

NGA Progress Report

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Note:

Throughout the report, decimal mark and thousands separator in the numbers follow the continental practice.

Management summary

[For a more extensive summary of the key findings and recommendations, refer to the concluding Section 5 of the study.]

1. The Digital Agenda for Europe sets far reaching and ambitious targets for the deployment and take-up of very high-speed broadband. At the present point in time, Europe is still far away from achieving these targets. In order to facilitate the deployment of NGA and to encourage investment in open and competitive networks the Commission adopted the *NGA Recommendation* to provide appropriate access remedies for an NGA environment.
2. The objective of this “NGA Progress Report” commissioned by ECTA is to describe the application of the *NGA Recommendation* in 17 countries, assess the state of competition, roll-out and take-up of very high speed broadband in these countries, examine the role of the *NGA Recommendation* in fostering competition and Digital Agenda targets, and make regulatory recommendations.

Key findings

Access to NGA networks

3. NRAs use a variety of approaches to FTTH regulation, which include
 - regulatory forbearance,
 - symmetrical fibre terminating access, combined with duct access,
 - SMP based terminating access, combined with local and/or regional wholesale broadband access,
 - access to the unbundled fibre loop at the MPoP, combined with local and/or regional wholesale broadband access.

Many of the approaches do not follow the *NGA Recommendation*, which – except otherwise justified - calls for a complete access ladder in case of SMP on the respective wholesale markets.

4. NRAs have followed more closely the *NGA Recommendation* in relation to FTTN/VDSL regulation, and many NRAs have imposed the full set of access remedies. New questions are however posed, where the SMP operator plans to deploy VDSL vectoring technology, which may conflict with sub-loop unbundling and requires a competitively neutral solution.
5. Where access to FTTN/VDSL and/or FTTH networks has been imposed, some NRAs have not applied all the relevant standards put forth in the *NGA*

Recommendation. Issues include the specification of aggregation points for physical access remedies, timely publication of a reference offer, cost orientation, *ex ante* margin squeeze tests, etc.

6. Even where access obligations have been imposed, there is no effective usage of NGA access, with only three exceptions:
 - In France, 30% of all fibre loops are based on terminating segment access.
 - In the Netherlands, 5-10% of fibre loops are unbundled at the MPoP.
 - In Germany, there is an identifiable number of VDSL wholesale broadband access (but likely smaller than 5%).

Thus wholesale NGA access is currently not a market reality.

7. The absence of effective access is in stark contrast to the legacy broadband market, where wholesale access remedies (local loop unbundling and ADSL wholesale broadband access) in most countries are effectively used and are characterized by higher usage numbers.

Competition in NGA

8. Because of the absence of access-based competition in NGA, SMP operators generally enjoy very high shares of retail VDSL lines and in several countries – where SMP operators have invested in fibre roll-out – also in retail FTTH lines. But even where ANOs have taken the lead in FTTH deployment, this does not result in a similar level of competition as has occurred in the legacy broadband market. As a result, the level of competition in the overall broadband market that has been achieved by access regulation (copper LLU and ADSL WBA) to date is effectively at stake.

NGA roll-out

9. Europe is still far away from its Digital Agenda target of NGA coverage. While this is clearly not satisfactory, there is no evidence that NGA regulation has had a negative effect on roll-out of fibre networks.
10. Two factors appear to be particularly important in relation to roll-out of fibre networks.
 - SMP operators predominantly react to the presence of cable operators by building out FTTN-VDSL networks and less so by investing into FTTH. At the same time, ANOs find it less commercially viable to invest into FTTH given the more limited addressable market.

- A major problem is the current pricing of the unbundled copper loop. As has already been pointed out in a recent WIK study, the current charges for unbundled copper loops tend to lead to a (significant) over-recovery of costs given the actual lifetime of the copper access network and its status of depreciation, which can provide a negative incentive for NGA investment of SMP operators.

NGA take-up

11. There is also a massive gap between the Digital Agenda 2020 target of 50 % of households to subscribe to 100 Mbps broadband and the penetration currently achieved. While the coverage of NGA networks achieved to date would allow for higher NGA penetration, take-up of NGA services remains low.
12. The absence of effective NGA access, and the associated lack of access-based competition in NGA, is likely to be a major reason for the low penetration in very high speed broadband. The absence of access-based competition seems to slow down migration of customers to higher speeds. This contrasts with legacy broadband services, where access-based competition was one of the major drivers of penetration (together with cable competition).

Major recommendations

13. NRAs should promote competition and progress towards the Digital Agenda targets by applying the *NGA Recommendation* more rigorously.

Unbundling of NGA networks

14. Where physical unbundling of FTTH networks at the MPoP is currently not technically feasible, as in the case of GPON fibre networks, NRAs should impose an obligation on the Market 4 SMP operator to provide a suitable alternative end-to-end solution or a viable virtual substitute (VULA). It should be ensured that the number of lines aggregated for unbundled access (physical or virtual) is sufficiently large to permit effective competition.
15. In order to ensure regulatory certainty, NRAs should also impose Wave Division Multiplexing (WDM) unbundling from now on, as some NRAs have already done, even though this form of unbundling is not immediately technically feasible.
16. Where copper sub-loop unbundling is not commercially viable at a larger scale, as appears to be the case in all countries, NRAs should impose an obligation on the Market 4 SMP operator to provide a viable virtual substitute (VULA).
17. The deployment of VDSL vectoring equipment at the street cabinet allows a substantial increase of transmission speeds, but may conflict with sub-loop

unbundling and collocating several operators in the street cabinet. If this is the case (further technological developments are possible), regulators should strive for a competitively neutral approach on how to deal with sub-loop unbundling, when VDSL vectoring is deployed.

Terms and price of NGA access

18. NRAs should ensure that SMP operators publish a reference offer specifying wholesale NGA products sufficiently in advance to enable ANOs to launch retail NGA services at the same time as the SMP operator. NRAs should also make sure that SMP operators use equivalent procedures and systems, when providing wholesale NGA services, and provide KPIs for both external and internal supply.
19. When regulating the prices of wholesale NGA products, NRAs should resort to pricing standards other than cost orientation only in the limited cases foreseen by the *NGA Recommendation*. *Ex ante* margin squeeze tests should be introduced in relation to all NGA products (including between each of the wholesale products along the rungs of the ladder of investment).

Price of copper access

20. We also reiterate the proposal made in a recent WIK study that above cost charges for unbundled local loops should be avoided unless there is some mechanism for excess charges to be used for funding fibre investment in a competitively neutral way.

Need for a coordinated approach of the Commission, BEREC and NRAs, with the involvement of all stakeholders

21. In order to ensure a consistent implementation across Europe of the proposals discussed, there is a clear need for a coordinated approach involving the Commission and BEREC as well as all stakeholders.

1 Introduction

The Digital Agenda for Europe (“DAE”) sets targets for the deployment and take up of very high-speed broadband.¹ The *Commission Recommendation on regulated access to Next Generation Access (NGA) networks* (“NGA Recommendation”) adopted in September 2010 performs a central element in achieving these targets: it aims “at promoting efficient investment and innovation in new and enhanced infrastructure, taking due account of the risks incurred by all investing undertakings and the need to maintain effective competition, which is an important driver of investment over time.”²

The objective of this “NGA Progress Report” commissioned by ECTA is to:

- describe the application of the *NGA Recommendation* more than one year after its adoption;
- assess the achievement of competition and better market outcomes (innovation/higher speeds, lower prices, greater availability and higher penetration);
- assess the progress towards 2020 DAE broadband targets, notably availability of and connection to very high-speed broadband networks;
- examine any links between the application of the *NGA Recommendation* and competition and other market outcomes, as well as progress towards DAE 2020 targets; and
- make recommendations on how competition can be improved and the DAE 2020 broadband goals promoted and better achieved.

NGA networks and very high speeds

NGA networks require optical fibre in the local access network. Depending on the extent of fibre usage in the access network, it is customary to distinguish:

- Fibre to the home (“FTTH”), where fibre is used up to the customers’ dwelling, including for the in-building wiring,
- Fibre to the building “FTTB”), where fibre is rolled out to the building, but copper, coax or LAN is used within the building;
- Fibre to the node (“FTTN”), where fibre is used up to a node (a street cabinet in a VDSL network or a last amplifier in a cable/DOCSIS³ network), but copper (in

¹ Commission (2010), A Digital Agenda for Europe COM(2010) 245 final2.

² Commission (2010), Recommendation on regulated access to Next Generation Access Networks 2010/572/EU (NGA Rec), Recital 2.

³ Data Over Cable Service Interface Specification.

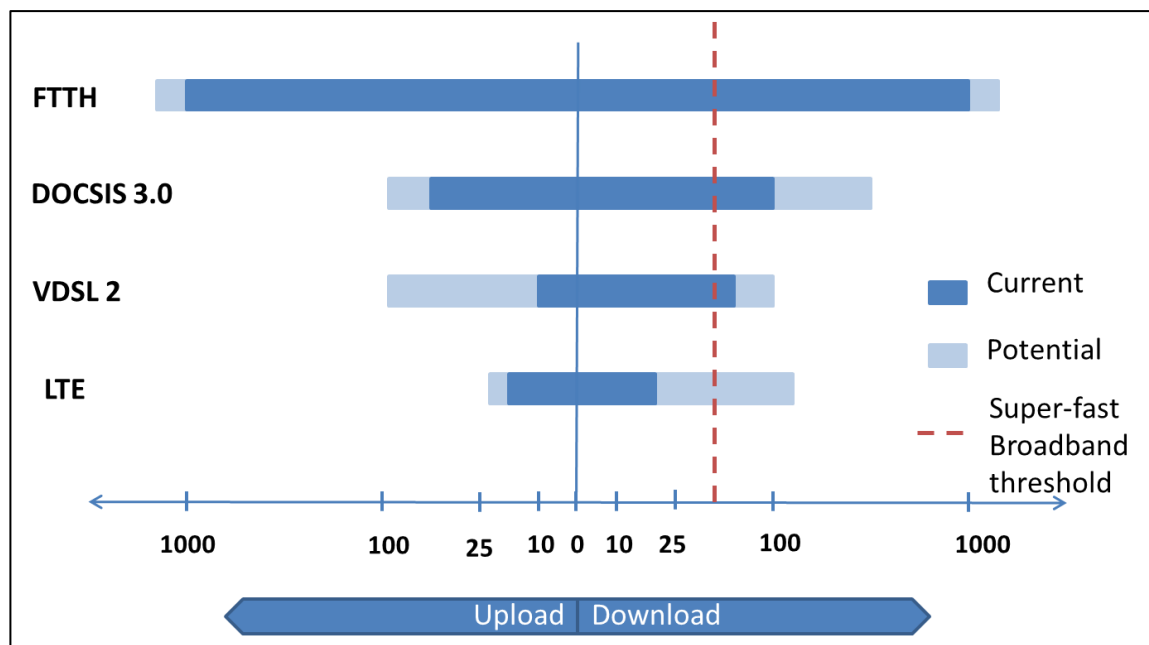
the VDSL network) or coax (in the cable/DOCSIS 3 network) is used in the final part of the access network.

The DAE targets refer to very high speed networks that provide download speeds of at least 30 Mbps. Upload speeds are also important for business customers, and are likely to become increasingly important for residential customers, as video sharing and services such as cloud computing (which require high upload capacities) become increasingly popular.

The key NGA technologies are capable of delivering the following speeds (see Figure 1):

- FTTH is already capable of download and upload speeds of up to 1 Gbps and more.
- FTTN/VDSL2 provides up to 50 Mbps.⁴ The upload speeds are currently significantly lower, reaching only 10 Mbps (and usually less).
- FTTN/DOCSIS 3.0 currently reaches download speeds of 100 Mbps (and in some countries 120 Mbps), whereas upload speeds are lower.

Figure 1: Technologies for very high-speed broadband (in Mbps)



Source: WIK partially adapted from Arthur D. Little (2011)

⁴ Vectoring technology being currently assessed by several operators may further increase VDSL speed.

For LTE technology, download and upload speeds lie in practice below 30 Mbps and are significantly affected by the degree to which capacity is shared between users; they are therefore not included in the present study.

It should be noted that speeds offered over NGA networks (and in particular, speeds over FTTN networks) may in practice be substantially lower and lie below 30 Mbps. In addition, the advertised (“headline”) speeds are usually not reached.

Application of the NGA Recommendation

National regulatory authorities (“NRAs”) are required to impose *ex ante* obligations on operators found to have significant market power (“SMP”) on identified markets. To target the competition problems related to SMP, namely those that result from the existence of access bottlenecks, NRAs can choose remedies from a menu provided by the *Access Directive*. Key remedies include:

- the provision of access,
- transparency,
- non-discrimination,
- accounting separation, and
- price control and cost accounting.

The *NGA Recommendation* sets out a common regulatory approach for access to NGA networks. Though not limited to SMP remedies, the prime focus of the *Recommendation* is on operators found to have SMP on Market 4 (wholesale physical network infrastructure access) and Market 5 (wholesale broadband access or “WBA”).

- The *NGA Recommendation* stipulates that a SMP operator on Markets 4 and 5 should provide access at all network levels. It is based on the continued validity of the ladder of investment principle and rules out regulatory holidays.
- In addition to mandatory access, the *NGA Recommendation* also provides for transparent, non-discriminatory and equivalent conditions of access.
- Finally, the *NGA Recommendation* asks for access prices to be cost-oriented (with limited exceptions) and free of margin squeezes.

Competition and other regulatory goals

The *NGA Recommendation*, in line with the goals of the EU regulatory framework, strives for the following major goals:

- Access regulation should promote competition on retail markets, such that these ultimately become effectively competitive.
- Regulation across the EU Member States should be consistent.
- More competition and consistent regulation should improve market outcomes and result in higher speeds, lower prices, wider availability and higher penetration of very high speed broadband offerings.

Policy (DAE) targets

A main building block of the DAE is to ensure the comprehensive availability and take-up of very high-speed Internet. The two relevant targets are:

- By 2020, broadband of 30 Mbps should be available to 100% of Europeans. Basic broadband should already be available to all EU citizens by 2013.
- By 2020, 50% of European households should be connected to at least 100 Mbps.

The *NGA Recommendation* can also be regarded as instrumental to achieve the DAE targets.

Scope of countries

The following countries are included in the study: Austria, Belgium, Denmark, France, Germany, Hungary, Ireland, Italy, Netherlands, Poland, Portugal, Romania, Spain, Sweden, UK (EU Member States), Turkey (EU accession country) and Switzerland. While the NGA Recommendation applies only to the EU Member States, it may also represent a benchmark for NGA regulation in other jurisdictions.

Sources

The study has used information and data from the following sources:

- Responses to a WIK questionnaire sent out to NRAs. All NRAs responded, with the exception of the Danish NRA, which at the time was in a process of restructuring. The information on NGA regulation in Denmark is based on public sources, as the Danish NRA could not participate in the survey.
- Responses of various ECTA member firms to the WIK questionnaire.
- Published data from various sources (European Commission, COCOM, OECD, FTTH Council/IDATE, ETNO, van Dijk, etc.)

Most information relates to October 2011 and takes account of remedies imposed at this time. The only exception is Italy, where in October 2011 remedies were still under consultation. The Italian NGA remedies have been adopted in January 2012 and are included in the study. NRAs were further consulted to check the accuracy of remedies and data contained in the report.

Structure of study

The study is structured as follows:

- Section 2 assesses the application of the *NGA Recommendation* one year after its adoption.
- Section 3 examines the market outcomes, notably the extent of competition (as reflected in market concentration) and the market performance achieved (prices, availability and penetration) in NGA and the overall broadband market, and analyses how the application of the *NGA Recommendation* has affected competition.
- Section 4 assesses the progress towards the DAE 2020 coverage and penetration goals, and analyses the impact of the *NGA Recommendation* on those targets.
- Section 5 summarizes the key findings and provides regulatory recommendations.

2 The application of the NGA Recommendation

2.1 What the NGA Recommendation requires

The *NGA Recommendation* is based on the continued validity of the ladder of investment principle in a NGA context and calls for access obligations at a wide range of access levels for operators found to have SMP in wholesale access to physical network infrastructure (Market 4) and wholesale broadband access (Market 5). These include:

- Access to civil engineering infrastructure (Recommend 13-17) across the full length of the access network, in all areas and across all segments, triggered by SMP in Market 4;
- Access to the fibre terminating segment (Recommend 18-21);
- Access to the fully unbundled fibre loop (Recommend 22-28), triggered by SMP in Market 4;
- Access to the unbundled copper sub-loop (Recommend 29-30), triggered by SMP in Market 4; and
- Wholesale broadband access to FTTx connections (Recommend 31-38), triggered by SMP in Market 5.

Full application of the *NGA Recommendation* requires for each of the above access levels the following:

- Provision of access, including ancillary measures such as colocation and backhaul;
- Obligations regarding non-price terms of access, comprising equivalence, non-discrimination and transparency;
- Obligations regarding the price of access, comprising cost orientation and absence of margin squeeze⁵ and provisions in relation to risk sharing; and
- Procedures for migrating to NGA access.

The application of the *NGA Recommendation* requires the prior finding of SMP. Where a NRA does not find SMP, the imposition of access obligations would not be justified. Relevant cases include the following:

⁵ Margin squeeze tests are not expressly prescribed at all levels.

- In four countries, NRAs have not found SMP in Market 5, either for a broadly defined national wholesale broadband access market (Romania) or, more narrowly defined, for the residential wholesale broadband access market (Austria) or for a subnational market (Portugal and UK). Absence of SMP in Market 5 implies that competition based on end-to-end infrastructures as well as Market 4 remedies (notably unbundling) is sufficiently strong such that wholesale broadband access does not need to be mandated. In the case of Austria, mobile broadband was considered to provide a further constraint on wholesale broadband access, in addition to unbundling.
- Likewise, if there is no SMP in Market 4, access remedies cannot be imposed in this market. So far, no NRA has found Market 4 to be effectively competitive. However, the *NGA Recommendation* explicitly mentions two cases, where fibre unbundling may not be imposed. Both cases are unlikely to emerge on a nationwide scale, but may potentially occur on limited subnational markets:
 - There is effective competition resulting from (i) the presence of several competing infrastructures in combination with (ii) competitive access offers on the basis of unbundling.⁶
 - There is effective competition resulting from multi-fibre cooperation models where (i) each party enjoys strictly equivalent and cost-oriented access to the joint infrastructure and (ii) the co-investors are effectively competing on the downstream market.⁷
- Similarly, the *NGA Recommendation* describes two cases where Market 5 remedies do not need to be imposed:
 - Effective competition resulting from effective access to the unbundled fibre loop of the SMP operator.⁸
 - Effective competition resulting from effective cooperation models, where (i) each party enjoys strictly equivalent and cost-oriented access to the joint infrastructure and (ii) the co-investors are effectively competing on the downstream market.⁹

In the following, the requirements of the *NGA Recommendation* and its implications are described in more detail. Section 2.1.1 sets out the obligations with regard to access, including ancillary measures. Section 2.2.2 and 2.2.3 look at the obligations with regard to non-price terms of access (transparency, equivalence and non-discrimination) and

⁶ NGA Rec Recommend 22 and Recital 20.

⁷ NGA Rec Recommend 28 and Recital 28.

⁸ NGA Rec Recommend 37.

⁹ NGA Rec Recommend 38.

pricing of access (cost orientation, risk sharing and *ex ante* screening of margin squeezes). Migration procedures are addressed in Section 2.2.4.

2.1.1 Obligations with regard to access, incl. ancillary measures

If Markets 4 and 5 are characterized by SMP findings, the *NGA Recommendation* in principle calls for access rungs at all levels. In order to ensure such access, access seekers will usually also need to be provided with colocation together with duct access and/or backhaul up to the access point (which may be a concentration point or an MPoP in case of fibre loop unbundling, a street cabinet in case of copper sub-loop unbundling, and a local or regional PoP in case of wholesale broadband access). The *NGA Recommendation* requires SMP operators to provide such types of services as ancillary to the access obligation. It should be noted that the imposition of backhaul should not be made dependent on other conditions being fulfilled. SMP operators in Market 4 are called upon to provide civil infrastructure access (including duct access), supplemented by backhaul measures, including fibre *and* Ethernet backhaul where appropriate, and not to make the provision of backhaul subject to duct access not being available.

There are cases, where the imposition of an access obligation may not be *technically* feasible. Two examples are noteworthy:

- Where duct access is not possible, because cable is directly buried into the ground or where there is no space left in ducts, the NRA should provide for an alternative, e.g., dark fibre.
- Where physical unbundling of the fibre loop at the MPoP is not technically feasible at an economically viable point, as is currently the case with GPON,¹⁰ the NRA may impose virtual unbundled access (VULA) that allows a maximum degree of freedom for the access seeker to define the parameters of its retail products and is priced in a similar way as passive infrastructure, that is, with a connection and monthly rental fee not differentiated by bandwidth. VULA is not expressly required in the *NGA Recommendation* if physical unbundling at the MPoP is not technically feasible, but its use has been accepted in the *Article 7* practice. As VULA involves a data stream, it is technically identical to a local wholesale broadband access product. It is justified to include VULA in Market 4 as long as access seekers would consider it to be a viable substitute to physical unbundling, i.e. it provides the same QoS, it is multicast enabled, and it aggregates a similar number of lines. It is, however, questionable whether the current VULA products, and in particular, their pricing qualifies them as viable substitutes.

¹⁰ GPON provides only for physical unbundling of the terminating segment.

The choice of remedies under Article 8 of the *Access Directive* is a matter of proportionality. This provides, but also limits the discretion of NRAs, when imposing remedies. It can be argued that it is precisely the purpose of the *NGA Recommendation* to narrow down the NRA's scope of discretion in accordance with the principle of proportionality. The following circumstances do not justify the non-imposition of access remedies:

- *De minimis deployment of NGA infrastructure by the SMP operator*: Where the SMP operator has started to roll-out FTTH, it should be in principle subject to the relevant access obligations. The *NGA Recommendation* does not provide for any *de minimis* threshold beyond which access is not recommended. Limiting access to legacy networks alone (local loop unbundling and wholesale broadband to ADSL connections), or ADSL and VDSL networks alone (including copper sub-loop unbundling and wholesale broadband access to VDSL connections) would not be compatible with the *Recommendation*.
- *Presumed negative effect of NGA access remedies on investment incentives*: Where there is SMP in Markets 4 and 5, it is unlikely that NGA access remedies would create negative effects on investments provided access is priced at a cost-oriented level, including an appropriate risk premium. Although the European regulatory framework establishes the obligation for NRAs to consider investment and innovation in the fulfillment of their tasks, the *NGA Recommendation* clearly does not offer to SMP operators a regulatory holiday for any form of NGA access for the purpose of providing investment incentives.

If there is SMP in Markets 4 and 5, the *NGA Recommendation* allows deviations only in the following circumstances,:

- *Lack of demand from alternative operators (e.g. access not economically feasible)*: Business models based on fibre terminating segment access, concentration point unbundling or copper sub-loop unbundling at the street cabinet may not be economically viable. Where there is a demonstrated lack of demand over the lifetime of a market review, an NRA may decide not to impose an access obligation. While this possibility exists, it requires compelling evidence.
- *Upstream NGA remedies sufficient to cope with competition problems*: Some NRAs believe that upstream remedies are sufficient to cope with competition problems in broadband access. E.g., they believe that the combination of duct access and fibre terminating segment access is sufficient to create competition and that fibre unbundling and fibre wholesale broadband access is not required. Others believe that, while fibre unbundling is required, this is sufficient, and fibre wholesale broadband access is not required in addition. The view is based on the assumption that, even in the presence of SMP in the relevant market (which

includes both legacy and NGA-based products), it is sufficient to impose access to ADSL and VDSL networks, while access to FTTH networks is not required. This possibility cannot be ruled out, but requires convincing evidence. The *Recommendation* expressly mentions two cases:

- NRAs may decide not to impose fibre unbundling, where the presence of several alternative infrastructures, such as FTTH networks and/or cable, in combination with competitive access offers, is likely to result in effective competition on the downstream level.¹¹
- NRAs may decide not to impose fibre wholesale broadband access, where there is effective access to the unbundled fibre loop of the SMP operator's network and such access is likely to result in effective competition on the downstream level.¹²

2.1.2 Obligations with regard to non-price terms of access (transparency, equivalence and non-discrimination)

The *NGA Recommendation* stipulates that access products should be offered on the basis of transparency, equivalence and non-discrimination. SMP operators should meet the following requirements:

- The SMP operator should provide access seekers with the same level of information on its access infrastructure as is available internally. Regarding civil infrastructure access, the SMP operator should provide the geographic location of, and available space in, ducts; geographic location of distribution points; and list of connected buildings. Regarding unbundling, the SMP operator should provide the geographic location of access points, available space for colocation, backhaul and duct access offers, etc.
- The SMP operator should provide ordering, provisioning and fault management systems that are equivalent to those provided internally. The SMP operator should publish Key Performance Indicators ("KPIs") for the external and internal provision of wholesale inputs and conclude Service Level Agreements ("SLAs") and Service Level Guarantees ("SLGs"). This is explicitly recommended for civil infrastructure access¹³ and fibre terminating access¹⁴. Though not explicitly mentioned, it should also be applicable to access to the unbundled fibre loop in case of FTTH, access to the copper sub-loop at the street cabinet in case of FTTN as well as wholesale broadband access.

¹¹ NGA Rec Recommend 22.

¹² NGA Rec Recommend 37.

¹³ NGA Rec Recommend 13 and Annex II/3.

¹⁴ NGA Rec Recommend 19 and Annex II.

- The SMP operator should offer wholesale broadband access products that make its NGA retail products replicable. It should make new WBA products available at least six months before the SMP operator or its retail subsidiary markets its own corresponding NGA retail services.¹⁵
- The SMP operator should publish terms and conditions and prices for the access services in a reference offer.

2.1.3 Obligations with regard to price terms (cost orientation, risk sharing and ex ante screening of margin squeezes)

The *NGA Recommendation* calls for cost-oriented prices for all wholesale NGA products and requires *ex ante* monitoring of margin squeezes. More specifically, prices for the various types of NGA should meet the criteria outlined below.

Civil infrastructure access

The SMP operator should charge cost oriented prices for civil infrastructure access taking into account actual lifetimes and depreciation.

Access to FTTH networks

The SMP operator should charge cost oriented prices for access to the fibre terminating segment, which are consistent with the methodology used for unbundled copper loops and which are adjusted for higher risk, if appropriate. Though not expressly mentioned in the *NGA Recommendation*, discounts for up-front commitments (early co-investment) should be within this logic.

In case of access to unbundled fibre loops at the MPoP, the SMP operator should charge cost oriented prices, where the prices reflect the costs of an efficient operator, and any risk premium is justified by an additional risk related to FTTH investment. The SMP operator may offer discounts for long-term commitment and volume, where the discounted prices are appropriately adjusted for risk.¹⁶ In case of volume discounts, a single level is called for, where the volume required should take account of (i) the estimated minimum operating scale necessary for an access seeker efficiently to compete in the market and (ii) the need to maintain a market structure with a sufficient number of qualifying operators to ensure effective competition.¹⁷ The volume discount should reflect the penetration already achieved, that is, it should be lower for already penetrated areas. It should be noted that the SMP operator may also offer collective discounts based on overall FTTH penetration achieved.

¹⁵ NGA Rec Recommend 32.

¹⁶ By implication, a risk adjusted discounted price cannot be lower than the cost oriented price without risk adjustment.

¹⁷ NGA Rec Recommend 26 and Annex I.

In case of FTTH, the SMP operator should also demonstrate on an *ex ante* basis the absence of a margin squeeze between the price of access to the unbundled fibre loop, the price of wholesale broadband access and the retail price prior to (i) launch of a new access product or prices and (ii) launch of discounts for long-term contracts and volume.¹⁸ The methodology for the margin squeeze test should be specified in advance by the NRA and based on the costs of a reasonably efficient competitor.¹⁹

Access to FTTN/VDSL networks

In case of copper sub-loop unbundling, the SMP operator should charge cost oriented prices, where the prices reflect the costs of an efficient operator, and the risk profile is not different from that of existing copper infrastructure.

For wholesale broadband access to FTTN/VDSL connections, the SMP operator should charge cost oriented prices, where the prices reflect the costs of an efficient operator and differences in bandwidth and quality. Cost-orientation is deemed not to be necessary to achieve effective competition under certain circumstances, e.g. where functional separation or other forms of separation have guaranteed equivalence of access²⁰.

The SMP operator should also demonstrate on an *ex ante* basis the absence of a margin squeeze between the price of access to the unbundled copper sub-loop, the price of wholesale broadband access to VDSL connections and the retail price prior to (i) launch of a new access product or prices and (ii) launch of discounts for long-term contracts and volume.²¹ The methodology for the margin squeeze test should be specified in advance by the NRA and based on the costs of a reasonably efficient competitor.

2.1.4 Migration procedures

The *NGA Recommendation* provides for migration procedures that allow ANOs to switch from legacy to NGA-based access products.

- The SMP operator should provide information on planned changes to network topology and copper switch-off that allows competitors to adjust their own networks and network extension plans²². The SMP operator should inform access seekers in a timely fashion about any network modification plans (i) that are likely to affect the competitive conditions in a given market or sub-market

¹⁸ NGA Rec Recommend 27.

¹⁹ NGA Rec Recital 26.

²⁰ NGA Rec Recommend 36.

²¹ NGA Rec Recommend 27, 36.

²² NGA Rec Recommend 41.

and (ii) to enable them to adjust their own network and network extension accordingly²³.

- The SMP operator should inform competitors no less than five years before decommissioning of points of interconnection such as the local loop exchange²⁴. Any exceptions to the above rule should be justified on the basis of (i) an agreement between the SMP operator and competitors on an appropriate migration path and/or (ii) an offer of fully equivalent access at the point of interconnection by the SMP operator.²⁵
- The SMP operator should design systems and procedures (including operational support systems) to facilitate the switching of alternative providers to NGA-based access products.²⁶

2.2 How NRAs have applied the NGA Recommendation

Section 2.2.1 assesses the application of the *NGA Recommendation* with regard to the provision of access at various levels. Sections 2.2.2 and 2.2.3 look at its application with regard to non-price terms and pricing of access. Migration procedures are addressed in Section 2.2.4.

2.2.1 Obligations with regard to access, incl. ancillary measures

2.2.1.1 Access to FTTH networks

According to the *NGA Recommendation*, NRAs should in principle impose access to FTTH networks provided SMP has been found in the market for wholesale physical network access (Market 4) and wholesale broadband access (Market 5). In fact, SMP on Markets 4 and 5 is widespread across the countries studied. In all countries assessed, NRAs have found SMP in Market 4 and, with four exceptions, there is also SMP in Market 5. No SMP has been found in Romania (throughout), Austria (residential market), and Portugal and the UK (subnational market covering dense areas).

The *NGA Recommendation* assumes that unbundled fibre and wholesale broadband access to FTTH connections are included in the respective Markets 4 and 5. Nevertheless, in 4/17 countries, NRAs have not yet included unbundled fibre loops in the definition of Market 4 (Belgium, Denmark, Switzerland, Turkey). In 3/17 countries, fibre WBA is not included in the definition of Market 5 (Belgium, Switzerland, Turkey). In some cases, such as Belgium, the non-inclusion of fibre in the market was justified by

²³ NGA Rec Recommend 39.

²⁴ NGA Rec Recommend 39.

²⁵ NGA Rec Recommend 39.

²⁶ NGA Rec Recommend 39.

the regulator on the basis that fibre was not present in the market. Not including fibre products in Markets 4 and 5 has regularly led the Commission to express critical comments, when the draft measures were notified.

Where there is SMP, NRAs have applied the *NGA Recommendation* to considerably varying degrees. Countries may roughly be categorized into four groups (see Figure 2):

1. *Countries with regulatory forbearance*: 7/17 of the countries surveyed have not imposed any remedies with regard to FTTH unbundling (Austria, Belgium, Denmark, Ireland, Romania, Switzerland and Turkey). 6/7 of these countries have also not imposed fibre WBA (the exception is Denmark).²⁷ Moreover, 6/7 of these countries have not imposed duct access across the full length of the access network, including duct access between cabinets and customer premises (the exception is Switzerland).
2. *Countries with symmetrical fibre terminating access*: In 3/17 countries, separate legislation has been used to require access to FTTH networks at the level of terminating segment or in-building wiring on a symmetrical basis, i.e. not related to a prior finding of SMP. The countries are France, Spain and Portugal. In France, the location of access has been determined (this differs depending on whether the area is dense or non-dense). Note that, in Spain²⁸ and Portugal²⁹, access requirements relate to in-building wiring only (any technology). All three countries have imposed duct access, including access to ducts between street cabinet and the customer's premises. Fibre WBA has been imposed in Spain, but only for speeds up to 30 Mbps. Fibre WBA is not available in France. In Portugal, proposals have recently been made to mandate it in certain areas.³⁰

²⁷ With regard to Turkey, based on ICTA Board Decision of 3 October 2011, Turk Telekom is "to comply with its own commitment, in which it pledged to provide wholesale resale and bitstream services over its fibre network in a non-discriminatory manner and to notify ICTA of the tariffs for these services before they become operational".

²⁸ According to CMT, symmetrical measures were imposed in February 2009, aimed at promoting and facilitating sharing of fibre deployments within and near buildings. Such measures are valid for buildings without common telecommunications infrastructures (those built before 1998). They establish that operators (actually the first operator) that deploy in-building fibre wirings shall meet all reasonable requests for access. In addition, operators are obliged to agree with third parties the procedures, technical constraints, prices and timings with regard to the provision of access to the fibre facilities installed. In Spain, the access obligation applies from the last concentration point, which can be outside the building (e.g. single dwellings).

²⁹ According to ANACOM, in Portugal, the Decree-Law no. 123/2009 imposes the set-up of fibre optics in the scope of the infrastructures for telecommunications in buildings, by sharing of the new (or upgraded) infrastructure within the building. The first operator to reach a (already built) building has to install at least two fibres per flat and associated infrastructure to be shared with other operators (e.g. vertical infrastructure and ODF). This issue is also regulated in the installation of telecommunications infrastructure, both in buildings, including the connection of infrastructure to the public networks (ITED), and in housing developments, urban settlements and concentrations of building (ITUR) Manuals.

³⁰ See http://www.anacom.pt/streaming/doc_consulta_MercadGrossista4_5.pdf?contentId=1116435&field=ATTACHED_FILE

3. *Countries with asymmetrical fibre terminating access:* 3/17 countries have imposed unbundled access to FTTH networks at the first concentration point determined according to the architecture of the SMP operator (Germany, Hungary, Poland). None of these countries has imposed unbundled access at the MPoP that would be currently feasible. Germany and Hungary have imposed Wave Division Multiplexing ("WDM"), once technically feasible, which is still an uncertain perspective. Poland has made unbundling at the MPoP conditional to duct access and dark fibre not being available. While Hungary and Poland have imposed duct access across the full length of the access network, this is not the case for Germany. According to BNetzA, there is no space available in the ducts between cabinet and the customers' premises. All three countries have imposed fibre WBA at both local and regional level.

4. *Countries with FTTH unbundling at MPoP (physical or other form):* 4/17 countries have imposed unbundled physical access or alternative forms of access at the MPoP. Two of these countries have imposed physical fibre unbundling at the MPoP (Netherlands, Sweden). 2/17 countries have imposed alternatives in the form of virtual unbundled access (UK) and a so-called end-to-end access service (Italy).³¹ In Austria, a VULA product has been introduced on a voluntary basis. In order to be considered as viable substitutes, such alternative solutions would need to be comparable in terms of quality of service and price. Among the four countries, only Italy has imposed concentration point unbundling.³² Fibre WBA access has been imposed in Italy, Sweden and (partially) the UK, while in the Netherlands no such access has been imposed.

³¹ According to AGCOM's final decision Telecom Italia is obliged to provide unbundling services at the local exchange level (MPoP) once feasible (P2P/WDM GPON); in any case, the incumbent is mandated to provide also an end-to-end service.

³² Italy has imposed on the SMP operator an obligation to provide access to the terminating segment irrespective of the technology used within buildings (fibre in case of FTTH, copper in case of FTTB).

Figure 2: Access to FTTH networks (as imposed in Oct. 2011)

Access to FTTH networks (as imposed in Oct. 2011)				
SMP in Market 4	Duct access across full access network	FTTH unbundling		MPOP
		Term. segm. or concentration point		
Countries with currently no FTTH unbundling ¹				
BE	Yes ²			
IE	Yes ¹			
TR	Yes ²			
AT	Yes ¹			
RO	Yes ¹			
CH	Yes ²	Yes		
DK	Yes ²	Only between MDF and Street Cabinet		
Countries with symmetrical fibre terminating access				
FR	Yes ¹	Yes	Yes (symmetrical)	
PT	Yes ¹	Yes	Yes (symmetrical)	
ES	Yes ¹	Yes	Yes (symmetrical)	
Countries with asymmetrical fibre terminating access				
DE	Yes ¹	Only between MDF and Street Cabinet ⁶		
HU	Yes ¹	Yes	Yes	
PL	Yes ¹	Yes	Yes	
Countries with FTTH unbundling at MPOP (physical or other)				
IT	Yes ¹	Yes	Yes (1/2012)	Yes (e2e) (1/2012)
UK	Yes ¹	Yes		Yes (VULA)
NL	Yes ¹			Yes (P2P)
SE	Yes ¹			Yes (P2P)

SMP in Market 5	Local WBA to FTTH connections	Regional WBA to FTTH connections
Countries with currently no FTTH unbundling ¹		
BE	Yes ⁴	
IE	Yes ³	
TR	Yes ⁴	
AT	No (res.) ³	
RO	Yes (non-res.) ³	
CH	No ³	
DK	Yes ⁴	Yes
Countries with symmetrical fibre terminating access		
FR	Yes ³	
PT	No ("C" area) ³	
ES	Yes ("NC" area) ³	Yes (up to 30 Mbps)
Countries with asymmetrical fibre terminating access		
DE	Yes ³	Yes
HU	Yes ³	Yes ⁵
PL	Yes ³	Yes
Countries with FTTH unbundling at MPOP (physical or other)		
IT	Yes ³	Yes (1/2012)
UK	No (high density) ³	VULA available
NL	Yes ³	Yes
SE	Yes ³	Yes

¹ Fibre is included in the definition of Market 4.

² Fibre is not included in the definition of Market 4.

³ Fibre is included in the definition of Market 5.

⁴ Fibre is not included in the definition of Market 5.

⁵ According to the NRA, in Hungary, because of the geographic size of the country, WBA to FTTH connections is provided at national - and not at a regional - level.

⁶ According to the NRA, in Germany, there are no known ducts between Street Cabinet and homes.

Source: NRA questionnaires (except for DK), BEREC, WIK

According to the *NGA Recommendation*, not mandating access can only be justified in very limited circumstances. These do not seem to exist in many cases as is explained below.

Civil infrastructure access

8/17 countries have not imposed civil infrastructure access (including duct access). Another 2/17 have only imposed duct access for subsets of the access network.

Not imposing a civil infrastructure access obligation is justified, where cable is directly buried into the ground. This seems to be the case for large parts of the access network in the Netherlands and Belgium.³³ Another reason for not imposing duct access may exist if space is generally unavailable. This has been argued by BNetzA with regard to the ducts between cabinet and customer premises in Germany.

In all other cases, not mandating duct access across the full length of the access network does not seem to be justified and is incompatible with the *NGA Recommendation*. In particular, limited demand (as stated by the Swedish regulator) does not seem to be a valid justification for not imposing civil infrastructure access as per the *NGA Recommendation*. Furthermore, duct access should be imposed in its own right and not be limited to an ancillary service to sub-loop unbundling.

Access to the terminating segment

10/17 countries have not imposed an obligation to provide access to the terminating segment in case of FTTH. Not mandating access may be justified in some cases:

- No FTTH deployment during the market review period (as was argued by the Belgian regulator).
- The wiring inside buildings is not owned by the SMP operator (as put forward by Sweden and UK),

In turn, the *NGA Recommendation* does not seem to allow abstaining from termination segment unbundling based on the argument that a more downstream remedy exists (unbundling at the MPoP) and demand is expected to be limited.

A case apart is Romania, where a high degree of platform competition exists, and where the extent of competition is largely independent of wholesale access measures.

The aggregation points at which ANOs can access fibre terminating segments are an important issue. Despite their significance for the effectiveness of access remedies and relevance to competition, the location of access points for terminating segment access has often not been determined (see Table 1). These have been specified only in France

³³ Both countries provide for an alternative and mandate dark fibre backhaul.

and, by default, in Spain and Portugal (since in these two countries terminating segment access relates only to in-building wiring), while in other countries they remain undefined. NRAs should ensure that the number of lines aggregated for fibre terminating access is sufficiently large to permit effective competition. A previous WIK study has shown that the nature of access points is fundamental in determining viable market structures.³⁴

Table 1: Aggregation points in FTTH networks, mid 2011

	Minimum Lines Terminating Segment	Minimum Lines Access at MPoP
AT	No access	No access
BE	No access	No access
CH	No access	No access
DE	Not determined	No access
DK	No access	No access
ES	(Access only to in-building wiring)	No access
FR	1000*	No access
HU	Not determined	No access
IE	No access	No access
IT	Not determined	na
NL	No access	Average 2500-3000
PL	na	No access
PT	(Access only to in-building wiring)	No access
RO	No access	No access
SE	No access	na
TR	No access	No access
UK	No access	(Access at or close to MDF)

* Actual minimum number of lines

Source: NRAs; WIK-Consult

Access to the unbundled fibre loop at the MPoP

13/17 countries have not imposed an obligation of FTTH unbundling at the MPoP. Only 2/17 countries have imposed physical access to the unbundled fibre loop (Netherlands, Sweden) and 2/17 countries have imposed alternatives (Italy, UK).³⁵

Lack of MPoP unbundling can only be considered justified in the following cases:

- *There is no FTTH deployment:* The Belgium and Austrian NRA have argued that this was the case in their countries.

³⁴ See Elixmann, D., Ilic, D., Neumann, K.H. and Plückebaum, T., The Economics of Next Generation Access. Study for ECTA, Bad Honnef 2008.

³⁵ In Austria, VULA has been introduced as a voluntary offer.

- *The imposition of a physical access obligation is technically not feasible, because of the roll-out of a GPON network by the SMP operator.* In this case, it can be argued that there should be a substitute until GPON unbundling becomes technically feasible. This reflects the Article 7 practice, even though the *NGA Recommendation* requires fibre unbundling at the MPoP independent of the technology deployed.³⁶ VULA in the UK, and the new end-to-end service in Italy in theory may represent such a temporary alternative, but that needs to be judged upon the technical characteristics and pricing of these services.³⁷ In Germany, Hungary and Poland, no such temporary alternative has been imposed as a Market 4 remedy. It should, however, be noted that, in all three countries, a local wholesale broadband access product has been imposed in Market 5, which - once it becomes a market reality - may be similar to the VULA product introduced in the UK.
- *Relying on more upstream NGA remedies is considered sufficient to create competition at the retail level:* The French regulator e.g. considers that symmetric access to the fibre terminating segment, together with duct access, is sufficient to foster infrastructure competition in the retail broadband market. Whether symmetric access to the fibre terminating segment, in fact, is sufficient to foster competition is debatable and needs to be further monitored. The location of the aggregation point may be particularly important in assessing the extent to which such measures might support competition in retail markets.
- A case apart is Romania, where a *high degree of platform competition* exists, and where the extent of competition is largely independent of wholesale access measures.

In all other cases, not imposing access appears to be in conflict with the *NGA Recommendation*. In particular, FTTH unbundling at the MPoP cannot be made conditional to duct access and dark fibre not being available (as in Poland³⁸). Although the European regulatory framework establishes the obligation for NRAs to consider investment and innovation in the fulfillment of their tasks, the *NGA Recommendation* does not offer to SMP operators a regulatory holiday for FTTH unbundling (as has been provided for in Turkey).

As for terminating segments, the aggregation points at which ANOs can access unbundled fibre loops are of great importance and need to be determined in advance. They are defined, where point-to-point architectures exist (Netherlands and Sweden).

³⁶ NGA Recommendation Recital 21.

³⁷ According to the final decision of AGCOM, Telecom Italia is obliged to provide unbundling services at the local exchange level once feasible (P2P/WDM GPON). In any case, the incumbent is mandated to provide the end-to-end service.

³⁸ The Polish NRA has pointed out that ANOs will most frequently use dark fibres in the particular loop (dark fibres are installed almost everywhere).

The VULA product in the UK appears to imply a connection at or close to the MDF (see Table 1 above).

Wholesale broadband access to FTTH connections

Local WBA to FTTH connections is not imposed in 13/17 countries (in the UK there is a similar VULA product imposed in Market 4). Regional WBA to FTTH connections is not mandated in 9/17 countries.

Note that in 4/17 countries there is no SMP in Market 5 (or in a particular product or subnational market) and thus the imposition of a remedy is not required.

Lack of WBA in the presence of SMP can only be considered justified, where there exists substantiated evidence that upstream NGA remedies are sufficient to create competition at the retail level. Two NRAs (Netherlands, France) argue that upstream NGA remedies in Market 4 are sufficient to cope with competition problems in broadband Internet access. It is debatable whether this is the case (see also section 3) and would need to further monitored.

In all other cases, not imposing WBA to FTTH in the presence of SMP on Market 5 may not be in compliance with the *NGA Recommendation*.

2.2.1.2 Access to FTTN/VDSL networks

According to the *NGA Recommendation*, NRAs should also impose access to FTTN/VDSL networks provided SMP has been found in the market for wholesale physical network access (Market 4) and wholesale broadband access (Market 5). As noted before, in all countries assessed, there is SMP in Market 4 and, except in four countries, there is also SMP in Market 5 (the exceptions being Romania and partially Austria, Portugal and UK).

The *NGA Recommendation* assumes that copper sub-loops and WBA to FTTN/VDSL connections are included in the respective markets. This practice is followed by all NRAs.

Regarding access to FTTN/VDSL networks, there are 2 types of approaches (see Figure 3):

- a. *Countries with no sub-loop unbundling at the street cabinet:* 2/17 countries have not imposed sub-loop unbundling (Belgium and Ireland). Among the two countries in this group, Ireland currently also does not impose wholesale broadband access to VDSL connections, although this is under consideration. The Belgian NRA has abandoned sub-loop unbundling in 2011 to facilitate the

planned deployment of vectoring technology in the street cabinet by the SMP operator.

- b. *Countries with sub-loop unbundling at the street cabinet:* 15/17 countries have imposed sub-loop unbundling (Austria, Denmark, France, Germany, Hungary, Italy, Netherlands, Poland, Portugal, Romania, Spain, Sweden, Switzerland, Turkey, UK). In addition, Austria and the UK offer a VULA type service. Most of the countries in this group have also imposed wholesale broadband access to VDSL connections. Exceptions, where wholesale broadband access to VDSL connections has not been imposed despite a SMP finding, are Switzerland (throughout) and Portugal (in less dense areas). Further exceptions are Romania (where SMP has not been found in Market 5), Austria (where SMP has not been found in WBA to residential broadband connections) and Portugal and the UK (where SMP has not been found in WBA to broadband connections in dense areas).

A priori, access to the copper sub-loop and wholesale broadband access to VDSL connections must be imposed. There are very limited circumstances, where a decision to refrain from imposing access can be justified, as we discuss below.

Access to the copper sub-loop

2/17 countries have not imposed an obligation of sub-loop unbundling (Belgium and Ireland). Among these countries, Ireland has not yet defined its approach to NGA regulation. Belgium, which had originally imposed an obligation of sub-loop unbundling, recently abandoned it.

Whilst no exclusions are foreseen in the *NGA Recommendation*, the Article 7 practice suggests that the lack of a sub-loop unbundling obligation could be considered justified, where there is a demonstrated lack of market demand (e.g., no business case for ANOs). According to the IBPT, this is the case in Belgium. The Belgian regulator has also argued that VDSL vectoring is currently incompatible with sub-loop unbundling, whilst the Dutch regulator has suggested that vectoring could be used as justification for rejecting requests for sub-loop unbundling. In its comments letter on the Belgium case, the Commission questioned this reasoning.³⁹

³⁹ The Commission recalled that, in accordance with the principles established in the NGA Recommendation, whenever SMP is found in the Market 4, “NRAs should, as a matter of principle, impose an appropriate set of remedies which includes, in case of FTTC deployment, unbundled access to the copper sub-loop.” The Commission acknowledged, however, that in the Belgium case “there appears to be sufficient evidence to sustain that it is neither justified nor proportional to impose such remedy, since there is currently a lack of demand for SLU products and the imposition of such remedy could hamper the NGA investment strategy of Belgacom and thus run counter to the need to promote and ensure sustainable investment in the development of high-speed networks.” See Commission decision concerning Case BE/2011/1227: Wholesale physical network infrastructure access at a fixed location.

Wholesale broadband access to FTTN/VDSL connections

Local WBA to FTTN connections is not imposed in 12/17 countries. Regional WBA to FTTH connections is not offered in 4/17 countries.

Note again that in 4/17 countries there is no SMP in Market 5 (or in a particular product or subnational market) and thus the imposition of a remedy is not required.

Not imposing VDSL WBA can only be considered justified, where there exists substantiated evidence that upstream NGA remedies are sufficient to create competition at the retail level. This, by implication, is the case, where NRAs have not found SMP on (parts of) Market 5 (Austria, Portugal, Romania, UK).

In contrast, it is questionable, whether in the presence of SMP in Market 5, wholesale broadband access to VDSL connections at local and regional level is not required (as regulators have assumed in Ireland and Switzerland).

Figure 3: Access to FTTN/VDSL networks (as imposed in Oct. 2011)

Access to FTTN/VDSL networks (as imposed in Oct. 2011)				
SMP in Market 4	Sub-loop unbundling	SMP in Market 5	Local WBA to FTTN connections	Regional WBA to FTTN connections
Countries with currently no subloop unbundling				
IE	Yes	Yes	Yes	Yes
BE	Yes	Yes	Yes	Yes
Countries with subloop unbundling				
CH	Yes	Yes	No ("C" area)	No ("C" area)
PT	Yes	Yes	Yes ("NCI" area)	Yes ("NCI" area)
AT	Yes	Yes	No (residential)	Yes (non-residential)
DE	Yes	Yes	Yes	VULL available
DK	Yes	Yes	Yes	Yes
ES	Yes	Yes	Yes	Yes (up to 30 Mbps)
FR	Yes	Yes	Yes	Yes
HU	Yes	Yes	Yes	Yes
IT	Yes	Yes	Yes	Yes (1/2012)
NL	Yes	Yes	Yes	Yes (1/2012)
PL	Yes	Yes	Yes	Yes
RO	Yes	No	Yes	Yes
SE	Yes	Yes	Yes	Yes
TR	Yes	Yes	Yes	Yes
UK	Yes	Yes (high density) Yes (lower density)	Yes (high density) Yes (lower density)	Yes (high density) Yes (lower density)

Note: Wholesale broadband access to VDSL connections is included in the definition of Market 5 in all countries.

Source: NRA questionnaires (except for DK), BEREC, WIK

2.2.2 Obligations with regard to non-price terms of access (transparency, equivalence and non-discrimination)

2.2.2.1 Access to FTTH networks

In most countries, where access to FTTH networks (terminal segment access and unbundling of the fibre loop at the MPoP) has been imposed on the SMP operator, NRAs have imposed additional obligations with regard to non-price terms of access.

Figure 4 gives an overview of the scope of transparency, equivalence and non-discrimination obligations using the grouping of countries introduced in Figure 2.

When interpreting the results, the following should be noted:

- The information is based on the answers of NRAs.
- It is unclear whether NRAs have interpreted “equivalence” of ordering, provisioning and fault management systems in the strict sense as stipulated by the *NGA Recommendation*.
- Key Performance Indicators (KPIs) differ between countries and do not always include external and internal KPIs.

Figure 4: Equivalence, non-discrimination and transparency of access to FTTH networks (as imposed in Oct. 2011)

Equivalence, non-discrimination, transparency - access to FTTH networks (as imposed in Oct. 2011)								
SMP in Market 4		Duct access across full access network	FTTH unbundling		SMP in Market 5	Local WBA to FTTH connections	Regional WBA to FTTH connections	
			Term. segm. or concentration point	MPOP				
Countries with currently no FTTH unbundling								
BE	Yes				Yes		BE	
IE	Yes				Yes		IE	
TR	Yes				Yes		TR	
AT	Yes				No (res.)		AT	
RO	Yes				Yes (non-res.)		RO	
CH	Yes	O&P, KPI, RO			No		RO	
DK ¹	Yes				Yes		CH	
Countries with symmetrical fibre terminating access								
FR	Yes	O&P, KPI & SLA, RO	O&P, KPI & SLA, RO		Yes		FR	
PT	Yes	KPI & SLA, RO	no equivalence principles enforced		No ("C" area)		PT	
ES	Yes	O&P, KPI & SLA, RO	KPI & SLA		Yes ("NC" area)	O&P, KPI & SLA, RO	ES	
Countries with asymmetrical fibre terminating access								
DE	Yes	Between MDF & Street Cabinet: O&P, SLA	O&P		Yes	./.	O&P, SLA	DE
HU	Yes	O&P, KPI, RO	O&P, KPI & SLA, RO (process not finished)		Yes	O&P, KPI & SLA	O&P, KPI & SLA	HU
PL	Yes	O&P, KPI & SLA, RO	O&P, KPI & SLA		Yes	O&P, KPI & SLA	O&P, KPI & SLA	PL
Countries with FTTH unbundling at MPOP (physical or other)								
IT	Yes	O&P, KPI & SLA, RO (1/2012)	O&P, KPI & SLA, RO (1/2012)	O&P, KPI & SLA, RO (1/2012)	Yes	O&P, KPI & SLA, RO (1/2012)	O&P, KPI & SLA, RO (1/2012)	IT
UK	Yes	RO		O&P, KPI & SLA, RO	No (high density)			UK
NL	Yes			O&P, KPI & SLA, RO	Yes (lower density)			NL
SE	Yes			KPI & SLA, RO	Yes		KPI & SLA, RO	SE

¹ Denmark could not participate to the survey. Therefore no detailed information on the equivalence of the access remedies available.

Abbr.: O&P: Ordering & Provisioning procedures equivalent to those provided internally
KPI: Key Performance Indicators for internal and external supply

SLA: Service Level Agreements w/wo penalties
RO: Reference Offer access included into existing RO or publication of a new RO)

Source: NRA questionnaires (except for DK), BEREC, WIK

Civil infrastructure access

Among the 8 countries, where the SMP operator is obliged to offer duct access across the full length of the access network, the SMP operator also has to:

- provide ordering, provisioning and fault management systems that, according to the NRA, are equivalent to those provided internally in 6/8 countries;
- publish service level reports with internal and/or external KPIs in 7/8 countries and conclude SLAs in 5/8 countries; and
- publish a reference offer in 8/8 countries.

Access to the terminating segment in case of FTTH

In the 7 countries, where the SMP operator is mandated to offer access to the terminating segment (either based on a finding of SMP in Market 4 or as part of a symmetrical approach), the SMP operator also has to:

- provide ordering, provisioning and fault management systems that, according to the NRA, are equivalent to those provided internally in 5/7 countries;
- publish service level reports with internal and/or external KPIs in 5/7 countries and conclude SLAs in 5/7 countries; and
- publish a reference offer in 3/7 countries.

Access the unbundled fibre loop at the MPoP

Among the four countries where the SMP operator is obliged to offer access to the unbundled fibre loop at the MPoP, the SMP operator also has to:

- provide ordering, provisioning and fault management systems that, according to the NRA, are equivalent to those provided internally in 3/4 countries;
- publish service level reports with internal and/or external KPIs in 4/4 countries and conclude SLAs in 4/4 countries; and
- publish a reference offer in 4/4 countries.

WBA to FTTH connections

In the 7 countries⁴⁰ where the SMP operator has been obliged to offer regional WBA access to FTTH connections, the SMP is also obliged to:⁴¹

⁴⁰ Denmark is excluded from the counts.

- provide ordering, provisioning and fault management systems that, according to the NRA, are equivalent to those provided internally in 6/7 countries;
- publish service level reports with internal and/or external KPIs in 6/7 countries and conclude SLAs in 7/7 countries; and
- publish a reference offer in 3/7 countries.

Where access is mandated, there is little justification not to enforce transparency and non-discrimination through equivalent ordering and provisioning procedures, KPIs and SLAs and reference offers.

2.2.2.2 Access to FTTN/VDSL networks

NRAs have also mandated additional obligations with regard to non-price terms of access, where access to FTTN/VDSL networks has been imposed on the SMP operator.

Figure 5 gives an overview of the scope of transparency, equivalence and non-discrimination obligations using the grouping of countries introduced in Figure 3.

When interpreting the results, the same qualifications as before apply, namely:

- The information is based on the answers of NRAs.
- It is unclear whether NRAs have interpreted “equivalence” of ordering, provisioning and fault management systems in the strict sense as stipulated by the *NGA Recommendation*.
- Key Performance Indicators (KPIs) differ between countries and do not always include external and internal KPIs.

41 Where wholesale broadband access to FTTH connections is mandated at local level, the obligations may be differ from regional wholesale broadband access.

Figure 5: Equivalence, non-discrimination and transparency of access to FTTN/VDSL networks (as imposed in Oct. 2011)

Equivalence, non-discrimination, transparency - access to FTTN/VDSL networks (as imposed in Oct. 2011)				
SMP in Market 4		Sub-loop unbundling		
Countries with currently no subloop unbundling				
IE	Yes			
BE	Yes			
Countries with subloop unbundling				
CH	Yes	O&P, KPI, RO		
PT	Yes	KPI & SLA, RO		
AT	Yes	(physical and vULL) O&P, KPI ¹ & SLA, RO		
DE	Yes	O&P, SLA, RO ²		
DK ³	Yes			
ES	Yes	no specific procedures due to lack of demand		
FR	Yes	O&P, KPI & SLA, RO		
HU	Yes	O&P, KPI, RO (process not finished)		
IT	Yes	O&P, KPI & SLA, RO (1/2012)		
NL	Yes	O&P, KPI & SLA, RO		
PL	Yes	O&P, KPI & SLA, RO		
RO	Yes	O&P, KPI & SLA, RO		
SE	Yes	KPI & SLA, RO		
TR	Yes	O&P, SLA, RO		
UK	Yes	KPI & SLA, RO		

SMP in Market 5				
Local WBA to FTTN connections		Regional WBA to FTTN connections		
Countries with currently no subloop unbundling				
IE	Yes			
BE	Yes	O&P, KPI & SLA, RO	O&P, KPI & SLA, RO	
Countries with subloop unbundling				
CH	Yes			
PT	No ("C" area) Yes ("NC" area) No (residential)			
AT	Yes (non-residential)		O&P, KPI & SLA, RO	
DE	Yes	./.	O&P, SLA, RO	
DK	Yes			
ES	Yes		O&P, KPI & SLA, RO	
FR	Yes		O&P, KPI & SLA, RO	
HU	Yes		O&P, KPI & SLA	
IT	Yes	O&P, KPI & SLA, RO (1/2012)	O&P, KPI & SLA, RO (1/2012)	
NL	Yes		O&P, KPI & SLA, RO	
PL	Yes	O&P, KPI & SLA	O&P, KPI & SLA	
RO	No			
SE	Yes		KPI & SLA, RO	
TR	Yes		O&P, SLA, RO	
UK	No (high density) Yes (lower density)		O&P, KPI & SLA, RO	

¹ Austria: KPIs delivered to NRA, not published

² Germany: Access to the sub-loop is part of the reference offer for ULL

³ Denmark could not participate to the survey. Therefore no detailed information on the equivalence of the access remedies available.

Abbr.: O&P: Ordering & Provisioning Procedures equivalent to those provided internally
KPI: Key Performance Indicators for internal and external supply

SLA: Service Level Agreements
w/wo penalties
RO: Reference Offer access
included into existing

Source: NRA questionnaires (except DK), BEREC, WIK

Access to the unbundled sub-loop at the street cabinet

Among the 14 countries,⁴² where the SMP operator is obliged to offer sub-loop unbundling, the SMP operator is obliged to:

- provide ordering, provisioning and fault management systems that, according to the NRA, are equivalent to those provided internally in 10/14 countries;
- publish service level reports with internal and/or external KPIs in 11/14 countries and conclude SLAs in 11/14 countries; and
- publish a reference offer in 13/14 countries.

Wholesale broadband access to FTTN/VDSL connection

In the 12 countries,⁴³ where the SMP operator is mandated to provide regional WBA access to FTTN connections, the SMP operator is also obliged to:⁴⁴

- provide ordering, provisioning and fault management systems that, according to the NRA, are equivalent to those provided internally in 11/12 countries;
- publish service level reports with internal and/or external KPIs in 10/12 countries and conclude SLAs in 12/12 countries; and
- publish a reference offer in 10/12 countries.

Where access is mandated, there is little justification not to enforce transparency and non-discrimination through equivalent ordering and provisioning procedures, KPIs and SLAs, and reference offers. We note that the NRA in Spain has not imposed specific procedures in relation to equivalence due to a lack of demand for sub-loop unbundling. However, this is not expressly allowed for by the *NGA Recommendation*. Regulator should ascertain that the lack of demand does not reflect the absence of transparent and non-discriminatory access conditions.

2.2.3 Obligations with regard to price terms (cost orientation, risk sharing and ex ante screening of margin squeezes)

2.2.3.1 Access to FTTH networks

Where access to FTTH networks has been imposed on the SMP operator, NRAs – to varying degrees – have imposed obligations with regard to pricing of access. Figure 6

⁴² Denmark is excluded from the counts.

⁴³ Denmark is excluded from the counts.

⁴⁴ Where wholesale broadband access to VDSL connections is mandated at local level, the obligations may be differ from regional wholesale broadband access.

gives an overview on the scope of obligations regarding cost orientation, risk sharing and *ex ante* screening for margin squeezes.

Figure 6: Cost orientation, risk sharing, and ex ante margin squeeze tests for access to FTTH networks (as imposed in Oct. 2011)

Cost orientation - access to FTTH networks (as imposed in Oct. 2011)				
SMP in Market 4		FTTH unbundling		
Duct access across full access network		Term. segm. or concentration point	MPOP	
Countries with currently no FTTH unbundling				
BE	Yes			
IE	Yes			
TR	Yes			
AT	Yes			
RO	Yes			
CH	Yes	co		
DK ⁵	Yes			
Countries with symmetrical fibre terminating access				
FR	Yes	co (TD-FDC)	reasonable, risk premium ¹	
PT	Yes	co	reasonable	
ES	Yes	co	reasonable	
Countries with asymmetrical fibre terminating access				
DE	Yes	Between MDF & Street Cabinet: co	co, ms	
HU	Yes	co (TD-LRIC)	co (TD-LRIC)	
PL	Yes	co	co	
Countries with FTTH unbundling at MPOP (physical or other)				
IT	Yes	co (BU-LRIC) ² ms (1/2012)	co (BU-LRIC) ² ms (1/2012)	co (BU-LRIC) ² ms (1/2012)
UK	Yes	co		fair & reasonable ⁴
NL	Yes			co (DCF), risk premium, ms
SE	Yes			co (LRIC)

SMP in Market 5		Local WBA to FTTH connections	Regional WBA to FTTH connections
BE	Yes		
IE	Yes		
TR	Yes		
AT	No (res.)		
RO	Yes (non-res.)		
CH	No		
DK	Yes		
Countries with symmetrical fibre terminating access			
FR	Yes		
PT	No ("C" area)		
ES	Yes ("NC" area)		co, ms
Countries with asymmetrical fibre terminating access			
DE	Yes	ms	ms
HU	Yes	co (TD-LRIC)	RM ⁶
PL	Yes	co	co
Countries with FTTH unbundling at MPOP (physical or other)			
IT	Yes	co (LRIC ³), ms (1/2012)	co (LRIC ³), ms (1/2012)
UK	No (high density)		
NL	Yes (lower density)		no cost orientation
SE	Yes		co (hybrid LRIC)

¹ France: Tariff of monthly rental per access includes a premium, compared to the tariff of those operators which co-invest

² Italy: FDC until implementation of BU-LRIC

³ Italy: Cost orientation only in "non competitive areas". Such areas will be defined by AGCOM in a future proceeding

⁴ UK: No cost orientation obligation for VULA. Service to be provided on fair and reasonable terms, condition and charges

⁵ Denmark could not participate to the survey. Therefore no detailed information on the cost orientation of the access remedies available.

⁶ Hungary: RM price setting method is applied on the national WBA level.

Abbr.: co: cost-orientation

TD: Top down

LRIC: Long-run incremental costs

RM: Retail Minus

BU: Bottom-up

FDC: Fully distributed costs

ms: margin squeeze test

Source: NRA questionnaires (except DK), BEREC, WIK

Civil infrastructure access

In all countries, where civil infrastructure access is imposed across the full length of the access network, cost orientation is required, although with different cost standards (8/8 countries).

Information provided by NRAs did not allow carrying out a benchmark for duct access prices. To make prices comparable, the effective monthly price per used cm² and meter of length would need to be calculated, with one-off charges distributed over an average lifetime of 30 years (360 months).

Symmetric access to the fibre terminating segment

In the three countries, where symmetric access to the fibre terminating segment is imposed, prices are required to be reasonable and do not need to be cost oriented (3/3 countries).⁴⁵

Again, information provided by NRAs did not allow carrying out a benchmark for prices of terminating segments.

Access the unbundled fibre loop at concentration point and MPoP

In 6/7 countries where FTTH unbundling at the concentration point and/or MPoP is imposed as an SMP obligation, prices are required to be cost oriented. The exception is the UK, where VULA prices only need to be fair and reasonable. In 3/7 countries, NRAs require *ex ante* margin squeeze tests.

Prices for access at the MPoP are set as follows: (see Figure 7):

- In Sweden, the basic connection charge for a fibre line amounts to € 46,46⁴⁶, and the monthly rental charge is € 13,52⁴⁷. If the connection charge is distributed over 24 months, the effective monthly price is € 15,46.
- In the Netherlands, the regulator has set a price cap of € 14,86 – 17,94 for the monthly rental charge per line. The actual prices currently charged by Reggefiber are as follows: The connection charge for the unbundled fibre loop amounts to € 102,52, and the monthly rental charges lies between € 12,30 – € 15,38.⁴⁸ If the connection charge is distributed over 24 months, the effective monthly prices lie between € 16,57 and € 19,65.

⁴⁵ In Spain, an obligation of reasonable prices has been imposed. Operators are autonomous to negotiate and conclude agreements. The regulator is empowered to resolve disputes in cases, where conflicts with regards to pricing issues may arise.

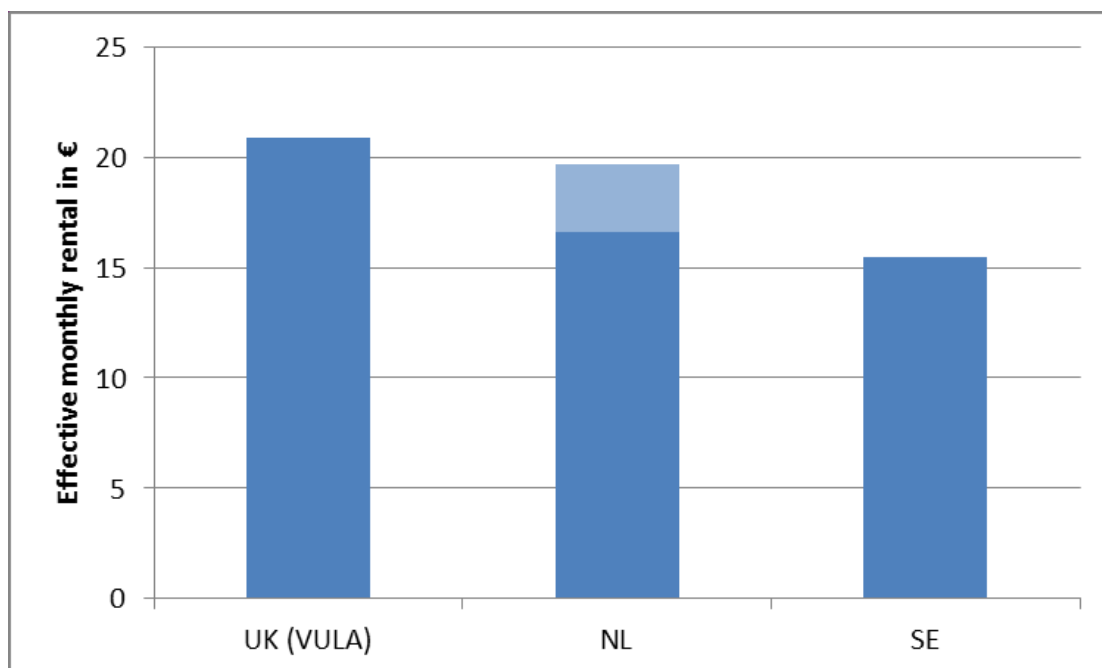
⁴⁶ The connection charge depends on whether fibre already is rolled out and the type of technical work required.

⁴⁷ For fibre to a detached house.

⁴⁸ Depending on the location.

- In the UK, the connection charge for VULA amounts to € 93,44, while the monthly rental charge is € 16,97.⁴⁹ It should be noted that VULA, according to Ofcom, is an incremental product to LLU and cannot be purchased on its own. The customer first needs to purchase Wholesale Line Rental (WLR) or LLU (monthly rental LLU: € 8,91 + monthly rental VULA: € 8,06). If the charges for the unbundled loop are also taken into account, and the connection charges are distributed over 24 months, the effective monthly price is € 20,86. It should be noted that the charges for FTTH/B VULA in the UK are not directly comparable with the charges for fibre unbundling in Sweden and Netherlands, because the large majority of NGA lines in the UK to which VULA currently provides access are FTTN/VDSL enabled rather than FTTH/B lines (FTTH/B lines in the UK are currently minimal).
- In Italy, prices for the alternative e2e access were not determined at the time of the survey.

Figure 7: Effective monthly prices for access to the unbundled fibre loop at the MPoP (in € per month), 2011



Note: Connection charges are distributed over 24 months.

The two colours for NL reflect the range of charges.

Source: NRA questionnaires

⁴⁹ Rate of exchange used: £ 1 = € 1,168 from 7.12.2011.

WBA to FTTH connections

In the 4/6 countries,⁵⁰ where WBA to FTTH connections is imposed, cost orientation is required. The exceptions are Germany and Hungary. In Germany, the WBA price would need to pass an *ex ante* margin squeeze test. In Hungary, cost orientation is only required at local level, while at regional level the WBA price is determined using a retail-minus approach.

2.2.3.2 Access to FTTN/VDSL networks

Where access to FTTN/VDSL networks has been imposed on the SMP operator, NRAs have also imposed obligations with regard to pricing of access. Figure 8 gives an overview on the scope of obligations regarding cost orientation, risk sharing and *ex ante* screening for margin squeezes.

⁵⁰ Denmark (no information) and the UK (FTTH-WBA to lower density areas is essentially non-existent) are excluded from the counts.

Figure 8: Cost orientation, risk sharing, and ex ante margin squeeze tests for access to FTTN/VDSL networks (as imposed in Oct. 2011)

Cost orientation - access to FTTN/VDSL networks (as imposed in Oct. 2011)				
SMP in Market 4	Sub-loop unbundling	SMP in Market 5	Local WBA to FTTN connections	Regional WBA to FTTN connections
Countries with no subloop unbundling				
IE	Yes	Yes		
BE	Yes	Yes	co (BU-LRIC), ms	co (BU-LRIC), ms
Countries with subloop unbundling				
CH	Yes	Yes		
PT	Yes	No ("NC" area)		
AT	Yes	No ("NC" area)		
DE	Yes	Yes (non-residential)	co, ms	RM, ms
DK ⁸	Yes	Yes		
ES	Yes	Yes		co (BU-LRIC planned), ms
FR	Yes	Yes		co (TD-FDC) ³
HU	Yes	Yes	co (TD-LRIC)	RM ⁷
IT	Yes	Yes	co (LRIC ⁶), ms (1/2012)	co (LRIC ⁶), ms (1/2012)
NL	Yes	Yes		co (TD-EDC/FDC), ms
PL	Yes	Yes	co	co
RO	Yes	No		
SE	Yes	Yes		co (LRIC+)
TR	Yes	Yes		no obligation ⁵
UK	Yes	No (high density) Yes (lower density)		no co

¹ Austria: Prices are minimum of retail-minus and FL-LRAIC. Currently retail-minus is binding

² Germany: Margin squeeze test part of ex-ante rate approval

³ France: Cost-orientation is mandated only in areas where there is no unbundling

⁴ Spain: Due to lack of demand, no specific procedures and no specific prices for access to copper sub-loops have been defined

⁵ Turkey: Turk Telekom pledged to provide wholesale resale and bitstream services over its fibre network in a non-discriminatory manner and to notify ICTA of the tariffs for these services before they become operational

⁶ Italy: Final decision adopted in 1/2012. Cost orientation to be mandated only in "non competitive areas". Such areas will be defined by AGCOM in a future proceeding

⁷ Hungary: RM price setting method is applied on the national WBA level.

⁸ Denmark could not participate to the survey. Therefore no detailed information on the cost orientation of access remedies available.

Abbr.: co: cost-orientation

TD: Top down

LRIC: Long-run incremental costs

RM: Retail Minus

BU: Bottom-up

FDC: Fully distributed costs

ms: margin squeeze test

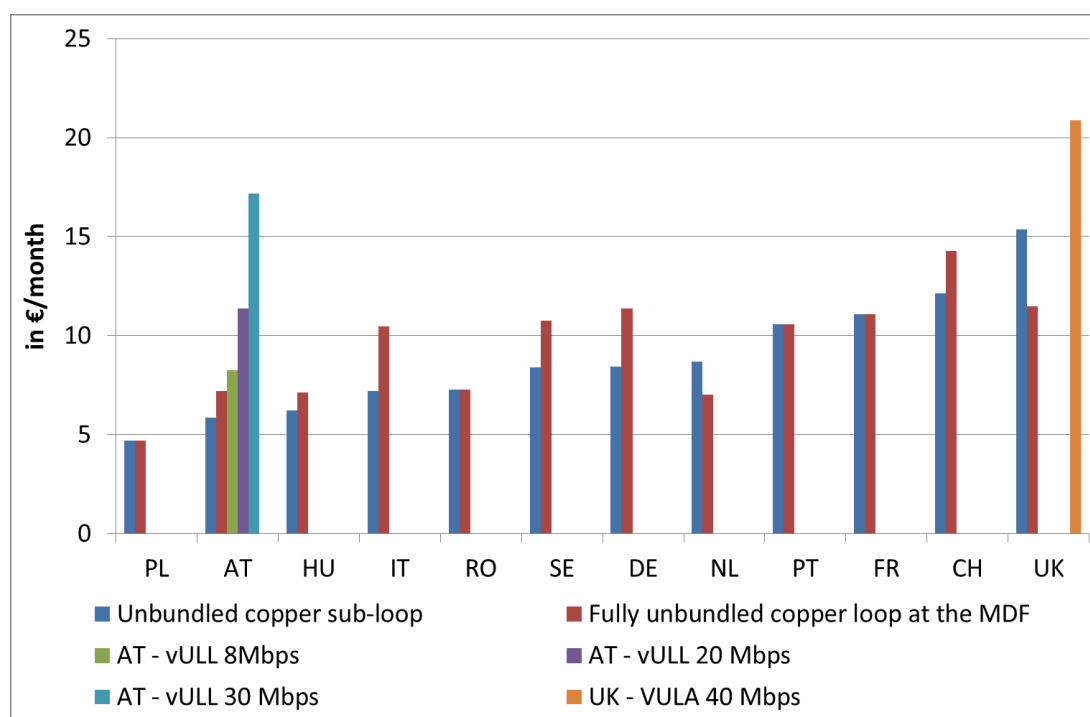
Source: NRA questionnaires (except DK), BEREC, WIK

Access to the unbundled copper sub-loop at street cabinet

In 14 countries,⁵¹ where copper sub-loop unbundling is imposed, prices are required to be cost oriented. In roughly a third of the cases (5/14 countries), they are tested for margin squeeze on an *ex ante* basis.

Figure 9 provides a comparative overview of prices of access to the unbundled copper sub-loop. For comparison, the price of access to the fully unbundled loop (at the MDF) is also included. The Figure shows the effective monthly prices if the connection fee is distributed over 24 months. The countries are ranked in the order of the price of the unbundled sub-loop. The price of the unbundled sub-loop is lowest in Poland, followed by Austria and Hungary. The highest prices of the unbundled sub-loop can be found in Switzerland and the UK.

Figure 9: Effective prices for unbundled copper sub-loop and fully unbundled copper loop as VULA (in € per month), 2011



Note: The connection charge is distributed over 24 months and added to the monthly charge.

Source: WIK-Questionnaires 2011

In the Netherlands and the UK, the copper sub-loop is actually more expensive than the copper loop at the MDF. Ofcom noted that connection costs are higher in the case of sub-loop unbundling, because the engineer has to travel to the street cabinet, whereas with LLU the work is in the local exchange, and these are either manned or frequently

⁵¹ Denmark is excluded from the counts.

visited. In addition, the price of the unbundled sub-loop may also include mark-ups. In the case of the Netherlands, project costs and a part of the collocation costs are included in the sub-loop charge.

Figure 9 also shows the prices for the Austrian and UK VULA products. Note that the prices for VULA are not directly comparable with prices for physically unbundled sub-loops, because they also cover the costs of active electronic components (e.g., DSLAM).

- The virtual unbundled loop (“vULL”) (as it is called in Austria) is priced by bandwidth like a local WBA product. The price for the higher bandwidths is substantially above the level of the unbundled sub-loop. Because of the bandwidth-dependency and the high prices, it is debatable whether it is a valid substitute for sub-loop unbundling.
- In the UK, VULA also provides access to FTTN/VDSL connections. As noted above, the connection charge for VULA amounts to € 93,44, while the monthly rental charge is € 16,97.⁵² VULA is an incremental product to LLU and cannot be purchased on its own. The customer first needs to purchase Wholesale Line Rental (WLR) or LLU (monthly rental LLU: € 8,91 + monthly rental VULA: € 8,06). If the charges for the unbundled loop are also taken into account, and the connection charges are distributed over 24 months, the effective monthly price is € 20,86. Again the high price of VULA renders it debatable whether it is a valid substitute for the unbundled sub-loop.⁵³

Wholesale broadband access to FTTN/VDSL connection

In 8/12 countries,⁵⁴ where regional WBA to FTTN connections is imposed, prices are required to be cost-oriented.⁵⁵ Turkey and the UK have not imposed obligations with regard to the pricing of WBA to FTTN connections. Austria and Hungary (in the case of regional WBA connections) rely on the retail-minus methodology for setting prices. In half (6/12) of the countries, prices are tested for margin squeeze on an *ex ante* basis.

2.2.4 Migration procedures

Migration procedures imposed on the SMP operator vary between countries (Figure 10):

- In 13/17 countries, the SMP operator is obliged to provide information on planned changes regarding its network topology and copper-switch-off. In two of

⁵² Rate of exchange used: £ 1 = € 1,168 from 7.12.2011.

⁵³ Note that both forms of access are available contemporaneously.

⁵⁴ Denmark is excluded from the counts.

⁵⁵ Where local WBA is imposed, obligations may differ.

the countries, where there was no such obligation (Germany and UK), the NRAs have argued that a migration path has not been imposed as no decommissioning of the copper networks was expected at least during the current market review period.⁵⁶

- In 7/17 countries, the SMP operator is obliged to inform competitors no less than five years before decommissioning of points of interconnection (Belgium, France, Portugal, Spain, Hungary, Italy, Sweden). In Switzerland and the Netherlands, the date of notification for the SMP operator to provide such information is two years in advance. Only 2/9 countries not imposing the five year limit principle have provided a justification in compliance with the *NGA Recommendation*. The Romanian NRA states that the SMP operator offers a fully equivalent access at the point of interconnection.
- In 10/17 countries, the ANOs and NRAs have been informed in a timely fashion of network modification plans. The Dutch regulator stated that there has not been a dispute in this regard.
- In 7/17 countries, NRAs report that the SMP operator has designed systems and procedures to facilitate the switching of alternative providers to NGA-based access products. It is interesting to note that in countries which have imposed FTTH unbundling at the MPoP, or an alternative to unbundling, the SMP operator does not offer systems and procedures to facilitate switching.

⁵⁶ See also BEREC (2011), Report on the Implementation of the NGA-Recommendation BoR (11) 43, p.75.

Figure 10: Migration procedures (as imposed in Oct. 2011)

	SMP operator obliged to provide information on planned changes to network topology and copper switch-off	SMP operator obliged to inform no less than 5 years before decommissioning the points of interconnection	Agreement on an appropriate migration path	Offer of fully equivalent access	Have ANOs/NRA been informed in timely fashion of any network modification plans	Has the SMP operator designed systems and procedures to facilitate switching
BE	Yes	Yes	not specified	not specified	Yes	Yes
IE	Yes	no	not specified	not specified	not specified	not specified
TR	Yes	no	not specified	not specified	no	no
AT	Yes	no	no	no	Yes	Yes
RO	Yes	no	no	Yes	Yes	not applicable
CH	no	no	not specified	not specified	not specified	not specified
DK ¹	not specified	not specified	not specified	not specified	not specified	not specified

Countries with symmetrical fibre terminating access

FR	Yes	Yes	no	no	Yes	Yes
PT	Yes	Yes	Yes	Yes	Yes	Yes
ES	Yes	Yes	Yes	no	Yes	Yes

Countries with asymmetrical fibre terminating access

DE	no	no	no	no	no	Yes
HU	Yes	Yes	Yes	not specified	Yes	Yes
PL	Yes	no	no	no	Yes	no

Countries with FTTH unbundling at MPoP (physical or other)

IT	Yes (1/2012)	Yes (1/2012)	Yes (1/2012)	Yes (1/2012)	Yes (1/2012)	no
UK	no	no	no	no	Yes	no
NL	Yes	no	Yes	Yes	not applicable	no
SE	Yes	Yes	Yes	no	not specified	not specified

¹ Denmark could not participate to the survey. Therefore no detailed information available.

Source: NRA questionnaires (except for DK), BEREC, WIK.

2.2.5 Effective usage of access

The formal imposition of access remedies through a regulatory decision must be followed by an effective implementation of the measures. Only if a relevant share of the SMP operator's lines is purchased on a wholesale basis, the remedies can be said to be effectively implemented.

2.2.5.1 Access to FTTH networks

As noted above, access to FTTH networks is only imposed in a subset of countries. Moreover, as is shown in Table 2, even where imposed, with two exceptions, access to FTTH networks is in practice not available, not at the level of terminating segments, not at the level of unbundling at the MPoP, and also not at the level of wholesale broadband access.

Access to the terminating segment of fibre loops / concentration point unbundling

In the three countries with symmetrical fibre terminating access, there appears to be effective usage in France (according to ARCEP 30% of all FTTH lines are based on fibre terminating access). There is no data available for Spain and Portugal.⁵⁷

In none of the four countries, where concentration point unbundling has been imposed on the SMP operator, there is relevant usage (Germany, Hungary, Italy⁵⁸ and Poland).

Access to the unbundled fibre loop at the MPoP

Regarding fibre loop unbundling at the MPoP, the only relevant usage is in the Netherlands, where 5-10% of the SMP operator's FTTH lines are provided to competitors on an unbundled basis. In Sweden and in the UK, the usage share is less than 1%.

WBA to fibre connections

In none of the countries surveyed is WBA to fibre connections effectively available. There is no relevant usage of this wholesale service.

⁵⁷ Note again that, in Spain and Portugal, the symmetric obligation relates only to in-building wiring (any technology).

⁵⁸ Note for Italy that, in mid-2011, there could not have been a positive usage number, because the regulatory decision was only adopted in January 2012.

Table 2: Share of unbundled fibre loops and fibre WBA lines of total number of FTTH lines of the SMP operator (in %), mid 2011

	Access to the unbundled fibre loop at the MPoP (incl. VULA and e2e)	Wholesale broadband access to FTTH connections	total
AT	No access	Partially no access ¹	0,0%
BE	No access	No access	0,0%
CH	No access	No access	0,0%
DE	No access	0,0%	0,0%
DK	No data available ²	No data available ²	No data available ²
ES	No access	0,0%	0,0%
FR	No access	No access	0,0%
HU	No access	0,0%	0,0%
IE	No access	No access	0,0%
IT ⁷	0,0% ⁷	0,0% ⁷	0,0% ⁷
NL	5-10% ³	No access	5-10%
PL	No access	0,0%	0,0%
PT	No access	No access	0,0%
RO	No access	No access ⁴	0,0%
SE	<1% ⁶	No data available	No data available
TR	No access	No access	0,0%
UK	<1%	Partially no access ⁵	<1%

Notes:

¹ AT: No WBA to residential connections imposed, because absence of SMP in relevant market.

² DK: Denmark could not participate in the survey.

³ NL: 15-20% if wholesale provision by Reggefiber is included.

⁴ RO: No WBA imposed, because absence of SMP in relevant market.

⁵ UK: No WBA in higher density areas imposed, because absence of SMP in relevant subnational market.

⁶ SE: Estimate based on operator information.

⁷ IT: In October 2011, access regulation was still under consultation; access remedies imposed in January 2012.

Source: NRA questionnaires; operator questionnaires

2.2.5.2 Access to FTTN/VDSL networks

Access remedies in relation to FTTN/VDSL are more often imposed than in the case of FTTH. But again, even when imposed, access to FTTN/VDSL networks is in practice not available, as is shown in Table 3.

Access to the unbundled sub-loop at the street cabinet

Access to the unbundled sub-loop is imposed in 14/17 countries, but in none of these countries are there any relevant usage numbers. In most countries, this may be explained by a lack of demand from ANOs. In many countries, there does not appear to be a viable business model, except perhaps for the highest-density areas. But even in such areas, sub-loop unbundling is not effectively used. The question here is whether non-discriminatory access is effectively ensured.

WBA to FTTN/VDSL connections

The picture is similar with regard to WBA to VDSL connections. For some countries, NRAs could not report access figures, but we presume that figures in these countries are also not more than *de minimis*, including in the Netherlands, where OPTA reports the usage to be 0-5%. The only likely exception with an identifiable number of VDSL WBA lines is Germany.

Table 3: Share of unbundled sub-loops and VDSL WBA lines of total number of FTTN/VDSL lines of the SMP operator (in %), mid 2011

	Access to the unbundled sub-loop	Wholesale broadband access to VDSL connections	total
AT	0,0%	Partially no access ¹	0,0%
BE	No access	No data available	1,0 % ⁸
CH	0,0%	No access	0,0%
DE	No data available	No data available	8,1% ²
DK	No data available ³	No data available ³	No data available ³
ES	0,0%	No data available ⁶	44,7% ⁶
FR	No FTTN/VDSL roll-out	No FTTN/VDSL roll-out	No FTTN/VDSL roll-out
HU	0,0%	No data available ⁴	No data available
IE	No access	No access	0,0%
IT	No FTTN/VDSL roll-out	No FTTN/VDSL roll-out	No FTTN/VDSL roll-out
NL	0,0%	0-5%	0-5%
PL	0,0%	No data available	No data available
PT	0,0%	No data available	No data available
RO	0,0%	No access ⁵	0,0%
SE	0,0%	No data available	No data available
TR	0,0%	0,5%	0,5%
UK	<1%	Partially no access ⁷	No data available

Notes: ¹ AT: No WBA to residential connections imposed, because absence of SMP in relevant market.

² DE: Estimate provided by BNetzA. Note that ANOs using fully unbundled local loops to provide VDSL from the MDF are included in this figure. Based on operator information, there is also an identifiable number of VDSL WBA lines. The total share of wholesale NGA lines (SLU and VDSL-WBA) is below 5%.

³ DK: Denmark could not participate in the survey, therefore no information available.

⁴ HU: No information available, because RUO approval is underway.

⁵ RO: No WBA imposed, because absence of SMP in relevant market.

⁶ ES: No disaggregated information available for wholesale broadband access. Total estimate provided by CMT. Note that ANOs using fully unbundled local loops to provide VDSL from the MDF are included in this figure. The actual number of VDSL-WBA lines is likely to be very small or zero, and the total share of wholesale NGA lines (SLU and VDSL-WBA) is likely to be close to 0% rather than 44,7%

⁷ UK: No WBA in higher density areas imposed, because absence of SMP in relevant subnational market.

⁸ BE: No disaggregated information available for wholesale broadband access. Total estimate provided by BIPT. Note that ANOs using fully unbundled local loops to provide VDSL from the MDF are included in this figure.

Source: WIK-Questionnaires 2011; WIK

3 The impact of the NGA Recommendation on competition

3.1 What competition requires

The *NGA Recommendation* aims at “*promoting efficient investment and innovation in new and enhanced infrastructure, taking due account of the risks incurred by all investing undertakings and the need to maintain effective competition, which is an important driver of investment over time.*”⁵⁹ While the study cannot provide a full-blown market analysis across 17 countries, it broadly assesses the level of competition achieved at the retail level, and the impact of the *NGA Recommendation* on competition. The following indicators are used:

- *Market concentration*: The market structure is conducive to competition if market concentration is sufficiently low. We consider this to be the case if the market share of the leading operator is less than 50%⁶⁰ and if there are at least three more relevant operators. The leading operator at the retail level is usually the operator found to have SMP at the wholesale level, i.e. on Market 4 (wholesale physical network access) and Market 5 (wholesale broadband access). Note that, for simplicity, we use the term “SMP operator” throughout, even though it may not be dominant in the relevant retail market.
- *Barriers to entry*: In the absence of effective access regulation, barriers to entry in electronic communications markets are high given the advantages of the SMP operator from vertical integration, economies of scale, scope and density in combination with sunk costs. Effective access regulation can substantially lower barriers to entry and make retail broadband markets effectively competitive. We thus measure barriers to entry essentially by the level of effective access usage achieved.
- *Prices*: Competitive markets drive prices towards cost. While the study cannot assess the cost orientation of retail broadband services, we will compare countries in terms of the prices charged for retail broadband products.
- *Availability and take-up of broadband access*: Innovation and good quality are a reflection of competitive markets, notably reflected in the availability and take up of very high speed broadband Internet access. It should, however, be noted that, while competitive markets will drive up availability and, in particular, penetration, they are unlikely to lead to full coverage and penetration of very high speed broadband given the high cost of network roll-out in less dense areas and consumer affordability issues.

⁵⁹ NGA Rec Recital 2.

⁶⁰ According to established case-law, very large market shares - in excess of 50 % - are in themselves, save in exceptional circumstances, evidence of the existence of a dominant position.

When analysing competition, it should be noted that the relevant product market for broadband Internet access is defined across all speeds (above 128 Kbps) and technologies, assuming a continuous chain of demand substitution across speeds and technologies. Thus NGA-based connections are considered merely a segment of a wider product market and do not give rise to a separately defined product market.⁶¹

3.2 What countries have achieved in terms of competition

3.2.1 Number of operators

Given the absence of access-based competition in NGA, consumers can only subscribe to end-to-end NGA platforms (where available). In many countries, in the dense areas, consumers have the choice between the SMP operator (VDSL) and a cable operator (DOCSIS 3). In the very dense areas, an FTTH operator (in most countries an ANO) may also be present. In the less dense areas, only ADSL, or no broadband network at all, may be available. Thus, depending on the density, consumers usually have a choice between 0 and 3 available operators.⁶² This is generally below the number of 4 operators that we would consider as required for a competitive market structure.

The little access-based competition achieved in NGA is in stark contrast to the level of access-based competition in legacy broadband. A significant number of ANOs, based on regulated access products (unbundled local loops and wholesale broadband access) were able to enter the market. In addition, most countries are characterised by the presence of cable operators. Thus consumers can choose between 4 or more operators (except in less dense areas, where, in some countries, the Market 4/5 SMP operator is the only provider of broadband services on the retail market, or no broadband is available at all).

3.2.2 Retail market share of SMP operator

3.2.2.1 FTTH/B

Figure 11 ranks the countries by the market share of the Market 4/5 SMP operator in retail FTTH/B connections. It should be noted that, at the time of data collection, Belgium and the UK had no FTTH/B roll-out.⁶³ No data was available for Switzerland.

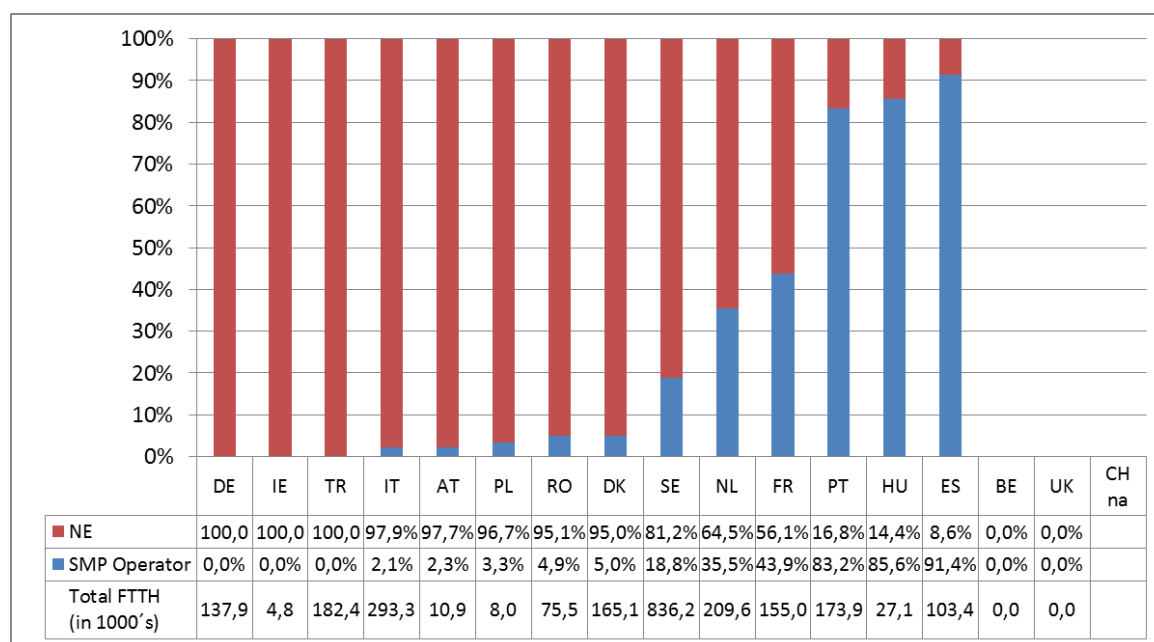
⁶¹ Some NRAs distinguish between markets for residential and non-residential customers. The geographic market is usually defined to be national, although two NRAs (Ofcom and ANACOM) define subnational markets, distinguishing between urban and rural areas.

⁶² Romania is a possible exception, where in the dense areas and in particular in Bucharest, customers may have a choice between 4 and more NGA networks.

⁶³ According to the BIPT, there were 1.900 fibre-to-the-office lines in Belgium. In the UK, BT has started a fibre roll-out programme.

While many ANOs have started to invest in FTTH/B, the SMP operators were more reluctant to do so. This is why, in mid-2011, the SMP operator's market share in retail FTTH/B connections was zero or close to zero in Germany and Ireland. Only in 3/15 countries has the SMP operator achieved market shares above 50% (Spain, Hungary, Portugal). SMP operators have a market share below 50% in 13/16 countries.

Figure 11: Share of retail FTTH/B connections of the Market 4/5 SMP operator (%), July 2011



Note: Belgium without fibre to the office (1.900 lines)

Source: WIK-Questionnaires; COCOM (2011); own estimates

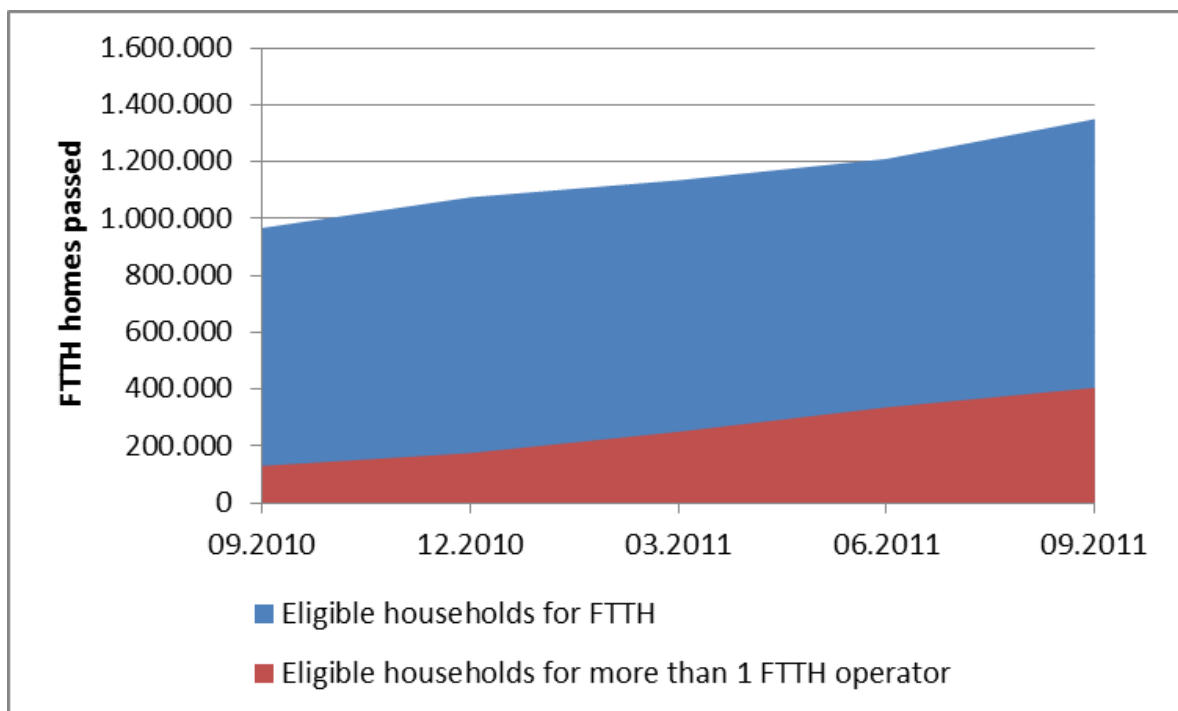
Roll-out of FTTH/B may be directed at complementary areas and not necessarily go along with direct competition. This is not a surprise to us. As we have shown in several previous studies, the viability of replicating FTTH/B is limited to the densest areas of a country if it exists at all.⁶⁴ France e.g. already has a relatively high FTTH/B coverage of around 20% of households, combined with a relatively low FTTH/B market share (43,9%) of the SMP operator. In September 2011, 1,3 million homes were connected to FTTH, but only 405 thousand homes could choose from at least two FTTH operators. Hence, over 60% of homes have only one FTTH operator to choose from.⁶⁵ It should be noted that the share of households covered by more than one FTTH operator, compared to the total number of FTTH households, is gradually increasing, as is shown in Figure 12. According to ARCEP,

⁶⁴ See Elixmann, D., Ilic, D., Neumann, K.H. and Plückebaum, T., The Economics of Next Generation Access. Study for ECTA, Bad Honnef 2008; Hoernig, S., Jay, S., Neumann, K.H., Peitz, M., Plückebaum, T. and Vogelsang, I., Architectures and competitive models in fibre networks. Study for Vodafone, Bad Honnef 2010.

⁶⁵ <http://www.arcep.fr/index.php?id=10292>

this process will go on, and the majority of FTTH customers will be able to order a service from more than one operator. However, if one considers four or more operators as an optimal market structure, the numbers of households with this degree of choice will remain very limited (even considering that in some parts of France there is also DOCSIS 3 coverage). Furthermore, in most cases, competition in FTTH/B in France is based on access of a competitor to the terminating segment of a fibre network and not on full end-to-end duplication of the fibre network.

Figure 12: Eligible households for FTTH in France, Sep. 2010 - Sep. 2011



Source: ARCEP

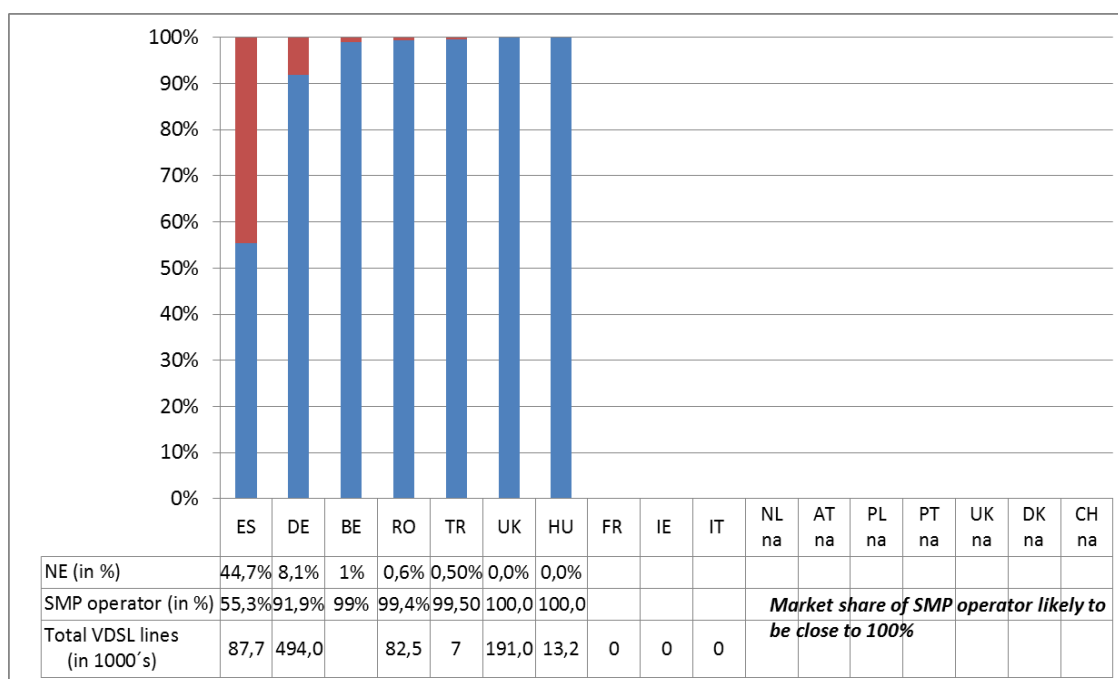
3.2.2.2 FTTN/VDSL

Figure 13 ranks the countries by the market share of the Market 4/5 SMP operator in retail VDSL connections. It should be noted that, in 3/17 countries (France, Ireland and Italy), there had been no relevant VDSL roll-out at the time of the survey. SMP operators usually enjoy very high market shares in retail VDSL, as the Figure shows. Even where sub-loop unbundling and VDSL wholesale broadband access has been imposed, there is little or no effective access.⁶⁶ The lower market shares in Spain (55%) and Germany (92%) reported in Figure 13 result - at least partially - from ANOs using unbundled local loops to provide VDSL from the MDF. Strictly speaking, such services are not based on NGA, since they involve no roll-out of fibre in the access network. Though data provided by NRAs is very sketchy, we believe that the retail VDSL market

⁶⁶ Germany aside, where there is some VDSL wholesale broadband access.

share of the SMP operators in almost all countries is close or equal to 100% if only VDSL based on fibre-to-the-curb is included

Figure 13: Share of retail VDSL connections of the Market 4/5 SMP operator (%), July 2011



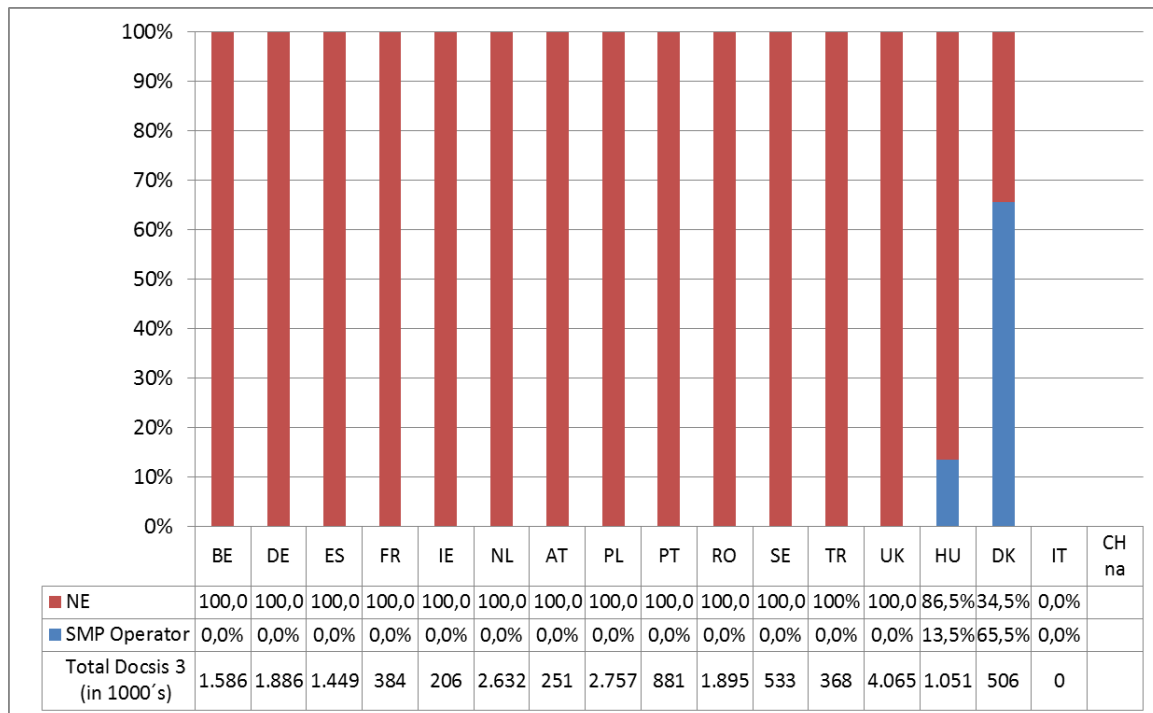
Note: VDSL lines of ANOs are partially based on local loop unbundling and provision of VDSL from the MDF (hence, strictly speaking, they may not be considered as based on NGA). The retail VDSL market shares in Germany and, in particular, Spain are likely to be closer to 100% if only VDSL over FTTN networks is considered.

Source: WIK-Questionnaire, own estimates

3.2.2.3 FTTN/DOCSIS 3

In 2/17 countries (Hungary and Denmark), the operator designated SMP on the wholesale market(s) also provides retail broadband Internet access on the basis of DOCSIS 3 connections. Figure 14 shows that the SMP operator's market share in DOCSIS 3 connections is 65,5% in Denmark and 13,5% in Hungary. In all other countries, cable networks have been structurally separated from the incumbent telecoms operator or have traditionally been operated by different companies. Note that, in Italy, there is no cable presence.

Figure 14: Share of retail DOCSIS 3.0 connections of the Market 4/5 SMP operator (%), July 2011



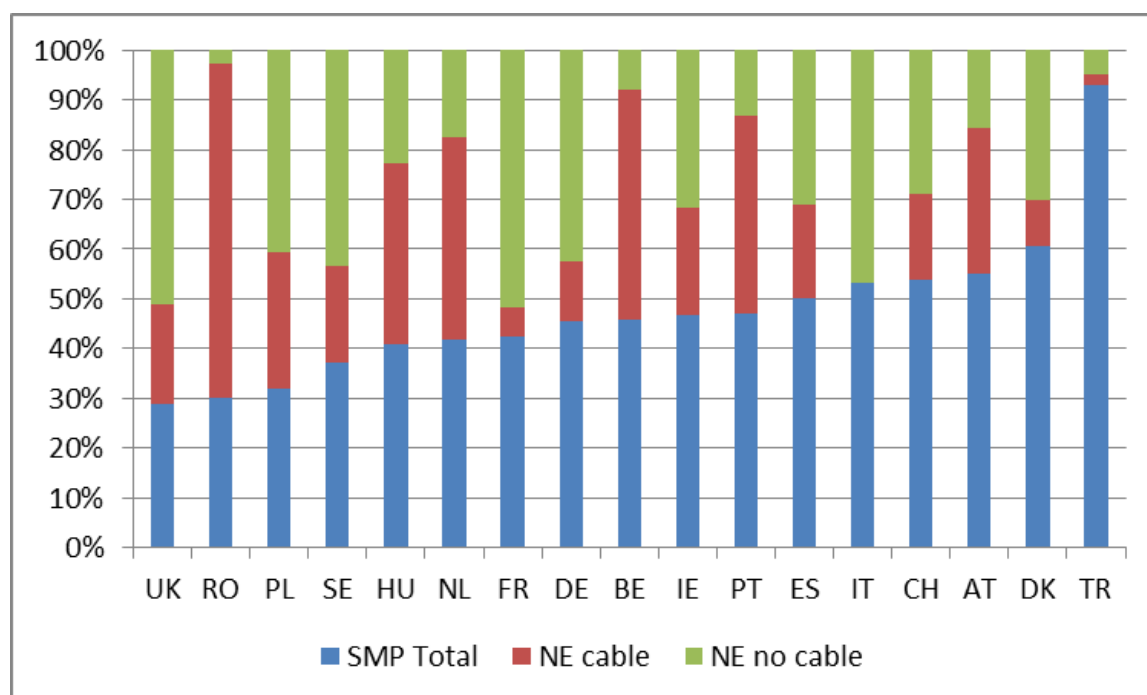
Source: COCOM (2011), WIK-Questionnaires, own estimates

3.2.2.4 Overall retail broadband

Figure 15 ranks the countries by the retail broadband market share of the Market 4/5 SMP operator. As is shown in the Figure, the SMP operator's market share in retail broadband has fallen below 50% in 11/17 countries, while it is still above 50% in 6/17 countries. The retail market share of the SMP operator reflects the impact of access regulation and the presence of cable networks. Access based ANOs have achieved the highest market shares in France, followed by the UK, Italy, Sweden and Germany. Countries, where cable operators have significant market shares, include Romania, followed by Belgium, Portugal, Hungary and Netherlands (see Figure 15).⁶⁷ The country with the highest market share of the SMP operator is Turkey, followed by Denmark, Austria, Switzerland and Spain.

⁶⁷ The SMP operator's market share may be lower in the residential segment and in urban areas than in the non-residential segment and rural areas.

Figure 15: Retail broadband market share of the Market 4/5 SMP operator (% of all broadband connections), July 2011



Source: COCOM (2011), BAKOM, ICTA

3.2.3 Barriers to entry

3.2.3.1 NGA

Given the little effective wholesale access provided by the Market 4/5 operator, retail NGA is characterized by high barriers to entry:

- There is little effective access to FTTH networks. The one exception is France, where about 30% of FTTH lines are based on FTTH terminating access. The other exception is the Netherlands, where a relevant number of fibre loops has been unbundled at the MPoP. In all other countries, neither access to the terminating segment nor unbundled access to the fibre loop at the MPoP does play a relevant role.⁶⁸
- There is also little effective access to FTTN/VDSL networks. The only exception with an identifiable number of VDSL wholesale broadband access lines seems to be Germany.⁶⁹

⁶⁸ Section 2.2.5.1, Table 2.

⁶⁹ Section 2.2.5.2, Table 3.

- In Denmark and in Hungary, the SMP operator's cable network has been opened up to wholesale broadband access. It is not clear to what extent this has already resulted in effective usage of such access.

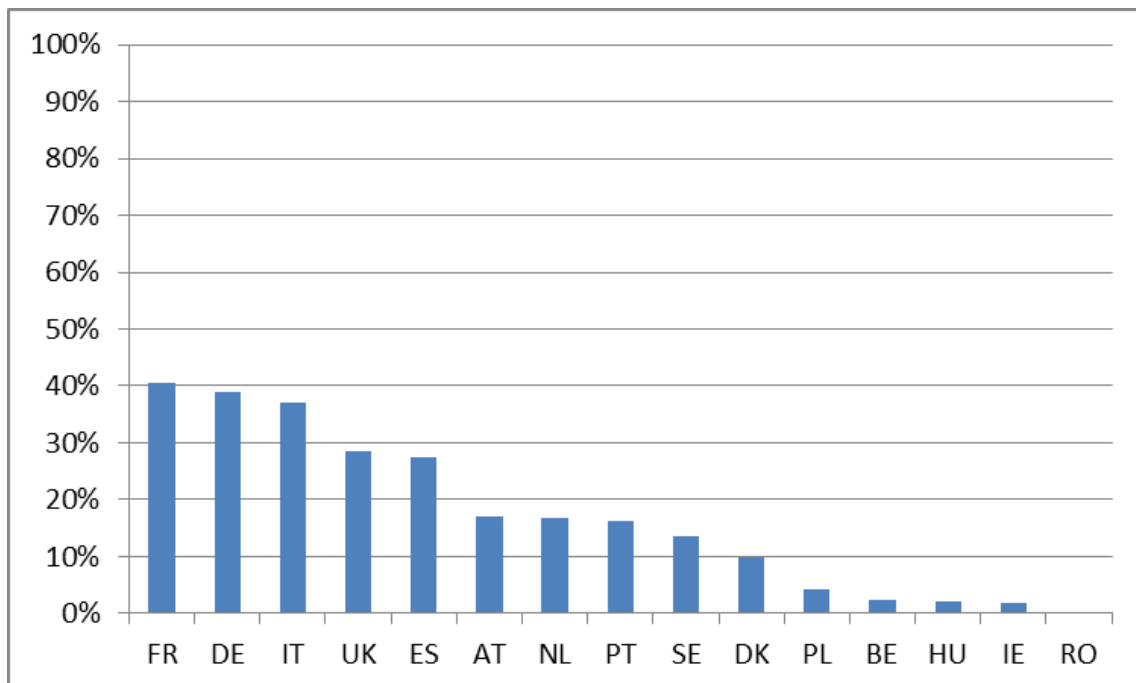
A particular case aside is Romania, where competition is almost totally based on own end-to-end infrastructure.

3.2.3.2 Overall retail broadband

In contrast to NGA, in most countries, barriers to entry have been significantly reduced through the availability of local loop unbundling and wholesale broadband access. The extent to which access regulation has reduced barriers to entry can be measured by expressing the share of unbundled local loops and, respectively, wholesale broadband access lines as a percentage of the SMP operator's total number of broadband lines.⁷⁰

Figure 16 ranks the countries by the share of unbundled local loops. It shows that the share of unbundled local loops is as high as 40% in France and Germany. Countries with ULL shares below 10% are Romania, Ireland, Hungary, Belgium and Poland.

Figure 16: Share of ULL of total number of broadband lines of the Market 4/5 SMP operator (%), mid 2011

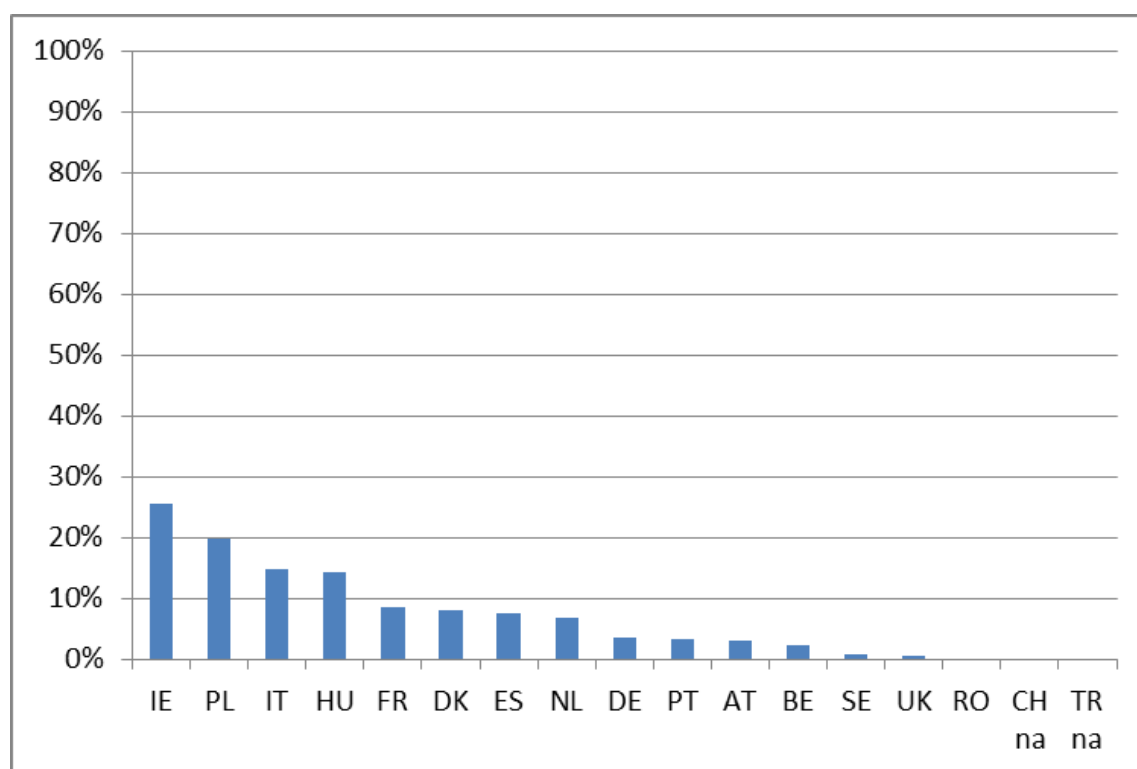


Source: COCOM (2011)

⁷⁰ The SMP operator's total number of broadband lines is the sum of its own retail lines plus unbundled local loops and wholesale broadband access lines provided on a wholesale basis (and which is used by ANOs to provide retail broadband access).

Figure 17 ranks countries by the share of wholesale broadband access lines as a percentage of all broadband lines of the SMP operator.⁷¹ Note that, except for Romania (where there is no SMP in Market 5), countries with little local loop unbundling have higher shares with regard to wholesale broadband access: The share of (mostly ADSL) wholesale broadband access lines of the SMP operator's broadband lines is 20% or more in Poland and Ireland.

Figure 17: Share of wholesale broadband access lines of total number of broadband lines of the Market 4/5 SMP operator (%), mid 2011



Source: COCOM (2011)

3.2.4 Retail prices

The Market 4/5 SMP operator, in many countries, has bundled its retail services into multi-play bundles and at the same time has upgraded its speeds. Figure 18 shows, that, in most countries, the SMP operator offers triple-play bundles with broadband speeds between 12 and 30 Mbps for retail prices between 34,11 €-PPP (Romania) up to 69,67 €-PPP (Spain).

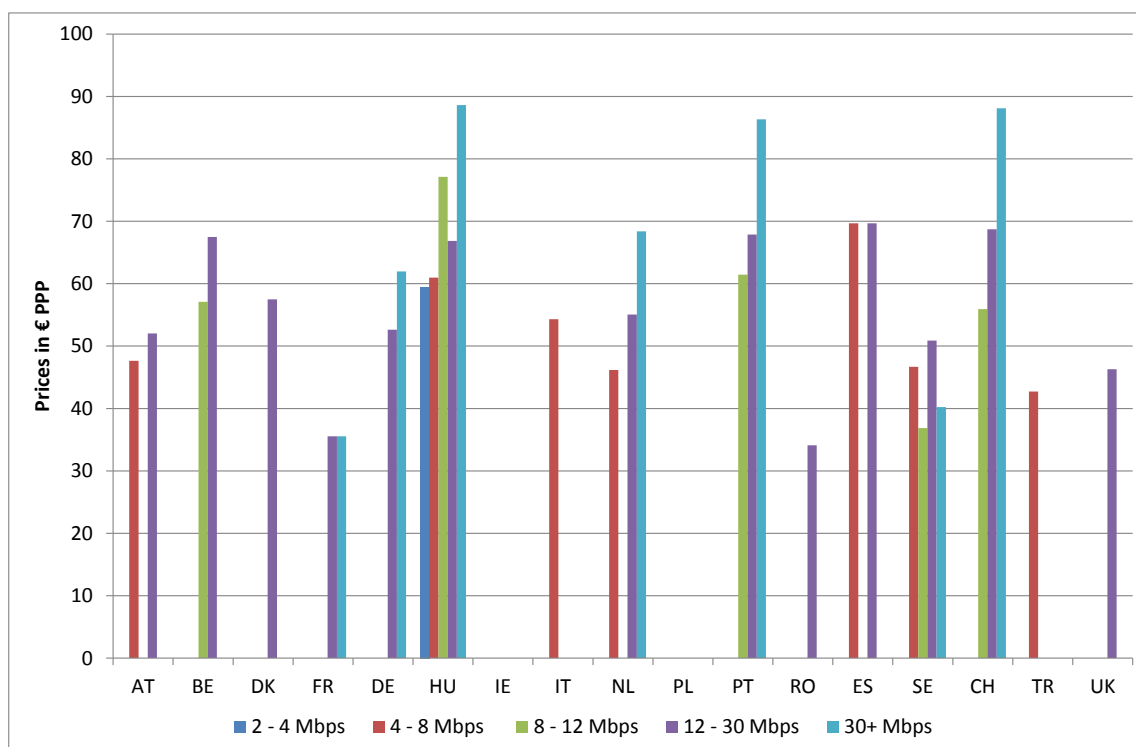
In contrast, there is a lack of very high-speed retail products above 30 Mbps on the side of SMP operators. Only in 7/17 countries, the SMP operator offered a triple-play product with broadband speeds above 30 Mbps (France, Germany, Hungary, Netherlands,

⁷¹ Resale is not included in the wholesale broadband access share.

Portugal, Sweden and Switzerland). In these countries, above 30 Mbps prices range from 35,54 €-PPP in France up to 88,60 €-PPP in Hungary. Hence, in some of these countries, such as Hungary, Portugal or Switzerland, the SMP operator seems to charge substantial price premiums for 30+ Mbps offers.

The lack of above 30 Mbps products in some countries, and the high price premium in other countries, where above 30 Mbps offers are available, may reduce both the possibility and incentive of the SMP operator's customers to switch to higher speeds.

Figure 18: Prices of Triple-Play products, selected speeds, least expensive offer of the Market 4/5 SMP operator (in € PPP, VAT included), Feb. 2011



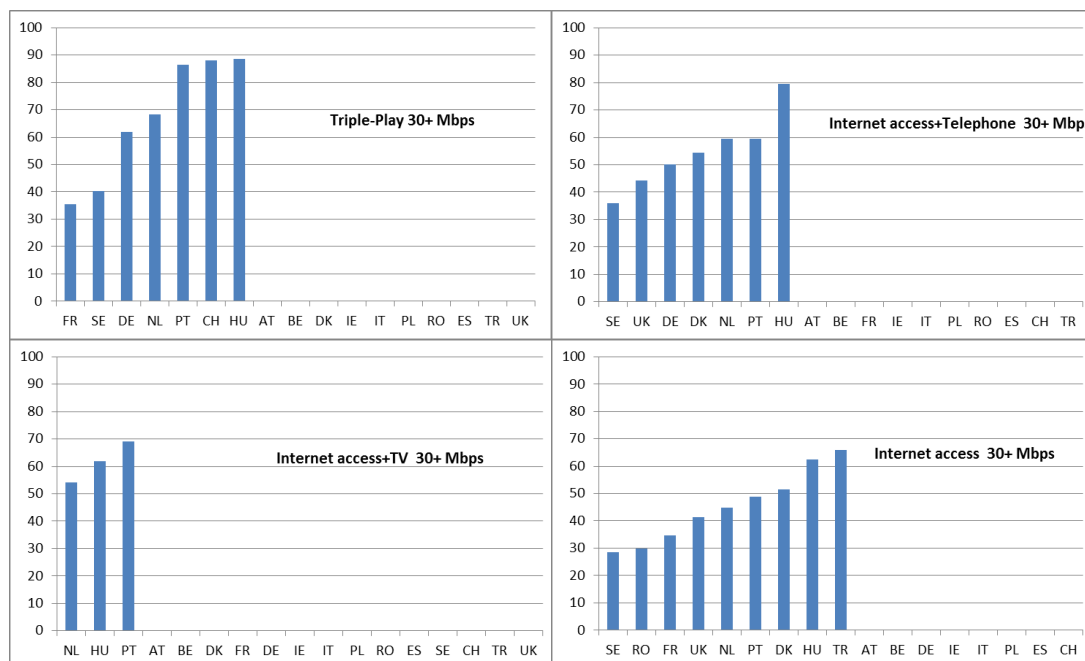
Note: Prices in €-PPP for Triple-Play products of Market 4/5 SMP operator for various speed levels are taken from van Dijk (biac reporting tool, see http://ec.europa.eu/information_society/digital-agenda/scoreboard/docs/pillar/biac_reporting_tool.xlsx).

According to RTR, Telekom Austria offered a 8 Mbps Triple-Play product for € 24,90 during promotions in 2011.

Source: van Dijk (2011)

Figure 19 ranks countries according to the price for various 30+ Mbps offers of the SMP operator (triple play, double play and stand-alone Internet access). In countries, where no price is indicated, the Market 4/5 SMP operator did not offer a 30+ Mbps product.

Figure 19: Prices of 30+ Mbps products, selected offers, least expensive offer of the Market 4/5 SMP operator (in € PPP, VAT included), Feb. 2011



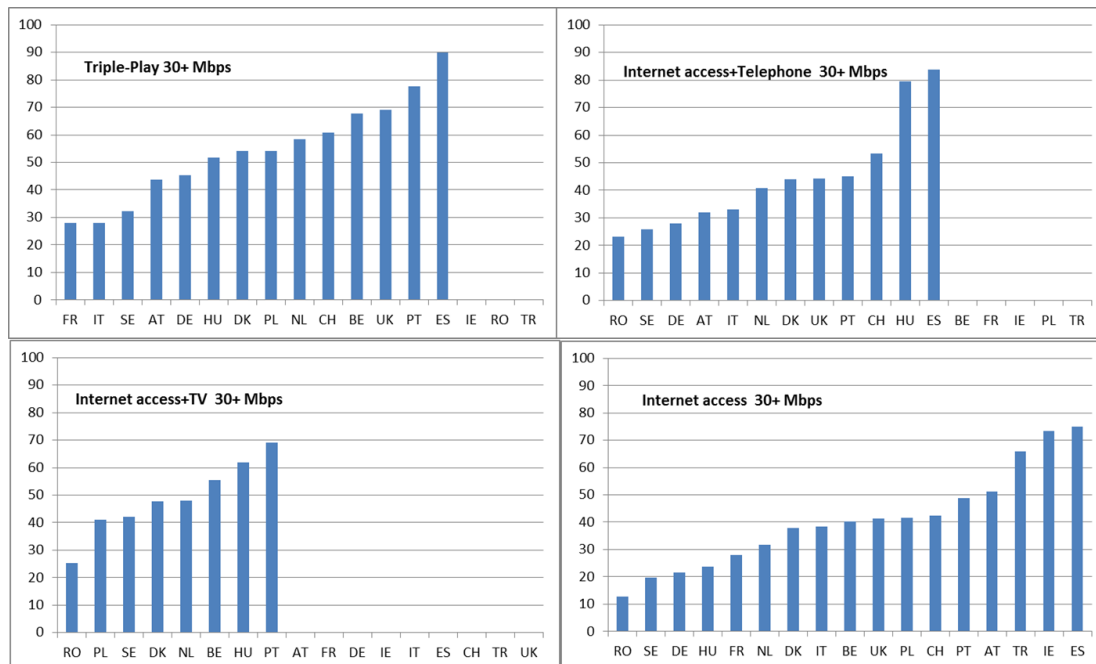
Note: Prices in €-PPP for 30+ Mbps broadband products of Market 4/5 SMP operator are taken from van Dijk (biac reporting tool, see http://ec.europa.eu/information_society/digital-agenda/scoreboard/docs/pillar/biac_reporting_tool.xlsx).

According to RTR, Telekom Austria also offered 30+ Mbps products in 2011.

Source: van Dijk (2011)

Retail price levels of the SMP operator are often higher compared to the least expensive retail price level of ANOs and cable operators. In the case of triple play offers, retail prices of the SMP operator are 10% to 40% higher. E.g. in France, the SMP operator offers its triple play package with 30+ Mbps for 35,54 €-PPP, which is about 21% above the least expensive offer in the country costing 27,97 €-PPP. The same price differences can be observed in the case of double play products with Internet and telephony as well as the stand-alone Internet access offer. Figure 20 shows the least expensive offer of all operators (SMP operator and ANOs).

Figure 20: Prices of 30+ Mbps products, selected offers, least expensive offer of all operators (in € PPP, VAT included), Feb. 2011

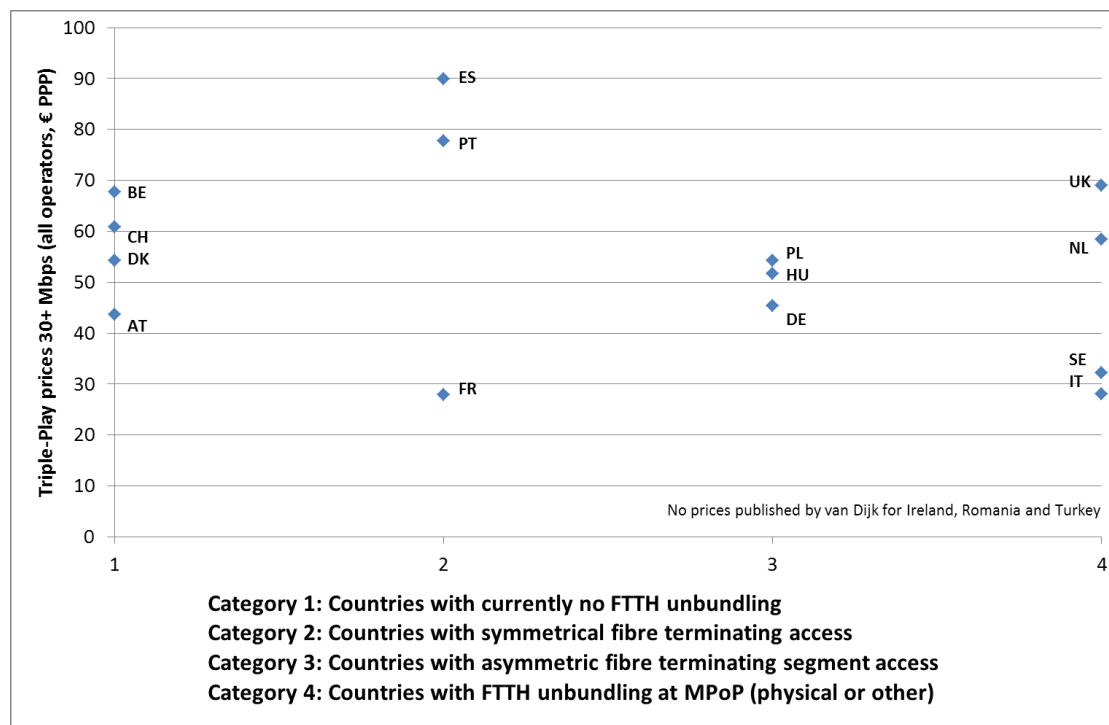


Note: Prices in € PPP for 30+ Mbps broadband products of all operators are taken from van Dijk (biac reporting tool, see http://ec.europa.eu/information_society/digital-agenda/scoreboard/docs/pillar/biac_reporting_tool.xlsx).

Source: van Dijk (2011)

The relationship between prices and fibre regulation is however ambiguous as Figure 21 shows. The lowest prices can be found in Italy, France and Sweden, which use different regulatory approaches (1 - no fibre unbundling, 2 - symmetric fibre terminating access, 3 - asymmetric fibre terminating access, and 4 - unbundling at the MPoP). Note that in Belgium and the UK, there were no fibre lines deployed to residential customers.

Figure 21: Price of 30+ Mbps Triple-Play product, least expensive offer of all operators (in € PPP, VAT included), Feb. 2011, and type of FTTH regulation



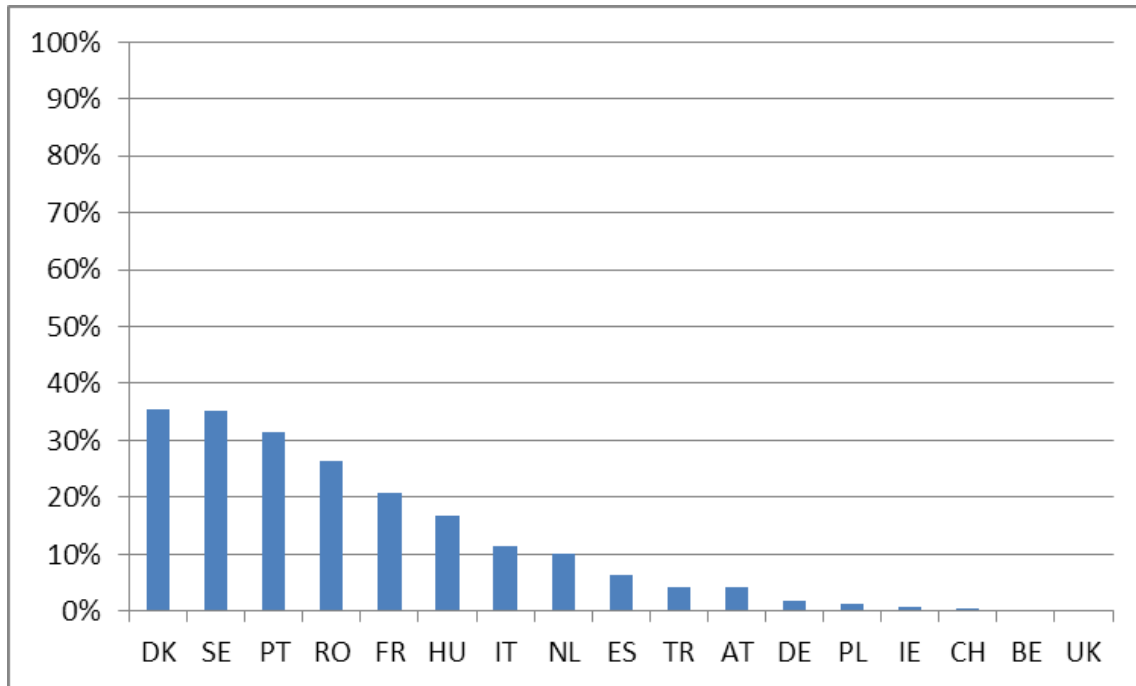
Source: van Dijk (2011), FTTH Council/IDATE (2011)

3.2.5 Roll-out

3.2.5.1 FTTH/B roll-out

Figure 22 ranks the countries by their FTTH/B coverage. 4/17 countries have FTTH/B coverage rates of more than 25% of homes. FTTH roll-out is highest in Denmark, followed by Sweden, Portugal and Romania. Coverage rates are between 5 and 25% in 5/17 countries. In 8/17 countries, FTTH coverage is below 5% of homes, and in some of these countries, there is almost zero roll-out.

Figure 22: FTTH/B coverage (in % of homes), mid 2011

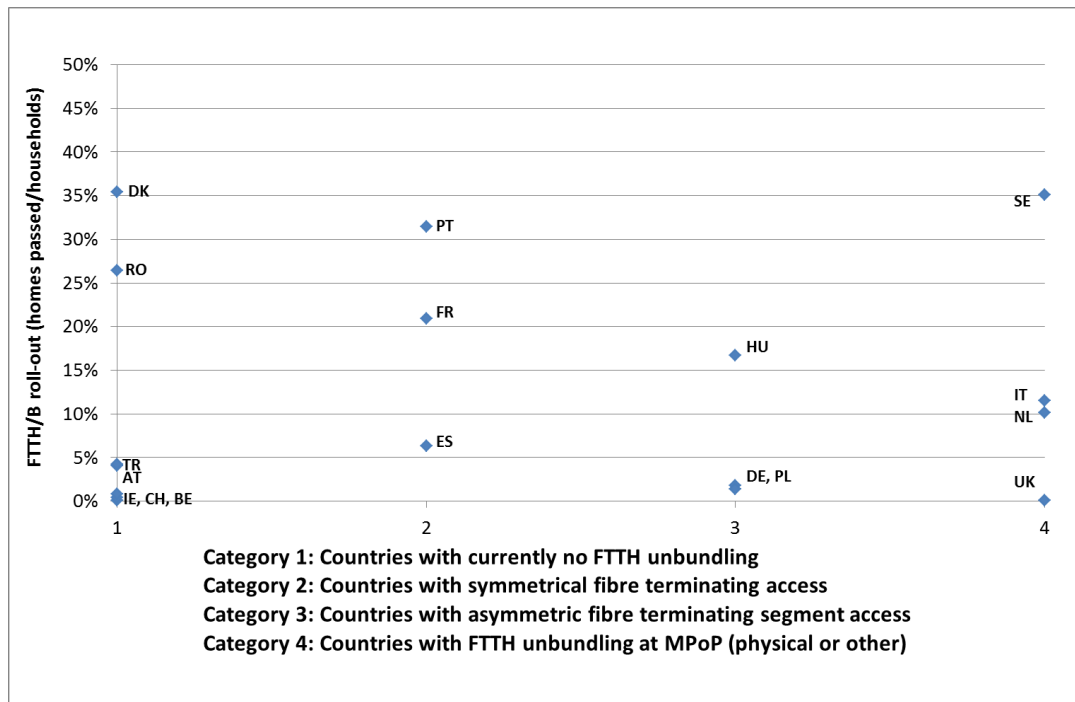


Note: In some countries (e.g. France), there is some overlap between FTTH/B networks such that the coverage figure for the country is overestimated in the Figure.

Source: Estimates are based on NRA responses to WIK questionnaire. Where such data was not available, estimates are based on FTTH Council/IDATE (2011).

While there are substantial roll-out differences between countries, the imposition of FTTH access remedies does not seem to have had a systematic impact on FTTH roll-out. This is illustrated in Figure 23 below, which uses the grouping of countries according to the fibre remedies imposed (1 - no fibre unbundling, 2 - symmetric fibre terminating access, 3 - asymmetric fibre terminating access, and 4 - unbundling at the MPoP). The Figure shows that among the countries with a high FTTH roll-out there are countries with no FTTH unbundling, and countries with only symmetrical fibre terminating access, but also countries with FTTH unbundling at the MPoP.

Figure 23: Imposition of access to FTTH networks and FTTH roll-out, mid 2011

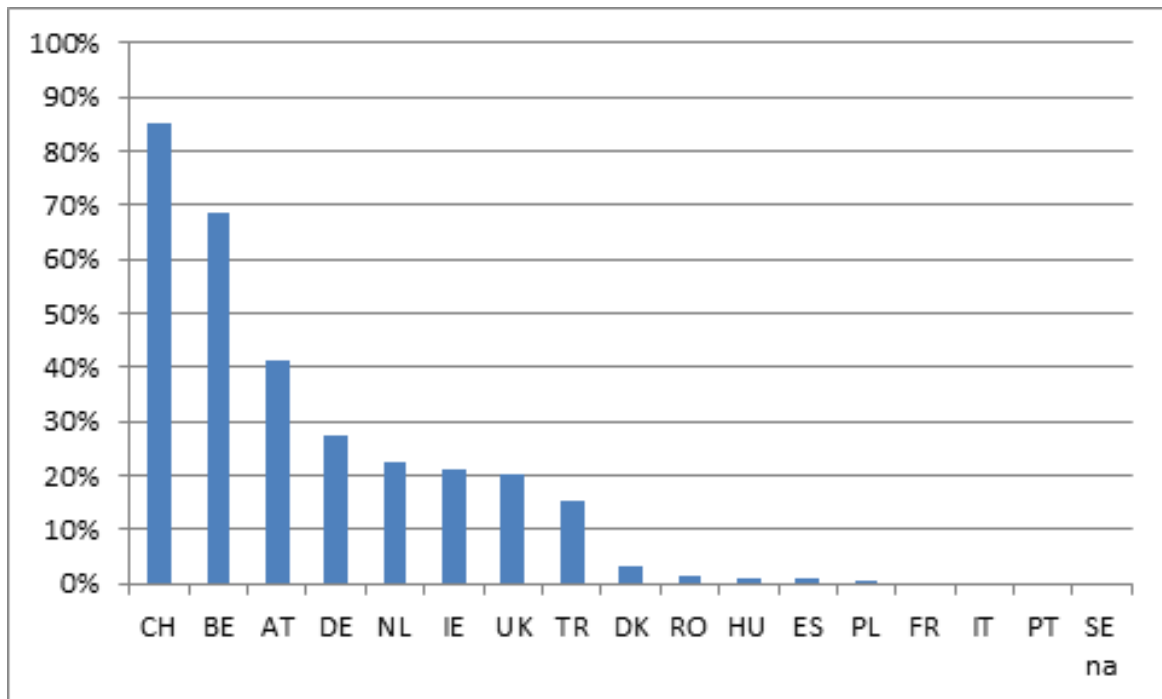


Source: Roll-out estimates are based on NRA responses to WIK questionnaire. Where such data was not available, estimates are based on FTTH Council/IDATE (2011).

3.2.5.2 FTTN/VDSL roll-out

Figure 24 ranks the countries by the VDSL coverage achieved at the end of 2010. In 4/17 countries, VDSL is available to more than 25% of homes. VDSL roll-out is led by Switzerland, followed by Belgium, Austria and Germany. In 4/17 countries, coverage rates lie between 5 and 25%. In 9/17 countries, VDSL coverage is below 5% of homes passed, and many of these countries, there is zero VDSL roll-out.

Figure 24: FTTN/VDSL coverage (in % of homes), mid 2011



Note: There is unlikely to be significant overlap between VDSL networks given the limited amount of roll-out by ANOs.

Source: Estimates are based on NRA responses to WIK questionnaire. Where such data was not available, estimates are based on ETNO (2012).

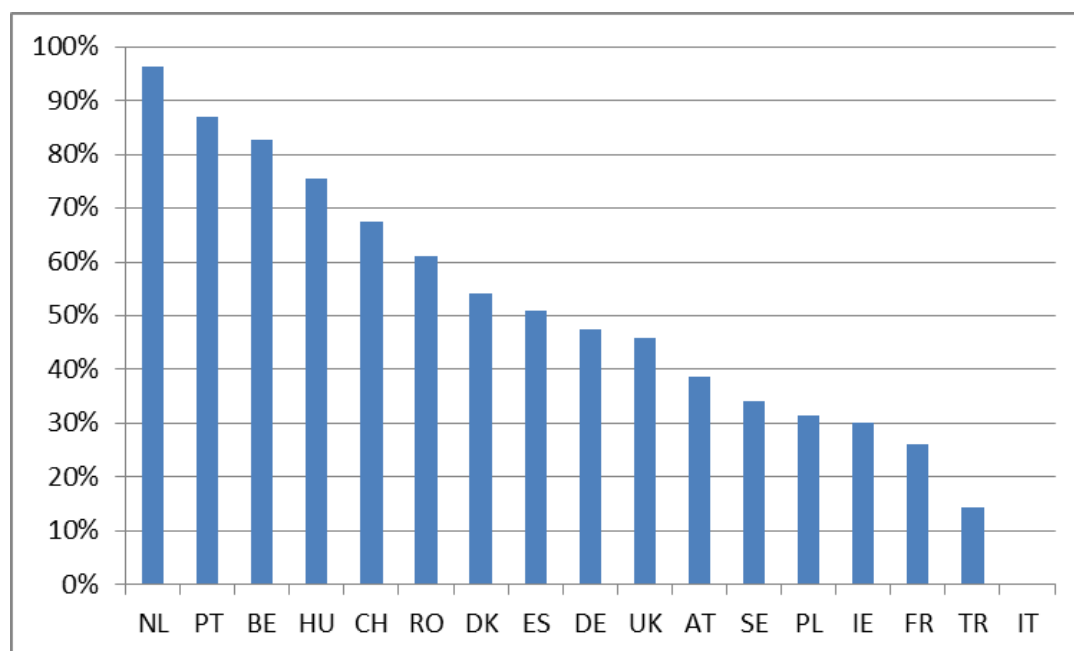
The varying FTTN/VDSL coverage rates across the countries reflect a largely similar regulatory framework for access to FTTN/VDSL network. All countries have imposed sub-loop unbundling (except Belgium⁷² and Ireland) and wholesale broadband access to VDSL connections.

3.2.5.3 DOCSIS 3 roll-out

In Figure 25, countries are ranked with regard to DOCSIS 3 coverage. 15/17 countries have DOCSIS 3 coverage rates of more than 25% of homes. DOCSIS 3 roll-out is led by Netherlands, followed by Portugal and Belgium. Note that some of the countries with high VDSL coverage also have a high DOCSIS 3 coverage (e.g., Netherlands, Belgium, Switzerland). In Italy, there is no cable presence.

⁷² The removal of sub-loop unbundling in Belgium is relatively recent.

Figure 25: FTTN/DOCSIS 3.0 coverage (in % of homes), mid 2011



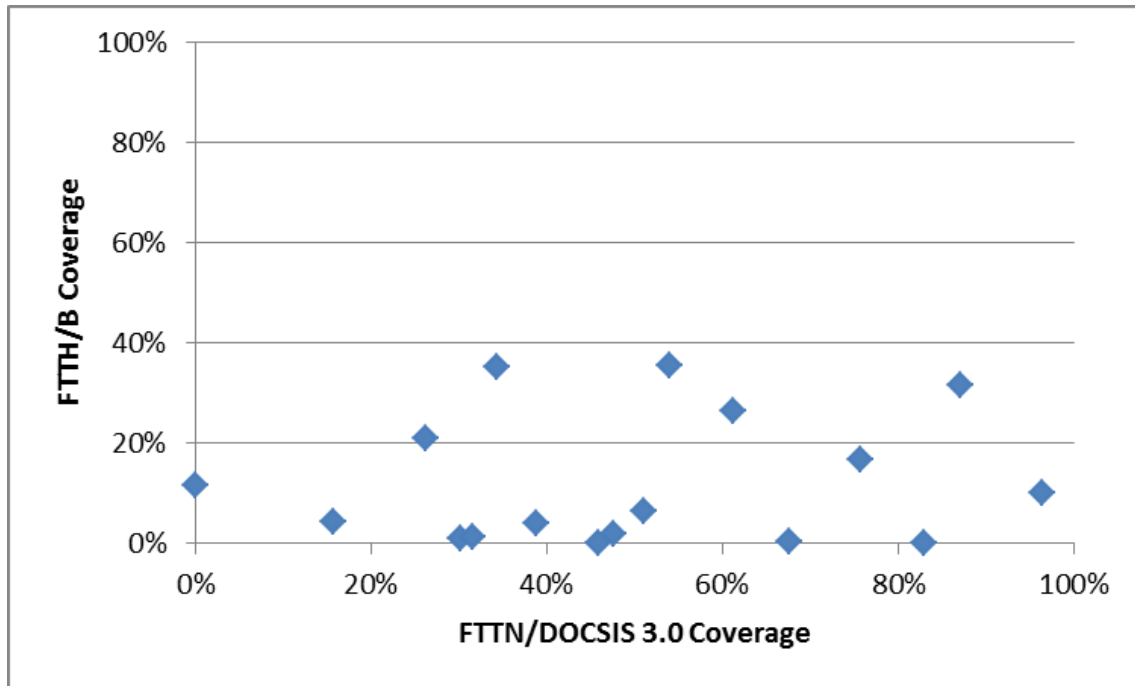
Note: There is unlikely to be overlap between DOCSIS 3 networks.

Source: Estimates are based on NRA responses to WIK questionnaire. Where such data was not available, estimates are based on 90% of cable coverage as reported by IDATE (2011).

3.2.5.4 The impact of DOCSIS 3 on FTTH/B and VDSL roll-out

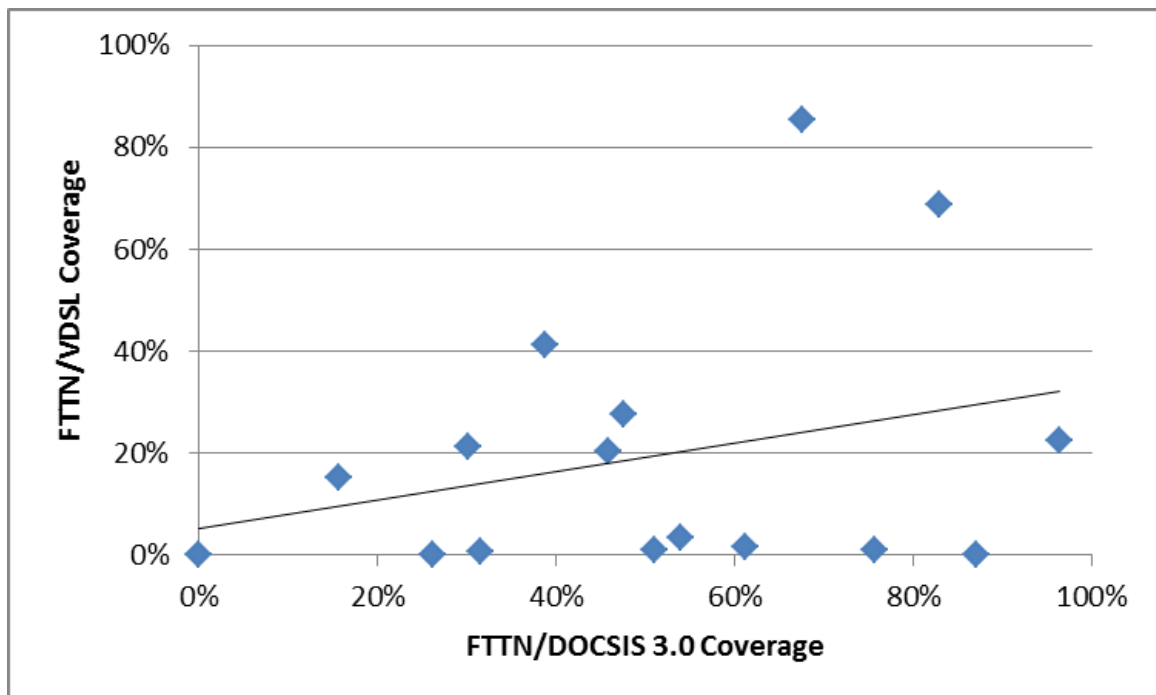
The presence of DOCSIS 3 networks does not seem to have pushed incumbents and ANOs to invest in FTTH/B yet. As Figure 28 shows, there is no relevant correlation between FTTH/B roll-out and DOCSIS 3 coverage. In turn, Figure 27 shows that VDSL roll-out (in most countries exclusively by the SMP operator) is positively correlated with DOCSIS 3 coverage. SMP operators may currently consider VDSL, rather than FTTH/B, as adequate to respond to competition by cable operators. On the other hand, the FTTH business case of ANOs may further suffer once there are two strong competitors – the SMP operator and a cable operator - in the market.

Figure 26: Coverage DOCSIS 3.0 and FTTH/B, mid 2011



Source: Estimates are based on NRA responses to WIK questionnaire, IDATE (2011) and FTTH Council/IDATE (2011).

Figure 27: Coverage DOCSIS 3.0 and VDSL, mid 2011



Source: Estimates are based on NRA responses to WIK questionnaire, IDATE (2011) and ETNO (2012).

3.2.5.5 The effect of pricing of the copper loop on FTTH roll-out

WIK has also argued in an earlier study that high charges for unbundled copper loops are deterring the roll-out of FTTH networks.⁷³ A factor which may explain the lack of fibre investment of SMP operators is the relative profitability of copper versus fibre. By allowing Market 4/5 SMP operators to reap high profits from their legacy assets without the need to invest in replacing the lines, current pricing structures are likely to delay the move to 100Mbit/s broadband speeds.

Current LLU wholesale prices in nearly all Member States, mostly based on FL-LRIC costing principles, tend to exceed the actual costs of the copper access network. European regulators set the wholesale charge for the unbundled copper loop at a price between €5 and €14 per month (see Figure 9 above). Such prices are higher than it actually cost to install the lines in the past. SMP operators therefore earn significant profits in the wholesale provision of LLU (including the internal use). Therefore, incumbents face a relevant opportunity cost when switching to a fibre access network. Potential returns of the fibre access network not only have to cover the cost of fibre but also the opportunity cost to switch-off the copper access network. This is a significant barrier to invest in FTTH networks. It also explains that incumbents stick to FTTN/VDSL networks.

3.2.5.6 Overall broadband coverage

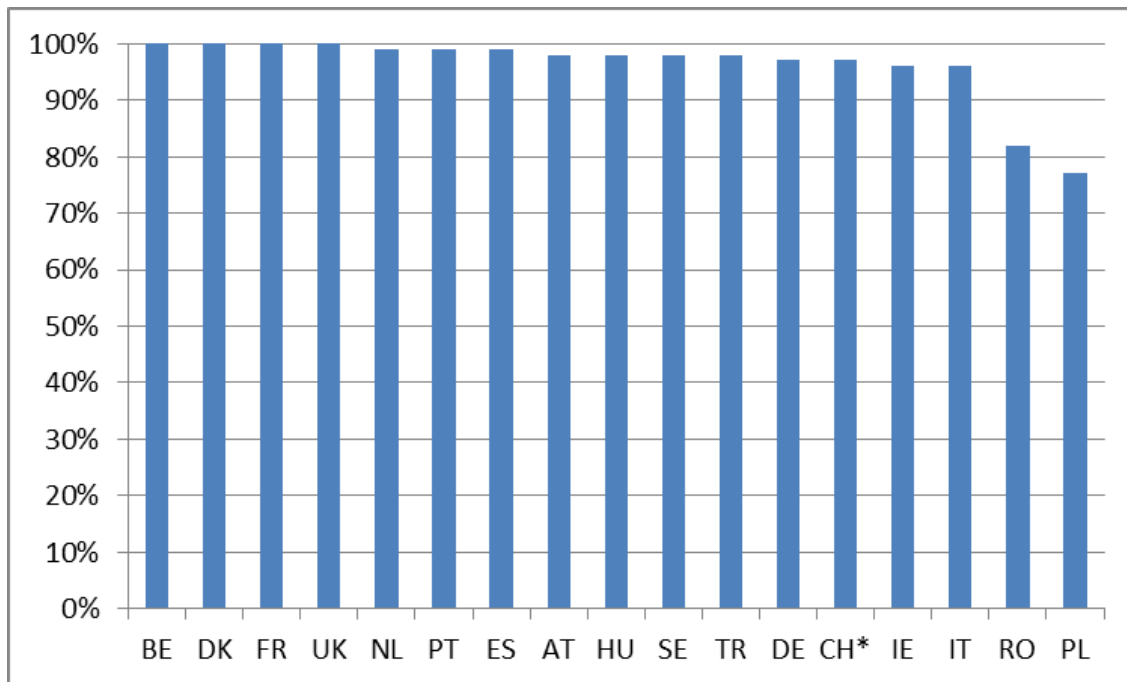
For comparison, the overall (fixed) broadband coverage is described below. To measure fixed broadband coverage, the footprint of DSL is used as a proxy. At the end of 2010, DSL access was available to 95,3% of the EU population, up from 94,4% one year earlier.⁷⁴ In the surveyed countries, broadband coverage is almost universal, except in Poland and Romania, which have DSL coverage of about 80%, and Turkey with less than 40% (Figure 28).

In some countries, the presence of upgraded cable networks provides a second end-to-end infrastructure and creates overlap with the incumbent copper/DSL networks, especially in the Netherlands, Belgium, Portugal and Hungary, where cable coverage exceeds 80% of homes (Figure 29).

⁷³ See Hoernig, S., Jay, S., Neu, W., Neumann, H.H., Plückebaum, T. and Vogelsang, I., Wholesale Pricing, NGA Take-Up and Competition. Report for ECTA, Bad Honnef 2011; See also Neumann, K.H. and Vogelsang, I., Cost Methodologies and Pricing Schemes to Support the Transition to NGA, Study for ECTA, Bad Honnef 2011.

⁷⁴ Digital Agenda Scoreboard 2011, p.11 f.

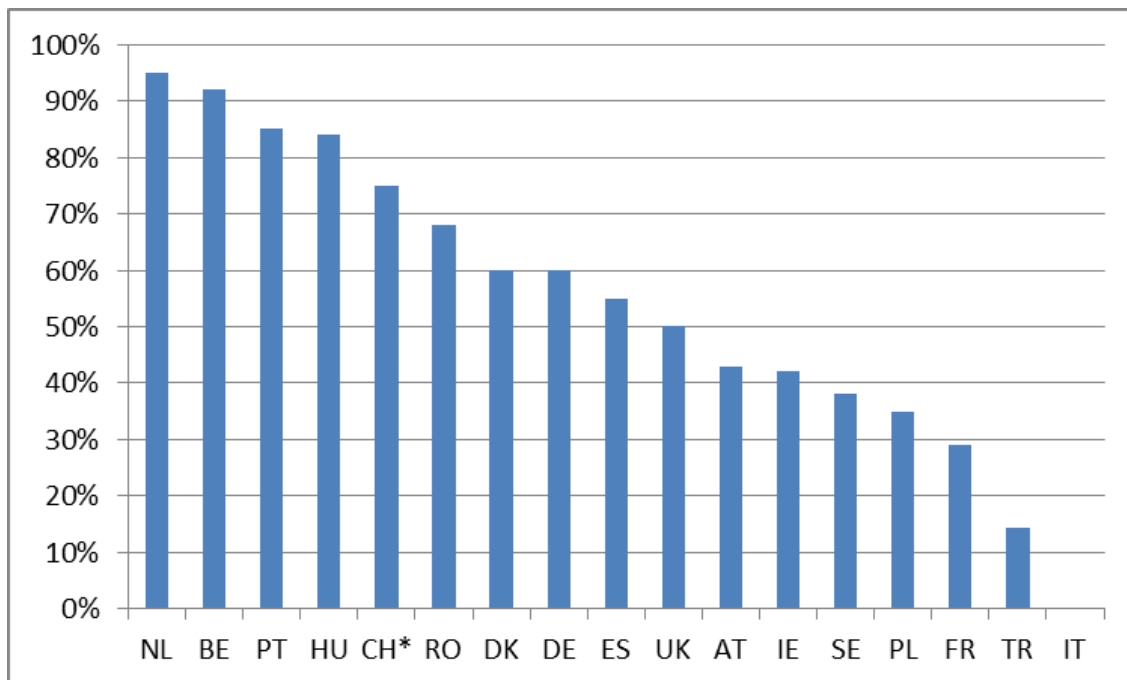
Figure 28: DSL coverage (in % of homes), Dec 2010



Note: CH 2007 data.

Source: IDATE (2011); OECD (2011)

Figure 29: Cable Coverage (in % of homes), Dec 2010



Note: CH 2009 data.

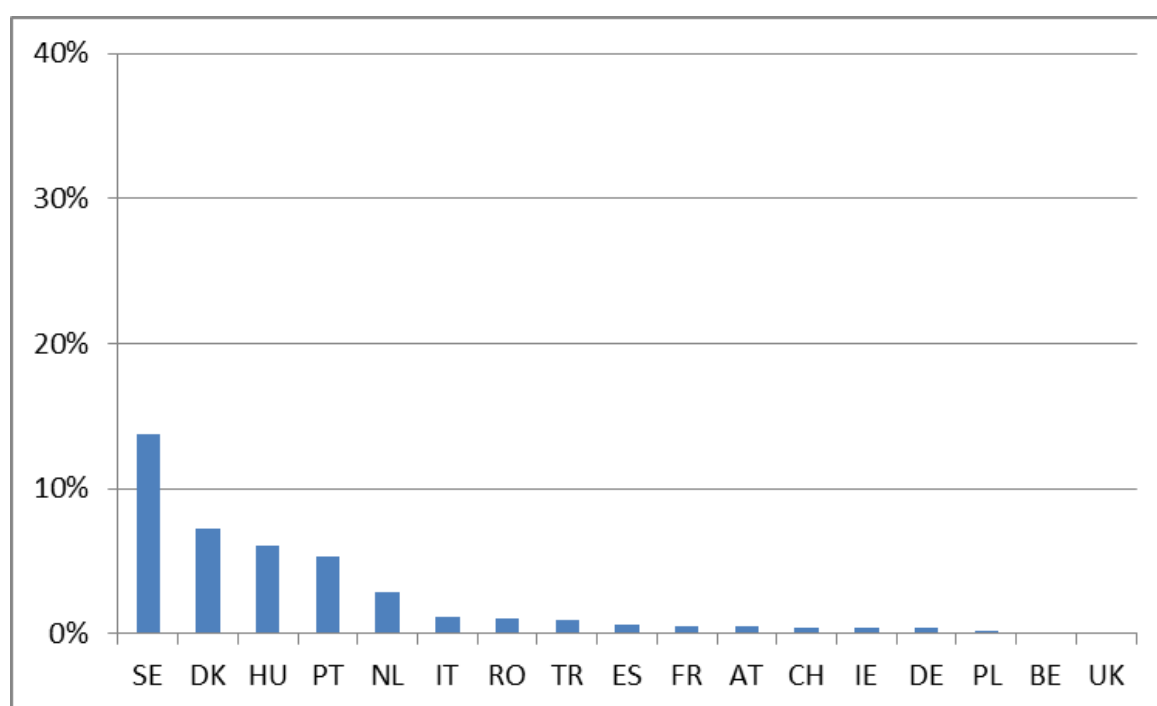
Source: IDATE (2011); OECD (2011)

3.2.6 Penetration

3.2.6.1 FTTH/B penetration

Figure 30 ranks the countries by the level of FTTH/B penetration. Only Sweden has a household penetration rate for FTTH/B above 10%. 3/17 countries have a penetration rate between 5 and 10% (Denmark, Hungary, and Portugal). In 13/17 countries, FTTH/B penetration remains below 5% of homes.

Figure 30: FTTH/B penetration (in % of homes), mid 2011

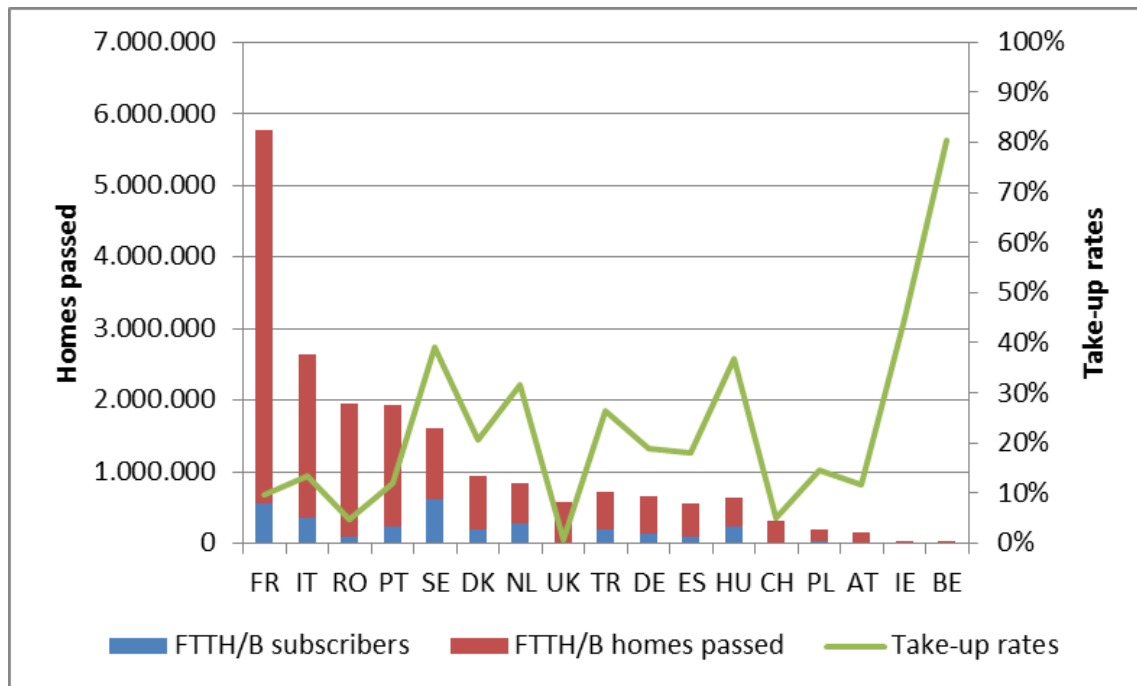


Source: Estimates are based on NRA responses to WIK questionnaire. Where such data was not available, estimates are based on FTTH Council/IDATE (2011).

The coverage of FTTH/B networks achieved would allow higher penetration rates, but take-up rates remain low as the following Figure 31 shows. In most countries, FTTH/B take rates (subscribers in % of homes passed) are low, and there is substantial unused potential. In France, Italy and Romania, the discrepancy between homes passed and penetration is substantial. In the case of Belgium and Ireland, the very high take-up rates have little relevance given that the roll-out (number of homes passed) is insignificant.⁷⁵

⁷⁵ Belgium has 4,1 thousand homes passed by FTTH/B (according to the BIPT these are actually only offices) and Ireland has 14 thousand homes passed. In contrast Sweden has 1,6 million homes passed, and Hungary, the Netherlands, Turkey and Denmark have between 500 thousand and 1 million homes passed by FTTH/B.

Figure 31: Take-up rates (subscribers/homes passed) for FTTH/B, mid 2011

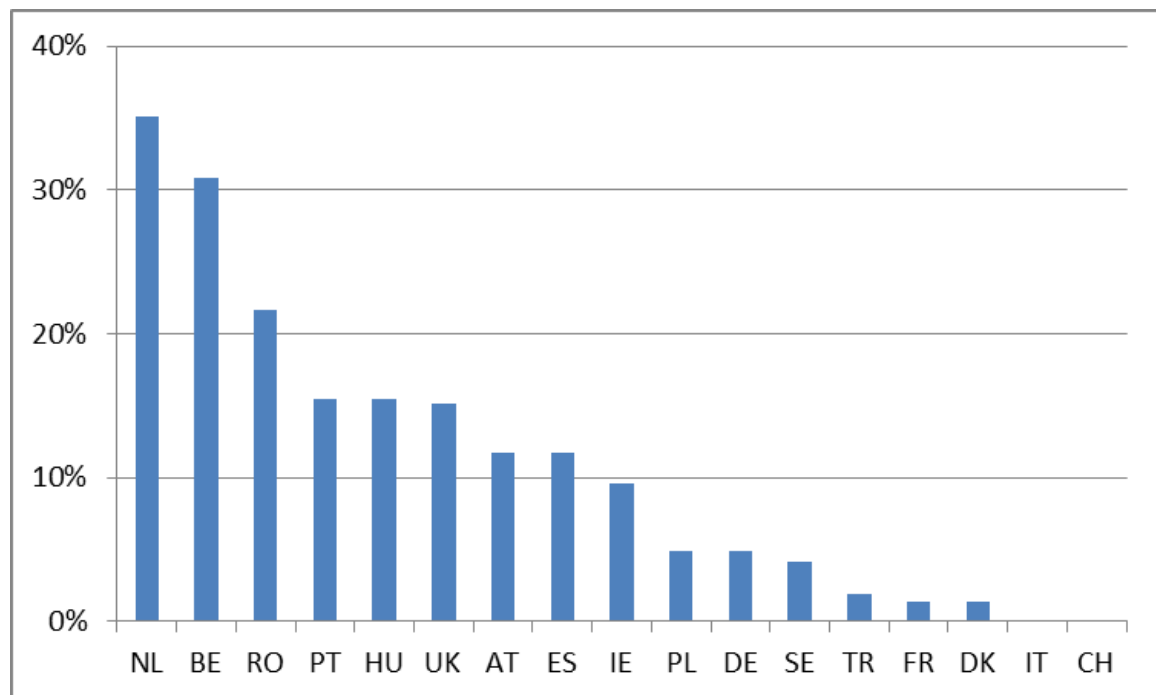


Source: WIK based on FTTH Council/IDATE (2011).

3.2.6.2 FTTN penetration

Figure 32 ranks the countries by the FTTN penetration rate. The available penetration data does not allow distinguishing between VDSL, DOCSIS 3 and other FTTN technologies (e.g. UPT/FTP in Romania). No FTTN penetration data was available for Switzerland. Only 2/16 countries (Netherlands and Belgium) have achieved a FTTN penetration rate above 25% of homes. A further 6/16 have FTTN penetration rates between 5 and 25%. 8/16 countries have FTTN penetration rates below 5%.

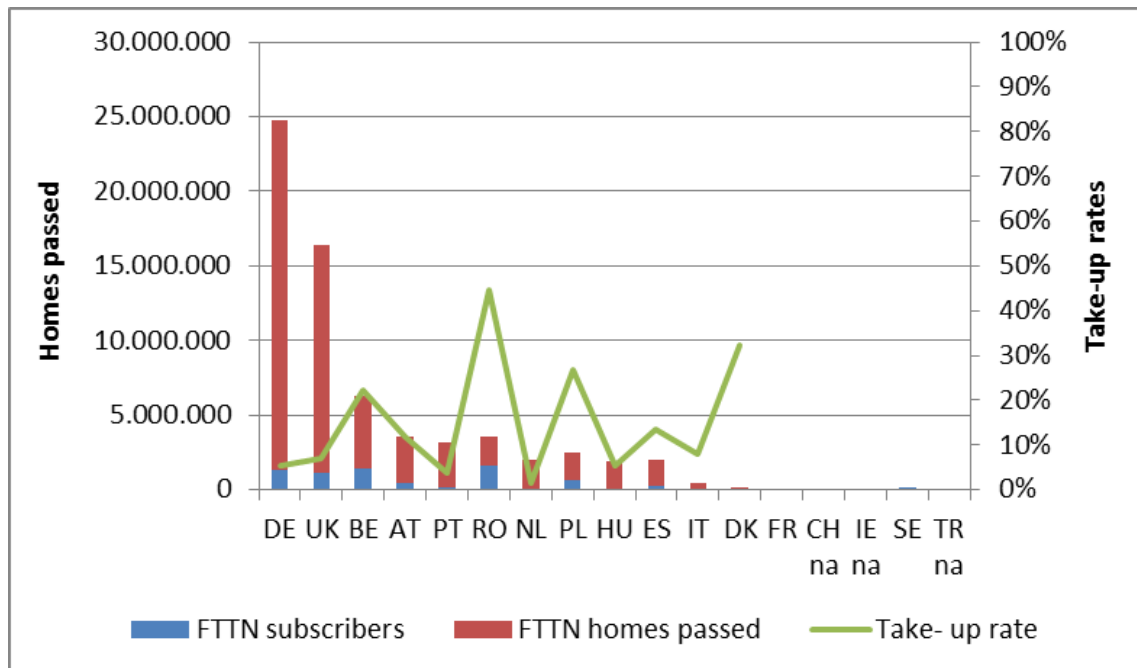
Figure 32: FTTN (VDSL + DOCSIS 3.0) penetration (in % of homes), mid 2011



Source: Estimates are based on NRA responses to WIK questionnaire. Where such data was not available, estimates are based on FTTH Council/IDATE (2011). The data published by FTTH Council/IDATE does not allow distinguishing between VDSL, DOCSIS 3 and other FTTN (e.g. UPT/FTP in Romania).

Again, whereas take-up of FTTN networks is relatively high in some countries, there is a large unused potential as Figure 33 shows. The discrepancy is largest in Germany and the UK.

Figure 33: Take-up rates (subscribers/homes passed) for FTTN, mid 2011



Source: WIK based on FTTH Council/IDATE (2011).

3.2.6.3 Overall broadband penetration

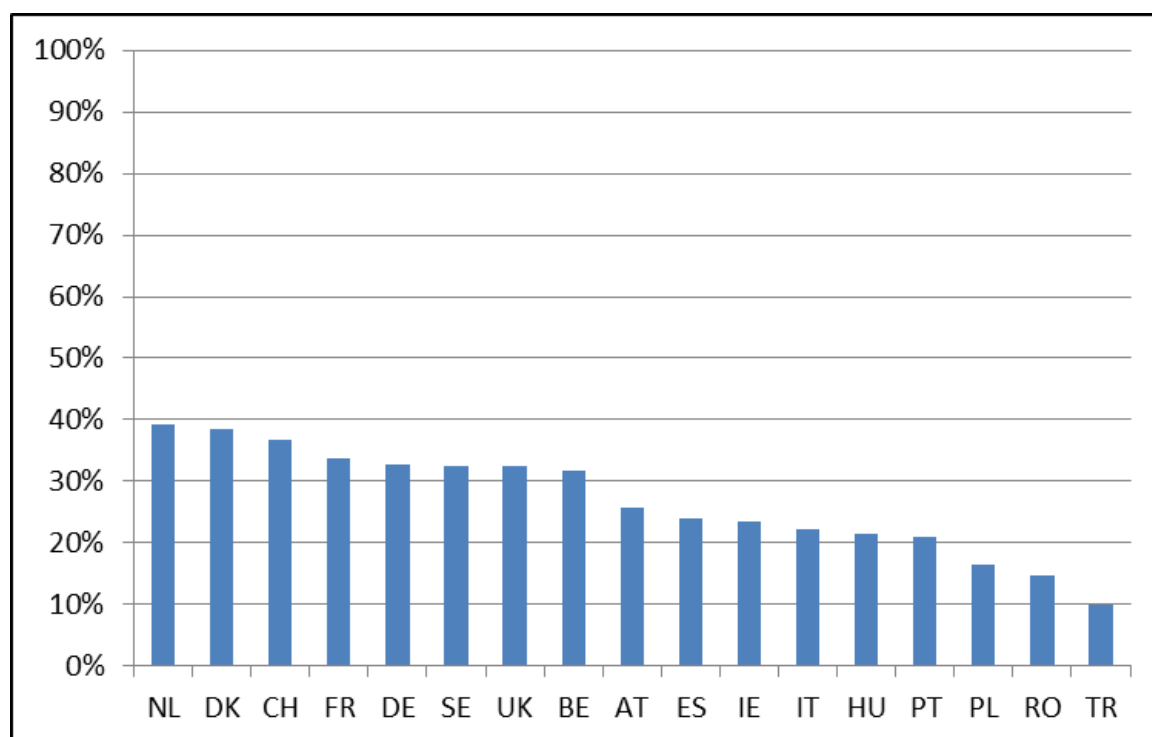
The lack of take-up seems to be a direct consequence of the incomplete and inconsistent application of the *NGA Recommendation*, the associated lack of effective access and the resulting absence of access-based competition in NGA.⁷⁶ This is in stark contrast to the overall broadband market, where access regulation and effective access have driven up penetration rates.

Figure 34 ranks the countries by the level of fixed broadband penetration per 100 inhabitants. 8/17 countries have penetration rates above the EU average of 27.2%, led by the Netherlands, Denmark and Switzerland. 9/17 countries are below the EU average, with Poland, Romania and Turkey having the lowest penetration. In July 2011, there were 27,2 fixed broadband lines per 100 inhabitants in the EU-27.⁷⁷

⁷⁶ The lack of access-based competition goes along with the absence of very high speed offerings and/or higher prices, which can be a direct consequence of it. Other factors may include a lack of attractive applications being available over very-high speed connections.

⁷⁷ COCOM (2011), Broadband access in the EU: situation at 1 July 2011, p. 5.

Figure 34: Fixed broadband penetration (number of fixed broadband lines in % of population), July 2011



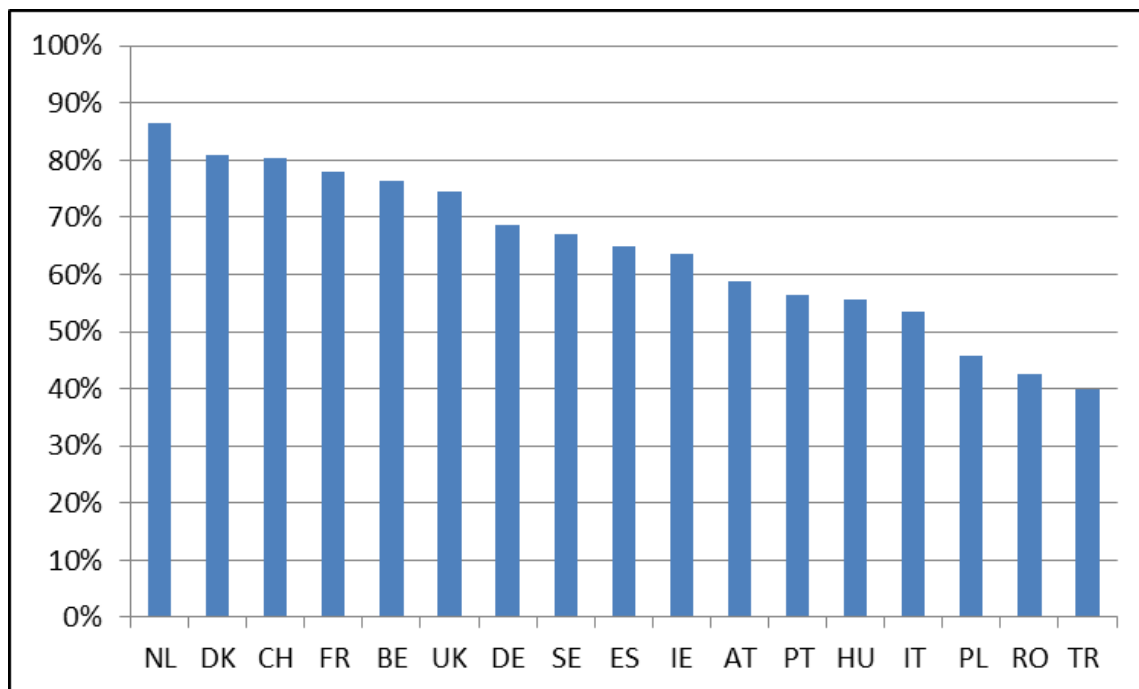
Note: CH data for end 2010, TR data March 2011.

Source: COCOM, EUROSTAT, WIK-Consult, ICTA, Turkstat, BAKOM, Statistik Schweiz

Figure 35 ranks the countries by household penetration. 6/17 countries have a household penetration of above 70%, led by the Netherlands, Denmark and Switzerland. The lowest household penetration rates can be found in Poland, Romania and Turkey. In the EU-27, close to 60% of households are connected to a broadband network.⁷⁸

⁷⁸ COCOM (2011), Broadband access in the EU: situation at 1 July 2011, p. 5.

Figure 35: Fixed broadband penetration (fixed broadband lines in % of households),

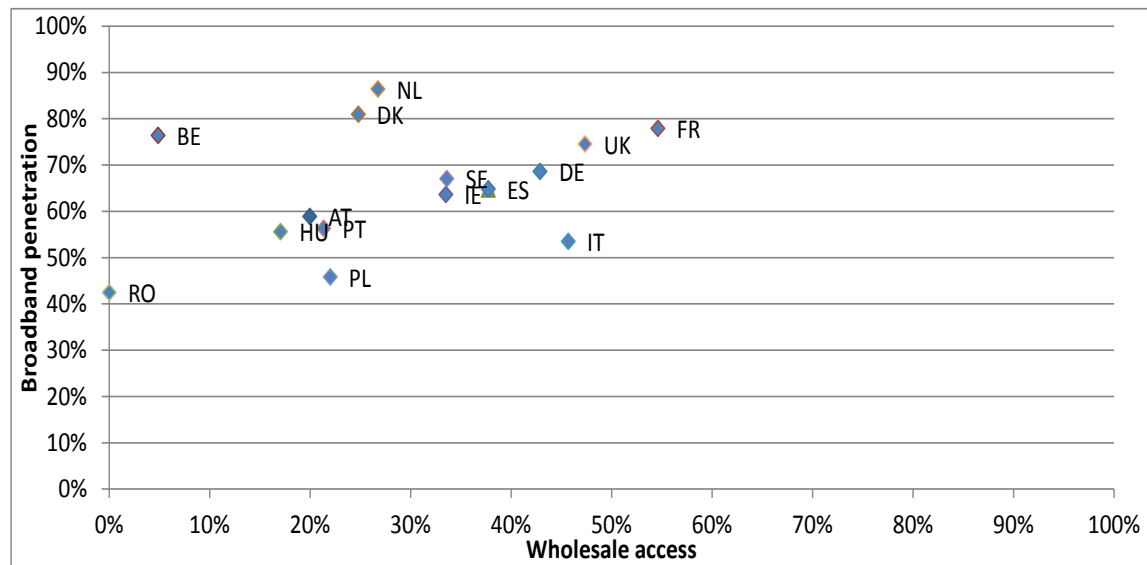


Note: CH data for end 2010, TR data March 2011.

Source: COCOM, EUROSTAT, WIK-Consult, ICTA, Turkstat, BAKOM, Statistik Schweiz.

As Figure 36 shows, there is a positive correlation between the wholesale access share in a country and its broadband penetration, such that more wholesale access (local loop unbundling and ADSL wholesale broadband access) promoted higher broadband penetration rates.

Figure 36: Broadband household penetration and wholesale access, mid 2011



Note: The broadband household penetration is measured as the number of households with a broadband connection in % of all households.

The wholesale access share is measured as the number of wholesale access lines provided by the Market 4/5 SMP operator in % of all access lines provided by the SMP operator.

Wholesale access lines include fully unbundled lines + shared access + wholesale broadband access lines (not resale).

All access lines include the SMP operator's own retail broadband lines + resale + wholesale access lines provided to ANOs.

Source: COCOM (2011)

4 The impact of the NGA Recommendation on progress towards Digital Agenda 2020 targets

4.1 What the Digital Agenda 2020 requires

One of the main building blocks of the Digital Agenda is to ensure comprehensive availability and take-up of very high-speed internet: The Digital Agenda expressly mentions two targets in relation to very high speed broadband:

- By 2020, broadband of 30 Mbps should be available to 100% of Europeans. (Basic broadband should be already available to all EU citizens by 2013.)
- By 2020, 50% of European households should be connected to at least 100 Mbps.

4.2 What countries have achieved

4.2.1 Coverage

The EU is far away from the DAE 2020 target of 100% of households to have 30 Mbps broadband available. At the end of 2010, 30 Mbps was available to only 29% of all households.⁷⁹

We note, however, that great progress has been made regarding the target of making ordinary broadband available to all EU households, as measured by the footprint of DSL. At the end of 2010, DSL access was available to 95,3% of the EU population, up from 94,4% one year earlier. Only six member states still have DSL coverage below 90% of population.⁸⁰ If the current trend continues, by 2013, the whole of the EU population is expected to have access to some kind of commercially viable broadband service, fulfilling one of the DAE 2020 targets.

4.2.2 Penetration

100 Mbps and more

There is a massive gap between the DAE 2020 target of 50 % of households to subscribe to 100 Mbps broadband and the penetration currently achieved. Figure 37 ranks the countries by the above 100 Mbps broadband penetration. In January 2011, less than 1 % of EU households subscribed to 100 Mbps.⁸¹ No countries have a

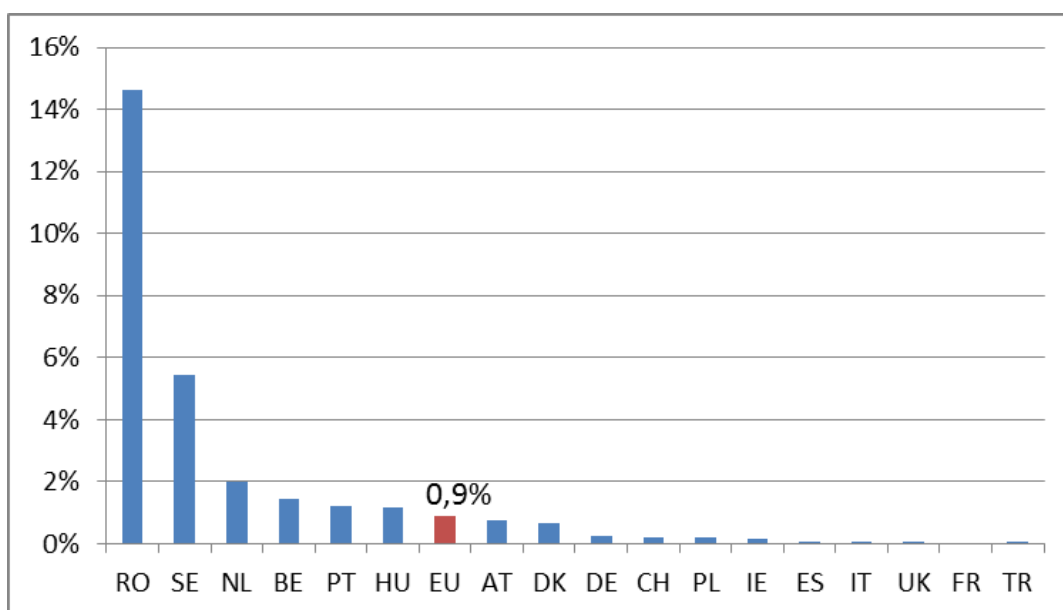
⁷⁹ Digital Agenda Scoreboard 2011.

⁸⁰ Digital Agenda Scoreboard 2011.

⁸¹ Digital Agenda Scoreboard 2011.

household penetration rate for broadband connections of 100 Mbps and more, which lies above 25%. Only 2/17 countries have a 100 Mbps penetration rate above 5% (Romania, Sweden). A further 4/17 countries are above the EU average of 0,9% (Netherlands, Belgium, Portugal and Hungary). 10/17 countries have a 100+ Mbps penetration below the EU average.

Figure 37: Broadband above 100 Mbps penetration (in % of homes), July 2011



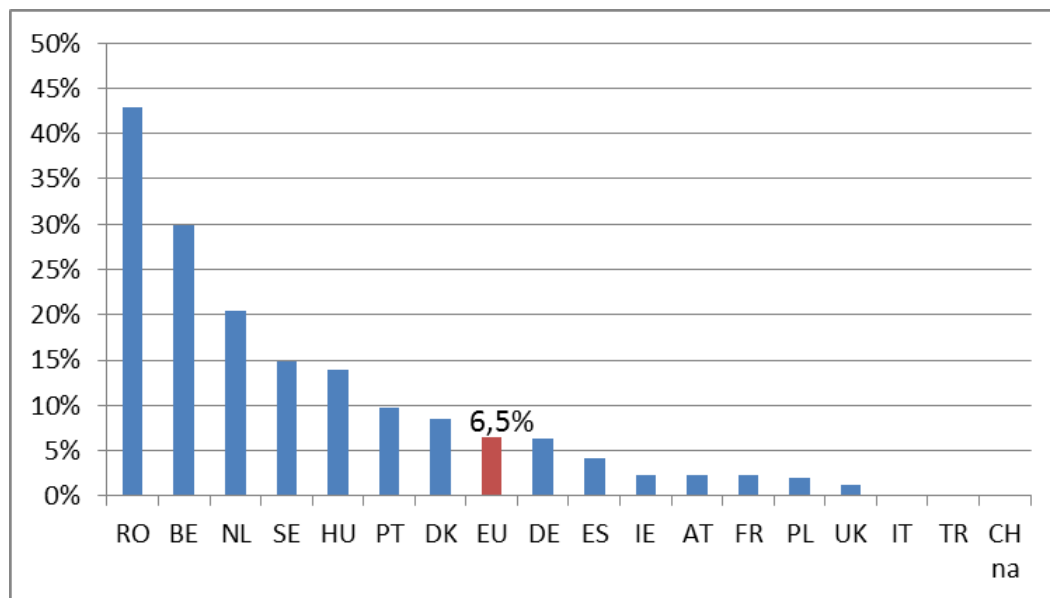
Source: COCOM (2011)

Both FTTH and DOCSIS 3 can meet the broadband penetration target with speeds of 100 Mbps and above.⁸² Currently, many of the FTTH and DOCSIS 3 connections provided could theoretically achieve higher speeds than users have subscribed to. It is therefore instructive to look at the penetration rate achieved for 30 Mbps connections. Figure 38 ranks the countries by the 30 Mbps broadband penetration rate. Only 2/17 countries have a 30 Mbps penetration rate above 25% (Romania and Belgium). A further 6/17 countries have a penetration rate between 5% and 25%. A further 7/17 have a penetration rate below 5%. For Switzerland no data was available. Even if all 30 Mbps connections would be upgraded to 100 Mbps, the gap to the 50% DAE target would be huge (50% versus 6,5%).

In the EU 27, the average penetration rate for broadband connections of 30 Mbps and more is 6,5% of households. 7/15 of the countries assessed in this study have a 30+ Mbps penetration rate, which is above the EU average, while 8/15 countries have a 30+ Mbps penetration below the EU average.

⁸² It should be noted, however, that upload speeds of DOCSIS 3 are typically much more limited.

Figure 38: Broadband above 30 Mbps penetration (in % of homes), July 2011



Source: COCOM (2011)

5 Key findings and recommendations

5.1 Key findings

1. The Digital Agenda for Europe sets far reaching and ambitious targets for the deployment and take-up of very high-speed broadband. At the present point in time, Europe is still far away from achieving these targets. At the end of 2010, 30 Mbps was available to only 29% of European households (2020 target: 100%), and less than 1 % of EU households subscribed to 100 Mbps (2020 target: 50%).
2. Given the relatively low coverage of NGA networks in Europe up to now, fostering further NGA deployment and take-up requires substantial infrastructure investments. In order to facilitate the deployment of NGA and to encourage investment in open and competitive networks the Commission in September 2010 adopted the *NGA Recommendation* to provide appropriate access remedies for an NGA environment.
3. The *NGA Recommendation* calls for access obligations at a wide range of access levels for operators found to have SMP in wholesale access to physical network infrastructure (Market 4) and wholesale broadband access (Market 5). The *NGA Recommendation* also requires transparent, non-discriminatory and equivalent conditions of access and asks for access prices to be cost-oriented and free of margin squeezes.
4. The objective of this “NGA Progress Report” commissioned by ECTA is to describe the application of the *NGA Recommendation* in 17 countries⁸³ more than one year after its adoption, assess the state of competition, roll-out and take-up of very high speed broadband in these countries, examine the role of the *NGA Recommendation* in fostering these objectives, and make regulatory recommendations where appropriate.

Application of the NGA Recommendation - Access to FTTH networks

5. NRAs use a variety of approaches to fibre regulation (see the following Figure). Some NRAs offer SMP operators a regulatory forbearance, while others have imposed a complete ladder of access possibilities. More specifically, approaches include:
 - *Regulatory forbearance*: 7/17 NRAs do not (yet) impose fibre unbundling, and most of them also do not (yet) impose duct access and fibre wholesale

⁸³ Austria, Belgium, Denmark, France, Germany, Hungary, Ireland, Italy, Netherlands, Poland, Portugal, Romania, Spain, Sweden, UK (EU Member States), Turkey (EU accession country) and Switzerland. While the *NGA Recommendation* applies only to the EU Member States, it may also represent a benchmark for NGA regulation in other jurisdictions. The report is mainly based on information gathered from NRAs and ECTA members through a questionnaire.

broadband access. The absence of such access remedies does not appear to be in accordance with the NGA Recommendation except in those countries, where Market 5 was found to be competitive and, therefore, a wholesale broadband access remedy is not warranted.

- *Symmetrical fibre terminating access, combined with duct access:* 3/17 NRAs have imposed symmetrical access to the terminating segment coupled with duct access (and, in one case, with wholesale broadband access). The lack of downstream remedies may not be justified in the light of the competitive conditions. It is debatable whether terminating segment and duct access alone is sufficient to cope with competition problems in broadband Internet access. Competition is most advanced in the French case, but even here the share of customers which have a choice between several FTTH providers is very limited. In the absence of further remedies, such as fibre VULA and wholesale broadband access, there is a substantial risk that competition in the overall broadband market will deteriorate in the future.
- *Asymmetrical terminating access, combined with local and/or regional wholesale broadband access:* 3/17 NRAs have focused on this approach. In these countries, SMP operators have deployed PON network architecture, for which there is currently no feasible form of unbundling at the MPoP available. Such countries lack an important rung in the access ladder if no viable alternative such as virtual unbundled access at the MPoP is imposed (VULA).
- *Access to the unbundled fibre loop at the MPoP, combined with local and/or regional wholesale broadband access:* In 4/17 countries NRAs have imposed access at the MPoP combined with wholesale broadband access in varying degrees. In 2 countries, where the SMP operators have deployed a P2P fibre access network, NRAs have imposed physically unbundled access to the fibre loop (Netherlands and Sweden). In the 2 countries, where SMP operators have deployed a GPON network, NRAs have imposed alternatives: the right to have an additional fibre deployed (Italy) as well as virtual unbundling (UK). Both alternatives can be viable substitutes for physical fibre unbundling provided that pricing and quality of the service is comparable. Concerns remain about the price level of VULA in the UK and the e2e product in Italy (where the price has not been determined yet).

Access to FTTH networks:

Access to FTTH networks (as imposed in Oct. 2011)						
SMP in Market 4	Duct access across full access network	FTTH unbundling		SMP in Market 5	Local WBA to FTTH connections	Regional WBA to FTTH connections
		Term. segm. or concentration point	MPOP			
Countries with currently no FTTH unbundling ¹						
BE	Yes ²			Yes ⁴		
IE	Yes ¹			Yes ³		
TR	Yes ²			Yes ⁴		
AT	Yes ¹			No (res.) ³		
RO	Yes ¹			Yes (non-res.) ³		
CH	Yes ²	Yes		No ³		
DK	Yes ²	Only between MDF and Street Cabinet		Yes ⁴		Yes
Countries with symmetrical fibre terminating access						
FR	Yes ¹	Yes	Yes (symmetrical)	Yes ³		
PT	Yes ¹	Yes	Yes (symmetrical)	No ("C" area) ³		
ES	Yes ¹	Yes	Yes (symmetrical)	Yes ("NC" area) ³		Yes (up to 30 Mbps)
Countries with asymmetrical fibre terminating access						
DE	Yes ¹	Only between MDF and Street Cabinet ⁶	Yes	Yes ³	Yes	Yes
HU	Yes ¹	Yes	Yes	Yes ³	Yes	Yes ⁵
PL	Yes ¹	Yes	Yes	Yes ³	Yes	Yes
Countries with FTTH unbundling at MPOP (physical or other)						
IT	Yes ¹	Yes	Yes (1/2012)	Yes ³	Yes (1/2012)	Yes (1/2012)
UK	Yes ¹	Yes		No (high density) ³	VULA available	Yes
NL	Yes ¹			Yes (lower density) ³		
SE	Yes ¹			Yes ³		Yes

¹ Fibre is included in the definition of Market 4.

² Fibre is not included in the definition of Market 4.

³ Fibre is included in the definition of Market 5.

⁴ Fibre is not included in the definition of Market 5.

⁵ According to the NRA, in Hungary, because of the geographic size of the country, WBA to FTTH connections is provided at national - and not at a regional - level.

⁶ According to the NRA, in Germany, there are no known ducts between Street Cabinet and homes.

Application of the NGA Recommendation - Access to FTTN/VDSL networks

6. NRAs have followed more closely the *NGA Recommendation* in relation to access to FTTN/VDSL networks, where many have imposed the full set of access remedies. Two approaches can be distinguished (see the Figure below):

- *Sub-loop unbundling combined with wholesale broadband access:* 15/17 NRAs have imposed sub-loop unbundling and most of them also wholesale broadband access. Some NRAs have also imposed a VULA product and/or local WBA to VDSL connections. Our survey reveals that the imposition of sub-loop unbundling is unlikely to be sufficient given that there seems to be a business case for ANOs only in the very dense areas, if at all. A VULA substitute for sub-loop unbundling is therefore required.
- *No sub-loop unbundling, but wholesale broadband access:* 2/17 NRAs have imposed wholesale broadband access, but no copper sub-loop unbundling. An important issue is how to deal with sub-loop unbundling if the SMP operator plans to deploy VDSL vectoring technology in the street cabinet. The Belgium regulator has abandoned sub-loop unbundling to facilitate VDSL vectoring, but this does not appear to be a competitively neutral solution for cases, where there is a demand for sub-loop unbundling from ANOs.

Access to FTTN/VDSL networks:

Access to FTTN/VDSL networks (as imposed in Oct. 2011)					
SMP in Market 4		Sub-loop unbundling			
Countries with currently no subloop unbundling					
IE	Yes				
BE	Yes				
Countries with subloop unbundling					
CH	Yes	Yes			
PT	Yes	Yes			
AT	Yes	Yes (physical + vULL)			
DE	Yes	Yes			
DK	Yes	Yes			
ES	Yes	Yes			
FR	Yes	Yes			
HU	Yes	Yes			
IT	Yes	Yes			
NL	Yes	Yes			
PL	Yes	Yes			
RO	Yes	Yes			
SE	Yes	Yes			
TR	Yes	Yes			
UK	Yes	Yes (physical + VULA)			

SMP in Market 5				Local WBA to FTTN connections		Regional WBA to FTTN connections	
Yes				Yes		Yes	
Yes				Yes		Yes	

CH	Yes	No ("C" area)	VULL available	Yes	Yes
PT	Yes ("NC" area)	Yes ("NC" area)		Yes	Yes
AT	No (residential)	Yes (non-residential)			
DE	Yes	Yes			
DK	Yes	Yes			
ES	Yes	Yes			Yes (up to 30 Mbps)
FR	Yes	Yes			Yes
HU	Yes	Yes	Yes	Yes	Yes
IT	Yes	Yes	Yes (1/2012)	Yes	Yes (1/2012)
NL	Yes	Yes			Yes
PL	Yes	Yes	Yes	Yes	Yes
RO	No	No			
SE	Yes	Yes			Yes
TR	Yes	Yes			Yes
UK	No (high density)	Yes (lower density)	NGA not relevant	Yes (NGA not relevant)	

Note: Wholesale broadband access to VDSL connections is included in the definition of Market 5 in all countries.

Source: NRA questionnaires (except for DK), BEREC, WIK

Application of the NGA Recommendation - Terms and conditions of access

7. Moreover, where access to FTTN/VDSL and/or FTTH networks has been imposed, NRAs do not seem to have imposed all the relevant standards put forth in the *NGA Recommendation*. Issues include:

- Some NRAs do not clearly define the aggregation points for fibre unbundling (fibre terminating access and fiber LLU at the MPoP).
- Some SMP operators have not yet included NGA wholesale services in a reference offer. Lack of a reference offer may create uncertainty for ANOs, require lengthy negotiations with the SMP operator, and delay effective access.
- While NRAs have usually claimed that ordering and provision procedures are equivalent to internal supply procedures, this may not be the case in reality.
- It is not clear whether KPIs have been imposed for *both* the external and internal provision of access.
- Instead of cost orientation some NRAs have imposed only reasonable prices or applied a retail-minus standard.
- Risk sharing schemes are very rarely used, which may be explained by the limited extent of fibre unbundling and fibre wholesale broadband access.
- Many NRAs have not imposed *ex ante* tests of margin squeezes between wholesale access and retail products.

Effective usage of NGA access

8. Even where access obligations have been imposed, there is no effective usage of NGA access, with only three exceptions:

- In France, 30% of all fibre lines are based on using terminating segment access provided by another operator.
- In the Netherlands, 5-10% of fibre loops are unbundled at the MPoP.
- In Germany, there is a identifiable number of VDSL wholesale broadband access (but likely smaller than 5%).

These two exceptions apart, there is no or very insignificant access (less than 1% of the SMP operator's NGA lines). In some countries, ANOs provide VDSL from the MDF based on unbundled local loops, but this cannot be regarded as NGA access.

9. The absence of effective NGA access is in stark contrast to the legacy broadband market, where wholesale access remedies (local loop unbundling and ADSL wholesale broadband access) in the majority of countries are effectively used and are characterized by relevant usage numbers (see the following Figure).

	Fibre LLU and fibre WBA in % of SMP operator's FTTH lines	Copper SLU and VDSL WBA in % of SMP operator's FTTN lines	Copper LLU and ADSL WBA in % of SMP operator's copper lines
AT	0,0%	0,0%	20,0%
BE	0,0%	1,0% ⁴	4,9%
CH	0,0%	0,0%	<i>no data</i>
DE	0,0%	<5%	42,9%
DK	<i>no data</i>	<i>no data</i>	24,8%
ES	0,0%	0,0%	37,8%
FR	0,0%	<i>No FTTN/VDSL roll-out</i>	54,6%
HU	0,0%	<i>no data</i>	17,1%
IE	0,0%	0,0%	33,5%
IT	0,0%	<i>No FTTN/VDSL roll-out</i>	45,7%
NL	5-10%	0-5%	26,8%
PL	0,0%	<i>no data</i>	22,0%
PT	0,0%	<i>no data</i>	21,4%
RO	0,0%	0,0%	0,1%
SE	<i>no data</i>	<i>no data</i>	33,6%
TR	0,0%	<i>no data</i>	<i>no data</i>
UK	<1%	<i>no data</i>	47,4%

Source: NRA and operator responses to WIK questionnaire, COCOM

Competition in NGA

10. Because of the absence of access-based competition in NGA, SMP operators enjoy generally very high shares of retail FTTN/VDSL lines and in several countries – where SMP operators have rolled-out fibre networks – also in retail FTTH lines (see the following Figure). But even where ANOs have taken the lead in FTTH deployment, this does not result in a similar level of competition as has occurred in the legacy broadband market. Quite to the contrary, the lack of effective access in NGA entails a high risk that competition in the overall broadband market will decrease in the future as customers migrate to NGA technologies and higher speeds. In the absence of effective access to NGA, ANOs will lose market share as – except in very dense areas – roll-out of own FTTH or FTTN/VDSL networks is not a financially viable alternative for them. Thus the level of competition in broadband that has been achieved by access regulation to date is effectively at stake.

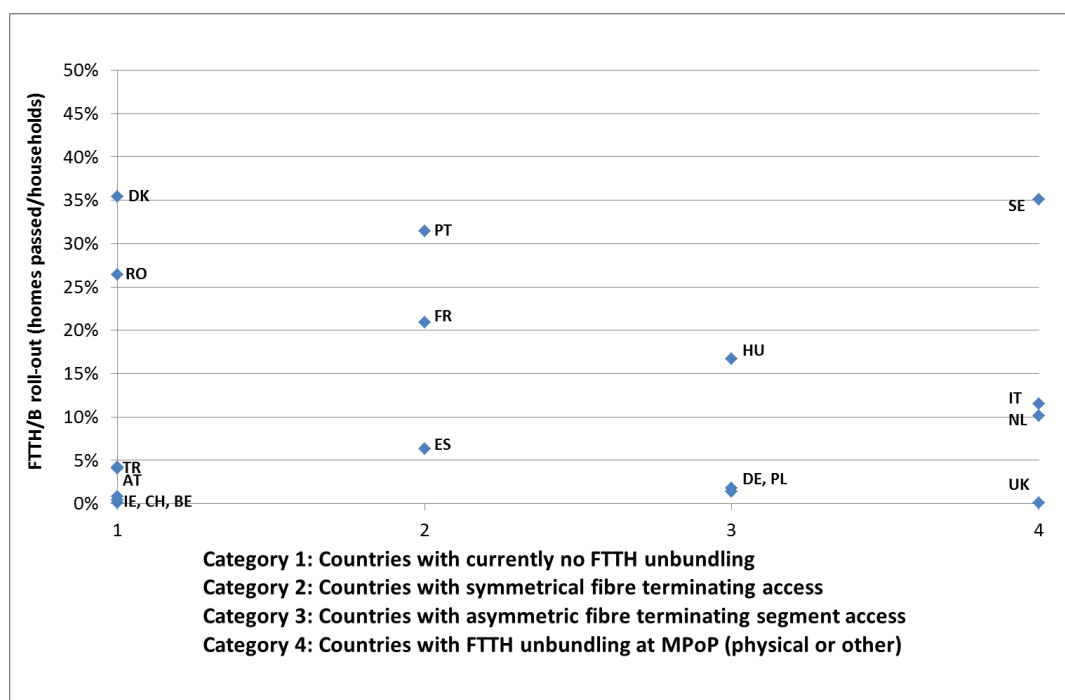
	Share of SMP operator of all (retail) FTTH/B lines	Share of SMP operator of all (retail) VDSL lines	Share of SMP operator of all (retail) retail broadband lines
AT	2,3%	close to 100%	55,2%
BE	0,0%	99% ¹	45,9%
CH	no data	close to 100%	53,8%
DE	0,0%	91,9% ¹	45,6%
DK	5,0%	close to 100%	60,7%
ES	91,4%	55,3% ¹	50,3%
FR	43,9%	no VDSL	42,4%
HU	85,6%	100,0%	41,0%
IE	0,0%	no VDSL	46,7%
IT	2,1%	no VDSL	53,1%
NL	35,5%	close to 100%	41,9%
PL	3,3%	close to 100%	31,8%
PT	83,2%	close to 100%	47,0%
RO	4,9%	99,4%	30,0%
SE	18,8%	close to 100%	37,3%
TR	no data	99,5%	93,0%
UK	0,0%	100,0%	28,9%

¹ ANOs using unbundled local loops to provide VDSL from the MDF are included in this figure. Except in Germany, the retail VDSL market share of the Market 4/5 SMP operator is close to 100% if only VDSL based on FTTN is taken into account.

Source: NRA and operator responses to WIK questionnaire, COCOM

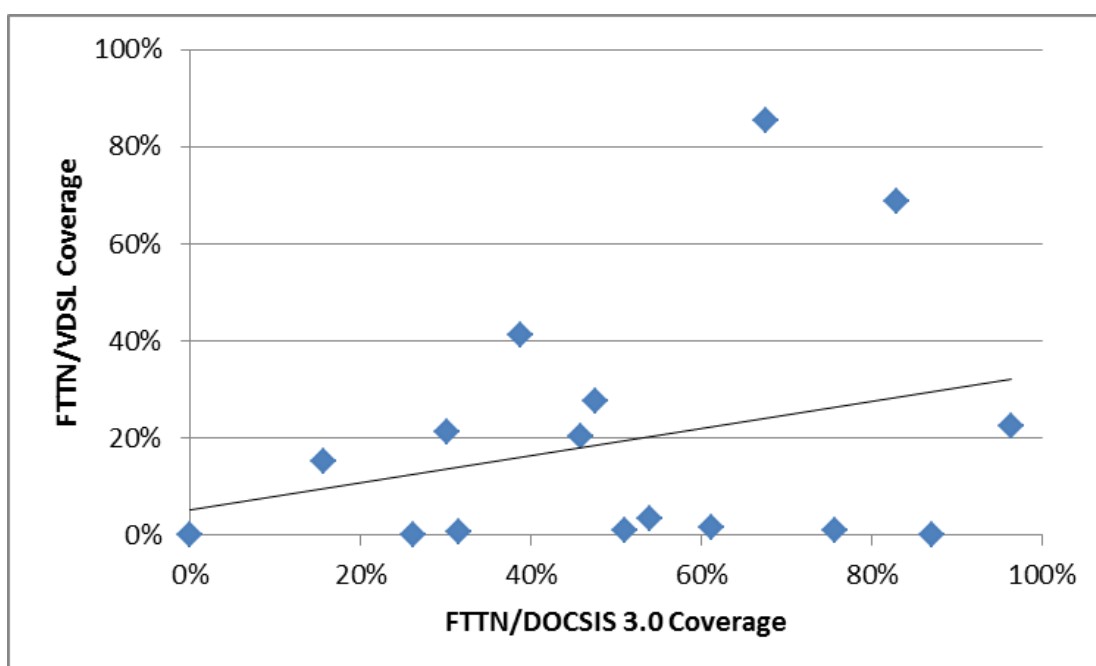
Roll-out of NGA

11. Europe is still far away from the Digital Agenda target of 100% of households to have 30 Mbps broadband available. At the end of 2010, 30 Mbps was available to only 29% of households. While this is clearly not satisfactory, there is no evidence that NGA regulation has had a negative effect on roll-out of fibre networks. As the following Figure shows, the extent of fibre roll-out achieved does not seem to depend on the regulatory approach chosen by an NRA.



Source: Roll-out estimates are based on NRA responses to WIK questionnaire. Where such data was not available, estimates are based on FTTH Council/IDATE (2011).

12. Other factors appear to be more important in relation to fibre roll-out. SMP operators basically react to the presence of cable operators by building out FTTN-VDSL networks and less so by investing into FTTH. At the same time, ANOs find it less commercially viable to invest into FTTH given the more limited addressable market.

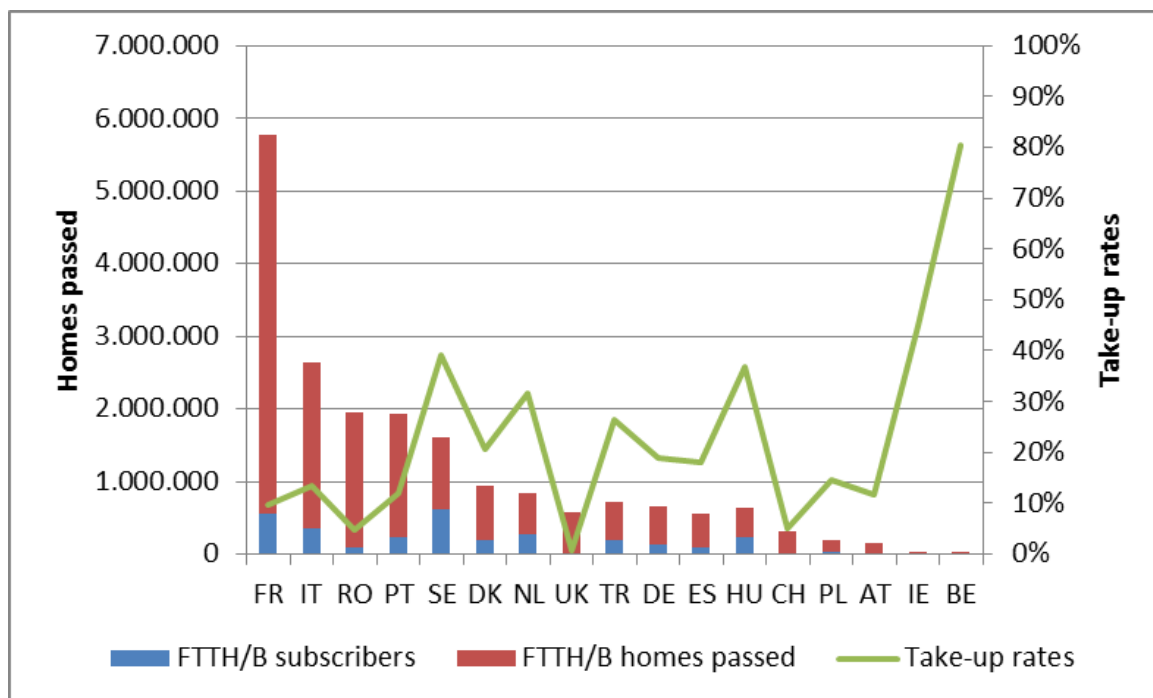


Source: Estimates are based on NRA responses to WIK questionnaire, COCOM (2011) and ETNO (2012).

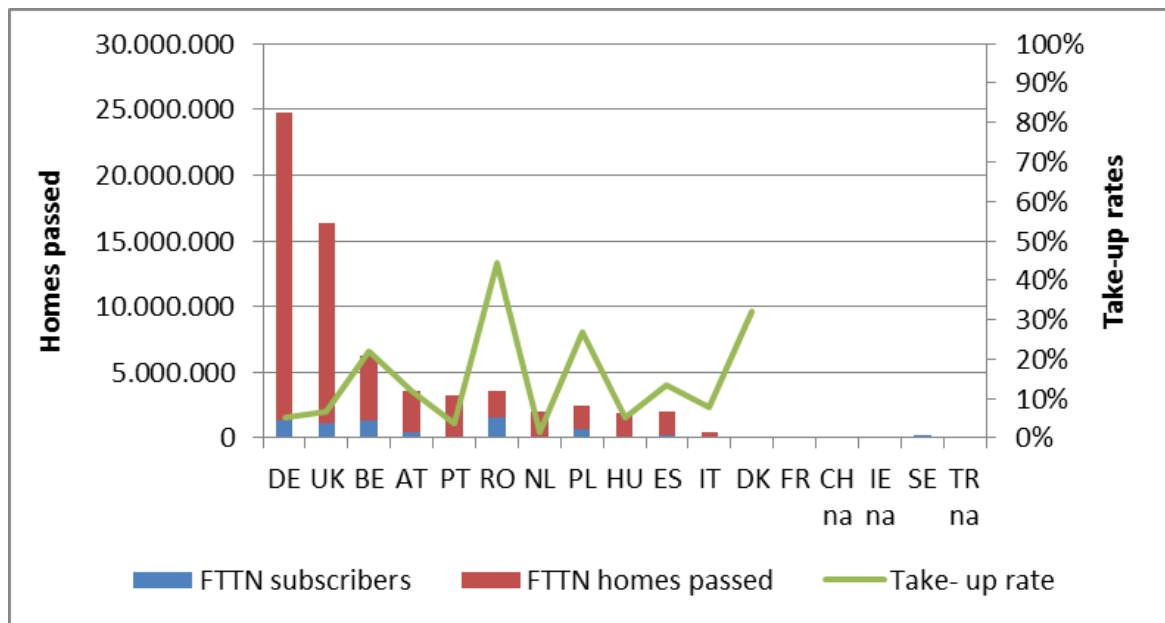
13. In a recent study, WIK has already argued that a major problem is the current pricing of the unbundled copper loop. The current charges for unbundled copper loops tend to lead to a (significant) over-recovery of costs given the actual lifetime of the copper access network and its status of depreciation, which can provide a negative incentive for NGA investment of SMP operators.

Take-up of NGA

14. There is also a massive gap between the Digital Agenda 2020 target of 50 % of households to subscribe to 100 Mbps broadband and the penetration currently achieved. In January 2011, less than 1 % of EU households subscribed to 100 Mbps. The coverage of NGA networks achieved to date would allow for higher NGA penetration, but take rates remain low. The large potential for more take-up in both FTTH and FTTN (VDSL and cable) is depicted in the following Figures.

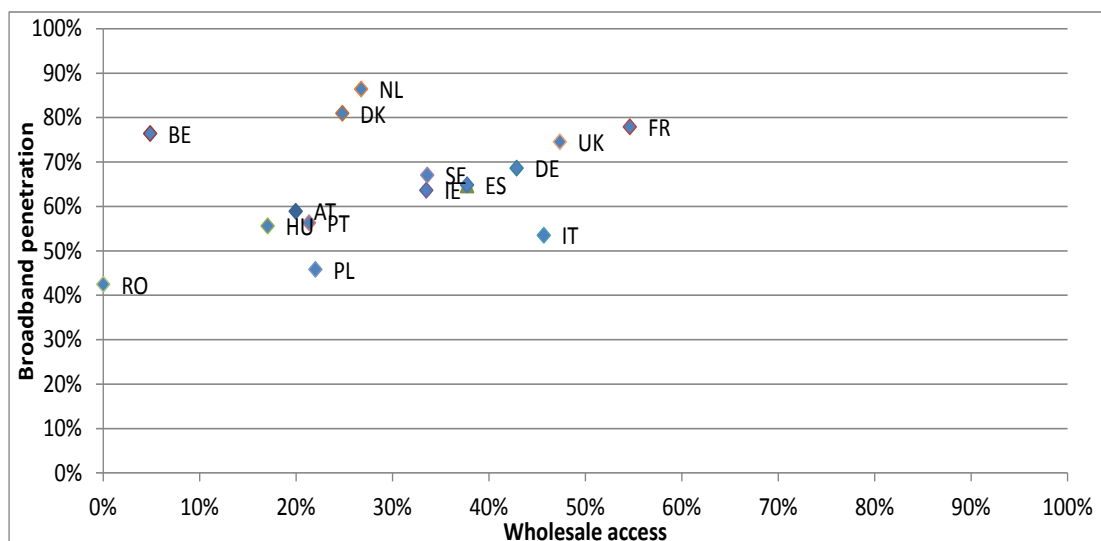


Source: WIK based FTTH Council/IDATE (2011).



Source: FTTH Council/IDATE (2011).

15. The absence of effective NGA access, and the associated lack of access-based competition in NGA, is likely to be a major reason for the low penetration in very high speed broadband. The absence of access-based competition seems to slow down migration of customers to higher speeds. It also increases the risk that the EU may miss its Digital Agenda 2020 penetration target.
16. Access-based competition was one of the major drivers (together with cable competition) to raise penetration of ordinary broadband. As the following Figure demonstrates, countries in which the SMP operator offers a larger share of his lines on a wholesale basis (unbundled local loops and WBA) have achieved a higher broadband penetration rate.



Note: The broadband household penetration is measured as the number of households with a broadband connection in % of all households.

The wholesale access share is measured as the number of wholesale access lines provided by the Market 4/5 SMP operator in % of all access lines provided by the SMP operator.

Wholesale access lines include fully unbundled lines + shared access + wholesale broadband access lines (not resale).

All access lines include the SMP operator's own retail broadband lines + resale + wholesale access lines provided to ANOs.

Source: COCOM (2011)

5.2 Recommendations

17. NRAs should promote competition and progress towards the Digital Agenda targets by applying more rigorously the *NGA Recommendation*. In particular, take-up and penetration could be increased if NRA imposed and effectively enforced NGA access remedies provided for by the *NGA Recommendation*.

FTTH unbundling

18. NRA should define aggregation points for unbundled access and ensure that the number of lines aggregated (fibre terminating access and fiber LLU at the MPoP) is sufficiently large to permit effective competition. BEREC should provide guidance on the specification of wholesale products in line with the *NGA Recommendation*.
19. Where physical unbundling of FTTH networks at the MPoP is not technically feasible, as in the case of GPON fibre networks, NRAs should impose an obligation on the Market 4 SMP operator to provide suitable end-to-end solutions and/or a viable virtual substitute (VULA). In case of end-to-end solutions and VULA, NRAs should impose quality and pricing obligations that make such services a viable substitute to physical unbundling. This requires quality of service features that leave a large degree of discretion to ANOs and allow them to provide the same services to retail customers as if they had used an unbundled fibre line. In case of VULA it also requires a pricing that is independent of the bandwidth offered. In order to ensure a consistent approach across the EU, the Commission should work together with BEREC on technical specifications for end-to-end solutions and VULA.
20. In order to ensure regulatory certainty, NRAs should also impose Wave Division Multiplexing (WDM) unbundling from now on, as some NRAs have already done, even though this form of unbundling is not immediately technically feasible. The European Commission and BEREC should actively engage in discussions on specifications for WDM to ensure that this technology does contribute to finding a longer term solution for NGA access.

Copper sub-loop unbundling

21. Where sub-loop unbundling is not commercially viable, as appears to be the case in many countries, NRAs should impose an obligation on the Market 4 SMP operator to provide a virtual substitute (VULA). As for VULA, NRAs should impose quality and pricing obligations that make such services a viable substitute to physical unbundling. It requires a pricing that is independent of the bandwidth offered. NRAs should carefully evaluate the price and quality characteristics of a VULA product with all stakeholders prior to its introduction. In order to ensure a consistent approach across the EU the Commission should work together with BEREC on technical specifications for VULA.

If sub-loop unbundling is found to be conflicting with VDSL vectoring, NRAs should evaluate carefully, jointly with all stakeholders, the obligations to be imposed on the Market 4 SMP operator in order to ensure a competitively neutral solution. The Commission and BEREC, with full stakeholder support, should study options for a competitively neutral approach on how to deal with sub-loop unbundling, when VDSL vectoring technology is planned to be deployed in the street cabinet.

Terms and conditions of access

22. NRAs should ensure that SMP operators publish a reference offer specifying wholesale NGA products well in advance to enable all operators to launch retail NGA services at the same time as the operator declared to have SMP on the wholesale markets. NRAs should also make sure that SMP operators use equivalent procedures and systems, when providing wholesale NGA services and provide KPIs for both external and internal supply. The forthcoming *Commission Recommendation on Non-Discrimination* should specifically address transparency, equivalence and non-discrimination of NGA access in greater detail as this has been possible in the *NGA Recommendation*.

Pricing of access

23. When regulating the prices of wholesale NGA products, NRAs should resort to pricing standards other than cost orientation only in the limited cases foreseen by the *NGA Recommendation*. *Ex ante* margin squeeze tests should be introduced in relation to all NGA products (including between each of the wholesale products along the rungs of the ladder of investment).
24. We reiterate the proposal made in a recent WIK study that NRAs should revisit the charging of copper loops (and sub-loops). Substantial investment will be needed to provide a sufficient coverage with fibre networks. Such fibre investment can only be expected if the structure and level of wholesale prices provide the proper incentives. Above cost charges for unbundled local loops should be avoided unless there is a mechanism in place for excess charges to be used for funding fibre investment in a

competitively neutral way.⁸⁴ Lower pricing of unbundled local loops would avoid excess profits and promote competition in NGA deployment. The Commission's forthcoming *Recommendation on Costing Methodologies* should provide further guidance on cost-based pricing and specifically address the pricing of unbundled copper loops.

⁸⁴ See Hoernig, S., Jay, S., Neu, W., Neumann, H.H., Plückebaum, T. and Vogelsang, I., Wholesale Pricing, NGA Take-Up and Competition. Report for ECTA, Bad Honnef 2011; Neumann, K.H. and Vogelsang, I., Cost Methodologies and Pricing Schemes to Support the Transition to NGA, Study for ECTA, Bad Honnef 2011.