

1.1. Market structures, developments and investments[3]

The challenges posed by the transition to NGA networks need to be situated within the context of overall competition for broadband access services in the EU.

On the EU market for fixed voice and broadband services (with a size of about €175 billion in 2009) large incumbent telecommunications operators compete with cable network operators, LLU competitors and bitstream competitors. As of July 2009, there were approximately 120 million fixed broadband subscribers in the EU. The market share of incumbents was 45.5 percent, while alternative providers held 36 percent (26.6 percent LLU competitors, 9.4 percent bitstream competitors) and cable 14.8 percent.[4]

Chart 1: EU broadband market shares by operator type (July 2009)[5]



The dominant broadband access technology in the EU is ADSL with a share of approximately 79 percent. Broadband access by means of cable has a share of about 15 percent with full optical fibre networks (FTTH/B) accounting for 4 percent.

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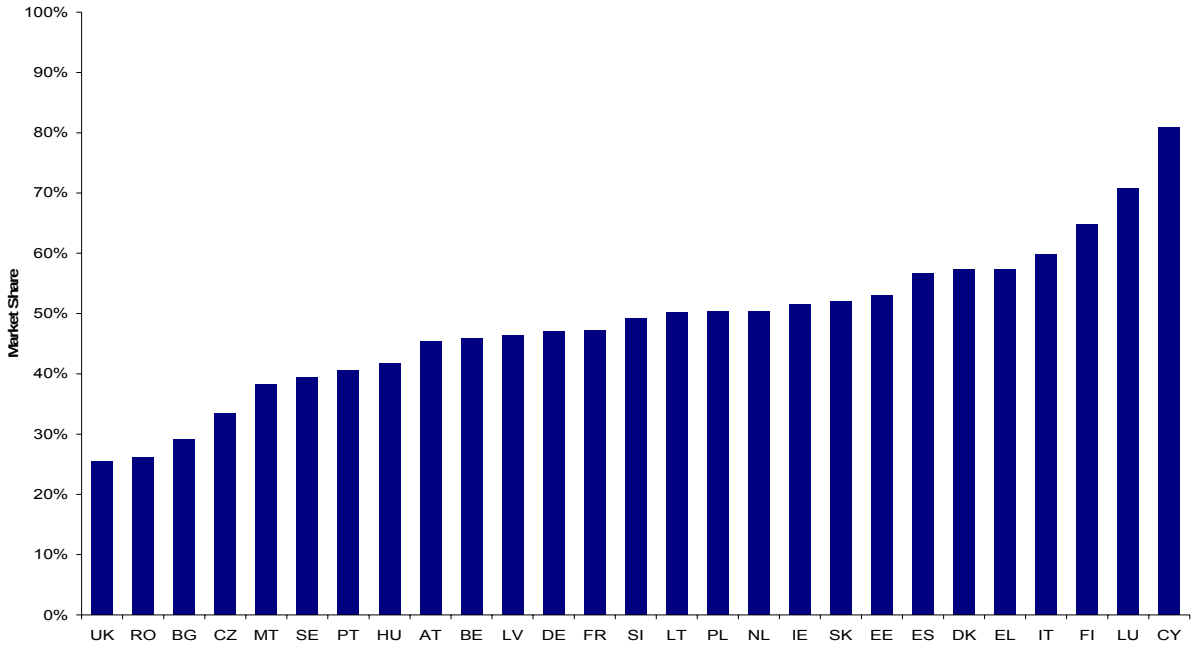
3 Data in this section is taken from the COCOM09-29 final *Broadband access in the EU: situation at 1 July 2009* (November 2009), the Commission's Progress Report on the Single European Electronic Communications Market 2008 (14th Report), March 2009; the Commission's Broadband Access Report (November 2008) and from Eurostat.

4 The EU penetration rate was about 23.9 percent of the population and about 50 percent of all private households. The penetration of mobile broadband as measured by dedicated data service cards/modems/keys was 4.2 percent.

5 Source: European Commission's Implementation Reports, Responses to European Commission's Public Consultations, European Commission's staff estimates.

At present, the EU markets for broadband services are not yet characterised by effective competition. In general, while the process of full liberalisation which started in the late 1990s has led to both market entry by alternative providers and increased competition, all NRAs in their most recent market reviews identified positions of significant market power (SMP) held by the former monopolist undertaking.[6]

Chart 2: Domestic broadband market shares of SMP-operators (EU27)[7]



Infrastructure-based competition from local loop unbundling (LLU) and cable has made important progress in recent years. However, the market position of alternative providers has developed on the basis of pervasive access regulation, and many entry barriers remain. These barriers may even become more pronounced in an NGA setting. For instance, while today an LLU competitor can connect its own network to the incumbent's access network at the local exchange (unbundling at a distance of several kilometres from the end-user's premises), such interconnection will as a general rule no longer be possible in an NGA setting. Alternative operators would have to install their equipment in street cabinets or manholes much closer to the end-user's premises, rendering alternative business cases more challenging than in the past (rather than connecting to one local exchange today they will have to connect to thirty street cabinets tomorrow). NRAs will thus have to develop and impose appropriate access products, which at the same time have to contain efficient NGA investment incentives for regulated undertakings. There could thus be potential conflicts of interests for regulators.

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6 Though it is true that the UK regulator Ofcom designated large segments of the UK broadband market as effectively competitive for purposes of market 5 (Case UK/2007/0733). Similarly, competitive conditions in the Austrian market were seen as diverging significantly in certain areas (Case AT/2008/0757).

7 Incumbent market share of total national broadband market (resale offers are counted towards the alternative share). Sources: European Commission's Implementation Reports, Responses to European Commission's Public Consultations, European Commission's staff estimates.

Moreover in many parts of the EU upgrades of competing cable networks are continuing apace, and the physical reach of cable networks in many Member States is very extensive, constituting another important variable for the development of future regulatory approaches. Finally, levels of competitive intensity are liable to vary not only between Member States, but also in certain segments and areas of a given national market, with infrastructure-based competition particularly strong in urban and metropolitan areas.

Compared to the signs of growing maturity displayed by the market for legacy broadband services, deployment of very high-speed broadband access lines in the EU is still at a relatively early stage of development. As at December 2008 the number of homes passed by FTTH/B was 10.9 million in the EU27.[8] In July 2009, there were approximately 2 million FTTH/B subscribers in the EU. In addition, there were about 1 million FTTN/VDSL subscribers, yielding a total figure of approximately 3 million customers actually being served by NGA networks. Alternative operators had a share of more than 80 percent of existing FTTH/B subscribers.

However, current NGA penetration in terms of physical coverage by FTTH/B and VDSL is much higher, with approximately 26.9 million homes already passed by at the end of 2008. This figure corresponds to 22.5 percent of all broadband fixed access lines in July 2009.[9] Since cable networks already are (or easily could be) upgraded to EuroDOCSIS 3.0, they need to be included in any realistic assessment of NGA coverage, and the current overall physical reach of NGA networks (FTTH/B, VDSL and cable) in the EU is thus likely to be higher than 22.5 percent (please refer to Chart 3 of Annex III for an illustration of this).[10]

While deployment patterns are of considerable diversity in the EU, to date actual NGA investment by incumbent operators has focussed more on FTTN/VDSL (more than 16 million homes passed) rather than on FTTH/B (more than 1.7 million homes passed). Alternative operators, on the other hand, were first-movers in FTTH/B investment (more than 7 million homes passed).[11] There is also ongoing deployment by utility companies, municipalities and housing associations (about 2 million homes passed).

An overview of selected commercial investments in NGA in Europe is provided in Table 1 below.

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8 IDATE for FTTH Council Europe IDATE, *FTTH European Panorama* (December 2008)

9 For instance, by August 2009 Deutsche Telekom's VDSL network had a physical reach of approximately 25-30% of the German population; however, commercially attractive retail offers resulting in actual customer take-up were only scheduled for H2:2009.

10 The exact figure depends first on how many of the existing cable lines have already been upgraded to EuroDOCSIS 3.0, and second on whether (and to what extent) such upgrades were effected within the present geographical radius of FTTH/B and VDSL networks. In any event, the resulting figure will be higher than 22.5%. While there will also be some geographical overlap between competing FTTH/B and VDSL networks, this is unlikely to outweigh the former effect.

11 For instance Fastweb in Italy, Numericable and Iliad in France, NetCologne in Germany, B2 in Sweden.

Table 1: NGA investments in selected EU countries (as at December 2009)

	FTTH/FTTB/FTTN	Cable
UK	**BT** announced a £1.5 billion investment in an FTTN project to cover 10 million households by 2013 (VDSL 40Mbps). The expected FTTN penetration is 50% of households by 2020.	12.7 million homes passed, 4.7 million unique cable subscribers. **Virgin Media**, the main operator, is planning to connect 50% of households. Expected DOCSIS 3.0 to 9 million households. Total current investments (2008): EUR 780 million
FR	France Numerique 2012" Plan. Expected 37% FTTB and 15% FTTN coverage by 2020. EUR11 billion investments, **FT** contributes with about 40%. FT aims to have 2 million subscribers by 2012 (G-PON). **9C**, 1 million homes passed by 2009, EUR 300 million investments. **Orange**, 0.2 million homes passed, EUR 270 million investments. **Free-Iliad**, 70% Paris coverage (FTTH) and EUR 300-400 million investments by 2009, EUR 1 billion by 2012. **SFR/Neufcegetel,** 1.5 million lines (FTTH, G-PON), EUR 250 million investments.	**Numericable**: 9.5 million households (40% of the total) passed in France with cable; of which 4.1 million based on optical fibre (objective: 8 million by end 2010). Network infrastructure: DOCSIS 3.0 and FTTB/Coax. Total current investments (2008): EUR 365 million
DE	**DT** has reached 10 million households in 2008 by a combination of FTTC/VDSL investing EUR 3 billion. Expected FTTB (P2P) for 3% and FTTN for 52% of population by 2020. Projected expenditure EUR 3.4 billion, to be added to the EUR 2.2 billion already spent. Competitors are usually deploying their own infrastructure up to MDFs. **NetCologne** is investing EUR125 million for FTTB deployment.	29.4 million homes passed, 20.5 unique cable subscribers. Market shares unique subscribers: **Kabel D** (44% - 10.9 million homes); **Unity Media** (25% - 5.9 million); **Kabel BW** (11% - 3.3 million). Current investments (2008): EUR 790 million
IT	A plan of EUR 1.5 billion, partly financied by public funds is under discussion in Italy. **TI** plan (2007) to deploy a mix of FTTB and FTTCab (VSDL2). Total Capex is about EUR 6.5 billion. **Fastweb** networks cover 10 million households, 20% with FTTH technology, the rest by LLU. Some infrastructure has been deployed by municipalities in large cities (f.ex. Milan) and by state owned companies (railways, highways) and it is used as backbone by competitors.	None
ES	**Telefonica** will deploy a mix of FTTB-VDSL (25%) and FTTN-GPON(15% households) by 2010, investing EUR 1 billion in total. For 2020 the figues are 24%, 22% and EUR 2.4 billion	1.6 million homes passed, 2.6 unique cable subscribers. **Ono** (71% market share unique subscriber) will launch a network based on DOCSIS 3.0 technology in major cities, for an investment of EUR 75 million. Total current investments (2008): EUR 526 million
SW	**TeliaSonera** will invest EUR 300 million (for half of the country) and it is expected to cover 27% by FTTB and 19% households by FTTN. Competitors and municipalities plans to deploy FTTB in specific areas.	2.7 million homes passed, almost all unique cable subscribers. Large number of cable operators, municipalities are involved in remote areas and small cities. The main player is **Com Hem** (73% market share). Current investments (2008): EUR 110 million
NL	**KPN** has announced in 2008 its intention to cover 60% households by FTTB/H, with an expenditure of EUR 1.8 billion to be added to the EUR 1.4 billion committed to FTTN deployment. Fibre deployment is dependent on the business case and on partnering opportunities. Other areas will be serviced via a mix of fixed and mobile infrastructures (2009). KPN has the ambition to reach 1.1-1.3 million homes passed by FTTH through Reggefibre by the end of 2012. By then, KPN targets is to have 600-800k active customers on FTTH and FttC combined (10% of Dutch households).	6.7 million homes passed, almost all unique cable subscribers. Main players, **Ziggo** (56% market share) and **UPC (**35%). Current investments (2008): EUR 469 million
BE	**Belgacom** has already invested EUR 600 million and it plans to invest an additional EUR 400 million to extend FTTN to 81% and FTTB to 12% households by 2020.	4.4 million homes passed, 3.8 million unique cable subscribers. **Telenet** (68% market share), **Voo** (30%). Current investments (2008): EUR 265 million

1.2. The EU regulatory framework

The EU regulatory framework *inter alia* requires NRAs to encourage efficient investment and promote competition.[12] When the latter is not effective, regulatory measures aiming to address market failure can be imposed by NRAs after conducting a thorough market review in accordance with *Article 7* of Directive 2002/21/EC.

After defining the relevant markets, NRA must assess competition in each market, and particularly whether any firms in those markets have SMP.[13] If the market is found not to be competitive, then SMP-operators will be subject to *ex ante* regulatory obligations (remedies) in order to stimulate competition. These remedies must be based on the nature of the problem identified, proportionate and justified.[14] Furthermore, *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 encourages companies to ascend 'the investment ladder'.[15]

The EU framework furnishes NRAs with a toolbox of remedies, allowing for the flexibility to design appropriate measures to tackle market failures and achieve intended regulatory objectives in each Member State. Any unjustified deviation from the practice established by the EU framework can ultimately be challenged by the Commission in court. [16] In addition, under *Article 19* of the revised Framework Directive, the Commission may, taking the utmost account of the opinion of BEREC (Body of European Regulators for Electronic Communications), issue Recommendations defining common principles to be followed by NRAs in order to ensure the consolidation of the internal market by bringing consistency to NRAs' decisions, thereby trying to prevent forms of regulatory fragmentation in the EU27.

Remedies under sector-specific *ex ante* regulation are limited to those instances where genuine bottlenecks exist or where competition is not functioning for other reasons. The regulatory framework contains a list of remedies which can be imposed on dominant undertakings (Access Directive), as well as the procedure to be followed by NRAs and the Commission when doing this (Article 7 of the Framework Directive). The framework does not make a distinction between the regulatory treatment of copper or fibre networks (reflecting the principle of technological neutrality).

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12 *Article 8* (5)(d) of Directive 2002/21/EC as amended.

13 "An undertaking shall be deemed to have significant market power if, either individually or jointly with others, it enjoys a position equivalent to dominance, that is to say a position of economic strength affording it the power to behave to an appreciable extent independently of competitors customers and ultimately consumers". Case 27/76 United Brands v Commission [1978] ECR 207.

14 Common principles and a methodology for this market analysis, based on European competition law, are provided in the Commission guidelines on market analysis and assessment of significant power under the Community regulatory framework for electronic communications networks and services (2002/C 165/03). "In an ex-ante environment, market power is essentially measured by reference of the power of the undertaking concerned to raise prices by restricting output without incurring a significant loss of sales or revenues.[…] Market shares are often used as a proxy for market power. Although a high market share alone is not sufficient to establish the possession of significant market power (dominance), it is unlikely that a firm without a significant share of the relevant market would be in a dominant position".

15 *Recital 19* of the Directive 2002/19/EC: "The imposition by national regulatory authorities of mandated access that increases competition in the short-term should not reduce incentives for competitors to invest in alternative facilities that will secure more competition in the long-term".

16 European Commission v Germany [2009] case C-424/07, OJ C283/

NRAs can respond to findings of dominance (SMP) by imposing obligations of transparency, non-discrimination and mandatory access and pricing obligations (known as the regulator's toolbox). The specific access remedies in this connection are:

- Resale (simple wholesale purchasing and branded reselling to retail customers, involving no separate own production effort)

- Bitstream access (wholesale broadband access combined with interconnection in the core network – IP bitstream)

- Shared access (alternative provider is present at the local exchange with its own network and shares a line with the incumbent)

- Local loop unbundling LLU (alternative provider rents the entire access line running from the local exchange to the end customer)

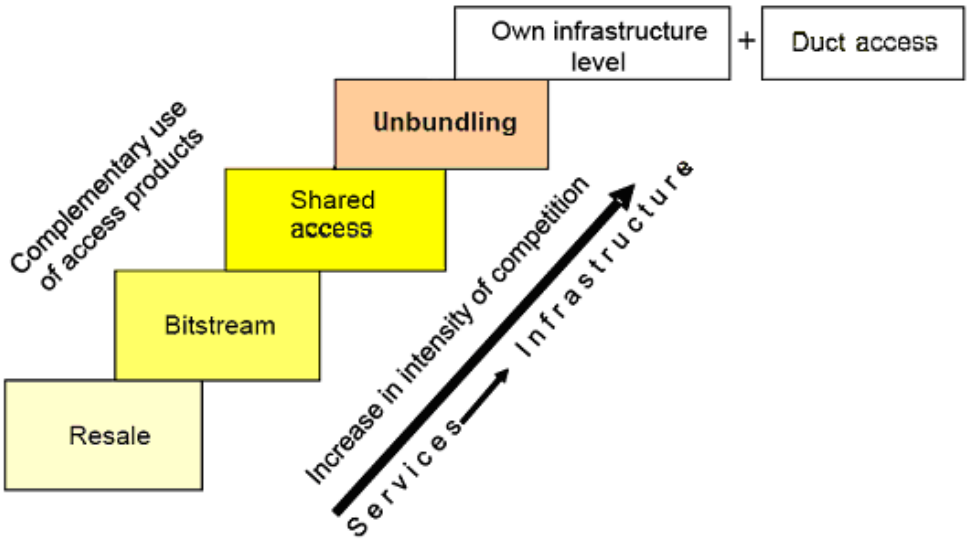
- Sub-loop unbundling (alternative provider does not rent the entire local loop but just the sub-loop, i.e. the access line running from the sub-loop to the end customer)

- Access to the terminating segment (alternative provider deploys its own network right up to a building and then pays for using the incumbent's vertical in-house wiring

- Access to ducts (alternative provider relies entirely on its own fibre or copper lines in the access network yet uses already existing civil engineering facilities such as manholes and ducts)

In EU practice, national regulators impose some combination of the above access remedies, complete with access prices, to set investment signals to all market players and drive infrastructure-based competition. This is known as the ladder of investment principle, according to which competitors start with low value-added products (for instance by reselling lines of the incumbent) and work their way up by gradually adding their own infrastructure, thereby becoming more efficient and less dependent on the incumbent's network over time. Economies of scale make it necessary to start by deploying their own infrastructures in the core network, before then gradually moving up the rungs of the investment ladder to deploy physical assets closer to the end customer. The ladder is displayed in Figure 2 below.

Figure 2: Rungs of the ladder of investment



1.3. Regulatory developments under the Article 7 procedure[17]

An increasing number of NRAs have begun to consider questions of regulated access to NGAs as part of their regular market reviews, and there is a growing number of regulatory measures notified to the Commission in this regard. The transition to NGA particularly affects two markets listed in Commission Recommendation 2007/879/EC: the market for wholesale (physical) network infrastructure access (including shared or fully unbundled access) at a fixed location (LLU, Market 4), and the market for wholesale broadband access (WBA, Market 5).

There are significant emerging divergences among NRAs with regard to general approaches, questions of market definitions, remedies imposed as well as pricing methodologies selected.

For example, three notifying NRAs favoured an approach combining symmetric access obligations (irrespective of a firm's dominance) with standard asymmetric remedies, while all others relied exclusively on asymmetric remedies. Further, a majority of notifying NRAs decided to include fibre based access products (FTTN/VDSL and FTTH/B) in the LLU and WBA markets (eight regulators), while others decided to exclude such products (five regulators). Also, some notifying NRAs have put in place measures mandating access to the unbundled fibre loop (three regulators), while one NRA refrained from doing so. The picture is similar with regard to wholesale bistream access based on VDSL. Finally, not all notifying NRAs have defined applicable price control methodologies, though most are currently adopting cost-orientation to regulate access prices to passive infrastructures. The Commission has however in several cases had to insist on the adequacy of cost-oriented price regulation.

Even though some of these differences may be justified in the light of national circumstances and specificities, this large variety of approaches currently implemented by NRAs nevertheless shows that regulatory guidance by the Commission is needed.

[17] Please refer to Annex II for a comprehensive overview

2. PROBLEM DEFINITION

2.1. Basic challenge

The basic challenge the Recommendation seeks to address is to bring consistency to NRAs' decisions (cf. chapter 1.3. supra), thereby creating regulatory certainty for undertakings, so as to ensure timely and efficient investment in NGA networks throughout the single market while fostering competition in the market for broadband services.

Investment

The case for commercial investment[18] to deploy very high-speed networks throughout the EU is still challenging. In fact, it is not clear that commercial investment will suffice to serve all of today's broadband subscribers with upgraded NGA services in the near future, much less the overwhelming majority of the EU's households. This causes a combined problem of efficiency and equity, with many EU citizens threatened by a new digital divide. While cable networks have significant geographical reach, they are not yet upgraded in their entirety and still have comparatively low market shares. The economics of NGA deployment (by SMP-operators and their competitors) are challenging, as average deployment costs are about €150-300 for VDSL and about €1500 for FTTH[19]. This elevated bloc of fixed costs contrasts with as yet unclear investment amortization perspectives, as there probably will not be outsize increases in consumers' willingness to pay for the total bundle of electronic communications and broadcasting services – likely are ARPU increases for telecommunications operators of about 10-15%[20] -, and improvements in operational efficiency alone might not be sufficiently large. Regulators thus need to be careful in setting good incentives for such investment.

Competition

In addition, and in line with the specific policy objectives as set out in Article 8 of the Framework Directive, NRAs have to safeguard and further intensify competition in the electronic communications services sector. Competition clearly remains essential to bringing about choice and affordable prices for consumers, and in the long-run also for investment.

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[18] Alternative operators combined with cable can be estimated to represent at least 30-35% of the EU's total investment in fixed networks, and regulatory policy needs to be designed to foster competition and investment by both dominant and non-dominant firms. ETNO in *Facts and Figures* (October 2009) provides a figure of 82% of EU investment in fixed networks to have been effected by incumbent undertakings; taking into account the much higher capex/revenue ratio of the cable sector (see for instance Solon, 2009, which provides an estimate of 25% vs. about 12% for EU incumbents) as well as its broadband market share of more than 15% yields at least 30-35% for the combined alternative and cable investment figure of total EU fixed investment.

[19] Unit costs per household connected, not served – excluding for instance customer acquisition and billing costs.

[20] Today's average retail ARPU for current-generation broadband in the EU is about €37 per month (see for instance Credit Suisse, *Equity research note*, 24 November 2009). From recent pilot projects by operators and extrapolating from current offerings (as depicted in Chart 9 of Annex III) moderate ARPU increases for future broadband services might reasonably be assumed.

In a nutshell, the problem for regulators in the EU single market thus is to converge on a common regulatory approach with a view to

- creating regulatory certainty and predictability
- avoiding insufficient regulation harming competition and alternative investment in NGAs
- avoiding insufficient regulation harming competition based on the unbundling of legacy networks (LLU)
- avoiding inappropriate regulation delaying or forestalling incumbent investment in NGAs

2.2. Problem drivers

The absence of EU guidelines and the deficiencies inherent in the Article 7 procedure are the principal problem drivers in the present context. The Commission has already examined and commented on a number of national measures covering NGAs. These individual comments were drafted with reference to the specific markets analysed by the national regulator concerned. Such approach has however two important drawbacks. First, it takes time and a large number of notifications to build solid case-law regarding the optimal design of NGA remedies. Stakeholders have made clear, however, that they need a comprehensive and specific framework from the outset. Second, individual comments made by the Commission in the context of a specific national notification do not necessarily imply that third regulators would take them into account.

In contrast to the oversight function exercised by the Commission in the Article 7 procedure over market definition and findings of SMP, the Commission can issue merely comments on regulatory remedies. These comments-letters are of necessity case-specific and cannot give the sort of general guidance needed to promote consistency. There are thus clear limits to what the Article 7 procedure can accomplish. Moreover, even the Commission's oversight function in the past needed to be strengthened by the SMP Guidelines and the Recommendation on relevant markets.

3. OBJECTIVES

3.1. General Policy Objectives

The objective of the Recommendation is to promote a common regulatory approach by NRAs, and to provide a predictable framework for investors in local loop unbundling and NGA networks.

3.2. Specific Policy Objectives

The Commission's policy objectives flow from *Article 8* of Directive 2002/21/EC, which binds the action of NRAs in setting remedies. In the present context, the following policy objectives are particularly relevant:

- promoting competition in the provision of electronic communications services
- ensuring that users derive maximum benefit in terms of choice, price and quality
- encouraging efficient investment in infrastructure and promoting innovation
- contributing to the development of the internal market (by ensuring inter alia cooperation in a transparent manner among NRAs and the Commission)

There also further operational objectives:

- providing re-configured access products in an NGA setting to allow LLU and bitstream operators to continue to compete
- setting appropriate access prices so as not to distort alternative operators' make-or-buy decisions and to foster efficient network duplication
- ensuring transparency of changes in network topologies and reasonable periods of transition

4. DESCRIPTION OF THE BASELINE SCENARIO AND POSSIBLE POLICY RESPONSES

4.1. Baseline Scenario

The Recommendation aims to give guidance to NRAs on remedies to be applied in an NGA setting in accordance with the regulatory framework. The baseline scenario consists of piecemeal guidance via the notification process of the Article 7 procedure and emerging inconsistencies of regulation in the single market.

Regulatory certainty afforded to EU undertakings over the past decade has been high, and the central principles of sector-specific *ex ante* regulation in the EU have remained the same since 2002. Furthermore, the case law which has developed under the Article 7 procedure since 2003 with regard to the regulation of copper networks – further strengthened by the SMP guidelines and the Recommendation on relevant markets – over time created an increasingly common approach towards market definition, SMP findings regulatory remedies to be imposed. The resulting regulatory certainty contributed to both competition (potential market entrants knew what to expect from regulators and could tailor their business models accordingly) and investment (regulated firms knew that despite being obliged to grant access to their networks they could reap stable and attractive returns on invested capital).[21]

This established EU consensus on the principles of *ex ante* regulation is now under attack. Faced with the transition from copper to fibre networks, national regulators come under pressure to revise their past regulatory approaches, and are sometimes struggling to find consistent answers. For instance, while some NRAs include FTTH or FTTN based services in their definitions of the relevant access markets, other have attempted to exclude these; further,

[21] Investment (measured in terms of capital expenditure) by regulated firms in the EU has been in a consistent range of 12-14 percent of revenues in recent years. In absolute figures, such investment exceeded €20 billion in 2008 for the fixed/broadband sector alone. The value of regulatory certainty is obvious from the magnitude of these figures.

while some NRAs impose unbundled access to the fibre loop, others refrain from doing so; finally, while some NRAs rely primarily on symmetric obligations, others do not impose such obligations at all. It is unclear where regulators are going from here, and thus significant divergence threatens with regard to questions of market definition, the set of remedies to be imposed, pricing methodologies, as well as periods of transition.

These developments are creating large-scale uncertainty in the single market, and make it likely that regulation will ultimately become a patchwork of different national regulatory approaches. This baseline scenario – and its attendant adverse effects on competition and investment – can only be avoided if guidance is given by the Commission.

The general legal instrument for providing such guidance is Article 19 ('Harmonisation procedures') of Directive 2002/21/EC, which stipulates that 'where the Commission finds that divergences in the implementation by the national regulatory authorities of the regulatory tasks […] may create a barrier to the internal market, the Commission may […] issue a recommendation'. Past attempts at achieving regulatory consistency in the single market by relying exclusively on the Commission's role in the notification process of the Article 7 procedure were fraught with difficulties. Indeed, the inability of EU regulators – despite many years of genuine efforts by the ERG - to converge on a common approach towards either international mobile roaming in 2006 or mobile call termination in 2009 have served to show that regulatory decision-making can be slow, piecemeal and ultimately ineffective without appropriate intervention (Regulation or Recommendation) by the Commission.[22] In the current situation, where the stakes are particularly high in view of the magnitude of investments involved, the pace of technological progress and the potentially large consumer benefits, swift Commission action is necessary to reconcile diverging approaches by NRAs.

While it is true that the revised Article 7 procedure (in which the Commission can issue recommendations to individual NRAs under Article 7a (5) in case of serious doubts) slightly strengthens the Commission's position with regard to the imposition or regulatory remedies, it does not transcend the boundaries of individual cases and falls short of creating the systematic approach needed for genuine consistency. Moreover the revised framework will only come into effect the Member States at the end of May 2011, leading to first notifications and case-law by end-2011. This however is clearly too late, as uncertainty pertaining to NGA regulation is a pressing problem in many Member States already today.

To see how this uncertainty might already affect investment in NGAs, it is useful to return to Table 1 (p.11). Investment activity by incumbent firms seems largely correlated, at this stage, with competitive threats from cable network operators. However, even in cases of such correlation, incumbent investment typically takes the form of VDSL rather than FTTH, for instance in Germany and the UK. With unit investment costs for FTTH much higher than for VDSL (see Chart 5 of Annex III), *ceteris paribus* investing firms have an increased risk of not being able to recoup their initial capital outlays. This risk is even more pronounced in the presence of uncertainty over future regulatory treatment. If one assumes that the benefits flowing to society from wide availability of FTTH networks are larger than those resulting from merely partial upgrades of copper networks, then uncertainties attaching to future regulatory treatment resulting in forestalled investment - or in a general preference for defensive and comparatively low-risk projects – will lead to lower consumer welfare over time. Similarly, uncertainty with regard to the future availability of certain wholesale access products – or with regard to the future existence of network inter-connection points such as

[22] See chapter 7 for a more detailed discussion of policy instruments and subsidiarity

the local exchange – can harm competition. As Chart 1 (p.8) makes clear, 26.6 percent of the EU broadband market is held by competitors relying on physical access products. Clearly, the business model of some of these LLU competitors is already being put in jeopardy by the fact that changes in network topologies might not be accompanied by suitable migration strategies, and that regulated NGA wholesale access products are often not available.

With this justification for creating consistency and regulatory certainty at hand, one can now explore what the Recommendation should contain in terms of the substance of regulatory guidance. Three broad policy responses towards regulating access to NGAs can be distinguished.

4.2. Regulatory forbearance and a priori exclusion of remedies (option 1)

The first policy response towards the challenges posed by the emergence of NGAs would consist in pursuing various forms of relaxation of the present regime of *ex ante* regulation, which is focussed on granting regulated access to key bottlenecks of legacy networks. Such response would be premised on the perceived need for a shift of emphasis away from promoting competitive structures towards promoting investment in networks. A policy response along these lines would typically incorporate the following elements.

Firstly, in this first policy response market definitions would be designed artificially such as to result in unjustified forms of partial regulatory forbearance, for instance (i) by excluding services based on optical fibre networks from the definition of markets 4 or 5, (ii) by broadening the definition of wholesale broadband services to include mobile (and thus by potentially not finding dominance on market 5) or (iii) by artificially segmenting geographic markets so as not to find dominance.

Secondly, advocates of this first policy response will strongly disagree with the view that regulators in an NGA context should in principle have at their disposal the full range of access remedies such as access to civil engineering infrastructure, unbundling and wholesale bitstream access. Instead, they are in favour of a chronological and logical preference for the lowest possible access remedy, including preference for civil engineering access over fibre access, and for remedies imposed on market 4 over remedies imposed on market 5.

Thirdly, a policy response favouring relaxation of the present regime would cast doubt on the primacy of the principle of cost orientation to underlie access price regulation. On this view, cost orientation – even if adjusted for risk by means of a risk premium - would not be a reasonable approach towards the pricing of NGA wholesale access products. Instead, more price flexibility should be granted in order to permit wholesale price discrimination or retail strategies such as aggressive penetration pricing over a sustained period of time. This claim, often accompanied by hostility to the principle of non-discrimination or even price regulation *per se*, is premised on the assumption cost-oriented access prices would hamper the NGA business case.

4.3. Imposition of full range of access and pricing remedies (option 2)

The second policy response towards the challenges posed by the emergence of NGAs would consist in resisting any adjustment of the specific rules governing the present regime of *ex ante* regulation, based on the assumption that mere technological progress or the advent of a new investment cycle involving upgrades and expansion of network capacity are unlikely to change the validity and justification of current regulatory practice.

A policy response along these lines would, first, urge the parallel imposition of all potential access remedies in an NGA setting from the outset. In other terms, all rungs of the ladder of investment would have to be present in every conceivable regulatory situation, from duct access over unbundling to bitstream.[23]

Second, advocates of this second policy response would also ask for such access remedies to be priced at very low levels, with preference given to cost orientation with little consideration of uncertainty and investment risk.

Third, they would oppose geographical market segmentation or geographical differentiation of remedies, arguing that regulation should be nationally uniform, so as to enable even very small undertakings to compete with the incumbent on a national scale.

Finally, a policy response favouring the imposition of a full range of access and pricing remedies would be in principle hostile to the introduction of risk-sharing mechanisms to promote investment in NGA networks. Arrangements for co-investment between several operators, on this view, would be overwhelmingly harmful to competition, and should not in any event result in regulatory treatment different from situations where dominant firms deploy networks on their own.

4.4. Imposition of access obligations adjusted for investment risk (option 3)

The third policy response towards the challenges posed by the emergence of NGAs would consist of designing and imposing access obligations appropriately adjusted for investment risk, aimed at driving both competition and investment.

Such policy response would be premised on the correctly-adjusted application of *ex ante* regulation, and would rest on five different pillars: first, the principle of facilitating market entry and competition by means of a proportionate application of the ladder of investment principle and a full range of wholesale access products at the regulator's disposal (though not all would have to be imposed in each case); second, the principle that for specific physical bottlenecks symmetric access obligations imposed on all undertakings could complement asymmetric obligations; third, the principle that investment risk should be rewarded by means of a risk premium incorporated in the regulated costs of capital, and by means of selective risk-sharing pricing mechanisms; fourth, the principle that differences in conditions of competition between geographic areas should be taken into account; and fifth, the principle that certain co-operative arrangements resulting in increased investment in NGAs and competition are desirable.

Specifically, this policy response – constituting the preferred option as argued in chapter 5 below, and informing the Recommendation– would be expressed through the following normative elements of regulatory guidance.[24]

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[23] Please refer to chapter 1.2. for a description of the ladder of investment principle.

[24] None of the following remedies would constitute genuinely new remedies; they would be mere adjustments of remedies originally designed to give access to copper networks.

General principles

- There needs to be consistency and regulatory certainty in the EU single market

- Regulators should analyse the markets for physical access (LLU) and wholesale bitstream access at the same time, as these markets are closely linked

- Regulators need to promote transparency about network deployment

- Differences in conditions of competition between geographic areas resulting from the deployment of fibre should be taken into account (separate geographic markets or geographically differentiated remedies)

- Asymmetric regulation could be complemented by symmetric approaches

- Investment risk should be taken into account (risk premium), and some pricing flexibility should be introduced

Physical access products (LLU)

- All access products should in principle be available (i.e. ducts, terminating segment, sub-loop, fibre loop)

- Regulated access prices should reflect investment risk, with further price flexibility attaching to high-risk projects such as some FTTH

- Certain arrangements for co-investment by several players could result in the lifting of *ex ante* regulation

Wholesale bitstream access

- Wholesale bitstream access should be imposed, as a general rule

- Where physical access remedies suffice to create effective competition, wholesale bitstream access could be removed

- Wholesale bitstream access products should be cost-oriented, in particular for VDSL

- Certain arrangements for co-investment by several players could result in the lifting of *ex ante* regulation

Transition

- Local exchanges currently used by competitors can be de-commissioned by incumbent firms only after a period of transition or by common agreement

5. ANALYSIS OF POLICY RESPONSES

This chapter provides a brief overview of the positions of key stakeholders (expressed *inter alia* in response to two public consultations) and will then proceed to analyse the three policy responses described above.

5.1. Positions of key stakeholders

The Commission has carried out two public consultations (on a first draft in November 2008, and on a second draft in July 2009), in the course of which a large number of submissions from a wide range of stakeholders was received and analysed. The consultations were in compliance with minimum standards. A thematic overview of submissions received is provided in the Annex.[25]

This section will briefly review the positions of incumbent operators, alternative operators and national regulators.

Position of incumbents

Commercial investments in NGAs and commercial agreements as a general rule should be given priority while regulatory certainty for investments above and beyond the current duration of standard market review periods is needed for investments to go ahead. Even if regulatory remedies were to be imposed, the pricing of these should be left to commercial agreements between incumbent operators and access seekers, and regulators should permit 'risk-sharing arrangements' based on price flexibility, for instance in accordance with capacity purchased or length of access commitment.

To the extent that *ex ante* regulatory obligations will be imposed on dominant operators, these should first and foremost focus on access at the deepest level of the network. At the same time national markets should be geographically segmented for purposes of defining wholesale physical and broadband access markets while market definitions should be broadened to include wireless broadband solutions. Also Regulation should make sure that in intensely competitive market areas all competing fibre operators can access ducts and terminating segments of such networks on a symmetrical basis.

No obligations should be imposed, and no preference expressed, for particular network architectures and topologies.

Position of alternative operators

Alternative operators generally welcome both the Commission's initiative and the current draft. However it challenges allegedly unwarranted emphasis on investment and the underlying presumption that relaxing remedies would promote incumbent investment; it argues that the Recommendation should not disproportionately rely on arrangements for co-investment and risk-sharing at the expenses of competition. Alternative operators argue there is insufficient emphasis either on the elaboration of the principles of non-discrimination and equivalence or on the clarity as to the precise application by NRAs of margin-squeeze tests.

[25] Both public consultations of 2008 and 2009 were preceded by an ISC. Apart from the author DGs INFSO and COMP, the following services were consulted: DG SANCO, DG REGIO, SJ, SG, DG TRADE, DG ECFIN, DG ENTR, DG MARKT and DGT-EDIT.

Position of NRAs

The ERG's analysis indicates that deployment of NGAs is currently at different stages across EU Member States, and that there are significant differences in both competitive environments and regulation. In this context ERG believes that the details should be left to individual NRAs, who have the relevant national market knowledge, to use the appropriate tools and guidance available to them regarding risk premia, suitable pricing freedoms and questions of migration from legacy infrastructure to achieve the outcomes agreed on by all. The Commission should not be too prescriptive. ERG also argues that it would be useful for operators to share as early as possible their future plans for investment in next generation technologies and the access they would intend to provide so that NRAs can respond in a flexible and appropriate manner commensurate with the needs of their particular market. Finally, the ERG stresses the importance not to pre-empt regulatory decision-making under the market analysis process.

With these positions at hand, it is now necessary to analyse the different policy responses: regulatory forbearance and a priori exclusion of remedies (option 1); imposition of a full range of access and pricing remedies (option 2); and imposition of access obligations adjusted for investment risk (option 3).

5.2. Option 1

The first policy response, seeking regulatory forbearance and a priori exclusion of remedies, has several components in need of critical scrutiny.

For a start, with regard to regulatory forbearance, the Commission has already instigated infringement proceedings against one Member State in connection with a legal attempt to grant regulatory holidays to dominant firms on allegedly new or emerging markets by means of the national telecommunications law.[26]

It is also doubtful that NRAs could simply depart from the present list of relevant product markets and define new markets in their market reviews. To achieve this, NRA analyses would have to show very significant breaks in the chain of substitution when comparing present broadband services to those based on optical fibre.[27] Thus, granting regulatory forbearance by means of the law or otherwise is not likely to be a viable policy approach.

Regarding the inclusion of mobile in the definition of broadband markets (and thereby arriving at overly broad market definitions making it difficult to establish dominance), it is probably too early at this stage to postulate full convergence and substitutability between fixed and mobile broadband as the default NGA scenario across all EU Member States.[28]

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[26] European Commission v Germany [2009] case C-424/07, OJ C283/19

[27] No evidence for such break for instance in Ovum, (2007), *Fibre: the socio-economic benefit*,a study done for the FTTH Council.

[28] From a short-term point of view, mobile-for-fixed substitution at present is actually waning in many parts of the EU. In the long-term, while mobile HSPA services might arguably be regarded as at least partially substitutable for the typical ADSL connections serving the mass segments of the current EU broadband market (65% of all users), they clearly are not substitutable for VDSL or even GPON. LTE technology, offering much higher bandwidth, as yet needs to be deployed. Large-scale LTE deployment in the EU will probably require further spectrum resources (not only in the 790-862 MHz band), and will remain subject to the familiar – and important - capacity constraints of cellular networks, with a large - and varying - number of users having to share the total bandwidth of one cell. LTE networks will also have to be much denser than current mobile networks – i.e. in need of significantly more base

Similarly, artificially fashioning market definitions with a view to a deliberate dismantling of *ex ante* regulation in certain geographical market areas or regions would clearly not be appropriate.

Turning to the claim that NRAs should systematically have a chronological and logical preference for the lowest possible access remedy (including preference for civil engineering access over fibre access, and for remedies imposed on market 4 over remedies imposed on market 5), this is not straight-forward either. Removing regulatory instruments from an NRA's armoury on an *a priori* basis - and outside of a proper market analysis process – would appear unnecessary.[29] In effect, such claim would amount to a priori exclusion of certain remedies and thus to a weak form of regulatory forbearance. Given the varying conditions of competition and existing network infrastructures in the EU27, depriving NRAs of a necessary degree of flexibility in selecting suitable combinations of remedies, where appropriate taking into account the different competitive conditions prevailing in certain geographic areas, would result in the wrong investment signals and would harm competition.

Finally, as to the doubt cast on the primacy of the principle of cost orientation, these doubts rely on the correct view that investments in NGA networks are risky, because investing undertakings cannot be sure that today's capital outlays will be recouped over time. Given the economics of NGA network deployment in the EU, investing undertakings for successful business cases either need to achieve retail ARPU higher than for current generation broadband (possibly accompanied by risk-adjusted wholesale prices), or need to capture higher market shares resulting in larger economies of scale.[30] Nevertheless, it would be wrong to dismiss out of hand the possibility of increased consumer willingness to pay for very high speed broadband services, and to jump straight to the conclusion that solely higher market shares would make commercial investment in NGA an attractive proposition.[31] It should also be considered that co-investment schemes and risk-sharing arrangements may significantly contribute to reduce the investment risk incurred by individual firms.

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stations – and will be expensive to build. Overall, commercial deployment appears likely only by 2013 or 2014.

29 NRAs should be free to choose a particular combination of remedies reflecting the competitive circumstances and structural conditions in a given market. To illustrate, while some observers argue that NRAs should as a matter of principle favour ducts access over other passive remedies, this would result in flawed regulatory designs if ducts are scarce, or in cases where there is insufficient capacity in existing ducts. Similarly, a principled preference for passive remedies and reluctance to impose wholesale bitstream access would be harmful in a setting where new entrants face – perhaps temporary – financing constraints, or are for reasons of as yet insufficient scale unable to invest in fibre deployment or active equipment of their own until critical size was attained.

30 With higher market shares overall investment costs would be distributed over a larger customer base and thus result in lower *unit* investment costs. This would accelerate amortization and make the business case more attractive.

31 In fact, there is preliminary evidence that future ARPU might turn out to be higher than today's EU average of €37 for broadband services, and in any case investment costs – and by implication payback periods and investment risk – substantially differ between network topologies and geographies. Certainly for incumbent investments in VDSL, or even in PON FTTH in metropolitan areas, it would be rash to assert that solely higher market shares would render the business case interesting, and that therefore pricing models leading to increased market concentration or foreclosure (penetration pricing or complete freedom of price-discriminate between access seekers) should be countenanced by the regulator.

For the above reasons, a policy response consisting of unduly relaxing the present regime of *ex ante* regulation along the above lines is considered to have certain drawbacks. While recommending such policy response would manage to avert the regulatory uncertainty caused by inconsistent regulation in the single market (and would at least in this dimension be preferable to the baseline scenario), it could endanger the continued ability of alternative providers to compete. Given the need to ensure competition in the market as stipulated by Article 8 (5) of Directive 2002/21/EC, it would also be problematic from a legal point of view, and would not as such strike a balance between competition and investment (see chapter 8 for an overview of impacts on incumbents and competitors).

5.3. Option 2

The second policy response, seeking the systematical imposition of a full range of access and pricing remedies, also needs to be looked at carefully.

To begin with, it is clear that in the past new entrants were capable of climbing the ladder of investment because NRAs had put in place access remedies proportionate with and tailored to the specific competitive conditions obtaining in a given market, for instance the state of unbundling, the financial capacities of alternative operators or competitive constraints, if any, from cable. However, it does not follow from this that the imposition of *all* access remedies will be necessary in every situation, in all geographic areas, and at any given point in time. Rather, the set of remedies imposed should reflect *inter alia* the conditions of competition on the ground, such as the size of competitors or the intensity of infrastructure-based competition. In particular, with strongly developed competition from successful unbundling, and sound evidence that further investment bringing alternative networks yet closer to the customer – for instance to street cabinets or the terminating segment – is about to happen, the imposition of wholesale bitstream access would be likely to stymie rather than foster competitive NGA deployment. NRAs should hence carefully calibrate their access remedies and rely on appropriate rather than full imposition in all circumstances.

Second, the demand for access remedies to be priced at very low levels is also vulnerable to criticism. Reliance on cost-orientation with minimal consideration of investment risk would depress NGA wholesale prices, drive down retail prices through arbitrage-oriented entry, and thereby prevent the investing undertaking from realizing profits commensurate with the original investment case. Ultimately, this would serve to delay or forestall NGA deployment, as incumbents would be less willing to execute business cases with severely truncated returns, and alternative operators though distorted make-or-buy decisions would be less likely to invest to build their own networks. It should be noted that in the past the setting of reasonable investment signals to alternative providers has contributed to a share of about 27 percent of infrastructure-based competition of the total EU broadband market, and thus constitutes one of the prime achievements of liberalisation.

Third, with regard to geographical nuancing of regulation, it should be noted that some NRAs have already pursued policies of geographical segmentation with regard to current generation broadband, which were endorsed by the Commission in the course of the Article 7 procedure.[32] Furthermore, the revised regulatory framework acknowledges in principle the need for NRAs under certain circumstances to define sub-national geographic markets or to

[32] See Chapter 1.3. above

differentiate remedies.[33] Moreover, the economics of NGA deployment are likely to render network duplication more rather than less difficult in the immediate future, and may thus further pronounce already existing geographical divergences in competitive conditions within and between Member States. The transition to NGA may thus well imply heightened differences in the overall degree of infrastructure-based competition in the EU, and as such may create the need for NRAs to develop geographically more flexible regulatory responses to problems posed by future positions of dominance. Claims insisting *a priori* on the importance of regulatory uniformity of all remedies in nationally defined markets across the EU27 should therefore be rejected.

Fourth, categorical opposition to the notion that under certain circumstances some forms of risk-sharing, such as pricing schemes offering discount on the basis of volume and/or longer contract, or the conclusion of co-operative arrangements[34] could be a good thing is unreasonable. Co-operative agreements are likely to allow faster deployment of network infrastructure by entrants and competition on those areas where otherwise no or very little NGA investment was likely to materialize.[35] They could also lead to efficiency gains in production. Finally, while risk-sharing pricing schemes – unilaterally adopted by dominant firms and outside of formalized investment co-operation – could be more problematic, it would be stretching the principle of non-discrimination for NRAs to prohibit *any* differentiation of prices for regulated wholesale products as a function of volume purchased. To the extent that such price differentials result in successful sharing of investment risk and timely NGA deployment, risk-sharing pricing should not be rejected on an *a priori* basis.

For the above reasons, a policy response consisting of resisting any adjustment of the specific rules governing the present regime of *ex ante* regulation does not seem to strike a good balance between the key objectives of promoting investment and safeguarding competition. While recommending such policy response would (just as option 1) manage to avert the regulatory uncertainty caused by inconsistent regulation in the single market (and would at least in this dimension be preferable to the baseline scenario), it would set distorted investment incentives and would not as such be optimal in terms of competition and investment (see chapter 8 for an overview of impacts on incumbents and competitors).

5.4. Option 3

The third policy response, centred on the imposition of access obligations adjusted for investment risk (and expressed by the normative elements regulatory guidance outlined in chapter 4.4. above) will, following our discussion below, emerge as the superior option - both in comparison to the baseline scenario and to options 1 and 2.

Before all else, a vital principle of this policy response is the continued validity of a proportionate application of the ladder of investment principle. As outlined in chapter 4, the Recommendation would make this principle operational by recommending to NRAs that all access products should in principle be available on market 4 (i.e. ducts, terminating segment, sub-loop, fibre loop), and that wholesale bitstream access should be imposed as a general rule on market 5. NRAs could diverge from this only in narrowly circumscribed and justified cases.

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33 Recital 7, Article 15(3), 2009/140/EC

34 Co-operative arrangements with participation of an incumbent firm.

35 Such cooperative agreements should also be assessed for their compatibility with the competition rules under Article 101 TFEU or the corresponding national competition laws.

This operationalisation of the ladder of investment principle is based on the assumption that ultimately competition is the main driver of investment, and that appropriate access products are a pre-condition for competition in an industry still characterised by the continued dominance of incumbent firms as well as by large economies of scale. To see how competition drives investment, it should be noted that the presence of today's infrastructure-based competitors (with a share of about 27 percent of the EU broadband market and a similar share of network investment) is both the result of past investment as well as a source for new investment in the future. Investment in stage one originally necessary for entering the market and building market share is now being followed by (i) maintenance or further expansionary investment by these new entrants and (ii) escape investment by incumbents who seek to defend their positions of dominance. A policy geared towards fostering overall investment and competition therefore ought to seek to preserve or enhance current levels of competitive intensity by updating and re-configuring existing wholesale access products, and to fit them to the changed NGA setting.[36] It should be noted in this connection that the transition to NGAs will not render questions of network replicability moot. While the comparatively high level of fixed investment costs will make duplication of NGA networks clearly a more challenging commercial proposition than today's unbundling of the copper loop, it cannot be said that no such duplication is likely to take place. In fact, as a variety of studies have shown, network duplication by a second mover would remain a feasible business strategy for important segments of a given market.[37]

It thus seems clear that no individual access product should *a priori* be excluded from consideration, while it would be appropriate to allow NRAs to identify the most appropriate remedies in each case and modulate them taking into consideration the specific conditions of competition prevailing in certain geographic areas. Given the importance of infrastructure-based market entry and competition, and given the continued feasibility of network replication in an NGA setting, the ladder of investment principle should be maintained and should find its appropriate expression in the remedies as specifed in the Recommendation.

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36 This is not to say that NRAs cannot gradate remedies so as not to truncate unreasonably the returns on incumbent investment. For instance, if the presence of cable (or even mobile platforms) were to engender strong competitive pressures and sufficient consumer choice, access to the unbundled fibre loop might render the continued imposition of bitstream access on market 5 unnecessary. Similarly, if competitive pressures from sizable alternative undertakings were found to be very strong in certain geographic segments of a market, the least-intrusive remedy of duct access might suffice to ensure a level-playing field and drive infrastructure-based competition.

37 For instance, according to Wik (2008), in Germany, network replicability based on VDSL deployment remains a realistic scenario for at least 25% of the overall broadband market. In Italy, VDSL can be replicated by a second mover for more than even 35% of the overall broadband market. For PON topologies – to take the example of parts of the French market – duplication is more ambitious, but even here more than 7% of all broadband customers could be served by a competing commercial PON network. Furthermore, it should be noted that given today's ARPU of about €37 for DSL-based offerings in the EU, retail revenues for PON or VDSL-based offerings may well turn out to be higher than assumed in the above modelling results, thereby further increasing the radius of feasible network duplication. Similarly, technological change and falling equipment costs may render competitive deployment of parallel infrastructure more attractive over time.

Turning to the second principle - that for specific physical bottlenecks symmetric access obligations imposed on all undertakings could complement asymmetric obligations[38] -, the deployment of NGAs would be facilitated if genuine remaining physical bottlenecks were to be opened up to all undertakings. In some areas, both incumbent and alternative investment in local fibre loop assets could occur simultaneously, in a competitive manner, resulting in a genuine race to invest and the pursuit of first-mover advantages. In such settings, mandating the sharing of in-house wiring (also known as terminating segment) for all operators deploying optical fibre networks inside buildings might be an integral element of the best regulatory response to tackling an enduring physical bottleneck with strong monopoly characteristics. Symmetric access to the terminating segment (coupled with the asymmetric obligation on the SMP-operator to grant access to civil engineering assets, in particular ducts) could result in the deployment of competing optical fibre networks in the most densely populated areas of the EU market. It should be clear, however, as specified by the Recommendation, that any symmetric obligations could only function as a strict complement – not a substitute – to asymmetric obligations imposed on the basis of finding SMP. Moreover, NRAs pursuing such approach – on the basis of the revised Article 12 of the Framework Directive[39] - should duly notify any facility-sharing measures as part of the Article 7 procedure.

The third principle of this policy response is that investment risk should be rewarded by means of a risk premium incorporated in the regulated costs of capital, and by means of selective risk-sharing pricing mechanisms. Investments in NGA networks are risky, because investing undertakings cannot be sure that today's capital outlays will be recouped over time, and, even if re-coupment occurs, that returns on these capital outlays will be superior to the returns of cash, low-risk bonds or alternative investment projects.[40] The Recommendation specifies that NRAs should analyse and weigh up all risk factors when determining regulated access prices to NGA networks. Such prices ought to include a reasonable rate of return, as regulators will model an investing undertaking's business case, and assess the weighted

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38 Symmetric obligations would differ from asymmetric obligations in that they would not be imposed as a result of a regulator's finding of significant market power, but rather apply to all undertakings active on a given market irrespective of their individual market position.

39 Revised Article 12 (3) of Directive 2002/21/EC: 'Member States shall ensure that national authorities, after an appropriate period of public consultation during which all interested parties are given the opportunity to state their views, also have the power to impose obligations in relation to the sharing of wiring inside buildings or up to the first concentration or distribution point where this is located outside the building, on the holders of the rights referred to in paragraph 1 and/or on the owner of such wiring, where this is justified on the grounds that duplication of such infrastructure would be economically inefficient or physically impracticable. Such sharing or coordination arrangements may include rules for apportioning the costs of facility or property sharing adjusted for risk where appropriate.'

40 Uncertainty arises in terms of several dimensions. First, as with any business activity, there is execution risk. Second, investment in networks may be risky because most of it is sunk, i.e. cannot later be re-deployed for other purposes. Third, there is a risk on the demand-side that consumers might not wish to subscribe to new services or that consumers' willingness to pay for new services (on which recoupment of the original investment might depend) could turn out to be less than expected. Fourth, for SMP-undertakings, there is also regulatory risk, i.e. the problem that regulators might not be able to commit over time to firm regulatory terms and conditions. Fifth, there are macro-economic uncertainties related to future growth of the economy and of consumption of electronic communications services. Sixth, there are uncertainties regarding technological evolution, such as the future upgrade path from chosen fibre topologies. Seventh, there are uncertainties over future competitive pressures, such as from mobile broadband or even from entirely new platforms. Finally, there are also uncertainties connected to projected deployment costs, as current investment experience is still limited.

average cost of capital (WACC) including a risk premium to reward the investor for taking the risk associated with making the investment.[41]

In cases of FTTH projects, where uncertainty is particularly pronounced, NRAs could use the complementary instrument of price flexibility. Price flexibility would allow the regulated undertaking to charge differentiated access prices, for example one set of access prices applying to long-term contracts and another set of access prices applying to short-term contracts. Similarly, regulators could approve of access prices tied to volume purchased in line with the conditions specified in the Recommendation. To pre-empt negative impacts on competition in such cases of price flexibility, NRAs should regularly perform margin-squeeze tests and conceptually specify the relevant elements in advance wherever possible.

Fourth, with regard to geographical nuancing of regulation, it should be repeated that some NRAs have already pursued policies of geographical segmentation with regard to current generation broadband, and that the economics of NGA deployment are likely to render network duplication more rather than less difficult in the immediate future. Already existing geographical divergences in competitive conditions within and between Member States may thus become further pronounced. This effect could be exacerbated by the emerging strong - yet geographically uneven - presence of cable operators competing on the basis of upgraded HFC networks. As a result, the transition to NGA may well imply heightened differences in the overall degree of infrastructure-based competition in the EU, and as such may create the need for NRAs to develop geographically more flexible regulatory responses to problems posed by future positions of dominance.

Finally, the fifth principle is that certain co-operative arrangements resulting in increased investment in NGAs and competition are desirable. Co-investment schemes could result in a better diversification of investment risk via an increased number of involved parties. When a sufficient number of the entrants are part of co-investment agreements and wholesale access is provided to third parties, this would likely lead to effective competition on the corresponding retail market(s) and regulators would not normally find SMP. While such non-finding would obviously be subject to the usual standards of market analysis, joint-ventures formed with a view to deploying NGA infrastructures and consistent with such practice and standards could be exempted from *ex ante* obligations.

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41 The dominant methodology among EU regulators for the calculation of access prices today is the capital asset pricing model (CAPM), which derives the WACC on the basis of a hypothetical structure composed of both debt and equity capital. The cost of equity capital in this methodology is the result of multiplying the equity risk premium (i.e. the overall stock market risk premium or the historical return of stocks in a given place and time above and beyond the risk-free rate) with the regulated firm's equity beta (i.e. the firm's stock price's volatility compared to the overall market in a given period of time). To this cost of equity capital is then added the cost of debt capital, to arrive at the overall WACC figure. Not all EU regulators use the CAPM; for instance the German regulator BNetzA prefers to employ a balance sheet method, relying on the actual (rather than hypothetical or idealized) break-down between debt and equity capital on the asset side of the regulated undertaking. However, even in such balance sheet methodology, the cost of equity capital is tied to the long-term average return of the German stock market. Regulators have, then, within the modelling frameworks and methodologies they currently employ, an in-built mechanism to fit risk premia – and by implication resulting access prices – to the regulated investment case at hand. Regulators should use this mechanism as the prime instrument to take due account of investment risk. See Table 3 of Annex III for an illustrative selection of current WACC figures used by NRAs.

Option 3 thus analysed does not propose the imposition of any new remedies. It does contain though, in addition to its emphasis on fostering competition, a few innovative ways of using existing remedies so as to push investment. For example, option 3 alerts NRAs to the especially risky nature of some investments – for instance in FTTH –, and calls for this risk to be properly reflected in the regulated access price. Moreover, by allowing NRAs to modulate remedies and access prices as a function of competitive conditions in certain geographic areas, option 3 will give an additional push to incumbent investment where it would be unlikely to occur otherwise (for instance VDSL in less densely populated areas). In addition, by granting price flexibility to regulated firms under certain circumstances, it will also likely serve to bring some incumbent investment forward in time (for instance investment in FTTH in metropolitan areas, likely to occur in the long-term in any event, could be moved forward to the near-term, as it would promise to create competitive advantages for the investor under price flexibility). Finally, by lifting regulatory obligations under certain circumstances of co-investment option 3 would bring forward in time the deployment of networks in (at a minimum) metropolitan areas.

For the above reasons, a policy response focussed on designing and imposing access obligations appropriately adjusted for investment risk is regarded as the best option. Recommending such policy response would not only (just as options 1 and 2) manage to avert the regulatory uncertainty caused by inconsistent regulation in the single market (being thus preferable to the baseline scenario), it would have significant benefits in terms of competition and investment (see chapter 8 for an overview of impacts on incumbents and competitors).

Option 3 would also strike a balance between key stakeholders' interests (cf. chapter 5.1. supra for s summary of their positions). Incumbent operators would benefit, for example, from risk premia, price flexibility and geographically nuanced regulation; while alternative operators would benefit, for example, from the continued validity of the ladder of investment, the principle of cost-orientation and transparency obligations. An overview is provided in Table 4 below.

Table 4: Overview of positions of key stakeholders as taken into account by the Recommendation

Elements and Principles of Regulation	ERG	Alternative Operators	Incumbents
Technological neutrality	**X**	**X**	**X**
Co-investment	**X**		**X**
Ladder of investment	**X**	**X**	
Symmetric regulation	**X**		**X**
Differentiation of remedies	**X**		**X**
Definition of geographic sub-markets	**X**		**X**
Cost orientation	**X**	**X**	
Margin squeeze		**X**	
Price flexibility			**X**
Risk premium	**X**		**X**
Transparency	**X**	**X**	
Migration		**X**	

All key stakeholders favour the principle of technological neutrality. Regulation should focus on actual services provided rather than on the technology of production.

There is much less consensus, however, on what remedies NRAs should impose to drive competition. The ERG and alternative operators are against a priori exclusion of certain remedies (such as unbundling) and favour the ladder of investment principle, enabling alternative operators to compete at most levels of the value chain. Incumbent firms reject this. In response to these conflicting claims, the Recommendation sticks to the ladder of investment principle, but allows for the absence of wholesale bitstream access in situations where physical access remedies lead to effective competition. It also remains open to certain co-investment schemes resulting in the non-imposition of access remedies. It also remains open to the definition of geographic sub-markets and the differentiation of remedies, which could result in NRA's departing from the full ladder in certain circumstances.

There is no consensus either on what pricing principles should guide NRAs in setting access prices. Incumbents reject the imposition of most *ex ante* prices, and object in particular to cost-orientation. The Recommendation adheres to this important principle, but it does emphasize the need for NRAs to reflect investment risk in terms of risk premia and, importantly, in terms of price flexibility (where appropriate, and held in check by margin squeeze tests, as demanded by alternative operators). The Recommendation thus strikes a reasonable balance between these conflicting positions.

Finally, on symmetric regulation and transparency, the Recommendation agrees with the ERG, confirming the need for NRAs to acquire all necessary information relating to changes

in network topologies, as well as accommodating some Member States' desire to impose access to certain key bottlenecks irrespective of dominance, and in line with Article 12 of Directive 2002/21/EC.

5.5. Conclusion of analysis and comparison to baseline scenario

To sum up, this chapter has analyzed the three different policy responses described in chapter 4. All options have the virtue of averting the regulatory uncertainty caused by inconsistent regulation in the single market and are, in this dimension, preferable to the baseline scenario.

Beyond this, a meaningful comparison with the baseline scenario in terms of the actual substance of policy responses is difficult – the baseline scenario by definition is characterised by divergence of approaches, with no readily discernible tendency of regulators to converge on a policy response of regulatory revision, adjustment or straightforward continuity. However, in the light of regulatory approaches currently pursued by NRAs, there is a clear danger that fibre-based services would not be part of the relevant access markets in all Member States, that similar remedies would not be imposed in similar circumstances, and that access prices would widely differ in the single market. None of this would be good for either competition or investment.

In terms of a comparison of options, we have argued that through its focus on investment incentives properly adjusted for risk, its emphasis on sustainable competition and its willingness to consider new regulatory designs such as symmetrical obligations and co-investment schemes, option 3 is regarded as most conducive to both the timely deployment of new networks and the subsequent take-up of services.

We will look at the impacts in terms of competition and investment on incumbents and competitors in chapter 8 below.

6. POLICY INSTRUMENTS

6.1. Coordination via Commission Recommendation confined to only very general regulatory principles applicable in an NGA setting

To promote a harmonized approach followed EU regulators, the Commission may, under *Article 19* of the Framework Directive, issue Recommendations of which the NRAs must take the 'utmost account'. Under a Recommendation confined to only very general regulatory principles applicable in an NGA setting, many central questions of regulation would be left to individual NRAs. This scenario could not only lead to wide divergence of approaches, but would also fail to respond to the call of the European Council of March 2009 to work towards a European broadband strategy and promote investment in new and enhanced infrastructures.

6.2. Coordination via Commission Recommendation including specific guidance on the design of NGA remedies

To provide overall certainty and to ensure consistent application of national approaches, it is essential that the Recommendation specifies clearly a set of remedies applying in an NGA setting, including access and pricing rules, as well as migration rules from legacy infrastructure. NRAs will continue to conduct proper market analyses based on general competition law principles to determine SMP, and to impose remedies proportional to the competitive problems at stake. They will thus always have to adapt regulation to the situation

in their national market(s). Regulatory guidance would however channel each NRA's analysis, and put the burden on NRAs to spell out clearly the reasons why they would deviate from the recommended approach.

From a legal perspective, Member States have to take the utmost account of the Commission's harmonisation measure under Article 19 (2) of the Framework Directive ('Member States shall ensure that national regulatory authorities take the utmost account of those recommendations in carrying out their tasks. Where a national regulatory authority chooses not to follow a recommendation, it shall inform the Commission, giving the reasons for its position').

In a recent judgment, the ECJ (Case C-55/06 of 24 April 2008[42]) pronounced on the legal character of Commission Recommendations, ruling that

'even if recommendations are not intended to produce binding effects, the national courts are bound to take the recommendations into consideration in order to decide disputes submitted to them, in particular where they cast light on the interpretation of national measures adopted in order to implement them or where they are designed to supplement binding Community provisions (see Case C-322/88 *Grimaldi* [1989] ECR 4407, paragraph 18, and Case C-207/01 *Altair Chimica* [2003] ECR I-8875, paragraph 41)'

Compliance by NRAs with past Commission Recommendations in the electronic communications sector has been high. Both the Recommendation on relevant markets and the MTR Recommendation[43] are being applied in all Member States in a faithful manner.

Before this background of the legal character of Recommendations, of clear past precedent, and of the expected support of BEREC, it seems likely that NRAs will prove very willing to implement the principles contained in the NGA Recommendation.

As to proportionality and subsidiarity, the Recommendation only gives guidance with regard to the policies that need to be followed, leaving room for NRAs to deviate when justified in the light of national circumstances.

Action at EU level is necessary, because national means alone can ensure neither a level playing field nor that similar remedies will apply to all operators irrespective of where they invest or where they have their operations. Moreover the work of the ERG is not directed towards generating consensus among NRAs. The ERG Common Position and the most recent NGA-related document (Next Generation Access – Implementation Issues and Wholesale Products PRD2) were designed as surveys over emerging remedies and ancillary technical questions, and as such are very useful. It was however not their task to set out general principles to guide NRAs in their selection of appropriate remedies or pricing methodologies. The ERG's work on NGAs was deliberately conceived as strictly complementary in nature to the Commission's work (in which it participated on a regular basis, most recently in the course of meetings of 26 November 2009 at working level and 26 March 2010 at steering level). The Commission's efforts are supported by the ERG / BEREC, who expect to adopt the NGA

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42 Judgment of the Court (Fourth Chamber) of 24 April 2008 (reference for a preliminary ruling from the Verwaltungsgericht Köln (Administrative Court, Cologne — Germany) — Arcor AG & Co. KG v Bundesrepublik Deutschland)

43 OJ L 344, 28.12.2007; OJ L 124, 20.5.2009

Recommendation as the first high-level document under the new rules. Community action is thus necessary.

Guidance via the Recommendation is necessary because of the deficiencies inherent in the Article 7 procedure (cf. chapter 2.2. supra).

Providing guidance by means of a Recommendation would thus be both proportionate and in line with subsidiarity.

7. ASSESSMENT OF IMPACTS AND OBSTACLES FOR COMPLIANCE

7.1. Impacts on stakeholders, investment and competition

The economic impact of the policy options explored in the staff working paper can be assessed in terms of their effects on competition and on investment in the EU broadband sector. Both dimensions have important macro-economic implications for GDP growth and the Europe 2020 strategy, as connectivity and widespread internet usage over high-speed networks are likely to drive productivity growth and overall societal welfare.[44] On the one hand, further intensified competition in the electronic communications sector will lead to wide choice and attractive prices for consumers, and thereby foster take-up of services and applications. On the other hand, timely and efficient investment in infrastructure will create the modern networks necessary for broadband services provision, and is thus a precondition for the former.

The three policy responses fare differently in terms of these dimensions.

Competition

A policy response such as option 1 constraining the availability of certain wholesale access products (such as unbundled access to the copper or fibre loop) would serve to remove competitive pressures and lead to higher levels of market concentration. While cable operators would not immediately be affected by such policy in their ability to compete, LLU operators and new market entrants would find it more difficult to tailor their business cases to prevailing market conditions.

Policy responses 2 and 3 would both be conducive to continued competition, though they would differ in the relative weight they assign to the different modes of competition. Policy response 2 would drive service-based competition, whereas policy response 3 would privilege infrastructure-based competition.

[44] See for instance LECG, (February 22nd, 2009), Economic impact of broadband: an empirical study; The Berkman Centre (2009), Next Generation Connectivity: A review of broadband internet transitions and policy around the world.

Investment

Turning to the effects on investment, one needs to distinguish incumbent and alternative investment. Overall, investment in the EU broadband sector in 2008 can be estimated at approximately €24.7 billion (excluding cable), €20 billion of which were effected by incumbent operators and €4-5 billion by alternative operators.[45]

Policy response 1 might give a stimulus to incumbent investment in the short-term, while the medium-term effects are more ambiguous and would depend on the continued ability of alternative providers to create future competitive pressure. It would negatively impact on alternative investment, as incremental network duplication becomes less feasible and likely in the absence of an efficient number of wholesale access points.

Policy response 2 would be likely to hold up incumbent investment, while likely also resulting in inefficient incentives for alternative operators, as business models built on active access products (such as bitstream products which require very little own investment) could become the preferred or exclusive mode of competition.

Policy response 3 would give some additional impetus to incumbent investment – by means of risk-adjusted access prices, by geographically modulated remedies, by price flexibility and by co-investment[46] – while at the same time being more likely to set appropriate signals for alternative network investment by fostering competition over several network platforms where duplication remains possible and efficient.

The above high-level effects are summarized in Table 2 below.

Table 2:High-level effects of policy responses

	Effects on competition	**Effects on investment**	
		Incumbent investment	Alternative investment
Policy Response 1	--	+/o	-/o
Policy Response 2	+	-	-/o
Policy Response 3	+	+	+

With these impacts at hand, one can now explore how the different stakeholders will be affected by a Recommendation based on option 3. The following normative elements of the Recommendation (displayed in Table 3 below) are all liable to affect stakeholders' abilities to compete.

45 Commission 14th implementation report (2010); ETNO, *4th Facts and Figures*, 7 October 2009

46 Please refer to chapters 4 and 5 for further explanations regarding these instruments.

Table 3:Elements of the Recommendation affecting stakeholders

	+	-
Incumbent firms	Clarity and regulatory certainty; price flexibility; geographical segmentation; co-investment possibilities	Regulated access is here to stay; cost-orientation as default price methodology; transition periods to be respected
LLU competitors	Clarity and regulatory certainty; continued availability of access products; transparency; co-investment possibilities; margin squeeze tests	Price flexibility (small-scale competitors unable to secure term or volume discounts)
Bitstream competitors	VDSL bitstream; cost-orientation; transition periods; transparency; margin squeeze tests	No WBA if LLU sufficient to ensure competition; possibly no geographic averaging of prices

Given the sheer number of variables involved, attempts at quantifying the precise impact of the Recommendation on investment of necessity have to be rough. However, if one assumes that approximately 15% of firms' total capital expenditure would be net investment in optical fibre networks[47], one arrives at annual spending on fibre at about €3 billion for incumbents and €0.7 billion for alternatives. The Recommendation would have the effect of bringing some incumbent investment forward in time – resulting in consumer benefits from early deployment –, though it is unclear whether there would be a net positive effect on investment over time. However, by making deployment of NGAs in less densely populated areas, it is estimated that the Recommendation could result in increases in annual incumbent spending on fibre of approximately 10-15 percent or € 0.3-0.45 billion. Furthermore, alternative investment would be affected positively, as co-investment models and the slightly more challenging ladder of investment in an NGA setting would foster infrastructure-based competition. It is estimated that the Recommendation could thus result in slight increases in annual alternative spending on fibre of approximately 15-20 percent or € 0.1-0.14 billion.

Arguably the most important effect however would be that the Recommendation - by clarifying principles on an EU-wide basis - would create a degree of regulatory certainty comparable to the past. Such certainty is a necessary condition for undertakings to continue to invest in a regulated environment. If present levels of capital expenditure for the deployment of fibre networks (about €3.7 billion annually) can merely be maintained, a 15-20 year investment cycle would already result in cumulative private investment of €55-74 billion. Further commercial investment from cable network operators (who offer NGA services and currently have a substantial and growing share of 15 percent of the EU broadband market) would have to be added to this.

[47] 'We expect about EUR33bn to be spent on upgrading access networks with fibre between 2005 and 2020, with 85% of this spending still to come. The incumbent operators' share of this spending represents about 12% of [their] aggregate domestic wireline capex over the period.' (New Street Research, *Fibre: anxieties, delusions and bluff*, 13 March 2009)

It should be noted in this connection that divergence by NRAs from the Recommendation would not necessarily put regulatory certainty in jeopardy. In any event, such divergence could not be arbitrary, but only the result of objective differences in national circumstances and structures of competition. For instance, Article 15 (3) of Directive 2002/21/EC stipulates that 'national regulatory authorities shall, taking the utmost account of the Recommendation and the Guidelines, define relevant markets appropriate to national circumstances, in particular relevant geographic markets within their territory […]'. It is not unusual for objective situations in Member States to differ in some respects. For instance, the geographical coverage of competing cable networks is liable to vary between Member States. However, the Recommendation is based on competition law principles which are part of the regulatory framework, and as such is flexible and capable of adjustment to national circumstances. Moreover, market participants are of course familiar with national differences in conditions of competition. As a result, investing undertakings could still rely in their investment decisions on a well-defined default setting of regulation, from which NRAs could deviate only in well-justified circumstances.

Balancing investment and competition

To sum up, the regulatory framework is based on the assumption that in the long-run competition drives investment. However, access regulation designed to drive competition could, at least in some circumstances, mitigate or delay incumbent investment. The Recommendation acknowledges this trade-off, and, as seen above, proposes several mechanisms for reconciling the twin objectives of investment and competition.

- Access-based competition will continue to be facilitated after the transition to NGAs by a proportionate application of the ladder of investment principle and the availability of updated wholesale access products

- Risk incurred by regulated undertakings will be properly reflected in the regulated access price, giving an impetus to investment

- Risk incurred by regulated undertakings could result in price flexibility in cases of FTTH, giving an impetus to investment

- NRAs can lift regulatory obligations under certain circumstances of co-investment, giving an impetus to investment

- NRAs can modulate remedies and access prices as a function of competitive conditions in certain geographic areas, which will allow to apply less intense remedies in more competitive areas and will give a push to investment in less densely populated areas (by admitting a risk premium for VDSL investments in such areas)

The subsequent sections will look beyond the narrow the impacts on the EU telecommunications sector and consider some wider economic ramifications.

7.2. Wider economic impact

In 2008 revenues for the EU electronic communications sector were €351 billion, which accounted for about half of the overall ICT sector; about 50% of sector revenues were fixed voice telephony and broadband revenues; the remainder was provided by mobile communications.

Overall, global demand for information and communication technologies is a market worth € 2 000 billion, but only one quarter of this comes from European firms. If Europe fails behind on high-speed internet, this will affects its ability to innovate, including in rural areas, as well as on the on-line dissemination of knowledge and on-line distribution of goods and services.

The development of NGA will further the development of the internet-based economy across the EU. The transition to high-speed broadband and the related increase in bandwidth and quality of Internet access will improve the provision of existing Internet-based services and allow the provision of new services. Among other, the following market segments and services would be concerned:

E-commerce in the single market: the number of Europeans shopping online is predicted to have grown to 174 million by end 2011. Average yearly net retail spending should grow as well leading to EU consumers outspending even their US counterparts online. Overall, European E-commerce should surge to €263 billion in 2011, with travel, clothes, groceries, and consumer electronics all above the €10 billion per year mark.[48]

Content provision (IPTV) and content sharing (photos and videos), in particular high definition content: internet video now accounts for approximately one third of all consumer internet traffic, excluding P2P video file-sharing. The sum of all forms of video (TV, video-on-demand, internet and P2P) will account for more than 90% of consumer internet traffic by 2013.[49] In 2008, less than 230 million music tracks and 6.6 million movies were downloaded in Europe, while in the US these figures were over a billion and over 28.6 million respectively. Today Distribution channels are multiplying in the US, where iTunes, YouTube, Facebook, Hulu and all the major content distribution platforms commonly used in Europe were born.[50]

And other such as: remote presence, including teleworking and telemedicine, network computing (e.g. grid computing) and E-government services

A richer Internet-based service offering and improved individual services will in turn increase service usage and penetration as compared to today's broadband-based services. Positive externalities and network effects stemming from the provision of new and improved applications over the internet should increase overall welfare.

In the wider economy, increased Internet connectivity will provide business opportunities for companies using Internet as a platform for the production or the trade of goods and services and hence increase competition and cross-border trade inside the internal market."

From the discussion of competing policy responses provided above it is clear that a policy focussed on imposing access obligations adjusted for investment risk will be best suited to foster the development of such an internet-based economyy. Timely deployment of NGA networks would be effected by means of reasonable investment incentives, and take-up of new services would be driven by the choice consumers have as a result of broadband competition. The third response thus best serves the goals of the Digital Agenda and of the Europe 2020 strategy from an economic perspective.

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48 Forrester Research, *Europe's eCommerce Forecast: 2006 To 2011, Net Retail Will Soar From €102 Billion To €263 Billion* (March 2007)

49 Cisco White Paper *Cisco Visual Networking Index: Forecast and Methodology, 2008-2013* (June 2009)

50 Screen Digest (2008)

7.3. Environmental impact

By fostering economic growth and internet usage a transition to high speed broadband will increase energy consumption and greenhouse gas emissions. However by offering new ways of working, consuming and trading goods and services, it will also have a positive environmental impact and allow more energy-efficient and low-carbon forms of growth. New and improved services based on increased Internet connectivity, such as E-commerce, teleworking and E-government applications, and advanced collaboration technologies, will for example curb demand for transport and the resulting consumption of energy and other material resources.[51]

7.4. Social impact

The transition to high-speed broadband will provide end-users with enhanced capacities to communicate and exchange information with other end-users, administrations and businesses. In particular the current trend for end-users to produce and to share their own content will be further supported by the higher upstream capacities offered by fibre access networks (symmetric capacity). It is not clear however what the overall social impact of NGA deployment will be. End-users could for example spend more time using high-speed broadband services to the detriment of other activities with higher social value. At the same time it is certain that the development of new applications and usages, increased capacity to share information and knowledge will enhance social welfare in many ways. Access to education, health and other public services should improve. NGA-related growth should help create more and better jobs, while offering a platform for increasing the efficiency of the labour markets. New ways of working should improve work-life balance and gender equality. Wide-scale NGA deployment (based on appropriate regulation) should also enhance social and geographic inclusion.

7.5. Obstacles for compliance

Past compliance by NRAs with Commission Recommendations in the electronic communications sector has been high. (cf. chapter 6.2. supra). However, even in cases where NRAs are willing to apply the principles contained in the Recommendation, there might be further operational and judicial obstacles for compliance. Insufficiently staffed NRAs might not be able to conduct the necessary analytical steps and information gathering required to apply the principles contained in the Recommendation. SMP operators might also prevent NRAs from properly conducting their analysis by various delaying tactics and disturb the implementation of regulatory measures through systematic judicial challenge. The fact that the Commission releases well in advance a clear framework for NGA regulation should however allow NRAs to prepare and ask for resources to conduct the relevant market analyses and limit the incentives for the SMP operator to challenge or delay the implementation of EU-based rules.

7.6. Reduction of administrative burden

The Recommendation is unlikely to increase the administrative burden either on industry players or national administrations. Indeed, the provision of specific guidance on the design of remedies in regard to deployment of NGAs is likely to facilitate the work of national

[51] Transport systems represent about 26% of energy end-use in the EU and 21% of greenhouse gas emissions.

regulatory authorities considerably and to reduce the likelihood that their decisions are contested at national level. Nor will the Recommendation increase the notification work of NRAs under the Article 7 procedure. As regards industry, the Recommendation will not introduce any reporting (or other additional) requirements.

8. MONITORING AND EVALUATION

The Commission's annual implementation report on the Single European Electronic Communications Market provides comprehensive data and analysis on the status of the market, in particular by focussing on regulatory and consumer developments in the sector.

This report is assembled on the basis of information received from several sources, encompassing the findings and results arising from the missions carried out in the 27 Member States, the analysis of the notifications of national transposition and implementing measures received from Member States, market data received from national regulatory authorities and surveys commissioned on market and price development.

The annual implementation report remains a key tool for monitoring and evaluating the transition towards NGA.

8.1. Progress indicators

The following indicators would be useful for assessing the impact of the Recommendation over time:

- The number of active NGA retail lines by type of technology (and by type of access in the case of alternative operators)
- The number of homes physically passed with fibre lines or upgraded Hybrid fibre-coaxial (HFC) lines
- The presence of reference offers regarding access to civil engineering and to the terminating segment
- Surveys on the availability of ducts and capacity
- The amendment of the existing reference unbundling offers (RUOs) to include fibre unbundling
- The presence of reference offers relating to WBA
- The trends shown in the number of active retail lines based on less performing technologies (e.g. ADSL)
- The level of wholesale access prices for LLU
- The level of wholesale access prices for WBA
- The level of retail prices
- Development of market shares and concentration levels of broadband markets; and

- Macroeconomic indicators such as GDP, GDP per capita, productivity growth, per household average spending in telecommunications

8.2. Monitoring tools

Monitoring and evaluation to follow up on the above progress indicators will be based on the annual exercises of data collection performed in the framework of the implementation report, but also on Article 7 case work.

9. CONCLUSION

This staff working paper has addressed the issue of NGA deployment and some of its political, economic and regulatory ramifications for the EU. It recognizes that widely-used high-speed broadband networks have the potential to drive economic growth and to bring benefits to EU citizens; and argues that regulatory certainty and properly-tailored regulation are crucial to fostering competition and investment in new and modernized networks.

However, it is clear that even after several Article 7 notifications there are wide divergences of regulatory approaches in the EU single market, and that guidance is therefore necessary to provide a framework for competition, investment and consumer benefits. After situating the pace of NGA deployment in current market, regulatory and legal developments – and finding that the market for very high-speed services is still in its infancy -, the paper has explored three different regulatory responses. The first would involve drastic regulatory reform, consisting of forbearance and *a priori* exclusion of remedies. The second would consist in resisting any adjustment of the specific rules governing the present regime of *ex ante* regulation. The third would represent a response favouring the imposition of access obligations duly adjusted for investment risk.

The paper concludes that this last policy response would overall be superior - in terms of its impact both on competition and network investment, in terms of resulting usage of broadband networks in the EU, and ultimately in terms of dispersion of benefits to EU consumers.

ANNEX I: SUMMARY OF THE TWO PUBLIC CONSULTATIONS

The Commission has received a total of 75 submissions in response to the first public consultation which ended in November 2008 and a further 92 submissions in response to the second public consultation which ended in July 2009. Submitting parties have included all major European incumbents, many new entrants, the cable sector, trade associations, equipment manufacturers, the European Regulators Group, several national regulators and EU Member States' governments, as well as internet service providers, energy companies, regional authorities, business user groups and individuals.

In the two public consultations, respondents welcomed the initiative of the Commission and stressed the necessity of ensuring a viable and predictable regulatory framework which promotes efficient investment and competition. However, the comments displayed a clear dividing line between all-investment stakeholders, mainly the incumbent network operators and their suppliers (equipment and fibre manufacturers), and potential access seekers and independent service providers, which insisted on preserving competition and open access. National regulators (backed by their governments) were essentially concerned that the Recommendation could limit their margin of manoeuvre at national level.

The general issues raised by the stakeholders in the two public consultations are described below.

First public consultation

Flexibility granted to the NRAs in imposing remedies

Many respondents considered the initial draft Recommendation to be overly prescriptive. They advocated more discretion to NRAs to pick and chose the remedies which are most adequate to national circumstances, taking into account, in particular, the availability of civil works infrastructures or different levels of infrastructure competition. They advocated that the Commission should confine itself to establishing the fundamental regulatory principles in an NGA environment, such as the need for duct access, transparency, non-discrimination, cost-orientation, visibility of network changes and the need for continuation of services of operators hosted on traditional access infrastructures.

Asymmetric vs. symmetric approach

Incumbents claimed that it was inappropriate to apply the same approach to NGAs that was applied to legacy telecoms infrastructure. They advocated that entrants would be subject to symmetric access obligations to their NGA. By contrast, alternative operators supported asymmetry to avoid re-monopolisation of the market by the incumbents. Several respondents (both incumbents and manufacturers) stressed the need to foster a symmetric approach (based mostly on the promotion of commercial voluntary agreements). Complementary measures relating to public funding, building requirements and town planning were also emphasised. It was stressed that the recommendation should promote symmetric regulation since investment in NGA was not necessarily always undertaken by the incumbent and, as such, remedies should also cover non-telecom infrastructures.

Gradation of remedies

Incumbents, as well as fibre and equipment manufacturers, welcomed the aim of promoting infrastructure competition and stressed the need to impose only the lightest possible remedies (principle of gradation of remedies). Most alternative operators, as well as several regulators, invoked the limited availability of ducts in most Member States and the need to realise economies of scale for the rollout of NGA networks. According to these respondents, rolling out parallel fibre networks would only be possible in the longer term. They argued that, in the short term, fibre unbundling provided a more realistic business case. This remedy would moreover reduce investment risks by maximising the use of fibre networks, keeping prices at affordable levels and stimulating innovation in services to boost demand. Regulators stressed the importance of being allowed to impose both passive and active remedies in parallel. In particular, the ERG highlighted that infrastructure and service competition could complement each other ("ladder of investment" principle). The need to maintain the same principles regardless of the technology evolution was also underlined.

Importance of active forms of access

Comments stressed the importance of bitstream input given the limited prospect for infrastructure competition. Alternative operators required a full optical Bitstream input, such as the "Active Line Access" Ethernet-based product proposed by Ofcom in the UK. Some respondents called for different treatment for residential and business-grade Bitstream.

Application of a project-specific risk premium

A risk premium was accepted by alternative operators. However, they stressed the need carefully to assess the real level of risks, taking into account specific national circumstances. In particular, these alternative operators insisted that risk was higher for them as compared with the incumbents (incumbents have notably high retail market shares, they control essential infrastructures, they have a better access to equity markets). Some respondents also considered that the cost of capital already took into account the risk of investing capital in telecom infrastructures: according to this group, the risk premium is nothing new. Alternative operators insisted on the importance of the non-discrimination principle: the retail arm of the SMP operator should incur the risk premium.

Second public consultation

Mandatory provision of access to all rungs of the "ladder of investment"

While entrants generally welcomed the move from reliance on ducts access to a "ladder of investment" approach involving parallel access to different passive and active access products, regulators and incumbents voiced strong concerns against it. According to national regulators, the only way forward at the current stage of market development was to leave a broad margin of discretion to the NRA to choose the appropriate mix of access remedies following a review of the wholesale broadband markets. NRAs were concerned, in particular, that an "all-out" access regime could lead to distortions of competition or a failure to invest. Incumbents claimed that deviating from the principle of gradation of remedies would hamper their fibre projects. In their view, minimum regulation should be promoted and commercial agreements preferred to access regulation. If this were not the case, incumbents saw a high risk of having their business case "cannibalised" by access seekers owing to arbitrary distribution of the investment return by the regulators.

Symmetric remedies not covered by the Recommendation

A number of regulators, as well as incumbents, objected that symmetric remedies were not addressed in the Recommendation. They claimed, notably, that in the case of access to true infrastructure bottlenecks, such as terminating segments and ducts, symmetric remedies were often more appropriate. Some regulators further stressed that, in their countries, in-house wiring was the property of home owners rather than of the telecom operator.

General application of cost orientation

Entrants supported the systematic application of cost orientation for the pricing of all access products mandated by the regulators. They regarded cost orientation as necessary to maintain a true level playing field between access seekers and infrastructure owners. They campaigned, however, for a careful, case-by-case assessment of the level of risk of each investment project and warned against a systematic inclusion of inflated risk premia in the cost of capital. Regulators claimed, on the contrary, that cost-orientation should only be mandated in specific competitive conditions to be assessed and decided by the regulators themselves. Incumbents were strongly opposed to a systematic application of cost-orientation. In their view, this would lead to lower and uniform retail prices when the NGA business case relied heavily on retail pricing flexibility. For the incumbents, risk sharing arrangements would allow for faster penetration than mandated cost-based pricing including a risk premium.

Exemptions to cost-oriented access

Incumbents did not see a particular advantage to the exemption scenarios proposed in the revised draft Recommendation. In the view of the incumbents, the scenarios proposed were too restrictive. In their opinion and contrary to the approach of the Recommendation, the baseline scenario should be to impose minimum regulation (in particular symmetric obligations) and to let stakeholders negotiate freely any risk sharing agreements. Conversely, regulators and entrants strongly opposed the exemption scenarios on the basis that they provided opportunities for strategic behaviour from the SMP operators aimed at avoiding regulation. Further, such scenarios would, in their view, encourage sub-competitive oligopoly market structures. This group insisted that SMP-finding and access remedies should not be decided on the basis of the existence of deals between stakeholders. In their view, there could not be any *a priori* exemptions. However, while regulators strongly opposed the use of "mechanistic" criteria to assess whether SMP were present in a market, entrants were more open to the multi-operator scenario leading to an absence of SMP, provided the conditions for the regulators to accept such deals were reinforced.

Emphasis put on multiple fibre deployment

Incumbent operators strongly opposed the promotion of multiple fibre deployments. In the view of incumbent operators, multiple fibre would impose in most situations high additional costs to be incurred by the SMP operator, while the competitive advantage of multiple fibre as compared to single fibre access remains unclear. Regulators agree that it is difficult to forecast the potential increase in competition via multiple fibre deployments. On the other hand, entrants acknowledged that in principle multiple fibre networks can clearly have a positive effect for the development of effective competition in the market. As the economic evidence is quite unclear on the viability of multiple fibre deals, the conclusion is that multiple fibre should be pursued where it delivers clear benefits (e.g. in a cooperative deal, for access to in-house wiring), but without taking the competitive outcome for granted in advance.

ANNEX II: REGULATORY DEVELOPMENTS UNDER THE ARTICLE 7 PROCEDURE

An increasing number of NRAs have begun to consider questions of regulated access to NGAs as part of their regular market reviews, and there is a growing number of regulatory measures notified to the Commission in this regard. The transition to NGA particularly affects two markets listed in Commission Recommendation 2007/879/EC: the market for wholesale (physical) network infrastructure access (including shared or fully unbundled access) at a fixed location (LLU, Market 4), and the market for wholesale broadband access (WBA, Market 5). This annex provides an overview of market definitions and remedies proposed by NRAs on Markets 4 and 5, which relate to the provision of NGA services, under the 'Article 7 procedure'.[52]

Definition of wholesale broadband access markets

As regards market definition, NRAs' analyses have so far not shown significant breaks in the chain of substitution when comparing current generation broadband services to those provided over optical fibre. An increasing number of NRAs decided to include fibre based access products (FTTN/VDSL and FTTH/B) in the LLU and WBA markets.[53] NRAs which excluded such products[54] did so mainly because of the lack of extensive fibre access network deployment.

The Commission has repeatedly commented on the need properly to assess the substitutability between fibre and copper based products and has urged for the inclusion of both in Market 4 and in Market 5. The Commission has already expressed serious doubts as to, in its view, inaccurate definitions of the relevant product market.[55] Where NRAs excluded fibre access products from their market definitions, the Commission has requested NRAs closely to monitor market developments and to take account of the increasing availability of fibre networks and the prospective deployment plans of operators.[56]

Remedies on Market 4 (LLU) and on Market 5 (WBA)

With regard to remedies, the Commission has invited NRAs to ensure third-party access to NGA infrastructures at different levels, and to impose price control as well as migration obligations which strike an appropriate balance between investment imperatives and the need to preserve competition.

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52 This overview is thematic and focussed on the most relevant issues.

53 E.g. EE/2009/0942, FI/2008/0839, FR/2008/0780, IE/2009/0875, NL/2008/827, PT/20080850 (LLU market); BE/2007/0736 and BE/2009/0950, EE/2009/0943, FI/2009/0900, FR/2008/0781, NL/2008/0827, PT/2008/0851 (WBA market);

54 CY/2009/0869, CZ/2009/0933 withdrawn by NRA, DK/2008/0860, EL/2009/0934, SK/2009/0929 withdrawn by NRA (LLU market) and CY/2009/0870, CZ/2008/0797, EL/2009/0935 (WBA market).

55 DE/2005/0262, and ES/2008/0805.

56 AT/2009/0970, CY/2009/0870, CZ/2008/0797, EL/2009/0935.

Remedies on Market 4 (LLU)

Physical access obligations are usually associated with the imposition of access to the incumbent's civil engineering infrastructure, and most NRAs have mandated access to such facilities in order to foster the deployment of alternative fibre networks.[57] In some Member States, complementary symmetric measures pertaining to in-building wiring - based on specific national law or on Article 12 of Directive 2002/21/EC - were imposed to tackle physical termination bottlenecks associated with FTTH deployment.[58] The Commission has invited NRAs to impose additional remedies on the SMP operator, beyond access to ducts and symmetric access to in-building wiring, in case the latter prove to be insufficient to ensure effective competition in the interest of end-users.[59]

Some regulators have put in place measures mandating unbundled access to fibre loops (fibre unbundling).[60] Furthermore, in FTTN/VDSL scenarios, regulators have put in place specific obligations related to sub-loop unbundling (SLU) and ancillary remedies.[61] Where NRAs did not impose access to unbundled fibre loops, the Commission has stressed that, unless properly justified, access to passive infrastructure (and active forms of access over optical fibres) could prove insufficient to safeguard effective broadband competition and recalled that in the context of NGA developments, NRAs should consider the imposition of unbundled access to the fibre loop irrespective of the network architecture and technology implemented by the SMP operator.[62]

Although not all regulators have defined applicable price control methodologies, most NRAs are currently adopting cost-orientation to regulate access prices to passive infrastructures. The Commission has, in several cases, insisted on the adequacy of cost-oriented price regulation.[63] As regards prices for unbundled access to the fibre loop, NRAs have implemented different forms of price regulation ranging from price flexibility (when NGA deployment was at an early stage[64]), and cost-oriented access based on a LRIC+ methodology (when some deployment was already achieved[65]), to a more advanced pricing methodology including a risk premium.[66] The Commission commented on the need for NRAs to choose suitable parameters in order to implement the chosen price control methodology and correctly estimate the investment risk.[67]

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57 BE/2008/0801, FR/2008/0780, EE/2009/0942, PT/2008/0850, DK/2008/0860, EL/2009/0934, CY/2009/0869; IT/2009/0987, ES/2008/0804.

58 FR/2008/0780, ES/2008/0804, Portugal (Decree-Law 123/2009, of 21 May, subsequently amended by Decree-Law 258/2009, of 25 September).

59 FR/2008/078.

60 NL/2008/0826, FI/2008/0839 and SI/2009/0957.

61 Including equipment collocation at the street cabinet level and backhaul access (duct sharing, dark fibre access or Ethernet access). SI/2009/0957, DE/2007/0646, BE/2008/0801.

62 IT/2009/0987.

63 E.g. IT/2009/0987 and ES 2008/0805. .

64 FI/2008/0839.

65 SI/2009/0957.

66 NL/2008/0826

67 SI/2009/0981 and NL NL/2008/0826.

Only a number of NRAs have imposed additional transparency measures concerning NGA network developments as well as migration rules to ensure continuity of wholesale access products and monitor the decommissioning of local exchanges.[68] The Commission called on NRAs to specify in detail the transparency obligations and the migration process.[69]

In general, the variety of approaches followed by NRAs when imposing remedies in Market 4 underlines the need for further guidance by the Commission.

Remedies on Market 5 (WBA)

While several regulators have mandated bitstream over fibre[70], some NRAs have been reluctant to impose remedies on fibre-based products in Market 5. The Commission has carefully assessed the justification put forward by those NRAs which refrained from imposing WBA remedies or proposed to implement lighter regulation on fibre. In cases where an NRA explained that WBA access over fibre in the low quality market segment was unnecessary because of unbundled ODF access imposed on Market 4 (and since copper-based WBA was sufficient to address current competition problems on both the downstream retail market and Market 5), the Commission invited the NRA to closely monitor market developments and to review its decision if necessary[71].

Price regulation of fibre-based bitstream products differs from country to country, and some regulators do not impose any *ex ante* price controls. Cost-orientation is generally imposed in cases where fibre-based bitstream is considered as an essential input for alternative operators to compete with the SMP operator.[72] However, where lower-level remedies (ducts access, fibre unbundling) are seen as the prime input for the deployment of competing infrastructures and the provision of competing high speed retail services, no or only laxer price controls are imposed. For instance, one NRA applied a *retail-minus* price control method for both copper and fibre networks on the basis of a combination of cost-orientation and benchmarking data[73]. In many cases, such incremental price regulation (e.g. cost-orientation in Market 4 and retail minus in Market 5) is already imposed for copper networks.

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68 BE/2008/0801, DK/2008/0860, EE/2009/0942.

69 E.g. EE/2009/0942, IT/2009/0988.

70 So far bitstream over fibre has been mandated in Belgium, Italy, Spain, Slovenia and partly in the Netherlands and in Estonia.

71 NL/2008/0827.

72 BE/2008/0801. NL/2008/0827. In the Netherlands OPTA has also imposed cost-orientation in the high-quality WBA market.

73 SI/2009/0982.

ANNEX III: CHARTS AND TABLES

Fig. 1: Common NGA topologies (excluding cable)[74]

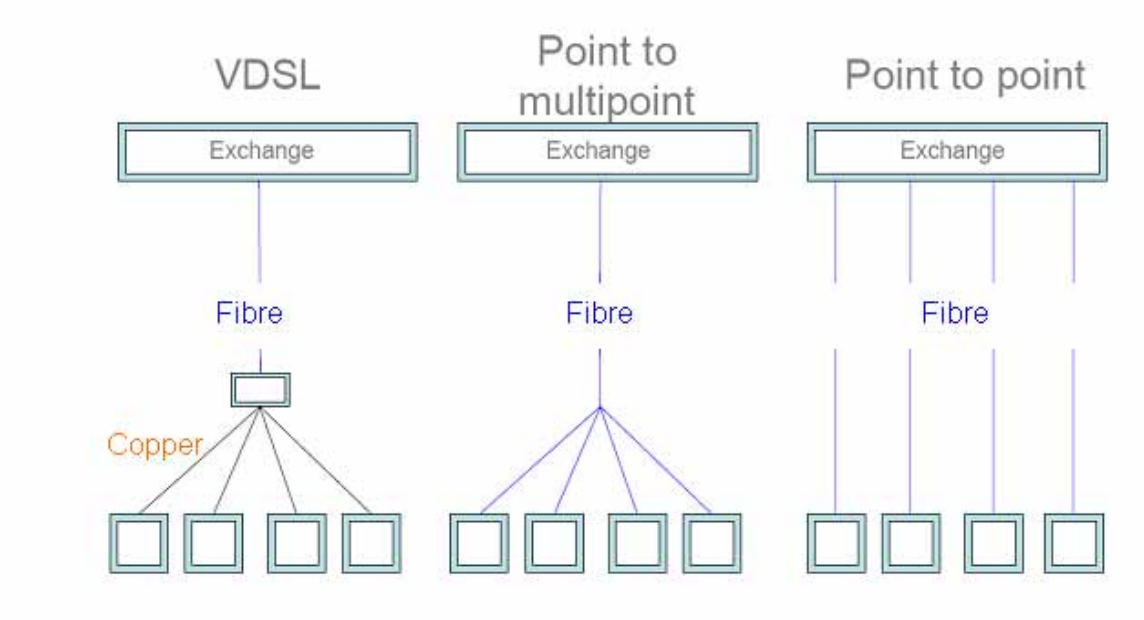
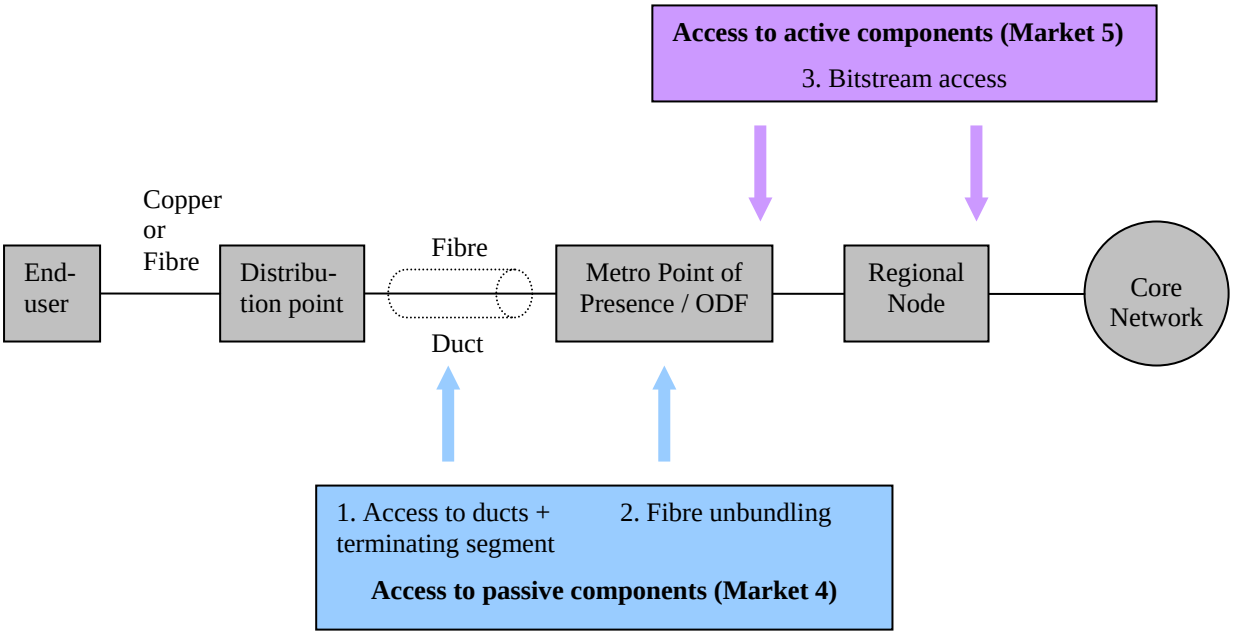


Fig. 2: Access remedies at different levels of the NGA infrastructure



74 Source: OECD.

Chart 1: Physical reach of existing cable networks in the EU (2008)[75]

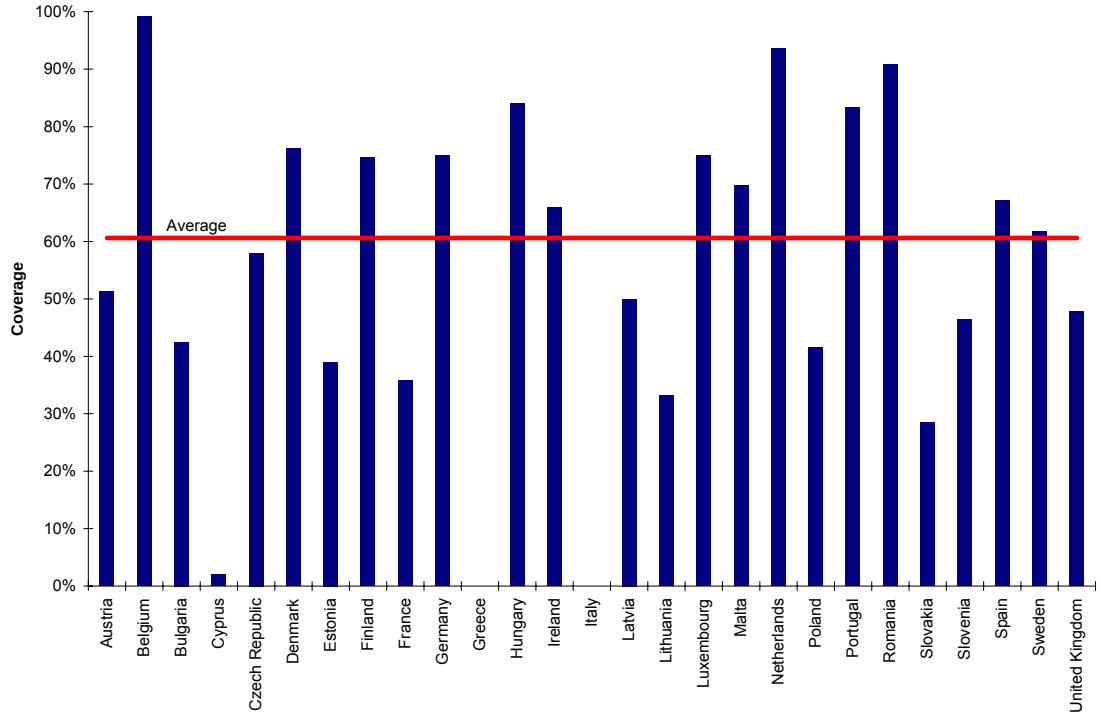
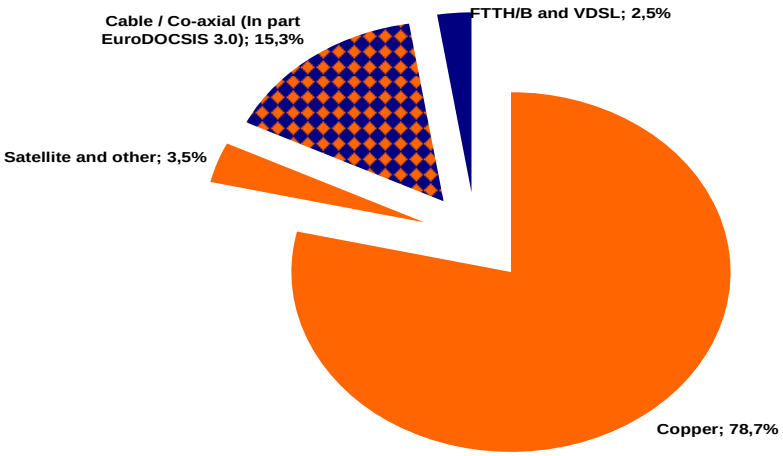


Chart 2: NGA share of the EU broadband market by technology (2009)[76]



75 Source: European Commission's Implementation Reports, Responses to European Commission's Public Consultations, European Commission's staff estimates.

76 Source: European Commission's Implementation Reports, Responses to European Commission's Public Consultations, European Commission's staff estimates.

Chart 3: Physical reach of NGA networks in the EU27 (homes passed, in % of total fixed broadband market, January 2009)[77]

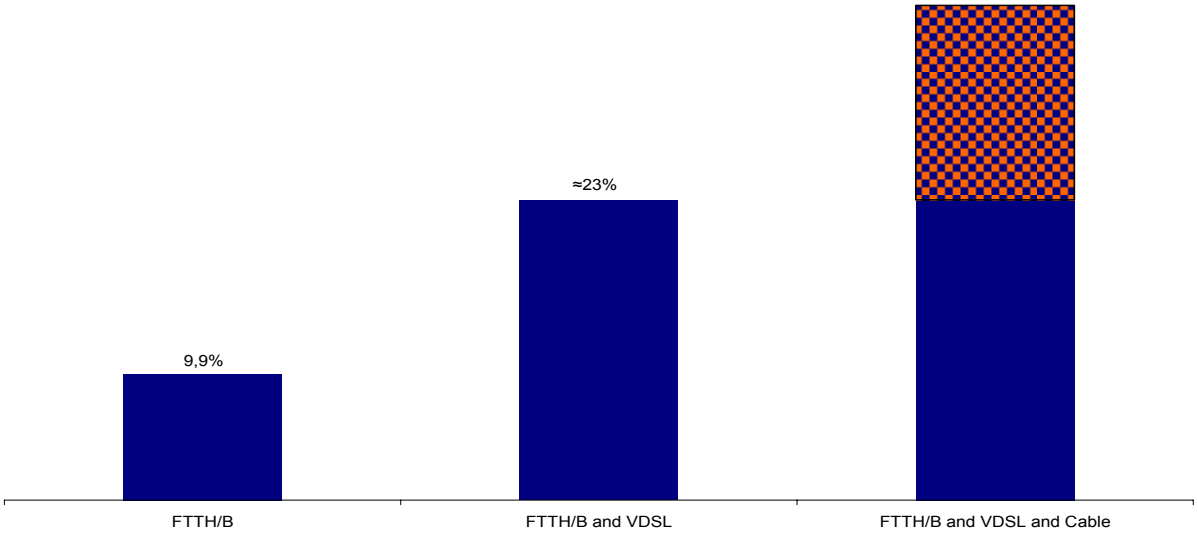
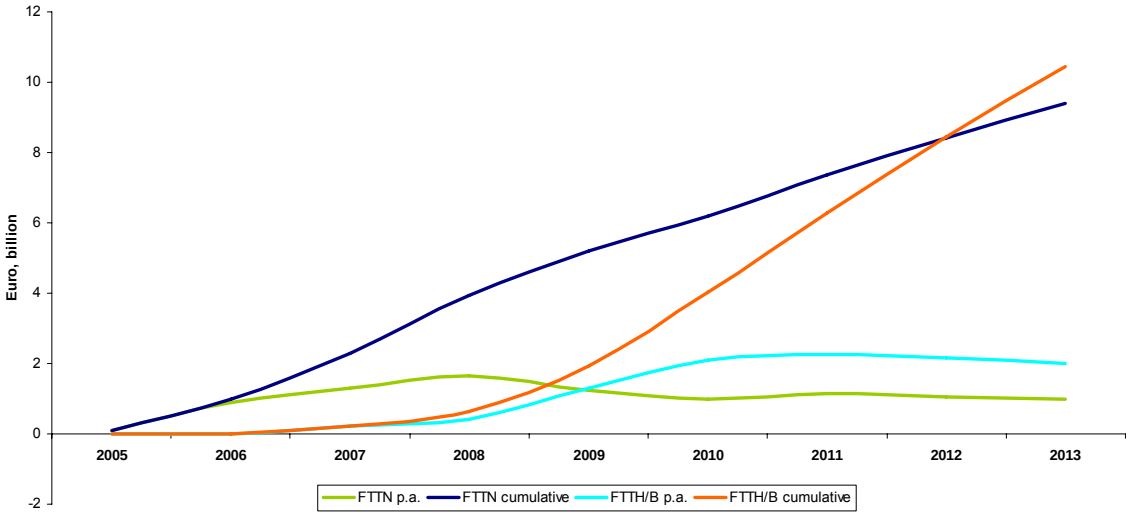


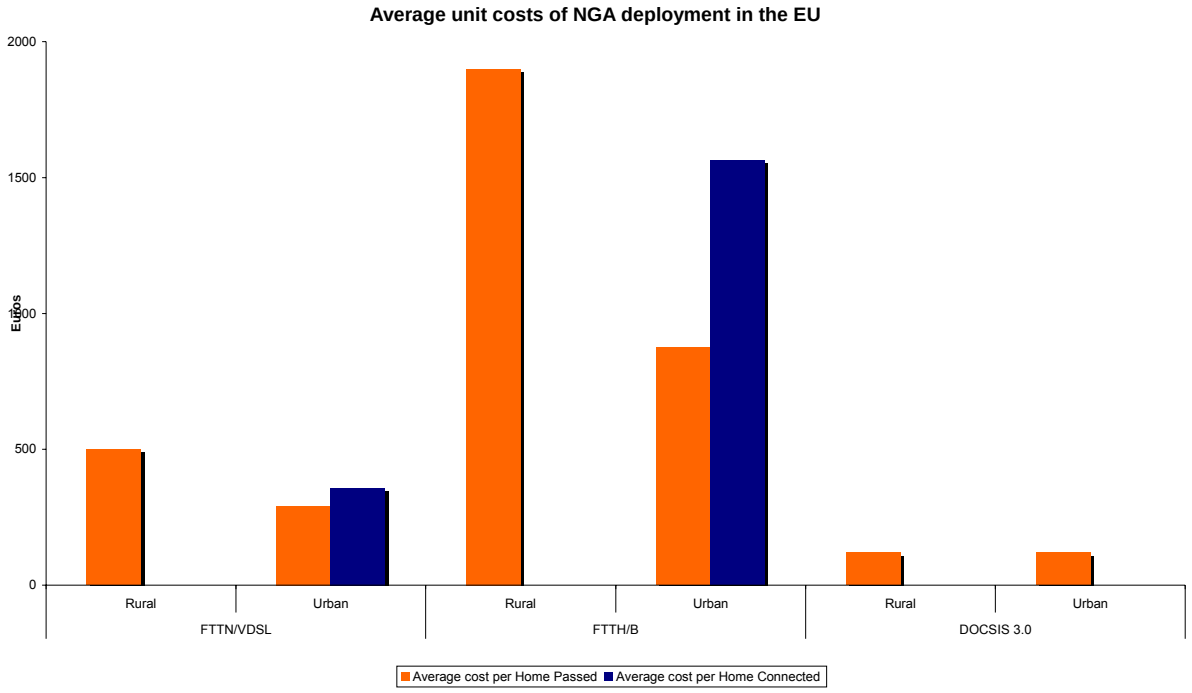
Chart 4: Forecast investments into FTTN vs. FTTH/B (Euro, billion, EU27)[78]



77 Source: European Commission's Implementation Reports, Responses to European Commission's Public Consultations, European Commission's staff estimates.

78 Source: European Commission's Implementation Reports, Responses to European Commission's Public Consultations, European Commission's staff estimates.

Chart 5: Average unit costs of NGA deployment in the EU[79]



79 Source: European Commission's Implementation Reports, Responses to European Commission's Public Consultations, European Commission's staff estimates.

Chart 6: Alternative operator lines by type of access [80]

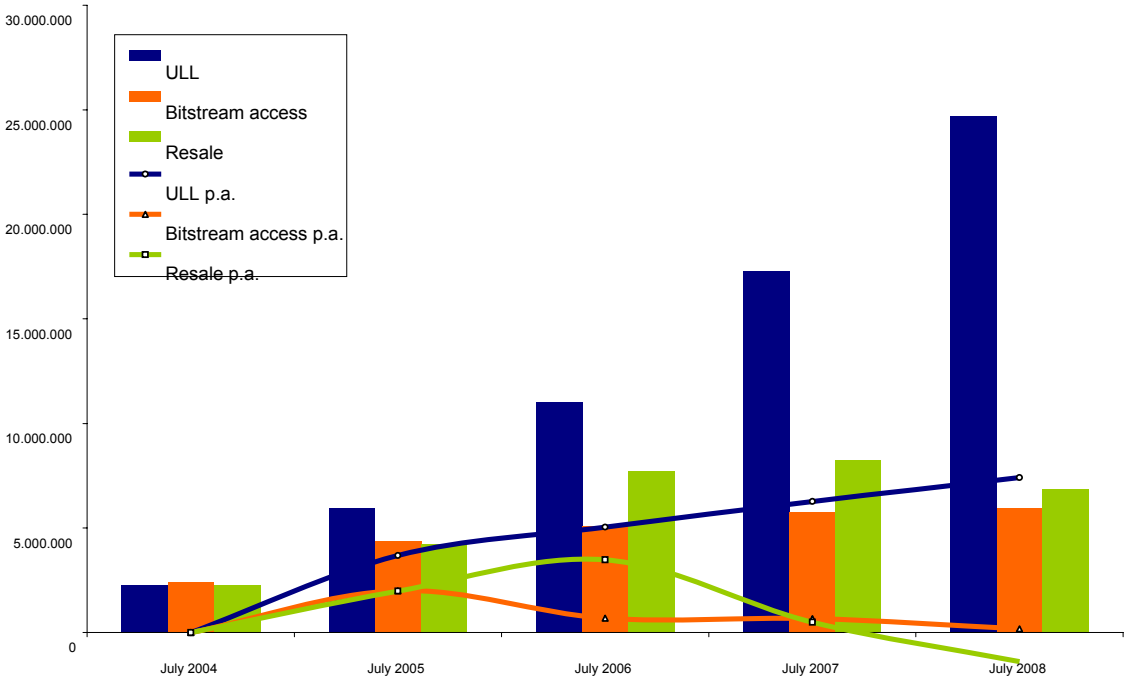
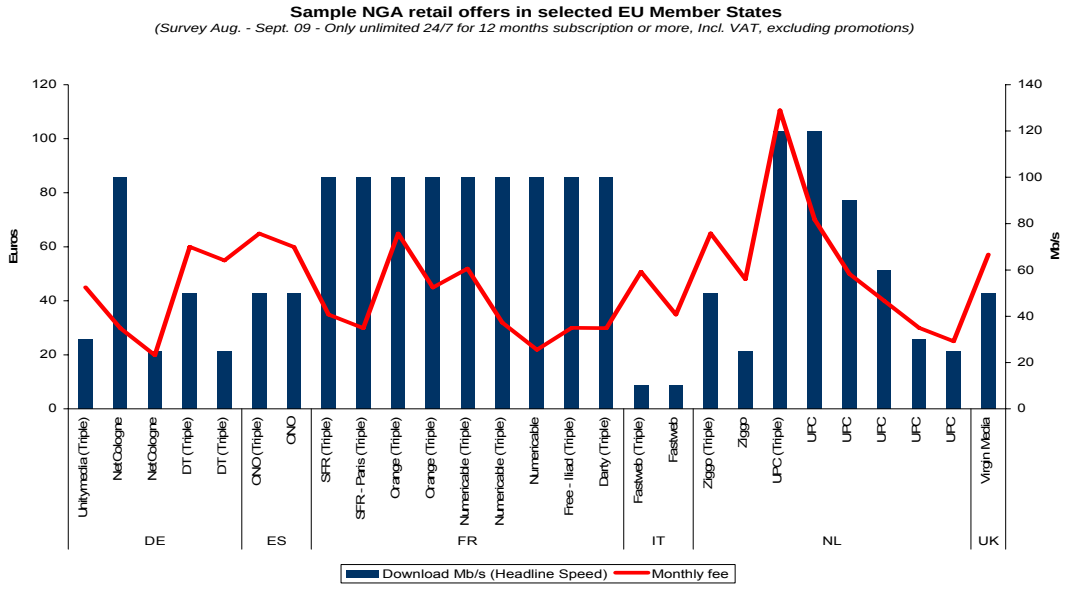


Chart 7: Broadband offers in the EU[81]



80 Source: European Commission's Implementation Reports, Responses to European Commission's Public Consultations, European Commission's staff estimates.

81 Source: European Commission's Implementation Reports, Responses to European Commission's Public Consultations, European Commission's staff estimates.

Table 1: Network duplication in selected countries, VDSL [82]

Critical market share for network duplication (%) VDSL						
	Germany (ARPU €35)			**Italy (ARPU €43.2)**		
Cluster	Accumulated customer base (%)	Incumbent first mover (%)	Second mover 80% Infrastructure access (%)	Accumulated customer base (%)	Incumbent first mover (%)	Second mover 80% Infrastructure access (%)
Dense urban	0,3	10	17	0,2	12	11
Urban	2,4	15	23	1,6	10	9
Less urban	13,7	18	31	9,3	15	14
Dense suburban	18,5	20	35	12,6	14	14
Suburban	25,1	27	46	17,6	15	15
Less suburban	37,4	34	65	55,4	13	51
Dense rural	71,5	78	N	76,6	42	47
Rural	100	N	N	100	80	n

[82] Wik (2008)

Table 2: Network duplication in France, FTTH/PON[83]

Critical market share for network duplication % PON			
France (ARPU €42.3)			
Cluster	Accumulated customer base (%)	Incumbent first mover (%)	Second mover 80% Infrastructure access (%)
Dense urban	2,6	18	32
Urban	6,8	32	37
Less urban	18,6	80	97
Dense suburban	25,2	87	98
Suburban	34,7	100	n
Less suburban	44,3	N	n
Dense rural	62,6	N	n
Rural	100	N	n

Table 3: Weighted average cost of capital determined by NRAs in some countries

EU Member State	NRA	Regulated Undertaking	WACC
Italy	Agcom	Telecom Italia	10.2%[84]
United Kingdom	Ofcom	BT Openreach	10.1%[85]
France	ARCEP	France Telecom	10.8%[86]

83 Wik (2008)
84 Case IT/2009/0867
85 Ofcom, *A new pricing framework for Openreach* (May 2009)
86 ARCEP, *Consultation taux de remuneration du capital* (February 2008)

Annex IV: Glossary

ADSL	Asymmetric Digital Subscriber Line
ARPU	Average Revenue Per User
Capex	Capital expenditure
CATV	Cable television
CPE	Customer Premises Equipment
DOCSIS	Data Over Cable Systems Interface Specifications
DSL	Digital Subscriber Line
DSLAM	Digital Subscriber Line Access Multiplexer
FTTB	Fibre-to-the-Building
FTTC	Fibre-to-the-Cabinet
FTTH	Fibre-to-the-Home
FTTN	Fibre-to-the-Node
GDP	Gross Domestic Product
GPON	See PON
HDTV	High Definition Television
HFC	Hybrid Fibre Coaxial
HSDPA	High-Speed Downlink Packet Access
IP	Internet Protocol
IPTV	Internet Protocol Television
IRU	Indefeasible Rights of Use
LLU	Local Loop Unbundling
LRIC	Long Run Incremental Costs
LTE	Long Term Evolution
MDF	Main Distribution
MPoP	Metropolitan Point of Presence
NGN	Next Generation Networks
NGA	Next Generation Access
NRA	National Regulatory Authority
NTE	Network Termination Equipment
NTP	Network Termination Point
ODF	Optical Distribution Frame
ODP	Optical Distribution Point

OLT	Optical Line Termination
ONT	Optical Network Termination
ONU	Optical Network Unit.
P2P	Peer to peer
PON	Passive optical network
PSTN	Public Switched Telephone Network
QoS	Quality of service
SLA	Service Level Agreement
SLU	Sub-loop Unbundling
SMP	Significant Market Power
TDM	Time Division Multiplexing
ULL	(See LLU)
UMTS	Universal Mobile Telecommunications System
VDSL	Very-high-data-rate Digital Subscriber Line
WACC	Weighted Average Cost of Capital
WBA	Wholesale Broadband Access
WDM	Wave Division Multiplexing
WLL	Wireless Local Loop

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