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EXPLANATORY NOTE

Accompanying document to the

COMMISSION RECOMMENDATION

of [...]

on regulated access to Next Generation Access Networks (NGA)

(Text with EEA relevance)

This is a draft document which does not necessarily represent the official position of the European Commission.

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EXPLANATORY NOTE

1. INTRODUCTION AND BACKGROUND TO THIS RECOMMENDATION

Today, about 36% of European households are using broadband¹, and some European countries are among the world leaders in broadband penetration. More than half of Europeans are regular Internet users, and 80% of them use broadband². New broadband applications and services increasingly require higher bandwidths. Next generation communication networks will allow more efficient provision of multiple services over the single infrastructure. However, the roll-out of access layers of these networks has not yet started on a large scale³. The development of new higher-capacity networks based wholly or partly on fibre optic cable is therefore a positive trend and is to be welcomed in the context of facilitating innovation and long-term consumer welfare. The coming years will be crucial for the migration to such high-capacity Next Generation Access ("NGA") networks. However, the deployment of these networks requires substantial investment, in the range of billions of euros over the coming years⁴. Investment decisions depend on a number of factors. Regulatory predictability is clearly one of them. It is therefore necessary to provide regulatory certainty to investors and foster investment and innovation for the benefit of all parties involved.

Thus, while most of the issues that are currently impeding investment in NGA relate to the uncertainty of demand for new high-speed services and the nature of such services, expectations about regulation are also likely to influence the nature and timing of investments. On the one hand, the incumbents face regulatory uncertainty as the specifics of ex ante regulation, once put in place, can significantly influence their business case. On the other hand, most of the alternative players that have invested in the unbundling of the local loop may be compelled to change their business model or may face seeing some of their network assets being stranded, and there is a consequent risk that the transition to NGA could provoke a re-monopolisation of e-communications markets.

For these reasons, regulatory consistency in this area is key to maximising the benefits and minimising the costs related to the regulation of NGAs at European level, in particular in terms of lowering transaction costs, reducing the costs of uncertainty and fostering the emergence of truly pan-European services. There is thus a need for increased predictability, clarity and consistency in the regulatory responses to the changes that may result from the roll-out of NGA networks.

¹ eCommunications household survey published in June 2008: the results of a special Eurobarometer survey conducted by TNS Opinion & Social between 9 November 2007 and 14 December 2007.

² i2010 Mid-Term Review, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2008) 199 final.

³ Earlier this year, the Fibre to the Home Council commissioned research which showed that there were slightly more than 1 million FTTH subscribers in Europe with nearly 5 million homes passed.

⁴ In March 2007, Telecom Italia announced a 6.5 billion euro plan to roll out fibre over 10 years. Deutsche Telekom has engaged in an approximately 3 billion euro investment to roll out very high-speed DSL. BT recently (15 July 2008) announced a GBP 1.5bn fibre plan to give 30% of homes access to fibre in the UK.

Some national regulatory authorities ("NRAs") have already adopted obligations concerning NGAs while others are currently investigating the issues around NGA investments in order to identify the associated regulatory challenges and find the most appropriate regulatory response. In spite of these efforts, no consistent regulatory approach has emerged yet, while efficient access remedies have in the past been crucial to the competitiveness of the telecommunications sector but also to other industries.

In order to safeguard and foster the significant cross-border investment currently under way or envisaged, guidance should be provided on the application of the provisions of the common regulatory framework to NGA developments. The aim of the present Recommendation is thus to provide NRAs with guidance that will form the basis for a consistent and coordinated regulatory approach in the transition to NGA and simultaneously increase regulatory predictability and legal certainty for market players.

In general, the Commission considers that facilitating infrastructure competition is the preferred regulatory option. This allows longer-term sustainable competition and increases consumer choice and innovation. With civil works representing up to 80% of the total roll-out costs of NGA, an efficient remedy would be to ensure cost-orientated non-discriminatory sharing of legacy physical infrastructure. There may however be cases where infrastructure competition is not viable because the ducts are not available or because the population density is too low for a sustainable business model. In such cases, access to other passive elements (dark fibre) or access to active elements — service-based competition ("bitstream") — should be mandated. Where access to passive elements is mandated, the pricing should take into account any higher risk and the need for the investor to recoup its investment through its revenues on the retail markets. Where access to active elements is mandated, this should not undermine investment closer to the customer or deeper in the network. This is consistent with the Commission's practice and experience in the implementation of the regulatory framework to date. Experience shows that in Member States where remedies on the market for wholesale physical access (Market 4) have worked well in as much as many operators rented local loops, remedies on the upstream market for wholesale broadband access (Market 5) were not required. As in past practice, NRAs cannot wait to see if remedies work before moving to the next layer of remedies; they must instead make an ex ante assessment of which remedies are likely to work and base their interventions on that assessment.

Finally, it should be noted that the most likely competitive NGA investments will not cover the whole territory and consequently service-based competition will probably remain necessary in those areas where there is only one network.

2. NEXT GENERATION ACCESS NETWORKS

2.1. Different NGA architectures

NGAs are networks — linking the end-user to the core network — which have been substantially upgraded either wholly or in part, using existing local access infrastructures and technologies and/or using new optical fibre infrastructures, and

which are capable of delivering broadband access services with bandwidths significantly above those currently widely available.

There are a number of possible scenarios for future NGA roll-out and, as a result, competitive outcomes are likely to vary both between and within Member States. Two main forms of next-generation fibre access ("FTTx") may be distinguished depending on how close fibre is brought to the end-user: Fibre to the Home ("FTTH"), which includes Fibre to the Building ("FTTB") where fibre is simply installed to a concentration point near to the building, and Fibre to the Cabinet or to the Node ("FTTN").

The ERG highlighted in their Common Position on Regulatory Principles of NGA⁵ several technical aspects of FTTx that need to be taken into account. As operators move to NGA networks, different technologies may be deployed in different geographic areas in order to deliver end-services to customers. It is likely that the most effective strategy for NGA deployment will utilise a mix of technologies to deliver these services depending on specific local characteristics, including:

- copper local loop and sub-loop lengths;
- customer density and dispersion;
- presence of multi-dwelling units; and
- quality and topology of existing network architecture, in particular the number of street cabinets per Main Distribution Frame ("MDF") and available capacity of facilities such as ducts.

As a result, the economics of NGA networks are likely to vary across different technologies and different geographies. The aforementioned developments mean that certain adjustments to the regulatory remedies will be necessary, but this will not lead to a fundamental variation in the regulatory approach.

This Recommendation aims to cover the main possible roll-out scenarios and competitive situations that may arise across the EU and therefore focuses on the two scenarios described above.

The main focus will be on fibre upgrades to fixed wire-line networks (copper and cable) and new fibre-based networks. However, it should be noted that broadband services at fixed locations will also be supplied using other technologies, including wireless networks. In addition, networks designed to supply mobile broadband services will also potentially be available for use at fixed locations. The current expectation is however that the services potentially offered over fibre-based networks will comprise a far greater (and higher) range in terms of bi-directional bandwidth.

⁵ ERG Common Position on Regulatory Principles of NGA, ERG (07) 16 Rev 2.

2.1.1. FTTH

In an FTTH architecture, fibre is rolled out all the way to the customer's premises. This allows download speeds of 70 Mbits/s or more with current technologies, and almost unlimited bandwidth in the long term with technological advances in photonics equipment. It also offers a wide range of configurations including symmetric high-speed broadband and guaranteed bandwidth. From a technological perspective, there are two ways of realising this type of architecture: *point-to-point* ("P2P") fibre, with a dedicated fibre for each end-user, and *point-to-multipoint* ("PON") fibre where several end-users share the same fibre.

Point-to-point fibre deployment has the advantage of allowing virtually infinite bandwidth for each end-user, while PON currently offers up to 100 Mbits/s to be shared between the end-users and perhaps up to 2 Gbits/s in the future with Wavelength Division Multiplexing technologies. The choice between the different architectures is finely balanced. In general PON may have lower operational costs and in-field deployment costs but these are often offset by in-building deployment and lower maintenance costs. To date most fibre actually deployed is P2P, whereas many announced future deployments are PON-based.

2.1.2. FTTN

In an FTTN architecture, fibre is rolled out as far as the street cabinet, and from there to the end customer copper is used. This technology offers download speeds to users of typically 20 Mbit/s (up to a theoretical maximum of 100 Mbits/s) downstream and up to 5 Mbit/s upstream per user depending on the copper sub-loop's length and quality.

In both FTTN scenarios, as fibre replaces copper, the traditional architecture of the copper access network changes. At the moment, the copper loops serving most end-users run from the end-user's premises to the Main Distribution Frame ("MDF") site of the incumbent. The copper loop may be further divided into two parts — backhaul from the MDF to the street cabinet and sub-loop from the cabinet to the end-user.

With MDF-based DSL, the access provider locates its DSL access equipment (DSLAM) at the MDF site to provide broadband to the end-user. With FTTN, the access provider replaces the copper between the MDF and the street cabinet with fibre. It then locates the DSLAM at the cabinet to provide high-speed broadband to the end-user. In essence the traditional local loop will be shortened, with the functionality of the MDF moving to the street cabinet. The number of end-users connected to these street cabinets is considerably less than that connected at the MDF, implying that larger market shares would be needed to support a business case for rolling out a fibre network to the street cabinet.

2.2. Factors that may influence investment

There are a number of different factors influencing the incentives for operators to invest in NGA and the nature and timing of those investments.

Firstly, the transition to NGA may generate substantial cost savings. Both FTTH and FTTN save operating costs because of their superior reliability and maintenance

characteristics. In the case of FTTH, these potential savings may be as much as 70% of current operating costs. However, a significant share of these potential savings can only be realised if, and when, the copper access network is switched off and all end-users have been migrated to the fibre network. A large slice of these cost savings will therefore benefit mostly the incumbent.

Secondly, the higher bandwidth offerings associated with NGA may lead to the development of new markets and increased revenues. This growth motivation is likely to be stronger wherever there is greater pent-up demand for higher-capacity Internet and the services it enables. The potential services are wide-ranging, including demand for more symmetric Internet access (for uploading or sending content), greater reliability as well as greater bandwidth, and new services such as high-definition content (including television, games and user-generated content).

Thirdly, NGA investments may be primarily motivated by a strategic response to competing networks and potential erosion of market share. For an incumbent, the need to adopt such a counter-strategy will be more pressing the stronger the level of competition from alternative infrastructure-based entrants (LLU-enabled) or from alternative full-scale end-to-end operators (cable or wireless). Notably cable operators are beginning to deploy DOCSIS 2.0 and 3.0 in their hybrid fibre/coaxial networks where fibre has been deployed to the head-end. DOCSIS 2.0 typically offers an end-user download speed of 20 Mbit/s (rivalling FTTN), and DOCSIS 3.0 offers speeds of 100 Mbit/s or more (rivalling current FTTH technology).

Fourthly, NGA investments may enable an undertaking to influence or control the regulatory agenda through the deliberate choice and design of new network topologies and the different wholesale access products that are possible under it. In particular, undertakings may be tempted to make network architectural choices that favour their market positions.

The relative mix or importance of these factors can be expected to vary between Member States and individual undertakings, and also over time. It should also be emphasised that the incentives vary between greenfield areas and areas covered by existing networks. In general, investment decisions will assess the balance between additional or incremental costs (in terms of capital expenditure, net of any operational cost savings) and expected additional revenues over the period considered. In greenfield areas, the cost differences between established technologies and new ones (such as all fibre networks) are sufficiently narrow for new technologies to be invariably chosen (see also Section 3.3.3). In areas covered by existing networks, investors (both the operators of those networks and entrants) will take into account the assets that are already in place.

Regulation can also influence investment incentives and the form and timing of investments. The potential impact of regulation is likely to be more significant during a period in which substantial infrastructure investments are expected to occur. The role of regulation should be to establish an environment as predictable and appropriate as possible for investment and market entry and to maintain or improve the level of competition in the marketplace.

3. REGULATORY APPROACH

3.1. General considerations

3.1.1. *General principles of the imposition of remedies*

It is worth recalling that when one or more operators have significant market power (SMP) within the meaning of Article 14 of Directive 2002/21/EC⁶ on the relevant markets, NRAs must impose at least one of the regulatory obligations listed in Directive 2002/19/EC⁷. Such obligations imposed on operators designated as having SMP on a relevant market (hereinafter referred to as "SMP operators") must be appropriate and be based on the nature of the problem identified, proportionate and justified in the light of the objectives laid down in Article 8 of the Framework Directive, in particular maximising benefits for users, ensuring that there is no distortion or restriction of competition, encouraging efficient investment in infrastructure and promoting innovation.

In accordance with these principles and other provisions of the Framework Directive, additional guidance to NRAs may be provided along the following lines when imposing remedies in the context of NGA roll-out:

3.1.2. *Timely analyses of the markets concerned*

NRAs will have a significant role to play in the transition to NGA both in facilitating investment and in safeguarding competition. This role is likely to be even more delicate during the phase when the initial investments are expected to take place or are taking place. It will be important to ensure that appropriate remedies are introduced in a timely manner to promote the realisation of the regulatory goals set out above.

It is therefore crucial that NRAs monitor the roll-out of NGA networks and developments in the markets concerned and undertake timely revisions of their market analyses in accordance with Article 16 of the Framework Directive. The Commission has already indicated that it considers it very important for the NRAs to analyse both Markets 4 and 5 together ensuring a coherent approach to the regulation of NGA. Before starting this analysis it will obviously be important for each NRA to have a clear view of the market in question and the position of the players thereon, taking also into account their investment plans.

3.1.3. *Technological neutrality of remedies*

NRAs should impose technologically neutral obligations, that is to say remedies that neither impose nor discriminate in favour of the use of a particular technology. Nevertheless, the principle of technological neutrality does not prevent NRAs from

⁶ Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive), OJ L 108, 24.4.2002, p. 33.

⁷ Directive 2002/19/EC of the European Parliament and of the Council of 7 March 2002 on access to, and interconnection of, electronic communications networks and associated facilities (Access Directive), OJ L 108, 24.4.2002, p. 7.

taking proportionate measures to adjust remedies to take account of the specific technical characteristics of fibre networks.

The new definition of Market 4 allows remedies imposed to go beyond those applied on the old Market 11⁸, which only aimed at enabling competitors to replicate the incumbent's historical copper network. In case the incumbent limits its deployment to VDSL, the remedies applied should be technologically neutral and provide room for alternative operators to move ahead further to an FTTH model.

Where fibre networks have been deployed based on a PON architecture, their topology starts to look like that of a cable network. NRAs should therefore carefully analyse whether this may indicate that placing cable and telecommunications networks in the same relevant market would be appropriate.

3.1.4. *Gradation of remedies*

As set out in the Explanatory Note to the Recommendation on Relevant markets⁹, there is a logical sequence for analysing and regulating markets. Accordingly, the market to be analysed first is the one that is most upstream in the vertical supply chain. Taking into account the ex ante regulation imposed on that market, an assessment should be made as to whether there is still SMP on a forward-looking basis on the related downstream markets. Accordingly, a downstream market should only be subject to direct regulation if competition on that market still exhibits SMP in spite of wholesale regulation in the related upstream markets.

The rationale of regulatory intervention must be clear and explicit. Otherwise, this could lead to a patchwork of national approaches resulting in regulatory uncertainty and less incentives for new fibre investment. It may also lead to investment decisions based not on the efficiency of the investment per se, but on the regulatory risks.

[Under the rationale of the current framework, where access to the passive infrastructure is sufficient to create effective and sustainable competition on the downstream markets, no further remedy would be considered on the downstream market since SMP would no longer exist.]

Therefore, in view of the objective of promoting infrastructure-based competition set out above, there should be a clear prioritisation of remedies. The concept of gradation of remedies in this context takes into account the need to promote infrastructure-based competition to the greatest extent possible while bearing in mind the necessity to maintain remedies to safeguard the level of service-based competition that has already been reached. Thus the gradation of remedies approach aims to ensure investment at the lowest level of the network infrastructure. In general, this means that when lower elements of the network such as ducts are

⁸ Market 11 of Commission Recommendation 2003/311/EC of 11 February 2003 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communication networks and services, OJ L 114, 8.5.2003, p. 45.

⁹ Explanatory Note, Accompanying document to the Commission Recommendation on Relevant Product and Service Markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services, SEC(2007) 1483 final.

available permitting a sufficient number of operators to ensure effective competition on the basis of infrastructure competition, upper level remedies such as bitstream or its equivalent should not put at risk the revenues that the investor expects on the corresponding retail markets. This linkage and gradation of the remedies between access to ducts, other civil infrastructures and fibre creates an environment favourable to investment and the development of effective infrastructure-based competition. It requires NRAs to analyse the entire telecoms value chain in a consistent manner.

Since investments will be considerable and only written off over longer timeframes, a consistent regulatory approach should apply over successive review periods.

The practical implications of this principle are set out in detail in the sections dealing with the specific remedies below.

3.2. Regulatory provisions

The following sections describe the regulatory measures which are deemed to be the most appropriate in dealing with the challenges raised by the roll-out of fibre networks taking into account the regulatory objectives set out above. There is a set of provisions which is considered to be generally relevant in the case of both FTTH and FTTN deployments. These recommendations will be dealt with under the title "General regulatory provisions". In addition there is a set of remedies that is considered to be specific to the chosen network architecture (FTTH or FTTN). These remedies will be dealt under the title "Specific regulatory provisions".

3.3. General regulatory provisions

This section describes the regulatory remedies and provisions which are generally considered relevant in both FTTH and FTTN scenarios.

3.3.1. Access to ducts, civil engineering works and other elements which are not active ("duct access")

As indicated in the Explanatory Note to the Relevant Market Recommendation¹⁰, access to ducts could be imposed as part of a regulatory remedy to address SMP on the market for wholesale physical access.

In the roll-out of fibre access networks, the cost of civil works and especially trenching and ducting constitutes a major factor and consequently an enduring economic bottleneck. Also, NGA roll-out is expected to rely to a larger extent on the SMP operator's legacy network infrastructure. This is therefore a major entry barrier for other operators wishing to invest. As most operators have not yet started to invest

¹⁰ "As networks evolve in most Member States and existing metallic loops are replaced partially, or even totally, by fibre, the existing local loop may become significantly shorter than today's local loops, or even entirely disappear. In such cases, where no alternative infrastructure is likely to become available to allow replication, then access to either ducts or alternative network elements must be considered. Access to ducts could be an important part of any remedy imposed to address problems associated with physical network access." See Section 4.2.2, p. 34 of the Explanatory Note, Accompanying document to the Commission Recommendation on Relevant Product and Service Markets.

in NGA there is a unique opportunity for NRAs to lower this entry barrier by imposing duct access obligations on the SMP operators' existing and new ducts, civil engineering works and elements which are not active to ensure a level playing field for incumbents and new entrants. This objective can in principle be achieved as long as equivalent access is provided by the SMP operator to the relevant passive elements of its legacy network, and as long as there is a viable business case for the roll-out of alternative networks.

The Commission is conscious of the fact that ducts and other relevant infrastructure might not be available in some Member States and that there might not be readily available data as to the whereabouts, technical characteristics and capacity of the ducts and other relevant infrastructure. At the same time, there are Member States that have already mandated duct access¹¹ or are in the course of surveying the ducts.

In the light of these considerations, it is important that NRAs gather all necessary information, on the basis of which they should take a preliminary view as to whether duct access is feasible or not. Accordingly, if it is feasible, NRAs should impose duct access obligations and require SMP operators to make a reference offer laying down the detailed conditions for duct access.

The Commission is aware of the technical/legal complexity inherent in developing such a reference offer. However, duct access obligations can only be effective if the conditions of access are developed with the greatest possible detail.

Duct access obligations should not be limited solely to ducts but should include all passive elements of the network which are necessary to roll out a competing infrastructure and the associated processes that are required to make duct access efficient. Accordingly, such obligations should in particular encompass provisions on information on the whereabouts and technical characteristics of the ducts and should contain appropriate procedures related to physical access to ducts (such as the procedure for entering the property and opening manholes) as well as to all other passive elements.

Since NRAs have extensive experience regarding the development of the details of local loop unbundling and the related reference offer, it is expected that they have the necessary expertise and adequate resources to carry out this task.

It is important that SMP obligations on Market 4 (such as duct access) should not be undone by changes to the network architecture or structure. It is therefore deemed appropriate and proportionate to require SMP operators in the context of the present remedies to allow sufficient space in their newly built ducts for other operators to use these ducts.

Mandatory access conditions including price controls should reflect the characteristics of different assets (existing or new ducts, for example) such as asset lifetimes and levels of risk in terms of uncertainty of demand and technological obsolescence. Access conditions should thus in some cases reflect historic costs and in other cases the value associated with the new investment.

¹¹ Such as Portugal, France and the Netherlands.

Access to civil engineering works and other passive elements necessary for the roll-out of NGA should be provided by the SMP operator according to the principle of equivalence as set out in Annex II to this Recommendation. NRAs should clearly define the scope of non-discrimination obligations imposed or preferably specify equivalence targets, updated regularly on the basis of information provided by the SMP operator.

Given the costs of civil engineering works, in addition to SMP-based obligations it seems appropriate for NRAs to explore the possibilities for facilitating and encouraging build-and-share projects between SMP operators and other alternative providers at the time of new investments to replace or establish cables, ducts and other facilities.

3.3.2. *Transparency*

There is a high degree of uncertainty about the exact timing and location of investments in NGA. Examination of the forward-looking scenarios also indicates the possibility of varying evolutions in the level of barriers to entry. NRAs thus need to have sufficient information concerning network investments and changes so as to be able to monitor and assess expected network changes and evolution. Such monitoring is necessary for two reasons. The first is that NRAs will need to anticipate the appropriate time to review their market analysis, given that current regulatory obligations are in place in respect of existing network configurations which may change. The second is that NRAs can also seek where possible to reduce entry barriers or offset the potential impact on effective competition where barriers may increase.

It is essential that all operators should have the opportunity to compete on an equal basis. NRAs should therefore ensure that a reference offer is put in place or adjusted in line with the provisions of this Recommendation as appropriate before any large-scale investment takes place. In practical terms this will require on the one hand the amendment of reference unbundling offers ("RUOs") to take account of the changes resulting from fibre upgrades and on the other hand, in most of the Member States, the establishment of a new reference offer concerning duct access.

In order to enhance legal certainty such reference offers should be put in place without undue delay.

One of the important features of such reference offers is the obligation on incumbents to provide information on duct location and capacity, with processes for the collection and distribution of such information. In order to allow all operators equal access to this information, NRAs will need to specify the procedures and the timing whereby the incumbent has to provide information to interested parties about changes in its access network architecture to the extent necessary for the planning and coordination of investments.

To ensure the effectiveness of such offers, they need to be complete, timely and accompanied by service level commitments. In addition, it is important that NRAs follow the negotiations and are able to intervene rapidly, in particular where SMP operators are delaying access to competitors.

As noted above, NRAs can draw on their experience of establishing a complex RUO in the case of local loop unbundling to develop an appropriate reference offer for access to ducts and other civil infrastructures.

3.3.3. *Revision of existing obligations to avoid unintended effects*

At the present time, the installation of new networks on greenfield sites presents the clearest commercial case for Fibre to the Home (FTTH). Even in these cases, there is evidence that copper access networks are also being installed in order to satisfy regulatory requirements concerning the provision of certain services (such as the rules concerning carrier selection and pre-selection or the provision of wholesale line rental).

In the light of the overall objective of promoting fibre investments it would be clearly counterproductive to require operators to deploy copper networks only to meet their existing obligations if the newly deployed network is capable of providing the same functionality. NRAs should therefore revise and adjust existing regulatory obligations in order to avoid such problems.

3.4. Specific regulatory provisions

This section describes the relevant regulatory provisions which are specific to the chosen network architecture (FTTH or FTTN). It also describes the relevant regulatory approach and remedies under Market 5.

3.4.1. *FTTH (Fibre to the Home)*

3.4.1.1. In-building wiring

In the context of FTTH investments, access to in-building cabling is an important factor the lack of which could inhibit investments. Cabling within buildings by more than one undertaking is likely to be difficult and/or inappropriate for legal (property rights), economic¹² and practical (lack of adequate space) reasons.

This Recommendation focuses on SMP remedies and therefore NRAs are recommended to rely on asymmetric SMP-based remedies in order to allow for access to in-building wiring. Symmetric remedies such as those available under Article 12 of the Framework Directive have a very important role to play but are outside the scope of this Recommendation. NRAs may, however, consider whether or not it is proportionate to impose SMP obligations where the parties involved have the incentives to negotiate commercial contract in the absence of regulation. NRAs could in such case allow SMP operators to refuse sharing new investments with alternative operators who, without due reason, do not agree to reciprocal sharing of commercially equivalent physical assets

Specifically in the context of FTTH roll-out, this means that where alternative operators have access to ducts and deploy their own fibre to the building or to the vicinity of the building they still need to connect to the access network reaching the

¹² The cost of in-building wiring represents an important factor in the costs of rolling out NGA access networks.

end-users. NRAs should therefore analyse carefully the SMP operator's network architecture and determine where the concentration point of the terminating segment of the access network, including inside-building wiring, should be for the purpose of granting access. In making such a determination NRAs should take into account the fact that multiple physical access deployments may be impractical or undesirable within buildings and that any concentration point will need to host a sufficient number of end-user connections to be economically viable for a sufficient number of operators to ensure effective competition. Consequently, physical access to the fibre sub-loops should be mandated as a remedy in Market 4 at the SMP operator's concentration points identified and determined by the NRA. In this context, NRAs should also consider whether specific interfaces are required to ensure efficient access.

Access to such fibre-loops should be provided according to the principle of equivalence as set out in Annex II to the Recommendation so as to ensure that the incumbent does not disadvantage alternative operators in comparison to its downstream retail arm. NRAs should clearly define the scope of non-discrimination obligations imposed or preferably specify equivalence targets, updated regularly on the basis of information provided by the SMP operator.

The opinion of the ERG¹³ also identifies in-building wiring as one of the main barriers to the deployment of FTTH, mainly due to property rights-related issues. The ERG document suggests that these issues could be tackled by using Article 12 of the Framework Directive.

In France the problem of access to in-building wiring is planned to be tackled through the enactment of a law imposing symmetrical obligations on operators. It is worth noting that the Federal Communications Commission in the United States has adopted a specific regime which prohibits the use of exclusive contracts with multi-site dwellings.

The imposition of asymmetric obligations under the Framework Directive does not exclude the application of Article 12 to allow for in-building wiring. This is, however, not covered by the scope of this Recommendation.

3.4.1.2. Alternative passive remedies

Appropriately working duct access obligations are considered to be feasible and sufficient to bring about sustainable infrastructure-based competition in many cases. Therefore — pursuant to the principle of gradation of remedies — NRAs do not need to consider additional physical access obligations (such as dark fibre) where access to the passive infrastructure enabling competitors to roll out competing networks is feasible and is economically viable for a sufficient number of operators to ensure effective competition. In case of doubt the economic viability will need to be assessed and verified by the NRA. Nevertheless, if access to infrastructure is technically or physically impossible or in cases where it is not economically viable for a sufficient number of operators to ensure effective competition, NRAs will need to impose alternative physical access remedies, such as access to dark fibre and unbundled access at the optical distribution frame. This is without prejudice to the

¹³ See footnote 5.

imposition of wholesale broadband access remedies on Market 5 as set out below in Section 3.4.3.

3.4.2. *FTTN (Fibre to the Node)*

If the network architecture chosen by the incumbent is FTTN, existing metallic loops may be replaced partially, or even totally, by fibre, with the existing local loop becoming significantly shorter than today's local loops. In such circumstances, unbundling of the sub-loop can take place at the street cabinet rather than a concentration point higher in the network. Sub-loop unbundling is technically feasible and is already an obligation on SMP operators in many Member States. But there is considerable uncertainty over the extent to which sub-loop unbundling is commercially viable. Most studies and operators suggest that sub-loop unbundling will be economically viable for a sufficient number of operators to ensure effective competition only in a certain number of cases (mostly in densely populated urban centres and business districts) where there are a sufficient number of customers to support investments by alternative operators in their own infrastructure. It must also be taken into consideration that FTTN may constitute an intermediate step on the way to a longer-term transition to FTTH. It may be feasible for operators that have already built out their networks to local exchanges to build out their networks further (to local concentration points) or potentially even to leap-frog the SMP operator by installing FTTH in some areas.

A significant share of the benefits of moving to NGA and therefore a firm's incentives to invest are linked to its ability to transit fully to the use of NGA and reap the resulting cost savings by switching off its existing copper network or part of it. SMP operators might therefore be interested in decommissioning their copper networks as soon as possible. At the same time, competitors may have equipment co-located at the SMP operator's sites and they will need a reasonable transition period to decide on their investment/business strategy to cope with the changes. NRAs therefore need to establish transition rules which balance these two conflicting requirements. NRAs will also need to act in a timely manner to improve legal certainty and thereby foster infrastructure competition.

Accordingly, before an SMP operator removes existing infrastructure to realise cost savings, NRAs should ensure competitors can continue to provide services by means of a proper migration path. NRAs should ensure that appropriate transitional arrangements are in place, with a view to enabling alternative operators to adjust their business strategies to the changed network structure. NRAs need to establish these rules in the updated reference offers. NRAs should seek to ensure that an agreement is reached between the SMP operator and access seekers within a specified deadline on an appropriate migration path from the prevailing access remedies to access under the new network structure. In determining the specific obligations such as the timing and technical functionalities to be maintained over copper during the transition period, the NRA should explicitly assess the implications for competition of decommissioning the copper network.

While FTTN can be deployed quite quickly, at the same time considerable difficulties may arise for access seekers deploying infrastructure at the street cabinet. Therefore, if there is a finding of SMP on the relevant market, at least in the short term, NRAs will need to ensure that local loop unbundling is maintained with a view

to ensuring the continuity of migration from local loop unbundling to sub-loop unbundling or to any other chosen business model. In practice sub-loop unbundling (SLU) is not an equivalent to LLU and in order to become an equivalent to the greatest extent possible, SLU normally needs to be supplemented by appropriate backhaul provisions.

In the light of the above, NRAs should impose (or maintain if already in place) an obligation of sub-loop unbundling. Sub-loop unbundling can take place at appropriate concentration points, be they street cabinets or at or near to (multi-dwelling) buildings (in the case of fibre to the building). In order to make this obligation effective the necessary ancillary obligations, namely co-location, duct sharing and/or access to dark fibre, should also be imposed.

When imposing such ancillary remedies NRAs should bear in mind the practical difficulties associated with such remedies. In particular, street cabinets may not be large enough to host multiple operators. NRAs may therefore consider imposing appropriate obligations to tackle this issue, such as virtual or distant co-location, or facilitate industry agreements concerning the size of the street cabinets. Adequate power supply may also be a problem which could be remedied by the NRAs by imposing corresponding obligations on SMP operators.

Where incumbents deploy FTTN, the gradation of remedies would not be appropriate for the same reason as it was not appropriate in the context of the roll-out of first-generation broadband. The investment required to supply sub-loop unbundling and associated backhaul and co-location has already largely been made. The problem of balancing incentives for efficient investment against the need to enable effective competition is avoided and the SMP operator should be required to provide the whole set of access products and ancillary services.

3.4.3. *Wholesale Broadband access remedies imposed on Market 5*

In line with the principle of gradation of remedies, where SMP is found on Market 5 on the basis of a forward-looking analysis, NRAs should maintain the current regulatory access remedies in place, in order to safeguard the level of existing competition. Where FTTN is deployed, entrants may need to roll out their networks to street cabinets where the available number of end-users is significantly less than at the MDF, which creates a much more challenging business case for competitive access seekers at this network point. This point has been made repeatedly in a number of studies¹⁴. Consequently, the effectiveness of sub-loop unbundling remedies must be examined. Similarly, end-to-end competition based on parallel PON fibre deployments, whilst more viable than in the past, will be subject to considerable economies of scale and density even when passive infrastructure is being shared. This means that, regardless of the underlying infrastructure, remedies permitting wholesale broadband access should be maintained and/or imposed in such SMP situations in a proportionate way.

¹⁴ See, for example: Study for OPTA in 2006 "The business case for sub-loop unbundling in the Netherlands" (<http://www.opta.nl/download/Analysys+Final+Report.pdf>); Study for ComReg: "The business case for sub-loop unbundling in Dublin" (<http://www.comreg.ie/fileupload/publications/ComReg0810a.pdf>); the OECD paper on "Developments in fibre technologies and investment", DSTI/ICCP/CISP(2007)4/FINAL.

The wholesale broadband access remedy imposed in relation to fibre networks will necessarily need to take account of the different technical characteristics of the underlying technology. However, in order to comply with the principle of technological neutrality, NRAs should ensure that the remedy imposed does not favour or discriminate against the use of a particular technology.

The market definition that applies to Market 5 will not be changed by a change to the underlying technology. Bitstream access or its equivalents should therefore continue to serve existing markets (including chain substitutes) as before.

However, NRAs should devote due attention to the proper market definition of Market 5, as in principle the deployment of NGA networks might lead to the emergence of retail services whose substitutability with existing retail services requires a more careful analysis (for example, very high-bandwidth Internet connectivity services, managed IPTV, high-definition audiovisual content or services requiring high-speed symmetric bandwidths, or a bundle of these services). These retail services may in such a case generate a wholesale demand for broadband access services with different characteristics from the existing wholesale broadband access services currently included in the relevant product market. NRAs should therefore carry out a detailed substitutability analysis of the retail broadband services and the corresponding wholesale inputs in their review of this market.

Unless there are clear indications of a break in the chain of substitution as compared to current product markets, services provided over NGA networks should be considered as incremental upgrades and therefore not treated as new markets. Inappropriate wholesale obligations should not be imposed where, based on a clear and adequate justification, an NRA finds that a service provided over NGA networks constitutes a newly emerging retail market.

Price controls on wholesale broadband access products should be consistent with the pricing of physical access, and NRAs should in particular avoid the creation of a margin squeeze, in line with the approach followed under competition law. Such an approach should allow a proper return on investment and not dissuade investments.

3.5. Pricing

In the absence of commercial or negotiated agreements with respect to access to inputs or wholesale services, NRAs will need to set the terms on which an SMP operator grants access to a third party. At the same time, such regulated terms need to preserve incentives to invest and innovate. This raises the issue of the prices on the basis of which access is mandated and whether they adequately reward the risks associated with undertaking the investment. It also raises the issue of the ability of NRAs to commit to terms that preserve such incentives, and remain consistent over several review periods.

The return that is allowed ex ante on equity capital to finance NGA networks should strike a balance between providing adequate incentives for companies to invest (implying a sufficiently high rate of return), while at the same time promoting efficiency and sustainable competition and maximising consumer benefits (implying a rate of return that is not excessive). In order to achieve this balance, regulated

returns should compensate companies for the relevant (i.e. project-based and non-diversifiable) risks they face when making the investment.

The return that is allowed on equity capital (hereinafter the "required rate of return") should be based on a concrete pricing model built on realistic assumptions and rigorous implementation through an objectively verifiable methodology. The Capital Asset Pricing Model (CAPM) is an adequate instrument to calibrate such required rate of return. The CAPM equates the required rate of return to the sum of the risk-free rate and a risk premium, where the latter is defined as beta times the market risk premium. The CAPM is the most widely used methodology for calculating the cost of equity in regulatory pricing models¹⁵. However, other methods could be used if they are fully justified as meeting the same quality standards.

The required rate of return should be set bearing in mind the risks involved in making the particular investment. Systematic risk, i.e. risk that cannot be diversified away, should be estimated by recourse to regulatory precedent or by direct statistical and financial comparator methods such as the equity beta from firms outside the electronic communications sector providing comparable services (e.g. media companies).

In the context of the CAPM model, the required rate of return should be derived considering the potentially high measure of systematic or beta risk associated with the investment in question. One could thus expect that the required rate of return (and hence weighted average cost of capital or WACC) related to undertaking NGA investments will exceed that of typical utility and telecom companies. From this perspective, it should be noted that the nominal pre-tax WACCs for fixed and mobile operators have been roughly 8 to 12% in recent years depending on the Member State.

Market developments which imply that additional investments involve a different systematic risk will lead to an adjusted rate of return (and WACC) for those further investments.

The calibration of the revenue streams that will allow companies to achieve the WACC should take into account all dimensions of the project-specific capital employed, including appropriate labour costs and building costs¹⁶, the anticipated efficiency gains and the terminal value of the assets.

¹⁵ As observed by the ERG, whilst this methodology has some empirical shortcomings, "on the other hand, alternative models also have their own problems such as weak empirical foundations and empirical challenges. Therefore, at the moment CAPM is widely used for the purpose of calculating cost of equity." See Principles of Implementation and Best Practice for WACC calculation (www.erg.eu.int/doc/publications/erg_07_05_pib_s_on_wacc.pdf).

¹⁶ In accordance with recital 20 of the Access Directive.