

# **Draft BEREC report on Co-investment and SMP in NGA networks**

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# Co-Investment and SMP in NGA networks

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## 1. Introduction

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The deployment of NGA networks brought along new issues related to market definition, the designation of operators with significant market power (hereinafter referred to as “SMP”) and regulatory obligations. In the recent round of market analyses, and taking into account the NGA Recommendation published on September 2010, some Member States proposed to exempt fibre-based networks from specific obligations based on their early stage of development. However, a number of issues in this regard are likely to rise soon, as NGA development progresses.

The following document aims at suggesting elements to be examined and specific sets of conditions and criteria considered to be suitable indicators of effective competition to national regulatory authorities (hereinafter referred to as “NRAs”) facing NGA co-investment agreements in their national market and conducting the next round of market analyses of markets 4 and 5. In the NGA recommendation, the EU Commission considered that NRAs would have to look particularly at NGA co-investment plans as they could – regionally – have an impact on competitive conditions, both at wholesale and retail level<sup>1</sup>. More specifically paragraph 28 of the NGA recommendation suggests that in a market analysis the number of operators, the structure of the network and the co-investment arrangements should be considered, as well as also whether the co-investments are based on multiple fibre lines and whether partners enjoy fully equivalent and cost-oriented access<sup>2</sup>.

Assessing the level of competition in a co-investment situation is not straight-forward. In a NGA co-investment situation, two (or more) partners share the costs and the profits associated with the assets instead of each having their own, resulting in a situation that is neither identical to single-operator situation, as more operators have access to the infrastructure, nor to a classical situation of competition as a co-investment from two operators may behave differently from how two competing independent operators would. Depending on the characteristics of the arrangement between the co-investors, the scheme can result in situations that are close to a monopoly or situations that are close to competition if the agreement can ensure efficient competition and grant partners sufficient independence.

Co-investment scenarios may improve the competitive situation (especially for market 4 but also on market 5 and the retail market) especially where alternative providers are part of the agreement. However, at the same time such agreements raise concerns of coordinated behaviour that could impact the competitive situation at both the wholesale and the retail levels since co-investment partners may not be inclined to provide access to third parties, or

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<sup>1</sup> Recital 28 of the NGA Recommendation specifies: “Arrangements for co-investment in FTTH based on multiple fibre lines may in certain conditions lead to a situation of effective competition in the geographic areas covered by the co-investment. These conditions relate in particular to the number of operators involved, the structure of the jointly controlled network and other arrangements between the co-investors which aim at ensuring effective competition on the downstream market. In such a situation, if competitive conditions in the areas concerned are substantially and objectively different from those prevailing elsewhere, this could justify the definition of a separate market where, after the market analysis according to Article 16 of Directive 2002/21/EC, no SMP is found.”

<sup>2</sup> Paragraph 28 reads “Where the conditions of competition in the area covered by the joint deployment of FTTH networks based on multiple fibre lines by several co-investors are substantially different, i.e. such as to justify the definition of a separate geographic market, NRAs should examine, in the course of their market analysis, whether, in the light of the level of infrastructure competition resulting from the co-investment, a finding of SMP is warranted with regard to that market. In this context, NRAs should in particular examine whether each co-investor enjoys strictly equivalent and cost-oriented access to the joint infrastructure and whether the co-investors are effectively competing on the downstream market. They should also examine whether the co-investors install sufficient duct capacity for third parties to use and grant cost-oriented access to such capacity.”

to offer it at unfair prices that would make competition ineffective for consumers. Also the co-investment partners could be inclined to operate in a way that would lead to a monopolistic outcome, for instance by exchanging critical information increasing incentives to coordinate. In such circumstances, the level of welfare could be more comparable to a monopoly situation than to effective competition in terms of quality, choice and prices for customers.

The appropriate regulatory approach to evaluate co-investments should avoid applying unnecessary regulatory pressure at the expense of investment incentives in case of effective competition as well as letting behaviour conducive to threats to effective competition persist where it should be regulated where an undertaking has been deemed to have significant market power.

However, as long as some of the conditions detailed in the present report are met, co-investments may have beneficial effects on competition. Those could be taken into account by NRAs when deciding how to proceed with *ex ante* regulation of wholesale broadband markets, either at the market definition/SMP stage or also at the remedies stage. Remedies are out of scope and will not be discussed in this report.

This introductory section describes the main points and relevant texts applicable to NGA deployments, before outlining the scope of the analysis presented in this report.

## **1.1. The SMP assessment process in a co-investment scenario**

### **1.1.1. Overview of the SMP framework**

On 11<sup>th</sup> July 2002, the European Commission published the guidelines on market analysis and the assessment of SMP under the Community regulatory framework for electronic communications networks and services. These guidelines set out the principles to be used by NRAs in the analysis of markets and effective competition. The markets to be regulated are defined in accordance with the principles of European competition law. They are identified by the Commission in its recommendation No. 2007/879/EC of 17<sup>th</sup> December 2007 on relevant product and service markets pursuant to Article 15(1) of the Directive 2002/21/EC.

This recommendation sets out seven product and service markets, of which market 4 “Wholesale (physical) network infrastructure access (including shared or fully unbundled access) at a fixed location” and market 5 “Wholesale broadband access” will be the main focus of this report. The SMP guidelines specifically address the geographical dimension of those product and service markets identified in the Recommendation, and specifies how to carry out a market analysis of the conditions of competition prevailing in the markets identified. Finally, the Guidelines have been designed for NRAs to designate, following the market analysis, undertakings with SMP in the relevant market and to impose proportionate ex-ante measures.

The main steps defined by the SMP guidelines are described below:

► **The relevant market** is the first element to be considered, as NRAs will constantly refer to it when carrying out tests to assess the degree of competition on the market. The relevant market combines the product market and the geographic market, defined as follows:

- a relevant product market comprises all those products and/or services which are regarded as interchangeable or substitutable by the customer by reason of the products' characteristics, their prices and their intended use;
- a relevant geographic market comprises the area in which the undertakings concerned are involved in the supply and demand of products or services, in which the conditions of competition are sufficiently homogeneous and which can be distinguished from neighbouring areas because the conditions of competition are appreciably different in those area.

The market definition mainly consists in identifying effective alternative sources for a customer, in terms of products and services and of geographic location of suppliers. Demand-side substitutability is indeed generally the main competitive constraint to be analysed in the market definition process, the second being supply-side substitutability, along with the existence of potential competition as assessed using competition law principles and methodology. The supply-side substitutability test consists in assessing whether other suppliers can switch production in an effective and timely fashion to the relevant products.

According to the Commission recommendation on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation<sup>3</sup>, in a second step the markets is examined if regulation is needed on the basis of three cumulative criteria (three-criteria- test):

- the presence of high and non-transitory barriers to entry (of a structural, legal or regulatory nature);
- the market structure does not tend towards effective competition within the relevant time horizon;
- application of competition law alone would not adequately address the market failure(s) concerned.

Market definition is not the main focus of this report. There are a wide variety of different national circumstances which may lead to different conclusions in this respect. The report will therefore work with generic market definition scenarios (e.g. separate market for fibre or not). Furthermore, regarding geographical markets the reader can refer to an extensive ERG common position laying down the basis for a possible geographical segmentation<sup>4</sup>. Finally when considering the relevant markets which may be under consideration in an NGA context this report will mainly focus on market 4 as it is the market most immediately relevant to the current status of network deployment across Member States. In the future BEREC may assess other markets if it is deemed necessary (e.g. wholesale markets (e.g. WBA, leased lines) or retail markets (broadband, telephony, etc.)).

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<sup>3</sup> 2007/879/EC

<sup>4</sup> ERG (08) 20

► **The SMP assessment** is carried out in a third phase. Once the relevant market is defined, NRAs may identify suppliers and customers active on that market. On that basis, the total market size and the market share of each supplier can be calculated with reference to their sales of the relevant product in the relevant area. An undertaking in a market will be deemed to have SMP if it is in a position of economic strength affording it the power to behave independently to an appreciable extent of competitors, customers and ultimately consumers.

Under the 2002 regulatory framework, an undertaking shall be deemed to have SMP if, either individually or jointly with others, it enjoys a position equivalent to dominance as defined under competition law and practice. The Guidelines continue to regard possession of high market shares as an important indication for dominance, and it is implied that a market share of 40% and above would be considered to be a very strong indication for existence of dominance, whilst a market share of less than 25% will not be regarded as an indication of dominance in general. Both volume sales and value sales are suggested to be used as methods for measuring market size and market shares in the Guidelines. Other criteria are suggested by the Guidelines to be used in order to measure dominance:

- overall size of the undertaking;
- control of infrastructure not easily duplicated;
- technological advantages or superiority;
- absence of or low countervailing buying power;
- easy or privileged access to capital markets/financial resources;
- product/services diversification (e.g. bundled products or services);
- economies of scale or scope;
- vertical integration;
- a highly developed distribution and sales networks;
- absence of potential competition;
- barriers to expansion.

Dominance in related markets and collective dominance have been introduced under the 2002 regulatory framework as measures for assessing SMP. Accordingly, on the one hand, an undertaking having SMP on a market may be designated as having SMP in a related market when links between the two markets allow the market power held in one market to be leveraged into the other market; on the other hand, two or more undertakings will be considered as having collective dominance when they have substantially the same position vis-à-vis their customers and competitors as a single company which is in a dominant position.

According to the new framework, some market characteristics may lead to the finding of joint dominance:

- high legal or economic barriers to entry;
- vertical integration with collective refusal to supply
- lack of countervailing buying power;
- lack of potential competition.

All these criteria are examined irrespective of the fact that the market includes a co-investment agreement or not. In the following the discussion is reduced on those market

analyses criteria where in connection with a co-investment agreement particular features arise which may need special consideration. Experiences regarding a large number of the criteria described in the guidelines not relating in a particular way to NGA co-investments may be found to exist in analyses of market 4 and 5 (listed in annex 3<sup>5</sup>). Such criteria need to be considered in NGA co-investments agreements as well.

► **Imposition of ex ante regulation** may occur in a fourth phase. The Guidelines explicitly state that the existence of an undertaking possessing SMP reflects a lack of effective competition in that market, and the designation of an undertaking having SMP obliges the NRAs to impose at least one regulatory obligation on the undertaking with SMP. Those obligations include non-discrimination, transparency, accounting separation, mandatory access to and use of specific network facilities, price control and cost accounting.

NRAs may decide on the type of obligation(s) to be imposed, in which they are only constrained by the principle of proportionality. NRAs, therefore, must choose between the range of regulatory obligations set out in the Directives by taking into account the objectives set out in Article 8 of Directive 2002/21/EC. NRAs must amend or withdraw existing obligations on undertakings with SMP in the event that there is effective competition in the market and again the principle of proportionality must be applied. Otherwise excessive regulation could decrease investment and competition.

### 1.1.2. Current implementation of the SMP framework across the Member States

In the process of market analyses, market definitions of market 4 have been detailed by all NRA Member States, as shown in the tables compiled based on Cullen International market analysis database (July 2011) provided in Annex of the report. They highlight:

► **Regarding market definition:**

- some market definitions include all possible technologies to deliver broadband services whilst others are limited to specific technologies e.g. copper, cable, fibre and other technologies;
- some market definitions include civil engineering infrastructure<sup>6</sup>, while most don't;
- most market definitions are national, but some are regional.

► **Regarding SMP findings:** all NRAs have designated incumbents as having SMP on the relevant market.

► **Regarding remedies:** access is generally mandated to copper and fibre lines. Non-discrimination, transparency (with the publication of a reference offer) and cost accounting are generally imposed on the SMP operator. Additional remedies are imposed in some countries, such as price control.

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<sup>5</sup> These market analyses as well as the respective comments by the European Commission may be found on CIRCABC - <https://circabc.europa.eu/faces/jsp/extension/wai/navigation/container.jsp>

<sup>6</sup> Some Members States have implemented remedies as ancillary services (e.g. ducts and dark fibre ACCESS)

### 1.1.3. NGA rollout acceleration prompts NRAs with new challenges

The rollout of fibre-based networks has accelerated in the last three years. Back in June 2004, there were an estimated 547 900 FTTx subscribers in Europe (EU 15 + Norway & Iceland) and roughly 1.96 million homes/building passed<sup>7</sup>, that have increased to nearly 1.7 million FTTH/B subscribers in the EU 31 and around 11.2 million homes passed<sup>8</sup> by the end of 2008. Recent figures from similar sources show that figures increased significantly in the last two years, with over 3.9 million FTTH/B subscribers and 22.3 million homes passed in Europe at the end of 2010. The NGA rollout acceleration is illustrated in the table below:

	June 2004	December 2008	December 2010
<b>FTTx subscribers in Europe</b>	547 900	1.7 million	3.9 million
<b>FttX homes/building passed</b>	1.96 million	11.2 million	22.3 million
<b>Scope</b>	EU 15 + Norway & Iceland	EU 31	EU 36 <sup>9</sup> excl. Russia

**Table 1: FttX networks rollout<sup>10</sup>**

Moreover, the Digital Agenda sets ambitious targets for broadband coverage and take-up, ensuring by 2013 basic broadband coverage for all EU citizens and, by 2020, fast broadband coverage at 30 Megabits per second available to all EU citizens, with at least half European households having access to broadband lines at 100 Megabits per second.

Whilst in the last round of market analysis, many EU Member States have excluded fibre-based local loops either from the relevant market or from specific obligations on the grounds of their limited development to date, the current acceleration of deployments may prompt NRAs to review their analysis with a view to considering the inclusion of fibre loops in market analysis of markets 4 and 5. The Commission has made comments on several related notifications during the last round of market analysis and has invited NRAs to carefully monitor future developments of fibre access networks and to analyse the substitutability between the fibre and the copper loop in light of future unbundling technologies for point-to-multipoint FTTH as they may become available and/or the development of point-to-point FTTH solutions.

In the event that NRAs do include fibre based access networks in the market definitions of markets 4 and 5, new questions could be raised depending on the market players involved in the roll out. For instance, if a large number of small local fibre-only players deploy fibre-based networks NRAs may need to examine the requirement to define geographical

<sup>7</sup> Source : iDATE FTTH situation in Europe - January 2005

<sup>8</sup> Source : iDATE FTTH European Panorama - December 2008

<sup>9</sup> EU 27 + Norway, Iceland, Switzerland & Andorra, as well as five countries in Eastern Europe : Russia, Ukraine, Croatia, Serbia and Turkey)

<sup>10</sup> Source: iDATE

markets. On the other hand, national markets could remain appropriate if the incumbent is the main leader of the fibre rollout. Furthermore, additional issues may arise if co-investments become the main pattern in fibre network rollout, including collective dominance, which may arise as the subscribers of copper networks' migrate to fibre-based products of the co-investors.

Rolling out NGA networks, especially through a form of co-investments may influence the relevant wholesale market definition (either through the service or geographical dimension), the SMP operator designation and the appropriate remedies.

This report aims at taking a step ahead before the next round of markets 4 and 5 analyses, by detailing key elements that should be considered by NRAs to determine whether effective competition in markets 4 and 5 may be assumed when joint deployment of fibre-based networks by several co-investors occurs. The purpose, therefore, of this report is to provide regulatory certainty and predictability to national markets and stakeholders, consistent with the general objective of encouraging efficient investment. However, each NRA will need to consider the particular national circumstances before adopting a final decision suitable to its market. These national circumstances may depend on several factors such as the market definition adopted by the NRA (co-investment affects fibre deployments whereas market 4 normally includes also copper), the co-investment scenario chosen by the partners, the existence of regulations outside of the framework (e.g. symmetric regulation) or the forward looking analysis of the impact on the retail market in case an NRA decides to change the wholesale regulation.

All of these elements should be taken into account by an NRA when assessing the sufficiency of the co-investment agreement to assure an effectively competitive environment both at wholesale and retail level in accordance to paragraph 28 of NGA Recommendation<sup>11</sup>. In any case, potential differences in competition may also be addressed through remedies differentiation, in order to assure the proportionality of them to the market failure identified. However, *ex ante* remedies that may be imposed on SMP operators are out of the scope of this report.

#### **1.1.4. Relevant market for the analysis carried out in this report**

The market definition is a necessary first step in the market analysis process. Before considering the SMP assessment in a co-investment scenario, it is necessary to specify which markets will be looked at in this report. Although the report will not focus on market definition (relevant as well as geographic), it should be noted that the NGA Recommendation allows NRAs to consider - depending on the conditions of competition - the definition of sub-national geographic markets. In situations where such definition is not justified by the competition conditions, the Commission adds that *“it could nevertheless be appropriate for NRAs to respond to diverging competitive conditions between different areas within a geographically defined market, for instance due to the presence of several alternative*

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<sup>11</sup> These elements need to be taken into account also as outlined earlier – if necessary – when defining geographic markets.

*infrastructures or infrastructure-based operators, by imposing differentiated remedies and access products.”<sup>12</sup>*

Regarding markets affected by roll out of new networks, the NGA Recommendation stated that *“The relevant markets in this connection are the markets for wholesale network infrastructure access (Market 4) and wholesale broadband access (Market 5)”*.

Most Member States have decided to include fibre-based networks in the relevant markets 4 (and fibre based services are usually included in relevant markets 5), along with the copper local loop (and, according to national circumstances, mobile broadband or cable networks in market 5 in particular).

In case a Member State decides to consider fibre-based networks as separated sub-markets 4 and 5, to be analysed independently from the existing sub-markets 4 and 5 defined previously by the NRAs (including the copper local loop and, according to national circumstances, mobile broadband or cable networks in market 5 in particular), that would certainly result in a different approach when assessing the impact of the co-investment project on the competitive situation in the market.

Based on the last round of market analysis, NRAs’ decisions regarding the inclusion of fibre optic networks in the relevant market have not been homogenous:

	Market 4	Market 5
<b>Fibre based networks included in the relevant market</b>	19 NRAs	17 NRAs
<b>Fibre based networks NOT included in the relevant market<sup>13</sup></b>	9 NRAs	11 NRAs

**Table 2: Fibre based networks and market definition**

The European Commission also recommends that retail markets should be the starting point of market definition and SMP analysis at wholesale levels, in order to ensure a consistent approach to appropriate remedies. This is particularly important, as obligations in the upper levels of the value chain affect competition conditions downstream (please refer to the Explanatory Memorandum of the Commission’s Recommendation for more information).

On the retail level, two ranges of services may be considered. First, as far as low/medium speed Internet services are concerned, new fibre networks are competing with traditional broadband networks (through several technologies, mainly xDSL and cable), being therefore constrained by them. Secondly, new NGA networks should be able to offer a whole range of enhanced services but, as the NGA Recommendation acknowledged (paragraph 23), currently these services are still very limited at retail level. The behaviour of co-investors in a

<sup>12</sup> For the definition of sub-national geographic markets see ERG (08) 20 Common Position on Geographic Aspects of Markets and ERG Report on Guidance on the application of the three criteria test (ERG (08) 21)

<sup>13</sup> The main reason evoked by NRAs that decided not to include fibre is that fibre rollout was at an early stage.

NGA network rollout is therefore likely to be affected for the time being by the competitive pressure exerted by copper, fibre and cable networks, at retail level.

Accordingly in the current state of the technology and in the absence of a significant take up of new enhanced services foreseen in the next few years, this report will focus on the base case, in which fibre-based networks are included in relevant markets 4 along with the copper local loop (and, according to national circumstances, mobile broadband or cable networks).

From a wholesale perspective, market 4 includes access to network infrastructure, including unbundling of copper pairs and to some extent access to incumbent's passive infrastructures (either as a substitutable product or as an ancillary infrastructure for access to unbundling products). Moreover, in some member states, market 4 includes access to civil engineering infrastructure allowing the deployment of an own network (essentially ducts and poles).

Where the co-investment project is offering wholesale access on layer 1, the jointly build network should be taken into account as a supplier in the market. The co-investment project's partners should therefore be considered in market 4. Depending on the cooperation agreement partners may be considered as independent players or as one single entity acting in a coordinated manner.

This reasoning may not apply to all co-investment projects, as it depends on the type of access granted by the co-investment project (passive/unbundling or active/WBA). If co-investment partners give access to third parties at layer 2 or layer 3 in form of a bitstream access product they are typically players of market 5<sup>14</sup>. This type of access is not the focus of this report.

In conclusion, no analysis of the impact of a co-investment project on the competitive situation can be undertaken without, in a first stage, providing a thorough market definition. NRAs should proceed with care as market definition is likely to lead to a different result regarding the impact of the co-investment project on the competitive situation in the market. On the one hand, NRAs have to bear in mind that new fibre networks are competing with traditional ones, at least on a segment of the market. On the other hand, services supplied between partners might in many cases be included in market 4, in particular when the conditions described in para. 25 of the NGA Recommendation are met.

- ⇒ The analysis presented in this report is based on the SMP framework designed by the European Commission. The report will provide some guidance on market 4 and 5 SMP assessment processes in a co-investment scenario to rollout NGA networks, although each NRA should consider the particular national circumstances in detail to adopt the final decision.
- ⇒ The report focuses on considering in which situation a co-investment project could impact competitive conditions to the extent of justifying a change in the SMP assessment in the next round of markets 4 and 5 analyses. However, *ex ante* remedies that may be imposed on SMP operators are out of the scope of this report.

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<sup>14</sup> This is not necessarily true for all countries. In the UK VULA products are included in market 4.

⇒ NRAs should be careful when assessing the relevant market as this will have a significant impact on the regulatory outcome. In this report, fibre-based networks which may also be rolled out by co-investment partners are, as a base case, considered to be included in relevant markets 4 (and 5) along with the copper local loop<sup>15</sup>.

## 1.2. The NGA Recommendation provides a definition of co-investment

The NGA Recommendation was adopted on the 20th of September 2010, after a two-year process that included two public consultations. It was presented retrospectively as a component of the Digital Agenda:

*“To foster the deployment of NGA and to encourage market investment in open and competitive networks the Commission will adopt a NGA Recommendation based on the principles that:*

- *investment risk should be duly taken into account when establishing cost-oriented access prices,*
- *National Regulatory Authorities should be able to impose the most appropriate access remedies in each case, allowing a reasonable investment pace for alternative operators while taking into account the level of competition in any given area and*
- *co-investments and risk-sharing mechanisms should be promoted.”*

This Recommendation also aims to:

- ensure the convergence of regulatory approach (i.e. no “regulatory holiday”);
- foster private investment in a context of limited public funding;
- ensure rapid roll outs in order to reach the Digital Agenda objectives.

It is consequently regarded in relation to initiatives on mobile broadband, and has been linked to the Radio spectrum policy programme (RSPP) and the Broadband communication in order to reach the speed and coverage objectives defined in the Digital Agenda, respectively basic broadband coverage for 100% of EU citizens in 2013 and complete coverage at 30Mbps and 50% of households with access to lines over 100Mbps.

The Recommendation covers different types of NGA underlying technologies, including FTTC technologies such as VDSL, as well as FttH PON and FttH P2P architectures. It also deals with various models, from the situation in some countries where the rollout of NGA networks is generally based on the use of the copper subloop, to other situations, such as in France, where the use of copper subloop is – so far – residual and mainly based on FTTH. Such diversity implies different possible set of remedies, from passive (e.g. duct access, in-house wiring, fibre loop unbundling, sub-loop unbundling...) or active products (e.g. bitstream, VULA, VLL...).

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<sup>15</sup> Market 5 may also for instance include cable or other technologies such as mobile as stated before.

The Recommendation aims at defining a common regulatory response to different conditions encountered in NGA roll out. The purpose is not to achieve regulatory homogeneity, but rather consistency:

- Recital 3: *“it is therefore appropriate to provide guidance to NRAs aimed at preventing any inappropriate divergence of regulatory approaches, while allowing NRAs to take proper account of national circumstances when designing appropriate remedies”;*
- following the principle that *“similar situations receive similar treatment”* in the regulation of markets 4 and 5.

Although the Recommendation is based on the common (i.e. asymmetric) regulatory approach, it recognizes the possibility for symmetric measures. This approach is coherent with the state of play in most Member States, as *“in most cases NGAs are the result of an upgrade of an already existing copper or co-axial access network”* (Recommend 11). However, symmetric obligations are expressly foreseen, and Recital 4 quotes: *“Member States may also impose obligations of reciprocal sharing of facilities on undertakings operating an electronic communication network in accordance with Article 12 of that directive which would be appropriate to overcome bottlenecks in the civil engineering infrastructure and terminating segment”*.

The NGA Recommendation provides a general definition for co-investment in FttH networks:

*“Co-investment in FTTH’ means an arrangement between independent providers of electronic communications services with a view to deploying FTTH networks in a joint manner, in particular in less densely populated areas. Co-investment covers different legal arrangements, but typically co-investors will build network infrastructure and share physical access to that infrastructure.”*

## 1.3. Key features of co-investment projects

### 1.3.1. Rationale for entering a co-investment project

So far, few FTTH co-investments schemes have been reported by IRG Member States. Those are currently limited to Switzerland, France, the Netherlands and Portugal, and where they exist, they account for a small proportion of the total FTTH deployments. However, the significant sunk investment required in NGA networks rollout, combined with the high risks due to uncertainties relative to the take-up of fibre-based services have resulted in little drive for operators to deploy such networks in the Member States to date.

Often, communications providers deploying NGA networks do not possess enough capital to immediately cover the whole territory it plans to serve ultimately. A wider coverage can be achieved:

- either by renting infrastructure owned by other operators;
- or through the shared ownership of an infrastructure to be deployed;
- or through co-operation agreements on the use of an infrastructure.

In those cases where LRIC-based cost-orientation is imposed as an appropriate remedy on the regulated market, an infrastructure rental solution, based on a per-line rental charge (including in terms of investment risk taken by the infrastructure operator, which can still

charge the appropriate risk premium) should be equivalent to building its own infrastructure where the operator would obtain the totality of the revenues, and paid the totality of costs for a given area. However, the co-investment and co-operation solutions both require co-ordination and legal efforts leading to additional risks. The rationale for co-investment is therefore analysed in this report.

There is a risk that a decision to conclude a co-investment arrangement could result from anticompetitive motives:

- Facilitating collusion or exchange of information: operators co-operating in a segment of the value chain may be officially competing in other parts of the value chain (e.g. in retail), where there is a risk that they co-ordinate their action, to the detriment of third-party operators.
- Creating a (joint-) dominant position with a plan to abuse of it: operators can use the co-investment as a communication and co-ordination device in the downstream market.

However, there also are technical, economical/financial, institutional or regulatory conditions causing the emergence of co-investments:

► **Co-investments enable operators to commit to wider coverage:** by agreeing on co-investments in large areas of the territory of a Member State, the various operators may demonstrate their commitment to a wide geographic coverage (with a given amount of capital), with potential benefits to competition, supposing a guaranteed number of operators will be present at the retail level in the areas covered by the scheme. It is not unconceivable that the operators' behaviour can have a positive impact on their image.

► **Mitigating risks for smaller operators:** the incentives may be different for a small operator, or generally for an operator that cannot deploy its networks in a sufficient variety of areas. Co-investing in several areas may be a way to avoid some of the risk associated with NGA investment in a particular area

► **Symmetric regulation fostering co-investments:** in certain Member States, symmetric regulation may force the operators to mutualise their investments for some elements of the network in certain geographic areas, in application of the local policy guiding the deployments. Locally, this will lead to a co-investment, but forced on the operators rather than decided by them. The competitive outcome of this situation probably differs from the standard case, in the sense that it is unlikely to prove a potential threat to effective competition per se. This sort of co-investment, by nature, offers a number of guarantees.

► **Balance-sheet and tax optimisation:** partly depending on the applicable company and tax legislation, an operator may have a preference for owning assets, rather than leasing them. For an operator with such preferences, co-investments can contribute to a balance-sheet optimisation strategy: the operator will be treated as the owner of a greater part of the infrastructure it uses. Facilitating co-investments would help such operators adapt their assets to their plans, and perhaps save on tax or legal costs.

Co-investment agreements should be monitored as they may facilitate behaviour conducive to lower the level of competition of the wholesale market with respect to fully independent

partners (e.g. with parallel networks). However, the terms and conditions of the agreement, independently of the legal structure of a given co-investment, can provide guarantees against such behaviour.

### **1.3.2. The report focuses on co-investment schemes including the SMP operator**

This report is focused on co-investment schemes whereby one of the parties to the co-investment is the operator or operators designed as having SMP in markets 4-5 of the 2007 EC Recommendation on Relevant Markets.

The NGA Recommendation emphasises that NRAs' task in a co-investment scenario consists also of analysing to what extent a co-investment project is sufficient to reach the conclusion that competition on the downstream markets would also be effective absent *ex ante* regulation.

Limiting the scope of the report to co-investment agreements whereby the SMP operator designated during the previous round of market analysis is a party to the agreement does not obviously imply that agreements entered into by non-SMP operators (e.g. Vodafone-Optimus in Portugal) do not need to be evaluated; as such agreements may also have an impact in the development of competition on both wholesale and retail markets. However, such an analysis is unlikely to be substantially different from an assessment including the SMP operator. In this case, markets 4 and 5 would most likely include the copper local loop, owned by SMP operator designated during the previous round of market analysis, as well as any fibre local loop rolled out by the co-investment project led by alternative operators. NRAs are already well equipped to determine, on the basis of the competitive structure and characteristics of the market, whether a particular operator has SMP.

### **1.3.3. Direct public intervention is out of the scope of this report**

Partners entering a co-investment agreement may be of different type and origin. Whilst co-investment projects often include incumbent or alternative operators, it appears from several examples in Europe (i.a. Switzerland, Sweden and France) or in other countries (i.a. Qatar, Australia and Singapore) that NGA networks rollout may also be initiated by other entities such as local authorities or publicly controlled energy and utilities companies.

Public intervention towards the development of NGA networks must be compatible with the TFEU (art - 106-109), as network deployment is an economic activity. Therefore, public intervention may incorporate a state aid unless:

- the local authority acts as rational, profit-seeking investor - Market Economy Investor Principle ('MEIP') (State aid decision C 53/2006, Citynet<sup>16</sup>, 11 December 2007);
- the networks provide a Service of a General Economic Interest ('SGEI') and the compensation was determined in respect with the Altmark criteria<sup>17</sup>.

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<sup>16</sup> [http://ec.europa.eu/competition/state\\_aid/register/ii/by\\_case\\_nr\\_c2006\\_0000.html](http://ec.europa.eu/competition/state_aid/register/ii/by_case_nr_c2006_0000.html)

In case the public intervention incorporates a state aid, it should abide by the Community Guidelines for the application of State Aid rules in relation to rapid deployment of broadband networks (2009/C235/04). This specific framework imposes several conditions, for instance regarding wholesale access:

*“In exchange for receiving state support, the beneficiary should be required to provide third parties with effective wholesale access for at least seven years. In particular, the access obligation imposed should also include the right to use ducts or street cabinets in order to allow third parties to have access to passive and not only active infrastructure. (...)*

*In addition, whatever the type of the NGA network architecture that will benefit from State aid, it should support effective and full unbundling and satisfy all different types of network access that operators may seek (including but not limited to access to ducts, fibre and bitstream).”*

This specific framework aims at ensuring that the operator that could benefit from the state aid (partner operator within a public-private partnership) won't be in the position to take “undue advantage” of it. In conclusion, public intervention that involves a state aid (or the provision of a SGEI) falls into the scope of specific additional constraints that are out of the scope of this report. Under the “market economy investor principle”, public authorities are in this report regarded as a “usual” market player.

#### **1.3.4. Utilities companies taking part to a co-investment project are part of the scope of this report**

Companies whose core-business activities are the provision of energy or other utilities sometimes enter co-investment projects to rollout NGA networks. Those companies usually don't compete on the retail market. Should they start to compete on the retail market, they would be regarded as alternative operators.

The NGA recommendation essentially focuses on the retail market when dealing with co-investment. Competition on the upstream market may, under certain conditions, lead to effective competition on the downstream market as mentioned in para 28 of the NGA Recommendation: *“These conditions relate in particular to the number of operators involved, the structure of the jointly controlled network and other arrangements between the co-investors which aim at ensuring effective competition on the downstream market”*. Wholesale operators such as utilities might indeed provide services to several alternative operators

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<sup>17</sup> According to the Court of Justice Case-C-280/00 Altmark Trans GmbH and Regierungspräsidium Magdeburg v. Nahverkehrsgesellschaft Altmark GmbH [2003] ECR I-7747, public funding of a Service of General Economic Interest does not constitute State aid, and is therefore compatible with the general prohibition set out in article 107 TFEU, if it respects four criteria:

*“- first, the recipient undertaking is actually required to discharge public service obligations and those obligations have been clearly defined;*

*- second, the parameters on the basis of which the compensation is calculated have been established beforehand in an objective and transparent manner;*

*- third, the compensation does not exceed what is necessary to cover all or part of the costs incurred in discharging the public service obligations, taking into account the relevant receipts and a reasonable profit for discharging those obligations;*

*- fourth, where the undertaking which is to discharge public service obligations is not chosen in a public procurement procedure, the level of compensation needed has been determined on the basis of an analysis of the costs which a typical undertaking, well run and adequately provided with means of transport so as to be able to meet the necessary public service requirements, would have incurred in discharging those obligations, taking into account the relevant receipts and a reasonable profit for discharging the obligations”.*

present on the downstream market that wouldn't have the capacity to invest (or co-invest) directly.

Insofar as they are acting under the "Market Economy Investor Principle" public operators involved in a co-investment scenario will be examined under the scope of this report.

In any case, NRAs when assessing the effective impact of such co-investment should monitor that the agreement of these parties ensures their independency from the other co-investors. This assessment could be done both through the analysis of the direct agreement clauses (for example, resale prohibitions) or by the potential impact of these partners (utilities or public operators) on retail conditions.

- ⇒ Co-investment agreements should be monitored as they may facilitate behaviour conducive to lower the level of competition in the market.
- ⇒ This report will focus on co-investment schemes whereby one of the parties to the co-investment is the operator or operators designed as having SMP in markets 4-5.
- ⇒ Public intervention that involves a state aid falls into the scope of specific additional constraints that are out of the scope of this report. The only public authorities' intervention considered in the scope of this report are those acting under the "market economy investor principle"
- ⇒ Energy or other utilities companies taking part to a co-investment project and acting as wholesale operators should be examined by NRAs when assessing the competitive situation in the market, and are included in the scope of the current report.

## 2. Overview of the answers to the questionnaire: co-investment agreements in the Member States

### 2.1. Type of partners and legal forms

Co-investment agreements throughout the Member States may generally be classified into several categories, according to the type of partners and the legal form of the agreement as shown in the table below.

	Incumbent and alternative operators competing at the retail level	Incumbent + utilities company	Incumbent and/or alternative operators + local authority
Joint-venture case	Netherlands (KPN 41% and Reggefiber 59%.)	n/a	Italy (Trentino)
Long-term cooperation agreement (IRU access)	Portugal, most co-investment projects in the very-high density in France	Switzerland (most local projects), France (some co-investment projects with energy utilities outside very-high density in France)	Co-investment projects outside areas declared as 'of interest' by private operators in France

**Table 3: Categories of co-investment agreements**

#### *Case Study n° 1: IRUs have been favoured in France*

In France, the co-investment agreements mainly take place between two to four players out of the four national DSL players (namely France Télécom, SFR, Free Infrastructure and Bouygues Telecom). The structure of those agreements is identical: one operator signs a contract with the co-owners of a building and becomes the operator of the building. This operator is in charge of the construction and the maintenance of the network within the building. This operator offers passive access, either through a dedicated fibre line or through a shared fibre line, to the other members of the co-investment agreement, in the form of a 30-year (or 24-year) indefeasible rights of use (hereinafter referred to as "IRU"), renewable two times.

Outside very-high density areas, several FttH projects have been launched on a local basis. They include deployments led by local authorities such as in the city of Pau or the département de La Manche, and deployments led by energy companies such as in the département de l'Ain and Pays Chartrain. Access to FttH networks in those areas is regulated under ARCEP's decision n° 2009-1106 (December 2009, 22nd) completed by decision n°

2010-1312 (December 2010, 14th). Access at the concentration point must be granted through a co-investment offer (long-term depreciable indefeasible rights of use) and through a location offer for any deploying operator (“symmetrically”).

## 2.2. Footprint

► ***Co-investment projects are a significant part of actual and future NGA deployments.***

So far, NGA networks have been deployed slowly across the EU Member States. Estimates for NGA homes passed are around 35 million as of December 2010, amounting to an estimated 17.5 % of households in the Member States<sup>18</sup>. Although those figures remain low compared to the target set by the European Commission (at least half of European households subscribing to speeds above 100Mbps by 2020), co-investment projects represent a significant part in these deployments: indeed, although the figures on the different projects are not always precise or available, co-investments currently represents at least 1.35 million households, if we take into account the networks built in France, the Netherlands, and in Portugal, where the coverage comprised in the co-investment agreement between two altnets is limited to 400 000 homes .

Within the next 7 years, the estimated number of homes passed, based on the announcements made by Free and France Telecom in France outside the very-high density areas as well as the stakeholders’ announcements in Italy, the Netherlands and Switzerland, amount to over 7.3 million households. This means that in some countries co-investment projects are likely to play a significant role in ultrafast broadband offers in the future.

► ***Co-investment projects tend to start the rollout in the largest and densest cities before expanding to achieve national coverage.***

Most of the live co-investment projects are currently taking place in the very-high density areas, or in the largest cities and their immediate surroundings; the coverage of less densely-populated areas for a complete national coverage has still not begun on a large scale.

In the Netherlands, 800 000 homes<sup>19</sup> have been covered by Reggefiber under co-investment so far in over 80 cities (about 10% coverage of total population). Reggefiber’s ambition is to realize nationwide coverage, and 1.2 million homes are planned to be covered by 2012. Similarly, in Switzerland, co-investment agreements between the SMP and different utilities (belonging to communes, cantons or cities) for co-investment in FttH networks include plans to achieve from 90 to 100% coverage in the considered areas (the largest Swiss cities) by 2015-2020. A recent decision by the Swiss competition authority of 11 November 2011<sup>20</sup> states that a series of clauses of the co-investment agreements cannot be exempted from sanctions according to article 5 Swiss carter law (comparable to article 101 TFEU regarding

<sup>18</sup> Source : Eurostat, 03/2011

<sup>19</sup> Source : [http://www.lightreading.com/document.asp?doc\\_id=206790](http://www.lightreading.com/document.asp?doc_id=206790)

<sup>20</sup> [http://www.weko.admin.ch/index.html?lang=de&download=NHZLpZeg7t,Inp6l0NTU042l2Z6ln1acy4Zn4Z2qZpnO2Yug2Z6qpJCDdIF3q2ym162epYbg2c\\_JjKbNoKSn6A--](http://www.weko.admin.ch/index.html?lang=de&download=NHZLpZeg7t,Inp6l0NTU042l2Z6ln1acy4Zn4Z2qZpnO2Yug2Z6qpJCDdIF3q2ym162epYbg2c_JjKbNoKSn6A--)

agreements restricting competition). The further development in the market is therefore unclear at this stage. However, in Basel for instance it seems that coverage targets are kept and that some clauses will be removed or adjusted to bring the agreement in line with the cartel law. The roll-out seems therefore not to be under fundamental review.

In France, the vast majority of the footprint of co-invested networks is – so far - located in the very-high density areas, as defined in a recent ARCEP decision<sup>21</sup> specifying the terms and conditions for accessing ultra-fast broadband optical fibre electronic communications lines. Those areas have been defined by the French NRA as a list of 148 communes gathering the urban areas with more than 250 000 inhabitants and their periphery, with the condition of a sufficient proportion of buildings with more than 12 dwelling units. So far, 28 % of the FttH homes passed in France have been rolled out under a co-investment scheme, amounting to about 335 000 households as of June 2011; the French regulatory framework also ensures that these co-investments remain open to other operators for future investment if they wish to address the corresponding households.

In France, outside very-high density areas, terms and conditions governing access have been defined in the decision n° 2010-1312 that was adopted by the French NRA in December 2010. France Telecom (SMP) and Free (third largest broadband operator in France) have since then signed a co-investment agreement on July 2011, concerning 5 million households to be passed between 2011 and 2020, in the majority of average-size French cities, representing 60 urban areas.

The two main Italian co-investment projects are located in the Trentino and the Lucca's districts. Although they have not yet been finalized, those projects, that include a large part of rural housing, are likely to happen in the medium-term. The first project between the SMP and a utility aims at covering the whole district (objective of about 200 000 houses within 7 years); the second between a utility and an altnet is centered on a white zone and is more restricted in size (1000 houses to this date). Finally a national co-investment project is under development foreseeing a national joint-venture of the largest Italian operators.

## **2.3. Technical forms**

### **2.3.1. Number of fibre per dwelling unit**

The issue of the number of fibres to be installed per dwelling unit is mainly relevant for the co-investment projects offering passive access to the co-investors. This number varies from one to four.

In the Netherlands, the number of fibre installed per dwelling unit is two, although it is currently not possible to buy them separately as one fibre is used for analogue TV.

In France's very-high density areas, ARCEP imposed an obligation for all building operator, when receiving a request from a third-party operator to install a dedicated fibre running to the customer premises on behalf of the requesting operator (which may be necessary for an operator opting for a point-to-point configuration and wanting to minimize the work that needs

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<sup>21</sup> Decision n° 2009-1106 of December 2009

to be performed on its network), provided this operator is willing to share the total installation costs at the outset. This scheme does not impose a “multi-fibre standard” but rather makes it an option that other operators can exercise. This means that, if no other operator is interested in exercising that option, the building operator can deploy the number of fibres it wants. Moreover, when at least four optical fibres have been installed per residential or office unit, and when all of the installed optical fibres are being used by operators, access can be provided at a location higher up the network than the concentration point, in either passive or active form. This obligation does not apply outside very-high density areas.

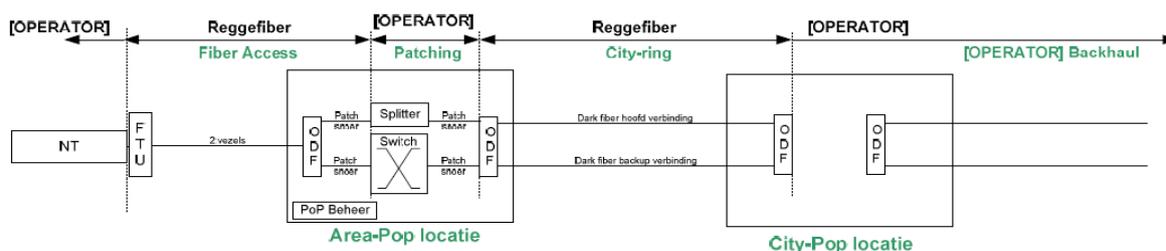
In Switzerland, in most cases in urban areas, four fibres are deployed in the building and usually up to the first concentration point outside of the building. In many cases several fibre lines per household (usually two) are also deployed in the feeder segment between the first concentration point and the POP.

### 2.3.2. Location of the access point

In the existing co-investment schemes, access is usually provided at a passive level. However, in some Member States and providing a contribution to the costs of the active equipment by the partner, access is provided at the active level. This is for instance the case in some areas in Italy.

The location of the access point may also vary: whilst the unbundling is provided at the ODF in the Netherlands, it is provided at the foot of the buildings in the very high-density areas in France.

In the Netherlands, Reggefiber builds the access network (FTU Fibre Termination Unit – Area-Pop with ODF) and backhaul network between Area-POP and City POP. There are about 20 Area-Pops connected to one city Pop. Other segments have to be built by the retail operators, as shown in the picture below.



Picture 1: Reggefiber ODF diagram<sup>22</sup>

The French regulatory framework allows for the access point to be situated within the limits of private property in the case of existing buildings in very high-density areas that have at least 12 residential or office units, or which are connected to a public sewage network that can be visited through a supply tunnel which can also be visited. In all other cases, the access point has to be located outside the limits of private property. In other zones, the regulatory constraint on the access point is a size constraint rather than a location constraint, as the access point has to gather a minimum of 1000 lines.

<sup>22</sup> Source : Reggefiber

In Switzerland, the location of the access point can be set freely by the partners. There are many different solutions developing with partners accessing layer 1 in the POP or one of different concentration points.

## 2.4. Contribution of the partners

In **France**, the building operator deploys the terminating segment (up to the first concentration point). The partners then usually construct their own feeder and backhaul segments. Co-Investors buy a long-term right of use of the terminating segment. For each of the regulated co-investment plans, the building operators have to publish a reference offer that specifies, in particular, the terms and conditions of subscription and cancellation, prior information, the technical characteristics, the delivery processes and after-sales service, timetables and advance notice, quality of service and pricing terms and conditions. The building operator is required to establish and keep up to date information on the costs, including the expenditures made and containing a sufficient degree of detail that enables the French NRA to perform an audit.

The terms and conditions governing the price of access must be reasonable and comply with the principles of non-discrimination, objectivity, relevance and efficiency. In accordance with these principles, when the operator benefitting from this access contributes at the outset to financing the installation of the lines in the building, its contribution will be composed of financing the costs that are attributable to installations made on its specific request, along with an equal portion of the costs that are to be shared by all of the operators. For later entrants' contributions, the rate of return on investment used to determine the pricing terms and conditions will take account of the risk incurred and will extend a risk premium to the building operator (resulting in a WACC of 10.4% and a risk premium of 4.6%).

In **Italy** (Provincia di Lucca) Telco builds OTO-CP, the regional government builds the part from the street cabinet to the POP (CP-ODF) and the Telco its own backhaul.

In **Switzerland** the contribution depends on the cooperation model:

- Construction contribution - regional split: in some cooperation agreements the partners build the whole access network in a certain region. As an example Geneva's utility SIG builds the access network in the agglomeration of Geneva, incumbent Swisscom the one in the inner city. Finally, mutual layer 1 access is granted. The roll-out cost is split in 60% Swisscom and 40% utility.
- Construction contribution - split in network hierarchy (terminating segment vs. backhaul): in most of the 2-Partner co-investments, all segments from OTO to ODF are also jointly built. Usually, the utility builds the terminating (OTO-CP) segment while the incumbent builds the feeder (CP-ODF) and provides collocation. Partners then exchange IRUs to have access where there is no own infrastructure. Maintenance is usually in the responsibility of the constructing operator.
- Financial contribution: in some special cases (e.g. village of Pfyn) there are other agreements implying only a financial contribution from one of the partner and no construction/telecoms asset contribution.

In the **Dutch** case, co-construction of Reggefiber and incumbent KPN takes place. KPN pays 41% and Reggefiber 59% of the deployment cost.

In **Portugal**, there is a cooperation of Optimus and Vodafone. Each operator builds full NGA networks independently, in the same or in different geographic areas (mainly in Lisbon and Porto metropolitan areas). The agreement defines the conditions in under which the parties may have access to (part of) the networks of each other.

## 2.5. Access conditions to the co-investment partners and to third-parties

In **France**, access to in-house wiring is mandated through symmetrical regulation. An operator installing in-building wiring is required to grant a passive access to other operators at the concentration point. If all installed fibres are already in use, access may be granted higher in the network (passive or active). When requests for access are made prior to the installation of the lines in the building, the respective operator must grant reasonable requests from operators to benefit from access to an additional dedicated optical fibre for each unit in the building. ARCEP recommended a transparent consultation process to identify all operators wanting to participate in co-financing in-house wiring. As result of this rules, buildings are alternately equipped by France Telecom, Free, or SFR (or other operators) who grant each other passive access.

Tariffs for all other plans (in particular later entrants), are calculated similarly for operators which take part in initial co-investment, except for a risk premium benefitting to these initial co-investors.

In the **Italian** case of the Lucca District, the granted operator will get access to 1/3 of the whole duct capacity. Newco (Trentino NGN/Telecom Italia) will provide access to third parties on physical layer. Newco will manage the access to the terminating segment from the base of the building to the customer NTP. Unbundling from the central office of Telecom Italia will be provided to third party only for customers (mainly business) that will be connected with a P2P network. In all other cases Newco will provide access to dark fibre from the central office of Telecom Italia to the base of the building. Newco will behave like an infrastructure operator giving access to partner and third party at the same conditions.

The District Authority ensures that the other two operators can have access to the passive infrastructure with no charge. Every other operator can use 1/3 of the capacity. The first operator should also provide access to third party(ies) to a bitstream product at retail-minus price.

In the **Netherlands** Reggefiber is regulated by OPTA at layer 1 at the area-POP (ODF). Regulated tariffs, with different CAPEX for different areas (depending on the capital expenditure per home passed), vary from 14.50€ to 17.50€ per Month. Volume-discounts per area-pop are provided based on total market-volume<sup>23</sup>.

Although not involving the incumbent operator, in **Portugal**, there is a cooperation between Optimus and Vodafone. Each operator builds full NGA networks independently, in the same or in different geographic areas (mainly in Lisbon and Porto metropolitan areas). The agreement defines the conditions in under which the parties may have access to (part of) the networks of each other. In **Switzerland** only copper access products are regulated. The

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<sup>23</sup> There are caps for upfront payments per line (100€) and per area-pop (ODF) (3000€)

incumbent usually accesses the utilities' inhouse and drop fibre while the utility usually accesses feeder fibre of the incumbent. Layer 1 products therefore usually terminate in the incumbents CO. In case of a territorial roll-out, the incumbent accesses the utilities' fibre on the utility territory and vice versa. Access for third parties is currently provided under the following conditions: Layer 1 access by utilities might be offered from around 30 Fr./month (ca. 23€), Layer 2 from around 40 Fr./month (ca. 31€) . The incumbent plans to offer Layer 1 from around 40 Fr./month (ca. 31€) on a national scale.

## 2.6. Symmetric regulation

While symmetric regulation is not the focus of this paper it needs to be considered in the analysis in countries where it forms a part of the co-investment agreement.

Under Article 12 of the Framework Directive, NRAs must “encourage” the sharing of facilities or properties. It also states that when undertakings are deprived of access to viable alternatives, Member States “may” impose the sharing of facilities or property on an operator. In case of FttH, this sharing principle would suppose that any first operator reaching a building grants access for all its competitors at a node, where every end user connected is linked with a point-to-point optical fibre. This may be imposed through an approach based on symmetric access obligations (irrespective of a firm's dominance) or standard asymmetric remedies (pursuant to a SMP analysis).

Based on the answers to the questionnaire sent to the NRAs, national circumstances and specificities seem to have resulted in a large variety of approaches currently implemented by NRAs.

A number of NRAs (including Belgium, the Czech Republic, Norway, Sweden and the United Kingdom) consider that, since there has been no evidence of co-investment plans in the near future in their country, reflections on the issue of symmetric regulation have not yet been necessary. Other reasons not to have considered that possibility include that the in-building wiring usually belongs to building owners, such as in Estonia.

However, an increasing number of NRAs are considering the possibility of imposing symmetric access regulation in execution of revised article 12 of the Framework directive (including Italy and Germany). For instance, the draft review of the German Telecommunication Act foresees that the German NRA would be authorized to regulate the sharing of wiring inside buildings or up to the first concentration or distribution point where this is located outside the building and to ask any company owning telecommunication services network infrastructure (including utilities and regardless of their SMP status) to provide information on their infrastructure to an inventory kept by the NRA.

Additionally, some Member States have combined symmetric access obligations with an asymmetrical SMP framework. It is for instance the case of Austria, where the market analysis decision for the wholesale market for access to physical infrastructure (market 4) obliges the SMP operator to invite alternative operators to planning meetings and co-operation talks prior to NGA roll-out for MDF regions.

In Croatia, the Electronic Communications Act and Ordinance on technical conditions of electronic communications network for business and residential buildings regulates shared use of in-house wiring in the case of new buildings. It imposes an obligation on any investor investing in new optical distribution networks to adopt a point-to-point network architecture from a distribution point mostly located in street cabinets, and to provide public information about their planned investment at least 60 days before the beginning of building works in a public accessible way.

#### *Case Study n° 1: Cooperation in Austria*

The market analysis decision for the wholesale physical network infrastructure access market (market 4, currently restricted to FTTB/FTTC) obliges the SMP operator to invite alternative operators to planning meetings and co-operation talks prior to NGA roll-out for MDF regions. In case several operators are planning to invest in a given area and it is not possible to deploy both networks, the option which would give higher bandwidth to the consumers should prevail, with the possibility to establish compensation payments. This obligation includes the following:

- plans for a NGA roll-out have to be made public by SMP operator 4 months in advance;
- information on NGA roll-out has to include: detailed area of roll-out (not later than 2 months after initial information); information on technical realisation scenario (FTTC or FTTB) and amount of roll-out; planned date of roll-out start; invitation for alternative operators to state the basis for compensation payments applicable in certain cases of NGA roll-out; invitation to enter into talks for possible roll-out co-operation;
- SMP operator is obliged to enter into talks within the following month with those alternative operators that showed interest in cooperation (although entering a co-operation with other operators remains a free decision of the SMP operator).

The draft of the new Austrian telecommunication act, which will be published soon, contains an obligation for operators to notify co-investment contracts to the NRA. However it is not certain whether this obligation will stand.

For an alternative operator being the NGA first-mover, similar obligations apply (organisation of planning meeting, invitation to co-operation talks, offering of compensation payment). In return the alternative operator gains the same advantages as were fixed for the incumbent operator, resulting into a regulatory level playing field with regard to NGA roll-out.

In other countries, symmetric frameworks that have been implemented mostly consist in access obligation, as it is the case in France, Poland (Act of 7 May 2010 on supporting the development of telecommunications networks and services), Slovakia, Slovenia and Spain.

In Cyprus, the Local Authorities and the Department of Civil Works organizes the operators' access to buildings through a common manhole, dividing the cost of the survey and digging work between the interested operators.

In Slovakia, a proposed amendment of the Act on Electronic Communications includes the possibility for the NRA to impose obligation of sharing of in-house wiring up to the concentration point, or cabinet, where the duplication of such infrastructure would be

economically inefficient or physically impossible. Infrastructure owners would be obliged to provide current information on the availability and geographic location of facilities, including buildings, premises and parts of lines, to allow the NRA to have a clear picture about the existing infrastructure. The accessing undertaking would then be obliged to pay the actual costs of maintenance and repair of such wiring, on the basis of rate of use. In case the parties do not agree on the terms of access, the NRA would be able, on its own initiative or at the request of undertakings, to determine the joint use of infrastructure including construction, premises and part of lines.

In Slovenia, the Electronic communication act imposes to communications networks and associated infrastructure to be constructed so as to best facilitate the common use of existing facilities. The NRA must be notified before the start of the investment about the planned construction, which is then made publicly available by the NRA to calls on any interested parties to express their interest for co-investment. If any party expresses an interest, the investor must offer the conclusion of an appropriate contract based on cost-oriented prices. In case the investor and the interested parties cannot agree on the content of the co-investment contract, the NRA may resolve the dispute.

#### *Case Study n° 2: Symmetric regulation in Spain*

Based on Spanish law (Royal Decree 1/1998), new dwellings need to install sufficient capacity to ensure that all electronic communications operators (i.a. xDSL and cable) are able to easily deploy their own networks and install their own infrastructure inside the building. The Spanish government has recently enacted new legislation that will extend these obligations to fibre deployments.

For residential dwellings that fall outside the scope of Royal Decree 1/1998, CMT adopted in February 2009 a decision<sup>24</sup> imposing symmetric obligations on operators willing to deploy fibre inside those buildings. Regardless of its SMP status, any operator that first deploys fibre infrastructure inside a building:

- (i) has to meet reasonable requests for access to, and use of, network elements and equipment in the building and must ensure that bilateral agreements are signed within four months of the request;
- (ii) has to provide access under reasonable prices;
- (iii) and has to respect transparency obligation, pursuant to which sufficient information should be provided to third parties in order to facilitate the planning and implementation of their requests for access.

The first operator is also in charge of managing the relationship with the owners of the building, and ensures that access by third party operators is guaranteed. It must also provide third party operators with all the information they may need in making their investment decisions, in particular regarding (i) the characteristics of the dwelling; (ii) the type of

<sup>24</sup> Link to CMT's decision imposing in-house wiring symmetric obligations for fibre deployments (only version available is in Spanish): [http://www.cmt.es/cmt\\_ptl\\_ext/SelectOption.do?tipo=pdf&detalles=0900271980075a88&nav=busqueda\\_resoluciones&hcomboAnio=2009&hcomboMes=2&categoria=todas](http://www.cmt.es/cmt_ptl_ext/SelectOption.do?tipo=pdf&detalles=0900271980075a88&nav=busqueda_resoluciones&hcomboAnio=2009&hcomboMes=2&categoria=todas)

deployment that will be undertaken; (iii) the location of the terminal points of interconnection, as well as its capacity.

### *Case Study n° 3: Symmetrical framework in France*

National law has allowed ARCEP to develop symmetric measures and to mandate passive access for all operators rolling out in-building wiring. Thus, the Law on modernising the economy (national law, LME dated 4<sup>th</sup> August 2008) introduces a system of rights and obligations for operators deploying ultra-fast broadband solutions. First, the process of installing fibre in buildings is facilitated for operators and imposed on property developers in Greenfield housing. Second, the party that installs the fibre in the building (i.e. the building operator) is responsible to the property owner for all operations performed on the network on the private property, and must satisfy an obligation to share its infrastructure, allowing other operators to provide ultra-fast broadband services to the residents of the building under non-discriminatory conditions. Furthermore, article L. 34-8-3, created by the LME stipulates that the concentration point must be located outside of private property, *“except in instances defined by the Electronic Communications and Postal Regulatory Authority”*.

The current regulatory framework implemented in very-high density is based on the December 2009 decision, that requires an operator installing the in-building wiring to grant a passive access to other operators at the concentration point, unless all four fibres installed are already in use. In this case, access may be granted higher in the network on a passive or activated basis.

Outside very-high density areas, the regulatory framework is also based on a decision, adopted in December 2010. It stipulates that the concentration point will gather on average 1 000 lines, resulting in a fibre passive access solution technically similar to unbundling. ARCEP’s decision n° 2010-1312 specifies the terms and conditions governing access:

- the building operator provides passive access at the concentration point (outside the building) under reasonable technical and economic conditions. A greater part of the network is shared outside very high-density areas compared to very-high density areas;
- requests to benefit from access to a dedicated optical fibre need not to be mandatorily granted;
- housing of active equipment at the concentration point is mandatory in order to allow optimization of all technologies (technology neutrality).

It also specifies that coordination of deployments, particularly with local authorities is ensured

Therefore, an operator deploying a network will have to launch a prior consultation in order to consult third operators for co-investment. This consultation can lead to a cost-sharing scheme with several operators. After the initial deployment, it shall be possible for others operators to catch-up and enter this cost sharing scheme. The tariff condition of this long-term right of usage may take into account a risk premium.

Furthermore, in order to ensure the openness of the market for smaller operators, the initial investors shall make a line rental access offer (layer 1) at the concentration point. Considering the size of the concentration points, this offer is technically equivalent to unbundling. These two levels of access offers ensure a ladder of investment for operators entering the market.

## 3. Elements to be examined in a co-investment scenario

### 3.1. Market players and co-investment agreement structure

#### 3.1.1. Type of market players in- and outside of the co-investment agreement

In the analysis of co-investment projects and their impact on competition on market 4 (which is the focus of this report), the types of players taking part in the co-investment agreement, the type of operators outside of the agreement and their respective incentives and the competitive conditions of corresponding retail markets are of importance.

Players may have different roles depending on their nature or type. Firstly, a player may be a purely financial institution without existing participations in the telecoms market or it may be an already active telecoms operator willing to deploy an own NGA network. These second type of players may be existing operators with an own network, such as a copper or fibre (perhaps an incumbent and SMP operator), a cable network or even operators controlling only ducts which may be used to deploy telecommunication networks (e.g. utilities).

In the following sections, these different scenarios are described, including the potential effects of the nature and incentives of the players on competition.

#### ► ***Nature of players within the NGA co-investment agreement***

- purely financial player: agreements in which operators have sought for financial resources<sup>25</sup> usually only result in a capital sharing of the project between an operator and a financial partner that does not belong to the electronic communications sector. The operator is then usually able to behave and manage the network deployed through the co-investment freely, the incentives of the operator and the co-investors being usually aligned. Therefore, NRAs should deal with this scenario as if the telecoms operator was rolling out a network on its own, because the co-investment is unlikely to change its incentives.
- copper operator: one of the investors may dispose of an existing copper access network (usually the incumbent and SMP operator in market 4). Such an investor generally owns street cabinets, shelters and civil engineering infrastructure necessary for a NGA rollout. Those co-investment projects should be analysed carefully by NRAs as they may result in minimal competition enhancement.
- cable operator: one of the investor may dispose of an existing cable access network. The deployment of a FTTLA or of a FTTH network would then consist in a network upgrade. However, cable operators today usually technically cannot or chose not to offer market 4 products similar to traditional unbundling. If such products are consequently offered based on the new network, competition in market 4 may be enhanced (the operator becomes a direct competitor in market 4).

<sup>25</sup> Direct public intervention is out of the scope of this report, for more details please refer to section 1.3.3

- already existing fibre operator: one of the investors may control an existing fibre access network in an area and decide to enter a co-investment agreement to expand in new geographical areas.
- mixed forms: one of the investors may control an existing copper as well as a cable network (e.g. TDC in Denmark). In this case the combined effects of c) and d) have to be considered.
- existing civil engineering owners: operators that are present in wholesale markets, such as utilities, may also wish to enter into co-investment agreements. These companies have already deployed either passive infrastructure to reach the final customers or even fibre, but they might not have the “know how” to effectively commercialize these services. The incentives for these firms to conclude an agreement with a retail operator is clearly related with economies of scope and cost reductions, whilst the co-investment partners may potentially benefit from cost reduction as these infrastructures are a substantial part of the overall cost of NGA roll-out. The potential enhancement of competition resulting from the involvement of such players depends on their ability to maximize their profit based on the maximization of both lines sold and access prices, thereby leading to a situation perfectly comparable with the one observed in a vertically separated operator. NRAs should carry out a close analysis of the agreement to ensure the independence of the co-invested network from the operator’s interests.
- alternative operator: alternative operators are usually not the owners of the local loop, but have generally already rolled out their own backhaul equipments and infrastructure. When the SMP operator and one or several competitors at retail level agree to roll out a NGA network, sharing investments and risks, the probability that all operators access the network at equivalent conditions are high. However, the retail market share of the alternative operators entering the co-investment agreement should be considered in the assessment. Thus, a co-investment with the SMP operator and a very small or even inactive alternative operator (with a low market share) is less likely to be conducive to effective competition than a co-investment with a significant market share (either nationally, or in the area considered for local operators). Nevertheless, NRAs should examine the terms and conditions of the co-investment agreement closely.

► ***Nature of players external to the NGA co-investment agreement***

Whether a co-investment project leads to competition on market 4 or not does not only depend on the number and nature of players participating in the project but also on existing operators outside of it.

- copper operator: in those situations where the operator controlling the existing copper access network (usually the incumbent and SMP operator in market 4) does not participate in the co-investment, it may deploy a competing NGA network on its own. This is not part of the scope of the report (see Section 1.3.2).
- cable operator: in situations where the operator controlling an existing cable access network chooses not to participate in the co-investment, the competitive effect of the

entry of co-investors depends on the strength of competitive constraints the cable operator exerts on market 4. In current market analysis cable-based products are usually not considered as direct substitutes in market 4. However, it is recognized that indirect effects may play a role.

How these effects may work is extensively described in the BEREC report on self-supply<sup>26</sup>. The paper describes: “Within the context of self-supply and its relation to market analysis, one can find the concepts of “direct” and “indirect constraints”. A company providing inputs at the wholesale level may be constrained “directly” at that level by other companies that are operating at the same level. Alternatively, that company may be indirectly constrained by the “customers of their competitors” i.e. that company may be indirectly constrained by competition that exists on the retail level.”

In fact, under perfect downstream competition and in presence of an alternative vertically integrated player, a wholesale price increase would lead downstream players to exit the market. Therefore the mere presence of an alternative network is constraining in this way indirectly the pricing behaviour upstream. Such indirect constraint is for instance stronger the stronger the competition on the downstream market is and the larger the wholesale price is with respect to the downstream price (e.g. CZ/2008/0797<sup>27</sup>).

Self-supply may be taken into account in the market definition stage enlarging the market when indirect effects over downstream markets are strong enough (e.g. ANACOM and OFCOM included cable self-supply in market 5<sup>28, 29</sup>), or later in the market analysis stage when assessing potential competition. Both approaches try to measure the competitive impact of a vertically integrated operator (e.g. cable) on upstream markets.

The Commission Recommendation on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation of 17 December 2007 does not include retail markets anymore. The expectation therefore is that retail markets are sufficiently competitive in presence of upstream regulation/competition. Consequently indirect effects are playing an important role in different market 5 analyses. On the other hand it may be expected that indirect effects on market 4 are much more restricted as the proportion of the ULL price compared to the retail price is smaller than the one of WBA and more importantly because the effect can be diluted on the retail market for telephony for instance. In particular it may be noted here that the Portuguese NRA tried to include cable in market 4 based on strong indirect effects from the retail market. The Commission however had strongly urged ANACOM not to include cable in market 4 in the final measure<sup>30</sup> mainly because an LLU price increase might not be entirely passed through to the broadband retail market as it could affect other retail products than broadband such as voice telephony or IPTV.

For the above reasons it must be expected that the competitive pressure of cable on market 4 is 1) lower than on market 5 and 2) in any case lower than in the case of direct effects. In any case, when these indirect constraints are proved not to be sufficient to assure either the

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<sup>26</sup> BoR (10) 09

<sup>27</sup> BoR (10) 09, p.10

<sup>28</sup> BoR (10) 09, p. 8

<sup>29</sup> Also, notwithstanding the Commission comments, ANACOM has maintained the inclusion of cable in market 4 definition.

<sup>30</sup> <http://circa.europa.eu/Public/irc/info/ecctf/library?l=portugal/registerednotifications/pt20080850-851/pt-2008-0850-0851/ EN 1.0 &a=d>

inclusion of the service in the relevant market or to assure effective competition, NRAs could also rely on the effects of retail competition when determining the appropriate remedies to be imposed at wholesale level.

- other existing fibre operator: in this case, there are two parallel fibre-based infrastructure networks included in the relevant market (the other existing fibre operator and the jointly-build infrastructure). This situation is consequently more likely to be conducive to effective competition both at the retail and the upstream level than in a situation without another existing fibre operator.
- mixed forms: one of the investors may control an existing copper as well as a cable network (e.g. TDC in Denmark). In this case the combined effects have to be considered.

Finally, when assessing the effective impact of co-investment, NRAs should monitor that co-investors included in the agreement have the incentives and the possibilities to ensure effective competition at the retail level, either by themselves (competing directly at retail level) or through their behaviour at wholesale level (assuring effective access at competitive conditions). This assessment will require the analysis of the partners themselves as well as the agreement (for example, resale prohibition clauses).

### 3.1.2. Types of co-investment agreements

Co-investment agreements in NGA generally are of a "horizontal nature", as they are entered into between actual or potential competitors either at the retail level, at the wholesale level or both. Whilst the European Commission Guidelines on horizontal cooperation explicitly acknowledges the potential benefits of such agreements in para.183, it also provides guidance in the assessment of whether such an agreement should be prohibited on the basis of its restriction of competition: Para 183 states: *"production agreements can be pro-competitive if they provide efficiency gains in the form of cost savings or better production technologies. By producing together companies can save costs that otherwise they would duplicate. They can also produce at lower costs if the co-operation enables them to increase production where marginal costs decline with output, that is to say, by economies of scale. Producing jointly can also help companies to improve product quality if they put together their complementary skills and know-how. Co-operation can also enable companies to increase product variety, which they could not have afforded, or would not have been able to achieve, otherwise. If joint production allows the parties to increase the number of different types of products, it can also provide cost savings by means of economies of scope"*.

Where a restriction of competition under Article 101(1) has been proven, Article 101(3) can be invoked as a defence. Regulation (EC) No 1/2003 puts the burden of proof on the undertaking invoking the benefit of this provision. There are four cumulative conditions which must be met for co-operation agreements to be exempted:

- the restrictive agreement must lead to economic benefits, such as improvements in the production or distribution of products or the promotion of technical or economic progress, i.e. efficiency gains;
- the restrictions must be indispensable to the attainment of the efficiency gains;
- consumers must receive a fair share of the resulting efficiency gains attained by indispensable restrictions;
- the agreement must offer the parties no possible elimination of competition in relation to a substantial part of the products in question.

Where these four criteria are met, the efficiency gains generated by an agreement can be considered to offset the restrictions of competition generated by it.

Operators interested in such horizontal agreements may decide to cooperate in the NGA network deployment by creating joint-ventures (hereinafter referred to as “JV”) or by entering general cooperation agreements in the form of long term agreements including the transfer of indefeasible rights of use (hereinafter referred to as “IRUs”) on a part of the infrastructure deployed.

Any horizontal agreement having an impact on competition in the market might need to be considered in an eventual market analysis.

Whilst JVs are strong and structural forms of collaboration between the partners, usually implying the set-up of jointly controlled corporations rolling out the network, long-term IRUs are contractual cooperation agreements that do not imply the set-up of a jointly controlled corporation rolling out the network.

► ***Main forms of co-investment agreements***

A(n Equity) JV typically implies a new common, legally independent firm is formed to achieve the specific objectives of the partnership, e. g. to manage and finance a joint NGA roll out. The partner companies (such as Reggefiber and KPN in the Netherlands) take equity stakes of the joint venture company in different amounts, carrying jointly the financial risk of an investment. The amount of equity participation can differ and determines the degree of the decision-making power in the company.

Long-term cooperation agreements foresee that no common company is founded. The partners have only contractual relations covering for instance the share of costs, risks and profits or access to the common infrastructure.

► ***Key elements to be examined related to the structure of the co-investment agreement***

When analysing the competition outlook in a co-investment scenario (may it be a JV or a long-term cooperation agreement), a NRA should closely consider the following key elements:

1. Purpose and goal of the cooperation
2. Terms of the operations, such as responsibilities and inputs provided by each party in terms of technology, assets, capital, expertise, goodwill, etc.

3. Financial contributions of the parties: they are usually made of a lump-sum capital at the start of the construction phase that may depend on the project other capital/asset contributions (e.g. ducts, layer 1) as well as of possible transfers during the following stages of the project (e.g. monthly maintenance fees). Another issue is the distribution of the expected profits (losses) and the total equity and debt percentages.
4. Provisions for the possibility of a failure to make the capital contributions.
5. Decision making and dispute resolution process, in particular in case of a JV, designed to settle conflicts in decision making between the Board of Directors and the project management team. Recourse to an independent arbitrator is sometimes considered.
6. Default and insolvency guarantees.
7. Tax issues for JV, as either the JV pays the taxes on the profits or the parties are taxed separately and are individually liable for tax on their share of the JV's profits.
8. Dissolution terms in case a party decides to voluntarily exit the cooperation

► **Focus on long-term cooperation agreements: IRUs**

According to the economic theory of property rights, welfare maximisation is not possible without clarity in the definition of property rights<sup>31</sup>. When property rights are poorly defined, this creates incentives for poor management or over-exploitation. Coordination can partly correct these issues, but this can only lead to a second-best optimum.

What this means for co-investments is that, for the whole duration of a scheme, the legal structure should make as clear as possible who pays for each unit of production or utilisation of each asset, who is paid in return, what transactions are possible and on what terms. The more complete the terms of the agreement, the less discretion remains possible subsequently, which suggests that the co-investment may not be used as a justification for undue strategic communication that could have led to anticompetitive effects.

A classic way of allocating clear and detailed long-term property rights is through the use of Indefeasible Rights of Use, a form of legal contract.

IRUs were first introduced in the US telecom market in the early 60's when the former monopolistic provider Bell, gave the competitors the right to use sub-marine cable capacity. They became again popular in the 90's, when the fibre deployment began and currently they constitute a standard practice in the telecom sector regarding network use, usually on physical level. IRU contracts often last between 20 and 25 years and are often renewable.

Well-suited to telecoms infrastructure access, they may play a central role in NGA cooperation agreements. An IRU can be defined as the agreement between two parties, the

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<sup>31</sup> A consensual definition of the economic notion of property rights, and how it differs from the legal notion of property rights, can be found at <http://www.coase.org/nieglossary.htm#Propertyrights>, retrieved on 4 November 2011: "*Property rights* There are two distinct meanings: economic property rights and legal property rights. The economic property rights of an individual over a commodity or an asset are the individual's ability, in expected terms, to consume the good or the services of the asset directly or to consume it indirectly through exchange. These can include (1) the right to use an asset, (2) the right to earn income from an asset and contract over the terms with other individuals, and (3) the right to transfer ownership rights permanently to another party. The legal property rights are the property rights that are recognized and enforced by the government."

“user” and the “grantor”. The user acquires the right to use network facilities, cables or fixed capacity of the grantor for a pre-specified period of time.

The business reasoning behind agreeing on an IRU relates mainly on the expansion to new areas and avoiding the construction of a second network. In particular, an operator might be interested in extending its business into a certain area where it believes will be profitable but where it has no capacity or facilities. Through an IRU, the operator could acquire access to capacity or a facility by basically by leasing it (long term). Thus, the operator can enter the market but skips the extensive costs for the network deployment.

The grantor, i.e. the network owner, invests the capital for the network construction (rights of way, ducts, poles, installation of fibre cables, testing etc.) and signs the IRU agreement with the users. In this agreement, it grants the right to use dark fibre (which most of the times includes maintenance), or a predefined amount of capacity (including the transmission equipment) or a network facility (ducts) for all or most of potential life of the asset. The grantor usually holds the ownership titles and control of the asset.

The IRU contract generally includes access the main infrastructure, as well as access to all strategic inputs (e.g. in case of ducts it should have access to manholes and cabinets, in case of fibre-LLU product, it should have access to necessary facilities such as collocation, access to splice/junction nodes in and outside of the building).

Additionally, options could be agreed among the involved operators. The infrastructure developer might request volume commitment of the beneficiary for a specific volume of lines in the period of the agreement.

### **3.1.3. Number of market players and number of co-investment partners**

Network roll-out is typically characterized by high fixed and sunk costs. With the co-investment projects, the number of operators which could assume these costs could increase resulting in new entrants offering unbundling products. An increase in the number of direct competitors in market 4 is likely to be conducive to more effective competition on both the wholesale and the retail level, at least in those segments whose upstream inputs rely on fibre.

In previous sections it has been highlighted that co-investment projects could lead either to positive competitive effects at wholesale and retail levels but also to collusive behaviour of the partners which will reduce consumers' welfare. The entity of the competitive impact of a co-investment in the market will also depend on the number of active operators both in the co-investment and outside it, as it has been described in section 3.1.1.

According to the Commission recommendation on relevant product and service markets within the electronic communications sector susceptible to *ex ante* regulation<sup>32</sup>, the markets susceptible to *ex ante* regulation are identified on the basis of three criteria test (see p.4):

The same recommendation cites market 4 as being a market which has been identified on the basis of these criteria<sup>33</sup>. Where high barriers of entry are present a market may still tend

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<sup>32</sup> 2007/879/EC

to effective competition under particular circumstances. Circumstances which are not likely to lead to competition are to some extent described in the Commission guidelines on market analysis and the assessment of significant market power<sup>34</sup>. The recommendation states that *“in the Commission's decision making practice, single dominance concerns normally arise in the case of undertakings with market shares of over 40 %, although the Commission may in some cases have concerns about dominance even with lower market shares, as dominance may occur without the existence of a large market share. 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”*.

Given that a market characterised by two operators implies automatically that one of the players disposes of a market share of 50% or more, it is to be expected that a market with high entry barriers with one or two operators in the market raises concerns about dominance and more generally the competitive situation of the market.

This thesis is (still in case of significant entry barriers) underpinned by various studies. In a paper on the question (*“Is two enough?”*) the Dutch regulator OPTA describes relevant economic theory<sup>35</sup> and concludes that *“it is unlikely that competition is effective with only two firms in the market”*<sup>36</sup>.

A more specific conclusion which is based on experimental oligopolies (Cournot) is made for instance by Huck-Normann-Öchssler 2004<sup>37</sup>. They conclude that collusion is found with two firms while it is not found with four or five firms, which is why they state that *“two are few and four are many”*.

Another specific conclusion based on empirical NEIO (new empirical industrial organization) can be read from Bresnahan and Reiss 1991<sup>38</sup>. The paper empirically estimates market power as a function of the number of players in different local markets. The paper shows a important decline of market power in local industries (e.g. tire dealers) when a third firm enters but much less so when a fourth firm enters. In fact the entry threshold ratios decline rapidly with successive entry from 1.81 to 1.28 to 1.04. This implies that a monopolist has 81% higher variable profits per customer than a duopolist, a duopolist a 28% higher variable profit per customer than a third entering firm, and a third entering firm a 4% higher variable profit per customer than a fourth entering firm). The paper concludes on all analysed markets that *“most of the increase in competition comes with the entry of the second and third firms”* and that *“it appears that the competitive effect of entry occurs rapidly and not gradually”*. These studies may be empirical, but they may show underlying economic drivers useful for NRAs during their market analysis.

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<sup>33</sup> It may be noted that currently all EU NRAs find SMP and regulate market 4.

<sup>34</sup> 2002/C 165/03

<sup>35</sup> <http://www.opta.nl/en/download/publicatie/?id=2051>

<sup>36</sup> An exemption is stated in case the assumptions of a static Bertrand game are fulfilled, the market is contestable or the market is a bidding market. But in the markets in question these assumptions are described to be not realistic. In market 4 in particular it can be assumed that interactions are frequent.

<sup>37</sup> Huck, S.; Normann H. –T.; Oechssler, J.: Two are few and four are many: number effects in experimental oligopolies (2004). *Journal of Economic Behavior and Organization*, Vol. 53, pp. 435-446.

<sup>38</sup> [http://www.hss.caltech.edu/~mshum/gradio/bresreiss\\_jpe.pdf](http://www.hss.caltech.edu/~mshum/gradio/bresreiss_jpe.pdf) p. 995

Finally there are concrete decisions by the European Commission sharing this view for example when clearing APEKs plan to maintain regulation of the mobile market<sup>39</sup>, where it is stated that *“If only two mobile operators can offer national coverage, then this is not enough to ensure that consumers are well served”*.

Whether a market with more than two operators (e.g. three or four) may be compatible with competition depends however on numerous factors and in particular on the level of independence that these operators enjoy, especially within a co-investment agreement. While such a situation has to be assessed in detail in a market analysis or while national authorities may adapt more specific guidelines in this respect it may be said in general that if sufficient independence between the operators is ensured, a market with more than two, i.e. three or more, operators may under optimal circumstances raise low concerns about collusion and the competitive situation.

For the above reasons it must be expected that the competitive pressure of cable on market 4 is 1) lower than on market 5 and 2) in any case lower than in the case of direct effects. On the other hand, the NGA Recommendation explicitly states that NRAs should examine downstream competition when assessing the impact of co-investment in the market analysis procedure. Retail competition could be affected by more operators than those active at the wholesale level, in particular, cable operators. To avoid overregulation, NRAs should take into account all operators active at downstream level which could prevent a collusive pattern to be implemented.

As described in detail in Section 3.1.1. operators may be of different type or nature. It may therefore be difficult to know the number of operators in the market. Regarding existing copper operators which are not (co-)investing in NGA infrastructure it had been concluded that the operator has to be considered as a direct competitor as long the NRA considers copper and fibre to be part of the same market. Regarding cable and FTTx players not offering market 4 products it had been concluded that their indirect competitive effect on market 4 is 1) lower than on market 5 and 2) in any case lower than in the case of direct effects (supply on market 4). It is therefore unlikely that for example a situation with two operators and a cable operator may lead to competition on market 4 even though such a situation might under optimal circumstances lead to competition on retail level.

## **3.2. Network roll-out by the co-investment partners**

### **3.2.1. Complementary roll-out**

Co-Investments aiming at the roll-out of fibre networks can be implemented in various ways. The type of possible fibre roll-out chosen depends on the partners' past business models (e.g. resale only, LLU, etc) and their consequent existing infrastructure previously described in section 3.1.1. Incumbents for instance very often dispose already of an ubiquitous access networks (copper) and backhaul, some alternative network providers have regional access networks with backhaul and cable operators often dispose of a large fibre backhaul networks with a Coax access network (however often no ducts available in this segment). Finally,

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<sup>39</sup><http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/881&format=HTML&aged=0&language=EN&guiLanguage=en>

some utilities dispose of civil engineering (e.g. duct capacity or poles) only in all parts of the network<sup>40</sup>.

	Ducts (Access Network)	Ducts (Backhaul Network)	Layer 1 (Access Network)	Layer 1 (Backhaul Network)	Layer 2
Incumbents	✓	✓	✓	✓	✓
Cable	✗ or ✓	✓	✓	✓	✓
Utilities	✓	✓	✗	✗	✗
Altnets	✗	✗	✗	✓	✓

**Table 4: Typical existing infrastructure owned by type of player**

Infrastructure competition in network based telecommunications is normally considered to be efficient. Once the roll-out is completed, the degree of value added determines the partner's contribution to infrastructure or service competition in retail or wholesale markets. The smaller the part of active and/or passive infrastructure jointly used is (commonality of costs), the higher – usually - the competitive potential<sup>41 42</sup>.

However the installation and operation of parallel connections and infrastructure may sometimes be economically inefficient. In particular if parallel network duplication does not lead to more competition with respect to any solution which does not require a (full) parallel roll-out.

Co-Investment partners could decide to roll-out their networks in a complementary manner. Agreements on complementary network expansion include a division of the network roll-out between the NGA co-investment partners. Such divisions may be geographic or concern the network hierarchy. Such agreements are rarely taking place within joint-ventures.

### ► **Geographic division**

In this scenario, the rollout areas are divided between the partners and each of them is in charge of the network rollout in a given area (e.g. one partner rolls out in the city centre, the other one in the neighboring suburbs). The partners subsequently grant each other mutual access to their part of the network (usually at layer 1 level, but layer 2 is also possible). This type of rollout results in differences according to the roll-out technology chosen by the partners. Access to the unbundled local loop of the fibre line will only be possible in case the rollout between the concentration point and the customer's premises is point-to-point. If the building operators chooses the PON technology, access to the unbundled local loop of the

<sup>40</sup> In this context other published BEREC work may be mentioned, e.g. BoR (10) 08, BoR (11) 06 and BoR (11) 43

<sup>41</sup> The higher the degree of commonality of costs the greater the potential for negative impact on competition. On the other hand, a low level of commonality of costs implies that the involved parties have the opportunity to differentiate its products or services as a higher share of value added are created outside of the co-investment project.

<sup>42</sup> It should be noted that is true not only for the market in question but also for downstream markets. Also, commonality of cost is not a fundamental driver. The competitive potential for example depends in a much more crucial way on entry barriers and the conditions of access to third parties.

fibre line will only be possible at a splitter very near to the customer, making the business case of the access seeking operators more complicated. Bitstream access at the MPoP could in this case prove a more economical solution.

► ***Division of network hierarchy***

In this scenario, the rollout is divided between the partners according to the network hierarchy. Such an agreement could be that one of the partners builds the feeder/backhaul network and provide collocation (e.g. in the traditional local exchanges) and the other partner the terminating segment.

► ***Competition Law perspective***

This report represent a preliminary analysis from the point of view of a regulatory authority, and does not prejudice in any way the opinion a national competition authority (NCA) may have on NGA co-investment agreements. In the case of joint NGA network roll-out, the role of the competition authority may, however, be of fundamental importance, which is why the way general terms of NCA intervention in such a case are described in this section.

Under competition law it has to be considered that cooperation in broadband expansion can be exempted from the ban on cartels under Section 2 ARC, Article 101 (3) TFEU even if they limit competition. The companies participating in the cooperation have to prove that the exemption requirements are met. This is the case when consumers would have a fair share of resulting benefit and furthermore when the advantages at least outweigh the actual or potential negative effects of the competition restraints. The competition restraints are considered indispensable if it can be proven that, without cooperation FTTx, broadband expansion cannot be realized in the area concerned or that the extent of the expansion activity would be considerably less<sup>43</sup>. Therefore, provided that the partners can clearly establish that without complementary investments those areas would not have been explored at all and open their networks to third parties, the competition restraints may be exempted from the ban on cartels. In case an exemption of antitrust rules is needed to allow the co-investment, the access obligation may be part of the antitrust proceeding.

In Germany for example, the German Cartel Office has indicated that it considers that complementary roll-out do not constitute hardcore competition restraints provided market allocation agreements are present and reciprocal access to the network is subsequently ensured<sup>44</sup>., resulting in partners remaining in competition at retail level in the whole area of network roll-out.

Independently of a decision by the competition authority if such agreements are present at the time of market analysis the NRA might need to take them into account in case they undermine the independency of partners.

► ***Equivalence of IRU access with own network***

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<sup>43</sup> See German Cartel Office, Instructions on the competitive assessment of co-operations in optical fibre expansion in Germany.

<sup>44</sup> Bundeskartellamt, Instructions on the competitive assessment of co-operations in optical fibre expansion in Germany, January 2010, URL: [http://www.bundeskartellamt.de/wDeutsch/download/pdf/Stellungnahmen/100119Hinweise\\_Breitbandkooperation.pdf](http://www.bundeskartellamt.de/wDeutsch/download/pdf/Stellungnahmen/100119Hinweise_Breitbandkooperation.pdf)

To benefit from the exemption from the ban on cartels, partners into a complementary rollout agreement have to prove that consumers would have a fair share of resulting benefit. Also NRAs may have to assess in what way those agreements influence the competitive conditions of the relevant market. This may be an issue in case:

- such an agreement results in a lower number infrastructure-based operators' retail broadband offers;
- or if the access seeking partner is not able, due to the conditions of access, to offer a similar variety of services than a completely own parallel network would have permitted.

From a technical point of view, IRU access to a (fully spliced) multi-fibre infrastructure is likely to provide near equivalent access with respect to an own network, providing SLAs and access to collocation nodes are well-specified in the agreement. Problems may however arise after the end of the cooperation agreement (usually long term, e.g. 20-30 years). As a result, complementary rollout with access warranted through IRUs on layer 1 to the partners is unlikely to significantly limit competition in a multi-fibre complementary roll-out scenario with respect to a fully parallel roll-out. NRA should however ensure that mutual access allows sufficient independence in all areas or on all network levels.

### **3.2.2. Multiple fibre FTTH and parallel roll-out**

The NGA Recommendation, published on 20th September 2010, identifies multiple fibre FttH as one of the conditions that may, under certain conditions, ensure effective competition on the downstream market (see Discussion 27 and 28). This section aims at assessing the impact, in a co-investment scenario, of the number of fibre lines deployed per dwelling unit on the SMP analysis.

The NGA Recommendation also provides a definition of multiple fibre FTTH: *“form of fibre deployment in which the investor deploys more fibre lines than needed for its own purposes in both the feeder and the drop segments of the access network in order to sell access to additional fibre lines to other operators, notably in the form of indefeasible rights of use (IRU)”*.

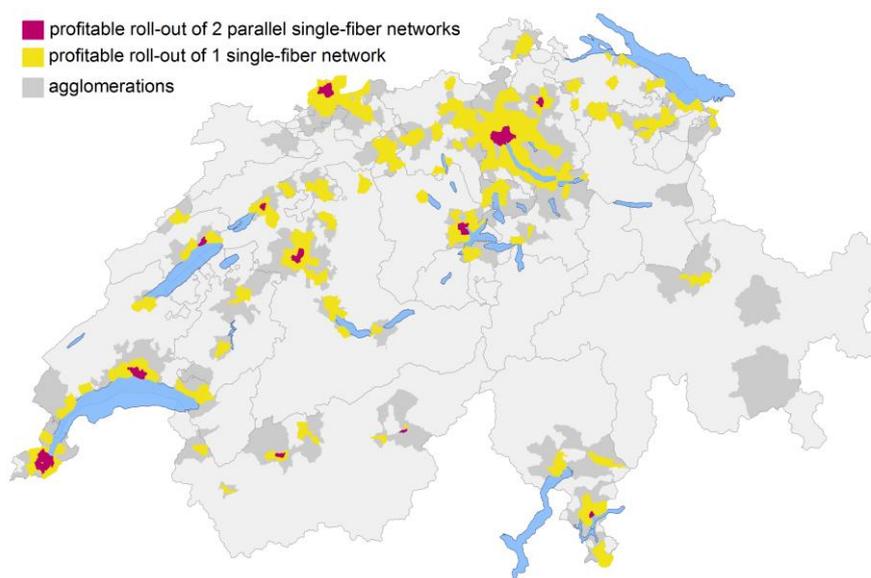
Multiple fibre FttH is currently being deployed in France and Switzerland. According to the NGA Recommendation, rolling out a multiple fibre FttH networks may be conducive to long-term sustainable competition as its key features include:

- allowing alternative operators each to fully control their own connection up to the end-user : this enables an end-user to subscribe simultaneously to several service providers connected at the physical layer, which could in turn help develop new applications;
- facilitating churn, since no manual cross-connection operation is needed at the concentration point, any churn request may be dealt with without any down time, and with lower operating costs than in a single fibre FttH scenario;

- o ensuring that access seekers can obtain full control over fibre lines, without risking discriminatory treatment in case of mandated single fibre unbundling.

► **Parallel and partially parallel roll-out of fibre**

The ERG concluded in its NGA Opinion<sup>45</sup>, that FTTH/FTTB roll-outs are likely to reinforce the importance of economies of scale and scope, reducing replicability and reinforcing enduring economic bottlenecks when compared to copper. Nevertheless, even in FTTH/FTTB architectures fully parallel roll-out are economically viable in few geographically limited areas (mainly urban areas). In Switzerland for example, it is expected that fully parallel FTTH networks will be economically viable only in the six largest cities<sup>46</sup> (red).



**Picture 2: profitable rollout of FTTH in Switzerland<sup>47</sup>**

Constructing two fully parallel FTTH networks would however imply that costs would amount to 200% of a single network. In such case the deployment of a multiple fibre network of which single fibre IRUs are subsequently sold to the partners may represent a solution which is productively more efficient if it would provide the same benefits as two fully parallel networks.

For this reason, in the areas where two operators want to deploy NGA networks, the optimal solution would be for one of those two providers to roll out multi-fibre lines up to the end-customer premises, and give third parties voluntarily access at a concentration point which in turn is usually connected by a partially parallel network of the partner. The concentration point can be jointly used by all companies involved.

Those agreements refer to the joint use of concentration points as well as to the access to the unbundled local loop or sub-loop of the multi-fibre provider.

It has to be considered however, that the roll-out of multi-fibre implies extra costs, which cannot be exactly determined and strongly depend on the size of the concentration point and

<sup>45</sup> ERG Opinion on Regulatory Principles of NGA, ERG (07) 16rev2

<sup>46</sup> <http://www.bakom.admin.ch/dokumentation/zahlen/00545/00722/00910/index.html?lang=de>

Szenarien einer nationalen Glasfaserausbaustrategie in der Schweiz

<sup>47</sup> Source: Graph based on WIK

the availability of civil engineering infrastructure in the area (under normal circumstances, it is estimated to about 10-30% of the investment). Whilst the NGA recommendation encourages NRAs to incentivise the roll-out of multi-fibre in general, the benefits of rolling out multi-fibre only exists where there is a significant risk of a full parallel network being rolled out by a rival competitor. As this is likely to happen only in limited urban areas, NRAs should focus on giving an incentive in areas of particular interest.

Main differences between end-to-end parallel roll-out and multi-fibre networks include:

- network maintenance as it is usually performed by the building operator in the multi-fibre scenario;
- SLAs that have to be agreed between the partners in the multi-fibre scenario;
- lifetime of a possible IRU contract, that may be shorter than the actual lifetime of the asset.

FTTC roll-out can also occur as partial parallel roll-out of fibre (between the MDF and the street cabinet). In this case, both partners roll out their networks up the (multifunctional) street cabinets and jointly use street cabinets only and ducts or dark fibres where necessary. The agreement refers to the joint use of those network elements as well as to the access to the unbundled local loop or subloop of the incumbent. Therefore, in this form of network expansion, the incumbent typically is the access granting partner. FTTx co-investment in partial parallel network expansion is also not very likely to limit infrastructure competition between the parties since only few infrastructure elements are jointly deployed.

Co-investment based relatively large partial parallel network expansion is less likely to limit infrastructure competition (only few infrastructure elements are jointly deployed in this case).

As far as market 4 and 5 are considered to be national markets regional network roll-out agreements will rarely have impact on the incumbent's SMP designation. But the regional roll-out may require a reassessment of geographic market delineation.

#### ► ***Multi-fibre and mono-fibre line networks***

Although multiple fibre FttH is the situation the more likely to be conducive to effective competition, sustainable long-term competition may also, under certain conditions, be fostered in single fibre FttH networks. In single fibre FttH networks, the operator rolling out the jointly-build network installs a single fibre per household, which may be shared with access-seeking operators via a cross-connection box. This solution, technically comparable to copper local loop unbundling, also ensures the existence of a passive offer at the concentration point that guarantees third-party operators the ability to control their active equipment and to choose their technology. This solution helps secure future network developments of competitors as it leaves open the possibility for each operator to upgrade their network independently in the same way multiple fibre FttH networks do. As with unbundling, the goal is to allow operators to differentiate their offers, to control the technological evolution of their network and the roadmap for its implementation, by providing them with a passive solution over optical fibre. It could therefore also result in satisfactory competition conditions in the long-term.

Additionally, although single fibre FttH does not provide the market with as many pro-competitive features as multiple fibre FttH, it is possible to implement operational processes to ensure satisfying competition conditions with single fibre FttH. For instance, although churn will nonetheless require a technical physical intervention, operational processes may be defined so as to enable effective churn.

Finally, multiple fibre FttH may not work in a general way and would have to be examined on a case by case basis depending on the local characteristics. For instance, in rural areas, the characteristics of housing, the population density and the availability of civil engineering infrastructure may prevent the rolling out of several parallel networks. Some surveys or deployments that have been conducted show that when the concentration point gathers several hundreds to several thousands of lines, with a point-to-point network rolled out, overloading issues can appear in the civil engineering infrastructure. In particular the problem would be insufficient duct capacities, especially in the access network. Besides, the rollout of a multiple fibre FttH network downstream of the concentration point has also an impact on the volume of the concentration point, which leads therefore to additional constraints regarding the local installation of such equipment, for the same housing service area. Moreover, studies show that in some regions only a layer 1 monopolist is economically possible. In these cases it must be carefully assessed whether multiple fibres should be rolled out and additional costs incurred given that it is unlikely that there will be operators able to connect the fibres.

Therefore, although networks based on multiple fibre lines may be more conducive to long-term sustainable competition in line with the objectives of the EU regulatory framework, it does not seem desirable that multiple fibre lines be deployed regardless of the local characteristics. Under some conditions, the extra-costs involved when deploying a multiple fibre FttH network compared to a single fibre network might be significantly higher the utility that can be derived. In any case, the deployment of multi-fibre seems to be a sensible solution in dense areas, where the fibres have a chance to be connected to an alternative network, be it at local exchange, cabinet or concentration point level (e.g. manhole or building entry point).

Thus, the comparative benefits of rolling out multi-fibre rather than mono-fibre need to be assessed by NRAs in the course of the market analysis keeping in mind the extra costs and the impact this could have on the location of the access point. In case rolling out multiple fibre line in-house or in the terminating segment is conducive to significantly bring closer the access point to the homes, this could lead to worsen the economic conditions for alternative operators to access this point. This could therefore be of fundamental importance to the competitive situation, and would need to be considered by NRAs when assessing the competitive situation. In co-investments agreements this is usually not an issue, as a concrete possibility to access the fibres (usually IRUs) is often the basis of the agreement. This may however be an issue in the case of third party pay as you go access.

### **3.3. Access conditions to co-investment scheme partners**

#### **3.3.1. Compensation mechanisms**

Investing includes risk management. Investment in NGA is risky by nature as there is uncertainty on the level of the return on investment. There is for instance uncertainty in connection with expected demand, market share (penetration) and ARPU. Investors therefore naturally look for ways to mitigate these costly investment risks. Mechanisms able to reduce the investment/costs in case of a negative development of the market can consequently spur the readiness to invest by investors.

► ***Compensation mechanisms in cost-based price regulated markets***

In some price regulated markets, compensation mechanisms reducing the risk for investors may be implemented. Those compensation mechanisms may pass through a risk premium, volume discounts, upfront payments or long-term access prices. These need however to be in line with Annex I (Pricing principles and risk) of NGA recommendation.

For instance in the Netherlands, OPTA has introduced a regulatory regime that commits to a long-term price-cap. The price-cap will only be adjusted if actual rates of return turn out to be higher than a certain percentage above the rate of return initially expected. OPTA indicates that it considers that “in comparison to a regulatory regime in which the price-cap is reviewed every three years, the system of multiyear regulation introduced by OPTA has positive effects on investment incentives and efficiency incentives.”<sup>48</sup>

► ***Compensation mechanisms between co-investment partners***

The risk of low demand cannot be mitigated through an agreement between the partners. Low demand may mean both low demand for partner A as for partner B, a risk which no possibly agreed mechanism between them could possibly mitigate. This risk is higher for operators active only on the wholesale level, such as utilities, with no existing retail customer base which can be migrated face a risk that the fibre local loop will remain dark (vacancy risk), i.e. having no running services after the rollout.

There are however several forms of compensation mechanisms which allow reducing the investment risk by redistributing the costs/investment between the partners according to their success on the market. This could for example result in co-investment modalities that take into account capacity usage of the infrastructure.

Therefore, whilst compensation mechanisms may mitigate the risk of obtaining a low market share while the partner faces a high demand, they will not be relevant to mitigate the risk of overall low demand.

► ***Forms of compensation mechanisms***

Various compensation mechanisms may be implemented in FTTH rollout co-investment agreements. For instance, transfer payments based on the number of lit fibre lines, based on lit FTTH lit accesses in the case of multi-fibre or based on the number of layer 1 products sold (including self-supply)<sup>49</sup> could be created.

The transfer payments can in theory be of any amount. In Switzerland where such agreements are most popular, standard agreements generally foresee that the incumbent is

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<sup>48</sup> OPTA, Regulation, risk and investment incentives, Regulatory Policy Note 06, May 2010

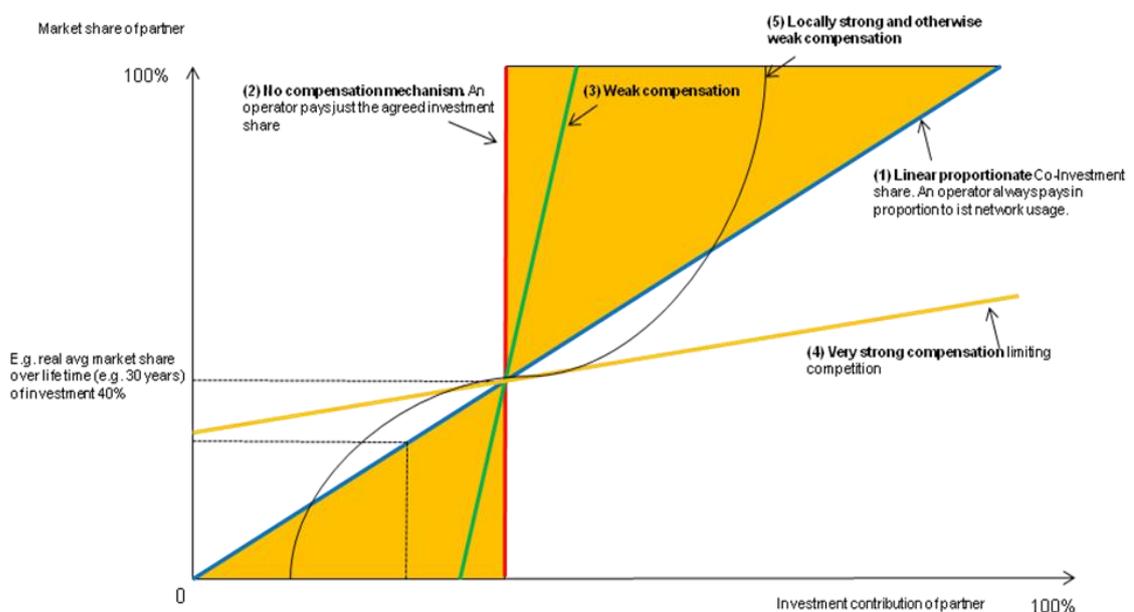
<sup>49</sup> Theoretically, L2 and retail services could also be used as calculation base.

contributing to the investment with 60%, the utility with 40% - which operators claim is corresponding to the respective expected market shares. While there are reports of different forms of agreements, the most popular in Switzerland seem to include periodic transfer payment adjusting the investment shares to the network market shares observed on the market (i.e. "ex-post"). A recent report by the Swiss Competition Authority has however stated that these agreements may be problematic<sup>50</sup>.

The graph below illustrates the various compensation mechanisms observed so far. It shows that the risk mitigation efficiency and the impact on competition are proportionate to the transfer payment. Would the transfer payment always be null, the compensation mechanism is inexistent (red line in the graph below). This might result in high barriers to entry for small operators. Would the transfer payment be infinite, this would fully cancel the risk of the operators having a network market share deferring from the investment share (yellow line in the graph below). In the linear proportionate case (case 1 corresponding to the blue line in the graph below), the co-investment partners pays according to its network usage. This is similar to unbundling, with a per line monthly charge and is likely to have little effect on infrastructure competition at wholesale level, but positively effects the competition at retail broadband access markets. All possible compensation mechanisms between these two extreme cases will be intermediate also in their effects.

In the case described above, an agreement that fixes market shares at e.g. 60/40 in advance would correspond to a division of the market and would be detrimental to competition.

A possibility to distinguish between strong and weak compensation mechanisms is given by the linear compensation mechanism, corresponding to an adjustment of investments shares in proportion to network market shares.



<sup>50</sup> [http://www.weko.admin.ch/index.html?lang=de&download=NHzLpZeg7t.Inp6l0NTU042l2Z6ln1acy4Zn4Z2qZpnO2Yug2Z6qpJCDdIF3g2ym162epYbg2c\\_JjKbNoKSn6A--](http://www.weko.admin.ch/index.html?lang=de&download=NHzLpZeg7t.Inp6l0NTU042l2Z6ln1acy4Zn4Z2qZpnO2Yug2Z6qpJCDdIF3g2ym162epYbg2c_JjKbNoKSn6A--)

**Picture 3: relation between investment contribution and market share<sup>51</sup>**

► ***Rebalancing effect***

The expected lifetime of a FTTH investment typically is of around 30 years, whilst most of the network rollout and the associated costs are borne in the very first years of the investment lifetime. Such costs may subsequently be considered as fixed (and largely sunk) costs. Given that operations and maintenance represent only a marginal part of the overall cost of proving a FTTH network, it can be argued that short term marginal costs will be low in comparison once the network has been rolled out. Those short term marginal costs, which are at the basis of current economic models, typically define full competition as the scenario where prices correspond to marginal cost.

This may also be considered as the worst case scenario for the partners on the market, as short term margins would be reduced to zero and the long term investment would even be unprofitable (as the costs are largely sunk the investment cannot be undone).

The above compensation mechanism may not only reduce risks in the way described but also converts fixed (and sunk) costs in short term marginal costs. The extent of this effect again varies:

- zero transfer payment: no changes;
- linear transfer payments: marginal costs correspond then to average long term costs per line. In this case even short term marginal costs (when exceeding the investment/market share foreseen) would become considerable. The risk of very low margins is therefore largely mitigated. However, the economic effect would be the same as if the network would be paid off over 30 years, one year after the other. Negative competitive effects are therefore not expected to be particularly strong – in particular when compared to today's LRIC regulated situation.
- strong transfer payments: an infinite transfer payment would mean that marginal costs become infinite when exceeding the investment/market share foreseen. This would imply that prices would have to rise very sharply, when an operator exceeds the network market share agreed, with corresponding negative effects for competition.

► ***Conclusion***

Any agreement including a compensation mechanism may or may not be cleared by competition authorities. In any case if an agreement is present it might need to be taken into account by the NRA if it restricts the independence of one or more partners.

Strong compensation mechanisms may largely undermine the independency between the partners. In such case partners cannot be considered as independent.

Linear and weak compensation mechanisms may weaken the independence of partners and competition, and constitute as such a reduction to the market competition. However, this reduction, whose effects may be low in case of a weak compensation mechanism, has to be

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<sup>51</sup> Source: BAKOM

analysed with regards to the reduction of the barriers to entry it may provide for small entrants partners to the co-investment. Barriers to entry nevertheless could remain high despite the compensation mechanisms in place. The agreement and its effects would need to be analysed in detail in order to assess whether it influences the competitive situation in the market.

### 3.3.2. Exchange of information

The direct or indirect sharing of data among competitors is subject to the competition law rules, and in particular article 101 TFEU which prohibits anticompetitive agreements which have as their object or effect the prevention, restriction or distortion of competition. In this context, the legal instruments available for the assessment of exchanges of information under the competition law rules may be of assistance to NRAs in determining whether the information exchanged goes beyond what is strictly necessary to ensure the well-functioning of the NGA co-investment.

While the mere exchange of information may be anticompetitive in itself, such practices will normally need to be assessed in the light of the agreement to which the information exchange relates (in this case, the co-investment agreement). That is, any negative effects arising from the exchange of information will normally be evaluated in the light of the overall effects of the agreement, and will require an analysis of elements such as the efficiency-enhancing effects derived from the co-investment agreement, or the adequacy and indispensability of the information exchanged in order for the co-investment agreement to achieve such efficiency-enhancing objectives. This analysis should have a close look at those information exchanges when carrying out a market analysis in a co-investment scenario.

#### ► ***EC Guidelines on horizontal co-operation agreements***

The EC revised Guidelines on horizontal co-operation agreements<sup>52</sup>. Guidelines contain detailed guidance on the competitive assessment of information exchanges, also in the context of production agreements<sup>53</sup>. In particular, it is stressed that if the information exchange does not exceed the sharing of data strictly necessary for the joint production of the goods or services subject to the common agreement (e.g. indispensable information on specific technical aspects of the joint production), it will be more likely to pass muster of the competition law rules than if the exchange goes beyond what is strictly necessary for the joint production (e.g. information on actual market shares or overall turnover when such information is not relevant for the purposes of carrying forward the production agreement).

The Guidelines also point out to a number of instances where the exchange of information will normally be considered to lead to a restriction of competition by object, thus making it very unlikely that the sharing of data is permitted. This is particularly the case of the exchange of information on the companies' individualized intentions concerning the setting of future prices or quantities.

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<sup>52</sup> Guidelines on the applicability of article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements, OJEC C11/1 of 14 January 2011.

<sup>53</sup> Generally, a NGA co-investment agreement may be considered as a type of production agreement, whereby two or more parties agree on the joint production of a particular good or service.

When assessing the potential anti-competitive effects of the information exchange in the context of a co-investment agreement, NRAs may want to pay particular attention to (i) the specific characteristics of the market where the exchange of information takes place; and (ii) the quality and characteristics of the data being exchanged.

It is important to note that the following should not be viewed as some sort of “checklist” to determine the level of information that can be exchanged in a particular co-investment initiative, but as a means of placing such exchange of data in its context in view of its assessment.

► ***Market characteristics***

As noted in the Guidelines, the risk of companies reaching a collusive outcome is greater in markets which are sufficiently transparent, concentrated, non-complex, stable and symmetric.

The impact of the information exchange will however depend not only on the intrinsic characteristics of the market, but also on how the information exchanged affects those characteristics. For instance, regarding transparency, the assessment of the pre-existing level of market transparency as well as of the way the information exchange modifies such initial level of transparency will enable NRAs to make preliminary determinations on whether the information exchange may have restrictive effects on the marketplace.

Collusive outcomes may also be facilitated by the structure of the market. In particular, coordination in tight oligopolies, where few companies are active, may be easier to achieve than coordination in markets where a large number of companies are involved. The existence of symmetric market structures – in terms of the companies’ costs, demand, market share, product range, capacities, etc. – may also increase the incentives to align the parties’ conduct via the exchange of information.

On the other hand, the complex nature of the market (e.g. due to the non-homogeneity of the products being produced), as well as its relative instability (due e.g. to the existence of volatile demand) are factors that may reduce the likelihood of an anticompetitive common understanding being reached via the information exchange.

Additionally, in order for a collusive outcome to be sustainable, the threat of retaliation in case of deviation must be likely. Collusive outcomes will not be likely in markets where the consequences of deviation are not sufficiently severe to ensure that the coordinating parties agree to the common policy. In this context, factors like the capacity of the co-investors to engage in actions such as price wars in case of deviation, as well as the degree of interrelation of the co-investors via vertical integration or expanded commercial relationships, may need to be evaluated to determine whether the threat of prompt retaliation is sufficiently credible.

► ***Characteristics of the information exchange***

The possibility of the information exchange leading to a collusive outcome will be more likely the more strategic the data is. In particular, the exchange of information related to actual prices, customer lists, capacity and quality, production costs, turnover, investment and marketing plans, R&D, etc. may increase the risk of anticompetitive harm, and will thus need

to be strictly indispensable for the well-functioning of the production agreement itself to be justified. The risk of foreclosure will also be greater the higher the market coverage of the parties to the co-investment.

As noted earlier, the exchange of information on the companies' individualized intentions concerning future conduct will require close supervision by the authorities in charge of assessing the potential beneficial or negative effects of the co-investment agreement. Additional factors such as the frequency of the information exchanges among the co-investors; the individualized (non-aggregated) nature of the data being exchanged; as well as the freshness of the data (non-historic data) may also point to the need for a detailed assessment of the type of data being exchanged.

► ***Information exchanges in the context of NGA co-investment agreements***

As noted above, data exchanges will normally be assessed in the light of the agreement to which the exchange of information relates (such as e.g. NGA co-investment agreements). Information exchanges pose serious risks to the competitive structure of the market, and will thus need to be carefully reviewed by NRAs in the context of their overall evaluation of the NGA co-investment agreement.

Experience to date in the joint deployment of NGA networks has been rather limited. It is however clear that, for the NGA co-investment to be operative, certain specific information needs to be shared among the investing parties. For instance, as exemplified by the experience in a number of countries regarding joint (symmetric) in-house deployment, information concerning the actual and foreseeable coverage of the infrastructure being deployed (e.g. buildings being passed with fibre), as well as technical information pertaining to the infrastructure being deployed (such as the location and characteristics of the interconnection points) may need to be exchanged among participating operators, and in fact may have been required to be made available by NRAs themselves to make the joint deployment of infrastructure feasible.

The evaluation of the information that can be exchanged between the parties to a co-investment agreement will be subject to the same challenges than the assessment of the co-investment agreement itself. In particular, one would assume that the greater the level of cooperation among the parties (e.g. cooperation at all levels of the network topology instead of cooperation limited to the joint deployment of fibre inside dwellings), the lesser the information that should be exchanged to limit potential anticompetitive outcomes arising from the agreement.

This may however contrast with market reality, where a high degree of cooperation (that is, beyond the terminating segments of infrastructure deployment) may unavoidably require the mutual deliverance of more information than less developed forms of cooperation. For instance, deployment of Layer 1 infrastructure by a party to the co-investment agreement whereby access is subsequently granted to the other co-investors may require the sharing of detailed information regarding production costs that may not be needed for softer forms of cooperation, in order for the parties to be able to determine the price at which access will be granted. In general, it is fair to conclude that the greater the risk that is jointly assumed by the co-investors, the higher the likelihood that the information being exchanged is objectively necessary for the well-functioning of the co-investment agreement.

A detailed analysis assessing the need for the information exchanges between the co-investment partners will therefore be necessary in the course of market analysis. When the information exchanges are proven the minimum necessary (as described in 3.3.3., the competitive threat of information exchange is limited.

### **3.3.3. Non-discrimination between co-investment scheme partners**

In the course of a market analysis of market 4 and 5 in a co-investment scenario, a NRA will have to assess some of the particularities of the co-investment agreements. One of these elements is the risks of discrimination between for instance two of the partners of the co-investment agreement that would compete at the retail level. In case the co-investment agreement proves to be discriminatory against some of the partners regarding access to a number of information such as coverage schedule, access conditions to the concentration point and hosting within the concentration point, this could have an impact in assessing the competitive situation on the market.

In case the network rollout in a given area is undertaken by one partner, the “leading operator”, that grants access to the other partners. Such a structure typically results in asymmetries of information of a technical nature: the coverage schedule, access conditions to the concentration point and hosting within the concentration point. Those are critical information to ensure satisfying conditions of a level playing field and the leading operators should be prevented from taking undue advantage of this position, as it would impact the level of competition on the market. Whilst information exchanges should be carefully monitored (see Section 3.3.2 above), it appears that information related to some operational aspects of co-investments should be exchanged to ensure access is granted to the jointly-build infrastructure in a non-discriminatory fashion to the partners. This should be examined by NRA carrying out a SMP analyses.

Network sharing raises issues about the division of roles between the party of the co-investment undertaking the rollout (in France the first operator deploying in the building) and other co-investors, which may be significantly different from the roles allocated in the copper local loop unbundling processes. As pointed out by the French Competition Authority, *“thanks to co-investment, not only is there a reasonable guarantee that the access conditions of alternative operators to the network are not damaged, but also these conditions could be better than those of the copper local loop unbundling: (i) from an economic standpoint, by replacing fixed costs with variable costs; (ii) from a technical standpoint, through a “right to have a say” on the operational terms (access delivery and after-sales process) and a better access to information”* (French Competition Authority Opinion no 10-A-07 dated 17 March 2010, point 144).

If proved effective, this “right to have a say” on the operational terms may be sufficient to ensure non-discrimination between the co-investment leader and other co-investors. However, there is a risk that network sharing will happen in a way that allows operators to engage in anti-competitive conduct. A number of good practices to ensure that operational processes used amongst co-investors respect the non-discrimination principle.

Prior to the installation of the FttH network, a number of architecture choices have to be made. Firstly, co-investors have to agree on whether the co-invested FttH network will be a multiple fibre or single fibre FttH network. Co-investments taking into account the demand and costs involved for dedicated fibre lines and allowing for a multiple fibre lines network to be rolled out under agreed circumstances ensure total technology neutrality. Secondly, the location, hosting capabilities and accessibility of the concentration points are of utmost importance to ensure non-discriminatory operational processes. The co-investment leader initiating the deployment therefore should:

- guarantee non-discriminatory access to the concentration point, both for providing connection to this point and for performing any work necessary to operations, specifically when the concentration point is located on private property;
- provide co-investment operators with the space they need either to perform connection operations or to host their active equipment at the concentration point.

In case such non-discriminatory access is not granted to the partners, it has to be assessed how far this reduces the independence of the partner affected and finally competition.

Availability of the host infrastructure may also be taken into account by the co-investment leader with regards to the location of concentration points. The concentration point should be accessible to any other operator wanting to serve the users in question, i.e. other co-investors should be able to deploy their own optical fibre cable to the concentration point. In high-density areas, where networks are generally installed underground in civil engineering infrastructure, this means that the ducts that make it possible to connect to the concentration point should not be saturated, to allow all operators to connect to it, as well as, when applicable, space in the utility vault or manhole if any coupling operation needs to be performed. In instances where the supply duct is saturated, when conveyance is through an aerial installation or when buildings are outfitted with optical cable up the facade, the co-investment leader should guarantee third-party operators' ability to connect to the concentration point, and obtain the necessary permissions. Finally, in more sparsely populated areas where a portion of the networks may be deployed overhead, the aerial installations need to allow for several optical cables to be run to the concentration point.

Lastly, the non-discrimination principle calls for some information on rollout to be exchanged between the partners, as a necessary way to ensure access is granted to the jointly-build infrastructure under equivalent conditions to the partners. Co-investors should have access to prior information regarding access conditions and rollout within a reasonable timeframe to be able to make relevant choices concerning their deployments and their commercial offers. The risk would be in having the operator leading the rollout gain an unfair competitive advantage by keeping information to itself. The exchange of information between operators is an important bulwark against the dangers of having the operator who has installed the local loop secure a disproportionate number of contracts with end users. If it does not share information in a timely fashion, the operator that has deployed the equipment will be the first and only one to be able to market ultra-fast broadband services to residents for some time, which creates the danger of signing the majority of the potential customers on to lengthy contractual commitments, which will considerably reduce potential competition in the ensuing months and years.

Therefore, to ensure that other co-investors benefit from satisfactory operations, information the co-investment leader should provide includes:

- information when it has received permission to equip a building with optical fibre in the month following signature of the agreement, including the address of the building in question, the name and address of the owner of the property or the condominium board representing the co-owners; the number of residential or office units in the building;
- other operators with the information they need to access the concentration point and to connect to it, notably the location of the concentration point (address, environment, means of access), the technical properties of the equipment installed at the concentration point and the processes for connecting to it, three months before this concentration point becomes operational – in other words before the date when end users are actually able to connect to this concentration point.

In case such non-discriminatory access is not granted to the partners, it has to be assessed how far this reduces the independence of the partner affected and finally competition.

### **3.4. Access conditions to third parties**

#### **3.4.1. Non-discrimination or investment protection clause**

Co-investment agreements may include a clause which states that the partners cannot sell network access to third parties at more attractive conditions than those of the partnership.

Partners facing large NGA investments may consider such a clause of fundamental importance to protect their investment from a sudden erosion of revenues (ARPU) in case one of the partners decides to cut prices for third parties to an unreasonably low level to increase volumes. Such an action cannot be excluded given that a large part of NGA network rollout costs are fixed and sunk. If after the investment prices would fall towards marginal costs, the investment could not be recovered anymore over the lifetime of the asset. A non-discrimination clause may ensure investors that such a situation will not be created and therefore offer more favourable circumstances for such an investment to be realised.

In particular some co-investment agreements in Switzerland are foreseeing such clauses which state that the co-investment partner of the incumbent (utility) could not charge wholesale prices lower than investment costs charged to the partner<sup>54</sup>.

Again any agreement including the agreement in question may or may not be cleared by competition authorities. In any case if an agreement is present it might need to be taken into account by the NRA if it restricts the independence of one or more partners.

From a competition point of view such a clause would restrict the freedom of a partner to set access conditions thereby reducing its independence and competition. The extent of the impact of such a clause on the competitive situation is difficult to judge and a close analysis of it should be performed by the NRA when carrying out the market analysis. However, the

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<sup>54</sup> [http://www.nzz.ch/nachrichten/wirtschaft/aktuell/die\\_weko\\_hat\\_grosse\\_bedenken\\_1.12359054.html](http://www.nzz.ch/nachrichten/wirtschaft/aktuell/die_weko_hat_grosse_bedenken_1.12359054.html)

financial conditions of access to the partners are generally close to cost-based; therefore setting lower prices would result in below-costs prices. As a result, such clauses may eventually not strongly restrict the pricing freedom of the partner. Furthermore, it might prove difficult to assess whether such a clause is respected as comparing long-term IRU access prices with monthly rental charges is characterised by a high degree of uncertainty.

### **3.4.2. Exclusivity agreements**

Some of the co-investment agreements in NGA identified so far include exclusivity clauses. Exclusivity clauses may be either based on horizontal or on vertical agreements comprising production cooperation between two or more companies. Horizontal exclusivity agreements are of particular interest here, implying that the involved parties introduce some kind of restriction on a partner to give access to the jointly deployed infrastructure.

Firstly, exclusivity agreement will de facto be forbidden in all the Member States that have implemented symmetric or asymmetric regulation of the access to NGA infrastructure: only unregulated partners may commit to grant such exclusivities as this measure is a clear restriction of access. Secondly, such exclusivity agreements are likely to require clearance from the national competition authorities. Finally, NRA should be informed by the parties of such clauses as they are likely to have a significant impact on the competitive situation as it clearly restricts the independence of one or more partners.

An exclusivity agreement may for instance foresee that a partner of a layer 1 FTTH roll-out is forbidden to resell access at layer 1 (be it in form of LLU or in form of an IRU). Again, any agreement including an exclusivity agreement may or may not be cleared by competition authorities. In any case if an agreement is present it might need to be taken into account by the NRA if it restricts the independence of one or more partners.

In case of an exclusivity agreement it is clear that the committing partner is no longer a direct competitor on market 4. The remaining competitive effect of the entry of the player is an indirect one that has been shown to be limited in section 3.1.1. Consequently it must be expected that exclusivity agreements importantly reduce the independence of partners and limit competition.

## 4. Conclusion

If the co-investment agreement includes many partners and fully ensures their independence then it may lead to a situation with more effective wholesale competition compared to a monopoly situation. Elements that can limit such a development and should be considered in the assessment of the impact of such an agreement are the following:

Elements to be considered	Negative impact on the competitive conditions <sup>55</sup>	Explanation and possible mitigation factors
1. Low number of partners in the co-investment agreement and other players in market 4 <sup>56</sup>	High	<p>A low number of partners in the co-investment agreement and players outside of the agreement on market 4 (i.e. two) can lead to collusive behaviour and impede effective competition unless:</p> <ul style="list-style-type: none"> <li>- competing infrastructure networks (e.g. cable or FTTx players or partners not offering wholesale products) maintain sufficient pressure on the wholesale level through indirect effects;</li> <li>- indirect effects are strong (i.e. there is effective competition on the retail level, the proportion of the ULL price compared to the retail price is high and the impact of an increase in the wholesale price cannot be diluted on the retail markets).</li> </ul> <p>When those conditions are not met, a low number of operators (i.e. two) leads to concerns about the competitive outlook of the market. The level of independence that the operators enjoy within the co-investment agreement is also an important factor to be taken into account.</p>
2. Type of partners		
- Financial contribution (capital only) and presence of state aids for one partner	-	Out of scope
- SMP + players present on the wholesale market and not at the retail	Low	The NRA should make sure that no clause restricting the operator not present on the downstream market to give access to third parties at a fair price is included in the co-investment agreement.

<sup>55</sup> All other things being equal

<sup>56</sup> Only partners with a significant market share / of sufficient scale should be included in this number of partners

level		In this case, the operator not present on the downstream market has a strong incentive to sell access on the wholesale level to recover its sunk costs by selling to as many third parties as possible.
- SMP + Alternative operator(s) present at the retail level	Medium	All partners in the co-investment have access to the jointly-built infrastructure under fair conditions.  In case there is resale (and no issue with capacity – see market share section), all the co-investment partners have an incentive to compete on the wholesale access market to third parties.
3. Type of contract :		
- Joint Venture	Medium-High	Joint-ventures are more likely to behave as a single-network operator. It depends on the terms of the contract regarding: <ul style="list-style-type: none"> <li>- governance;</li> <li>- equity;</li> <li>- etc.</li> </ul>
- Long term cooperation agreement (usually IRU)	Low-Medium	Long-term (>20 years) cooperation agreement based on IRUs theoretically allow for a high degree of independence between the partners. This is only the case if there are no clauses restricting this independence significantly.
4. Geographical roll-out		
- Partially parallel roll-out (agreements on ducts rollout, collocation of street cabinets...)	Medium	Some of the costs and information on rollout is shared, but parts of the physical networks are deployed in parallel. The lesser the commonality of costs is, the more competition there is. If only access on higher layers is available, it may lead to concerns about competition.
- Complementary roll-out swapping of areas)	Medium	Probably low as long as Layer 1 IRU access on wholesale level is granted in each area of the network roll-out. If only access on higher layers is available, it may lead to concerns about competition. High if this access is not granted or with important restrictions.
5. Mono-fibre instead of multi-fibre	Medium	Multi-fibre may be more favourable to competition as: <ul style="list-style-type: none"> <li>- Giving a layer 1 access to a mono-fibre GPON network means having a concentration point close to the end-customer, creating barriers to entry;</li> <li>- Mono-fibre may lower the independence and flexibility of the partners;</li> <li>- Switching procedure and churn create issues and needs increased cooperation between partners.</li> </ul> However, it may be possible to implement processes to ensure equity of the conditions of access and multi-fibre may not always be implemented as: <ul style="list-style-type: none"> <li>- Upfront investment is slightly higher;</li> </ul>

		- Multi-fibre presents problems of saturation of ducts & of the points with network equipment.
6. Exclusivity agreements	High	Creates a network club, restricts competition.
7. Non-discrimination clause between the partners	Low-Medium	A first step towards creating a network club, restricts competition.
8. Compensation mechanism	Low-High	High if strong CM because partners are no longer independent. Low if weak CM because partners remain largely independent.
9. Exchange of information	Low-Medium	Impact depends on: - quality and characteristics of the data being exchanged. - Characteristics of the market where the exchange of information takes place. - Presence of chinese walls.
10. Non-discrimination in operational access conditions between partners	High	The non-discrimination principle calls for some information on rollout to be exchanged between the partners, as a necessary way to ensure access is granted to the jointly-built infrastructure under equivalent conditions to the partners.

**Table 4: Impact of co-investment agreements**

Unlike the roll-out previous fixed networks (e.g. copper or cable) the rollout of NGA networks may represent - under the particular circumstances described in this report - an opportunity to avoid the recreation of a monopolistic bottleneck in the access network (despite increasing economies of scale of FTTH/B technologies). This would offer the best guarantees in terms of network players' independence that will be – in case of sufficient competition - beneficial to consumers. It can therefore be expected that competitive parameters other than price, in particular innovation and quality may experience a decisive drive leading the way to new and more powerful services. However, in case the NGA deployment is not sufficient to ensure effective competition, asymmetric forms of regulation of access to fibre infrastructures will continue to be necessary to protect consumers from possible abuses of market power.

## 5. Annex 1: Horizontal and vertical agreements

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As mentioned in Section 3.1.2, co-investment agreements in NGA generally are of a "horizontal nature", as they are entered into between actual or potential competitors either at the retail level, at the wholesale level or both. They generally include production agreements such as joint production of services like network capacity, and may cause competition problems due to coordination of the parties' competitive behaviour as suppliers. A production agreement in one market may also affect the competitive behaviour of parties in a market which is downstream or upstream.

In order to evaluate the impact of horizontal agreements on competition, it is, according to established practice by Competition Authorities and stated in Article 81 of the EC Treaty, a question of examining the degree of commonality of costs. The logic is that the higher the degree of commonality of costs the greater the potential for negative impact on competition. On the other hand, a low level of commonality of costs implies that the involved parties have the opportunity to differentiate its products or services as a higher share of value added are created outside of the co-investment project.

Vertical agreements on the other hand concern agreements between companies at different levels of the production and distribution chain. Vertical agreements are generally, according to the literature, not as harmful to competition as horizontal agreements<sup>57</sup>. The rationale for vertical agreements is that they can improve economic efficiency within a chain of production. The key parameters in the evaluation of vertical agreements are the level of market share and the intensity of competition from other suppliers. The threshold for clearance of vertical agreements is an aggregated 30 % market share, implying that a lower market share would not cause any concern for a distortion of competition<sup>58</sup>.

Finally, hub-and-spoke agreements are vertical relationships which, according to Bardell, could be transformed into horizontal cartels. The basis is that operators or companies must be able to determine their policies and actions independently. But if, for example, parties share information about future action, without a formalized agreement, it facilitates a co-ordination between players and therefore constitutes a co-ordination of their action. This implies a risk for distortion of competition as an exchange of information could remove uncertainties concerning a company's planned actions<sup>59</sup>. Altogether, it is a form a subtle cartel which could distort the competitive situation on the market.

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<sup>57</sup> [http://www.kkv.se/upload/Filer/Trycksaker/Rapporter/Pros&Cons/rap\\_pros\\_and\\_cons\\_vertical\\_restraints.pdf](http://www.kkv.se/upload/Filer/Trycksaker/Rapporter/Pros&Cons/rap_pros_and_cons_vertical_restraints.pdf)

<sup>58</sup> COMMISSION REGULATION (EC) No 2790/1999 of 22 December 1999 on the application of Article 81(3) of the Treaty to categories of vertical agreements and concerted practices

<sup>59</sup> Presentation prepared by Helen Bardell : Partner – Baker & McKenzie LLP, London for the BIICL Conference - 19<sup>th</sup> April 2010. [http://www.biicl.org/files/5000\\_helen\\_bardell.hub\\_and\\_spoke\\_-\\_slides.ppt](http://www.biicl.org/files/5000_helen_bardell.hub_and_spoke_-_slides.ppt)