WIK-Consult • Report

Regulatory approaches to risky bottleneck assets:

International case studies

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Executive summary

I. Aims of the study

Different National Regulatory Authorities (NRAs) have taken different approaches to address downside risks to investors in the regulation of bottleneck infrastructure, while protecting consumers and competition in fast broadband services.

When assets that are materially risky and sunk are also the source of persistent market power then regulation needs to be mindful that it does not distort incentives to invest. This study, conducted for Ofcom, describes and compares the various approaches to potentially risky sunk investments taken in six European markets – Belgium, France, Germany, the Netherlands, Spain and Sweden – with the aim of understanding:

- Which kinds of investments have been perceived to be materially risky;
- The policies NRAs have pursued to ensure that those investing in such risky assets can generate a return that reflects downside risk incurred – for example the risk that demand may not materialise as expected; and
- How perceptions of the specific risks associated with NGA investment and regulatory approaches to risky assets have changed over time.

II. Assessment of riskiness typically relates to market maturity

NRAs generally appear to have recognised that NGA investments exhibit certain risks related to cost and demand uncertainty given the relevant investments break even potentially only far ahead in the future. As a result, regulating access at cost without any consideration of risk would distort incentives to invest, as regulation caps the upside while firms would continue to be exposed to the full extent of the downside should the investment fail. As markets mature these risks tend to reduce as cost and demand become less uncertain, and regulators appear to become therefore less concerned about the potential negative impact of regulation on investment incentives.

III. Initially a variety of solutions were deployed by NRAs to address perceived risk

The NRAs in the studied countries took the first regulatory decisions concerning NGA in the period from 2009-2010. We refer to these decisions hereafter as the *initial* regulatory decisions. They deployed a variety of solutions to address risk. These included full forbearance on active NGA access requirements, intervening only in the event of a dispute, fostering co-investment and long-term pricing, flexible pricing (subject only to margin squeeze tests) and the inclusion of a risk allowance within a cost-oriented price. A summary of approaches taken in the initial decisions is provided in Table 1 below.

Table 1: Approaches taken to address risk in the initial NGA decisions 2009-10

Country	Incumbent NGA tech	Wholesale product	Initial (2009-10) regulatory approach
Belgium	FTTC	FTTC/VDSL regional Ethernet bitstream	Risk adjustment on cost-oriented price
France	FTTH/B	Fibre terminating segments	Intervention to set charges only in the event of a dispute under Article 12 not the SMP regime; pricing regime focused on co-investment through Indefeasible Rights of Use (IRU); cost-based charges with risk allowance recommended; Complemented by cost-based access to the incumbent's duct (no risk allowance) based on an SMP finding
Germany	FTTC	FTTC/VDSL regional IP bitstream	Commercial bilateral agreements and long-term pricing are permitted. NRA checks charges only in the event of dispute or after launch on own initiative. Checks are based on a margin squeeze test – no cost-orientation
Netherlands	FTTC/H	Fibre unbundling	Risk allowance on cost-oriented price for fibre unbundling. Consistent principles applied over multiple charge control periods.
		FTTC bitstream/VULA	FTTC access not explicitly treated as risky, but on basis of other constraints original bitstream remedy (2008) not subject to cost-orientation, and new (2015) VULA pricing commercially agreed, long-term discounts permitted
Spain	FTTH	FTTH regional Ethernet bitstream (<30Mbit/s)	Forbearance (no access obligation) on FTTH bitstream at speeds above 30Mbit/s; risk-allowance on cost-oriented price for FTTH bitstream speeds of 30Mbit/s and below; cost based access to the incumbent's duct (no risk allowance).
Sweden	FTTH/C	Fibre unbundling	Adjustment to cost-oriented price for single dwelling units (fibre to multi-dwelling units not deemed risky)
		FTTC bitstream	FTTC access not explicitly treated as risky. Subject to cost-orientation + economic space to incentivise move up ladder of investment

Source: WIK research

IV. These solutions were deployed in the context of different regulatory objectives and technological choices

It should be noted as context for these approaches towards risk, that NRAs pursued different objectives in applying NGA regulation, depending on the existing status of NGA deployment and the degree to which they expected that further end-to-end infrastructure competition could develop. Regulators in France and Spain initially focused primarily on incentivising entrants to **'climb the ladder of investment'**. These NRAs placed emphasis on regulated access to the incumbent's ducts on the basis of an SMP finding;[1] and additionally in the French case symmetric regulation of fibre terminating segments. Downstream active remedies were limited[2] or absent. Regulation in these countries focused around fostering FTTH, based on the apparent preferences of market players.[3]

The other regulators placed greater emphasis in the regulatory regime on facilitating local and/or regional wholesale **access to the existing infrastructure** of the incumbent on a technologically neutral basis. Access to the incumbent NGA network was either the main focus of regulation (in Belgium) or, in Germany, the Netherlands and Sweden was mandated in combination with subloop unbundling with the aim of supporting competitive investment in FTTC.[4] The initial approach of the different countries to the ladder of investment as well as the predominant technology adopted is shown in the table below.

Table 2: Initial NGA decisions (2009-2010) and the ladder of investment

Access type	Belgium	France	Germany	NL	Spain	Sweden
Decision date	2009	2009-10	2010	2008-9	2009	2010
Incumbent NGA technology	FTTC	FTTH/B	FTTC	FTTH/C	FTTH	FTTH/B/C
Duct access (local access)		**√**	√ *		**√**	
In-building wiring		**√**			**√**	
Fibre terminating segment		**(√)**				
Subloop unbundling	√	√	**√**	**√**	√	√
Dark fibre backhaul				√		√
ODF access (fibre unbundling)				**√**		**√**
Local active NGA access	√ FTTC **			√ FTTC		√ FTTC/H
Regional active NGA access	**√ FTTC**		**√ FTTC/H**	√ FTTC	√ (<30Mbit/s)	√ FTTC/H

Black indicates mandated by NRA across national territory
Brackets indicates mandated in portion (non-competitive/contestable part) of the territory
Bold indicates primary focus of NGA regulation
* Duct access mandated in feeder segment only. ** Remedy not applied/used in practice

Source: WIK research

1 Access to ducts is priced on the basis of cost-orientation without any risk premium. In France, the NRA additionally allocated duct costs between copper and fibre based on take-up at retail level, which results in lower duct access costs for fibre in the early deployment phase, at a time when take-up is low

2 In Spain no access above 30Mbit/s. In France no active access to the incumbent's network on an SMP basis

3 Iliad had already begun FTTH deployments in France. The Spanish NRA noted a lack of interest from market participants in FTTC

4 Dark Fibre backhaul was mandated in Sweden and the Netherlands, while duct access was mandated in the feeder segment in Germany to support SLU

V. For initial NGA decisions, cost orientation with a risk allowance was the most prevalent approach to addressing perceived risk

The Belgian NRA initially applied cost orientation with a risk allowance to address perceived risk in FTTC/VDSL, while in France, Spain, the Netherlands and Sweden NRAs applied this approach to regulated access to FTTH.[5] However, different approaches were taken towards the risk allowance. NRAs in Belgium and Sweden[6] allowed a mark-up on the cost with the stated aim of reflecting demand risk, while in Spain,[7] the Netherlands and France NRAs made an allowance on the WACC.[8]

VI. NRAs uplifting the WACC took account of project-specific risk

Those adjusting the WACC took into account project-specific risk either in the assessment of the FTTH WACC mark-up used to calculate the costs of FTTH provision (in Spain and France) or, in the Dutch case, in checking for the purposes of subsequent charge controls whether the actual rate of return was excessive in relation to the WACC. The FTTH WACC mark-ups are summarised in the table below.

Table 3: Approaches to FTTH WACC allowances to take account of project-specific risk

Applicable regulation	France	NL	Spain
Regulated product	FTTH terminating segment	FTTH unbundling	FTTH regional bitstream (<30m)
NRA sets price upfront?	No (only on dispute)	Yes	Yes
Basis for cost calculation	DCF illustrative cost model under development	DCF model based on actual costs	BU-LRIC+ model
Uplift on base WACC	4% indicative uplift for rental Composed of 2% for ex ante co-investment + 2% rental mark-up	2% FTTH uplift for cost calculation + further 3.5% when checking whether IRR excessive in relation to WACC	4.81%

Source: WIK research

5 FTTH terminating segments in France – no ex ante charge control but charges may be settled following a dispute, regional Ethernet FTTH bitstream capped at 30Mbit/s in Spain, fibre unbundling in the Netherlands and Sweden

6 In Sweden the adjustment applies to single dwelling units – greater penetration risks and higher cost are cited as rationales

7 For regional FTTH bitstream capped at 30Mbit/s

8 The Spanish NRA initially proposed to price FTTH regional bitstream access on the basis of retail minus (based on 100Mbit/s offers), but changed its approach following objections from the Commission. The French NRA elaborated this approach in draft guidelines in 2014.

VII. A number of countries also pursued mechanisms to support investor certainty including long-term pricing and co-investment

Alongside making allowances in the pricing to account for risk, NRAs in several countries promoted long-term pricing arrangements as a means of providing certainty to investors as well as access-seekers. In the Netherlands, the NRA set principles for a multi-period charge control for fibre unbundling, whereby the NRA signalled that charges in subsequent price control periods would be based on previous charge controls with only adjustments for inflation unless charges were found to be excessive[9] or there were material changes in circumstances.[10] More recently, the Dutch NRA permitted KPN to agree wholesale contracts with long-term volume discounts for the new FTTC VULA product introduced in 2015.[11] The German NRA also permitted long-term discounts for charges for FTTC/VDSL IP bitstream in Germany, and made reference to the Commission 2010 NGA Recommendation in support of this approach.[12]

Meanwhile, in France, the NRA used provisions under the electronic communications Framework which permit 'symmetric'[13] obligations for sharing of wiring[14] to promote co-investment in the fibre terminating segment. The French system for regulated co-investment involves obligations on all operators which instal FTTH to offer Indefeasible Rights of Use (IRU)[15] over a portion of the lines for a period of two decades or more.

VIII. Most countries with FTTC have since tightened regulation due to market maturity and/or expected obsolescence of unbundled copper

Having previously had only lighter or no bitstream regulation for FTTC,[16] in 2015, NRAs in Sweden, the Netherlands and Germany adopted FTTC VULA[17] or similar local

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9 The Dutch NRA assesses whether charges are excessive using a mechanism whereby the IRR is checked against the FTTH WACC as uplifted by a further markup aimed at reflecting asymmetric regulation risk

10 The Decision is in line with the electronic communications framework because it sets expectations, but does not bind the NRA

11 The pricing regime was based on commercial agreement subject to review by the NRA. The Dutch NRA notes that the incumbent was incentivised to reach agreement due to its proposal to prohibit vectoring and to set wholesale charge on the basis of cost-orientation in the absence of agreement

12 The 'contingent model' provides for lower unit prices over 8 years on payment of a fixed upfront fee. BNetzA argued that this model was compatible with provisions in the EC 2010 NGA Recommendation relating to long term discounts. It would by implication also be compatible with the telecommunications framework as a whole.

13 Obligations applying to all operators rather than an SMP operator

14 Article 12 Framework Directive

15 IRUs involve the granting of long-term (normally tradable) rights for the use of assets on payment of a fixed upfront fee. IRUs are normally treated as Capex rather than Opex in financial reporting.

16 In the Netherlands, bitstream regulation on FTTC was applied in 2008, but removed in 2012 on the basis that there was effective competition in the relevant market. In Germany only regional IP bitstream was mandated in practice.

17 VULA charges are subject to cost-orientation in Sweden. In the Netherlands, charges are only proposed to be set by the NRA in the event of a dispute and long-term discounts are permitted. The Dutch NRA prohibited the deployment of vectoring by the incumbent and stated that it would set charges on the basis of cost-orientation without a risk allowance in the absence of agreement on VULA.

Ethernet bitstream for the first time.[18] A core rationale given in these countries for the introduction of FTTC VULA was the expected decline of physical copper unbundling due to the migration to fibre and/or introduction of vectoring by the incumbent. NRAs in Belgium and Germany also tightened price regulation on FTTC bitstream. In 2011 the Belgian NRA removed the previously applied risk allowance on the cost-oriented price for FTTC bitstream citing market maturity[19] and impending local exchange closures. For the new local Ethernet bitstream, the German NRA moved to tariff approval based on margin squeeze tests before product launch rather than only checking prices after launch, as had previously been applied to the regional bitstream product. By 2015, of the four countries for which FTTC was relevant, only Germany still made an explicit allowance for risk within the regulatory regime.[20]

IX. In FTTH countries there has been some convergence towards flexible pricing, even though they did not all start that way

Between 2009 and 2015, two countries which came from different starting points moved towards flexible pricing on FTTH access. The Spanish NRA proposed in 2015 to introduce FTTH VULA outside 'NGA competitive zones'[21], after a 6 year period in which there had been full forbearance on regulation of active access at speeds above 30Mbit/s. The new VULA will be based on flexible pricing, subject only to margin squeeze tests. Regional FTTH bitstream - will now only be made available on regulated terms in more remote areas and, while the previous speed cap of 30Mbit/s will be removed, pricing will move from cost-based with a risk allowance to flexible pricing supported by a margin squeeze test.

The Swedish NRA also plans from December 2016 to move to pricing flexibility for fibre unbundling, away from cost-orientation. Both countries cited the 2013 European Commission Recommendation on cost methodologies and non-discrimination in their decisions, and referred to competitive constraints and the planned imposition of Equivalence of Input as justifications for the changed approach. In the two other countries in which there is significant FTTH coverage, France and the Netherlands, the regulatory approach has remained stable over time. These countries have retained the principle of cost-orientation with a risk allowance for FTTH, but in the context of long-term pricing arrangements, which aim to provide predictability for investors and access-seekers.[22]

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18 SLU was also abandoned at the same time in the Netherlands (draft) and had previously been abandoned in Belgium (2011)

19 By 2011, FTTC coverage had passed 80% and 30% of broadband connections were at speeds of 30Mbit/s or more

20 Risk is addressed in Germany through use of flexible pricing. In the other three countries pricing principles for FTTC are now based on cost-orientation without a risk adjustment – although in the Netherlands, the NRA would intervene to set charges only if commercial negotiation fail.

21 See Spanish case study for definition

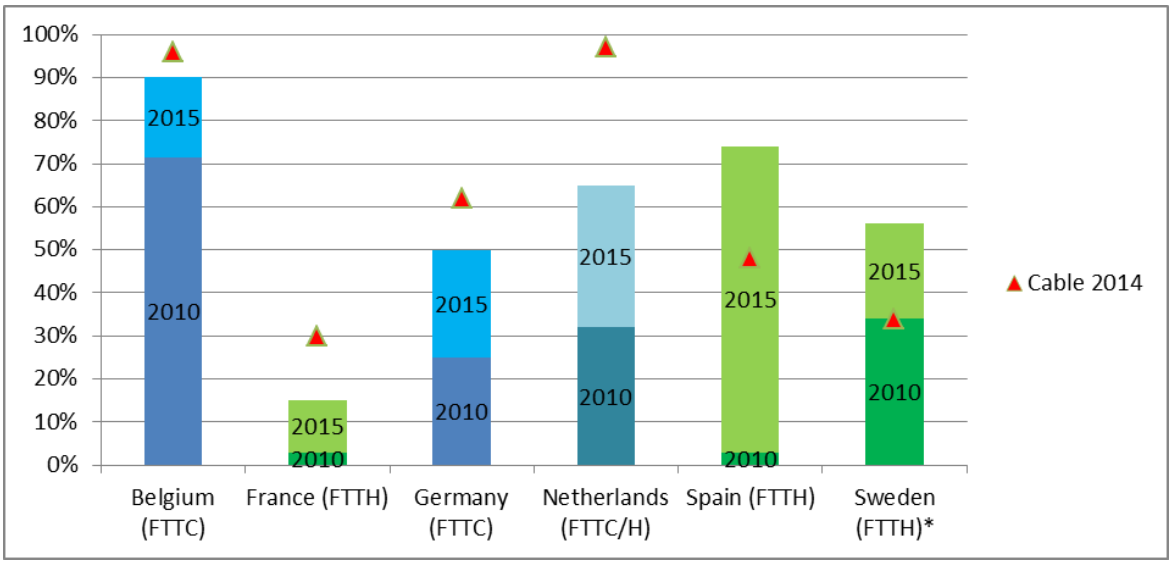
22 Co-investment based on IRU in the case of France. Multi-period charge control principles in the Netherlands

X. Regulatory strategies to address risk may have been one amongst a number of drivers that supported the continued deployment of NGA

Figure 4 shows the estimated deployment of prevalent[23] NGA technologies at the end of 2010 - shortly after the adoption of the initial NGA decisions - and in 2015. It also shows Docsis 3.0 cable coverage in each country. The significant expansion in FTTH by Telefonica is of particular note. It is possible that this deployment may have been supported by the policy of regulatory forbearance adopted by the NRA. NGA deployments by incumbents in other countries also continued to expand following regulatory decisions, and these deployments may also have been supported by the various strategies adopted by NRAs to address risk or other aspects of regulatory flexibility.

However, we note that regulation is just one amongst many factors that may affect NGA deployment. Other drivers identified in a previous study[24] include infrastructure competition such as competition from cable and municipal networks (in the case of Sweden) and demand-based factors. The higher cost of FTTH and/or differences in population density may also affect deployment. It is therefore challenging to isolate the specific role played by regulation or even more narrowly regulators' approach to risk.

Figure 1: Evolution of FTTx household coverage (predominant technologies) 2010-2015 against Docsis 3.0 cable coverage



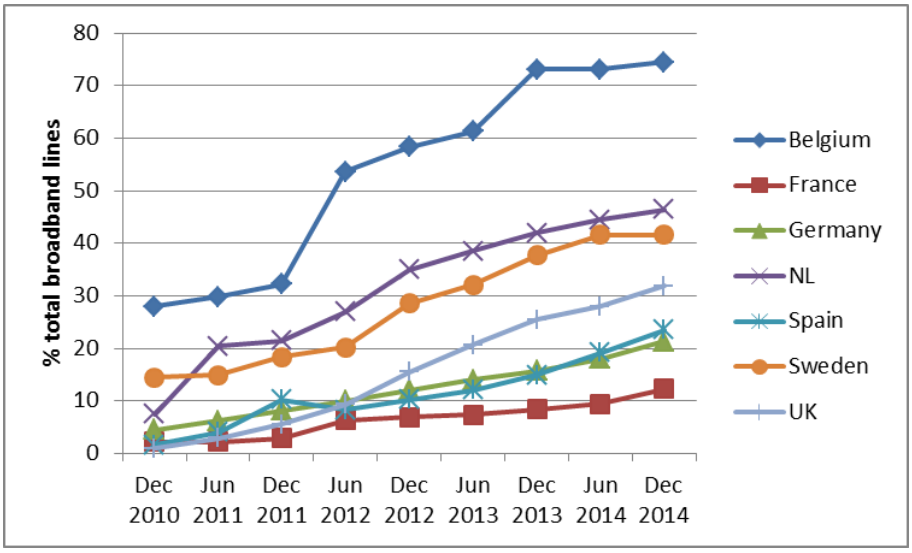
Source: WIK based on IDATE FTTx Watch, operator investor and NRA statements (for 2015)* Teliasonera's FTTH coverage estimated at 15% end 2014

23 Both FTTC and FTTH deployment are material in the Netherlands. At the end of 2015, KPN's FTTH coverage reached 29% of households, while a further 36% of households were served with FTTC. VDSL from the Central Office has also been widely deployed.

24 WIK (2015) for Ofcom 'Competition and Investment; an analysis of the drivers of superfast broadband http://www.wik.org/index.php?id=702&L=1.

Consistent with the high degree of cable and incumbent NGA deployment in these countries Figure 5 shows a high take-up of broadband at speeds of above 30Mbit/s in Belgium and the Netherlands. Although its NGA coverage is lower, take-up of fast broadband in Sweden is also relatively advanced, supported in large part by historic FTTH deployments by municipalities and alternative operators.[25] Take-up of fast broadband has been more limited in Germany, Spain and France.

Figure 2: % broadband lines at speeds >30Mbit/s



Source: WIK based on data from Digital Agenda Scoreboard

25 Incumbent Teliasonera's FTTH deployment covered approximately 15% of households in 2014

Contents

1 Introduction

Different National Regulatory Authorities (NRAs) have taken different approaches to address downside risks to investors in the regulation of bottleneck infrastructure, while protecting consumers and competition in fast broadband services. In this study, conducted for Ofcom, we describe and compare the various approaches taken in six European markets – Belgium, France, Germany, the Netherlands, Spain and Sweden – with the aim of understanding:

(i) Which kinds of investments have been perceived to be materially risky;
(ii) The policies NRAs have pursued to ensure that those investing in such risky assets can generate a return that reflects downside risk incurred – for example the risk that demand may not materialise as expected; and
(iii) How perceptions of the specific risks associated with NGA investment and regulatory approaches to risky assets have changed over time.

This study focuses specifically on regulatory approaches which aim to ensure that *regulated* operators (those considered to have significant market power in a relevant market relating to NGA, or are otherwise regulated under 'symmetric' obligations) receive appropriate signals that they will be able to make a fair return on their investments.[26] The question of which regulatory approaches might incentivise alternative operators to 'climb the ladder of investment' to build their own NGA networks is not the subject of this study, although was discussed in previous 2015 studies conducted for Ofcom by WIK-Consult[27] and Analysys Mason.[28] However, it is touched upon as necessary as the rationale for a particular approach to pricing may be related to not only to the downside risk of the regulated firm but also to incentives for alternative operators to climb the investment ladder.

- Chapter 2 provides a comparative overview of the approaches taken in different countries to risk associated with NGA technologies
- The approaches taken in each of the countries are further described through case studies in Chapters 3-8

26 Article 13 of Directive 2002/20/EC as amended by Directive 2009/140/EC (Access Directive) requires NRAs in the context of price control obligations to 'take into account the investment made by the operator, and allow him a *reasonable rate of return on adequate capital employed*, *taking into account any risks specific to a particular new investment network project'*.

27 WIK-Consult (2015) Competition & investment: an analysis of the drivers of superfast broadband http://stakeholders.ofcom.org.uk/binaries/consultations/dcr_discussion/annexes/Competition_and_investment_fixed.pdf

28 Analysys Mason (2015) International case studies http://stakeholders.ofcom.org.uk/binaries/consultations/dcr_discussion/annexes/International_case_studies.pdf

2 Comparative overview

2.1 The initial NGA regulatory decisions were taken in the period 2009-2010

In the countries we researched, the first NRA decisions which explicitly referred to FTTx (hereafter referred to as the initial NGA decisions) were taken in the period 2009-2010. This timing may have been influenced by the adoption in December 2007 of the second edition of the European Commission Recommendation on Relevant Markets,[29] which advocated a technologically neutral approach to reviewing the markets for 'wholesale physical infrastructure access'[30] and 'wholesale broadband access'.[31] The European Commission Recommendation on Next Generation Access which was ultimately adopted in 2010,[32] was also under discussion during the period of NRA's initial regulatory analyses concerning NGA, and although it is not binding, it may have influenced some of the approaches taken.

2.2 When first regulating NGA, NRA's did not pursue the same objectives

NRAs pursued different objectives in applying regulation to NGA, based on the existing status of NGA deployment and the perceived scope for further end-to-end infrastructure competition. Regulators in France and Spain initially focused primarily on incentivising entrants to **'climb the ladder of investment'**. These NRAs placed emphasis on regulated access to ducts under the SMP regime and in the French case, fibre terminating segments,[33] which were mandated under a separate 'symmetric' regime[34] for sharing of wiring. Downstream active remedies were limited[35] or absent. Regulation in these countries focused around fostering FTTH, based on the apparent preferences of market players.[36] The other regulators placed greater attention in the regulatory regime towards facilitating local and/or regional wholesale **access to the existing NGA infrastructure**[37] of the incumbent either as the main focus of regulation

29 EC 2007 Recommendation on Relevant Markets http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:344:0065:0069:en:PDF.
30 Market 4 of the Relevant Market Recommendation
31 Market 5 of the Relevant Market Recommendation
32 EC 2010 Recommendation on Next Generation Access http://eur-lex.europa.eu/LexUriServ/%20LexUriServ.do?uri=OJ:L:2010:251:0035:0048:en:PDF
33 Dark fibre connections at handover points aggregating at least 1000 households (roughly equivalent to a fibre subloop)
34 Regulation based on article 12 of the Framework Directive applying to all operators
35 In Spain no access above 30Mbit/s. In France no active access
36 Iliad had already begun FTTH deployments in France. The Spanish NRA noted a lack of interest from market participants in FTTC
37 Local and regional NGA access remedies in these countries were adapted to reflect the FTTx technologies deployed by the incumbent. Fibre unbundling was mandated where P2P deployments occurred, active remedies were applied for FTTC. Regulation was adapted to address vectoring development

(in Belgium) or, in Germany, the Netherlands and Sweden in combination with upstream passive remedies such as subloop unbundling and associated backhaul facilities.[38]

The table below shows the NGA wholesale products which were mandated at the time of the initial NGA regulatory decisions.

Table 4: NGA access obligations 2009-2010 and the ladder of investment

Access type	Belgium	France	Germany	NL	Spain	Sweden
Decision date	2009	2009-10	2010	2008-9	2009	2010
Main FTTx technology (FTTC/FTTH coverage)						
Duct access (local access)		**√**	√ *		**√**	
In-building wiring		**√**			**√**	
Fibre terminating segment		**(√)**				
Subloop unbundling	√	√	**√**	**√**	√	√
Dark fibre backhaul				√		√
ODF access (fibre unbundling)				**√**		**√**
Local active NGA access	√ FTTC **			√ FTTC		√ FTTC/H
Regional active NGA access	**√ FTTC**		**√ FTTC/H**	√ FTTC	√ (<30Mbit/s)	√ FTTC/H

Black indicates mandated by NRA across national territory
Brackets indicates mandated in portion (non-competitive/contestable part) of the territory
Bold indicates primary focus of NGA regulation
* Duct access mandated in segment between street cabinet and MDF site only. ** Remedy not applied/used in practice

Source: WIK research

2.3 In several countries NGA deployment had already progressed prior to the implementation of NGA specific access regulation

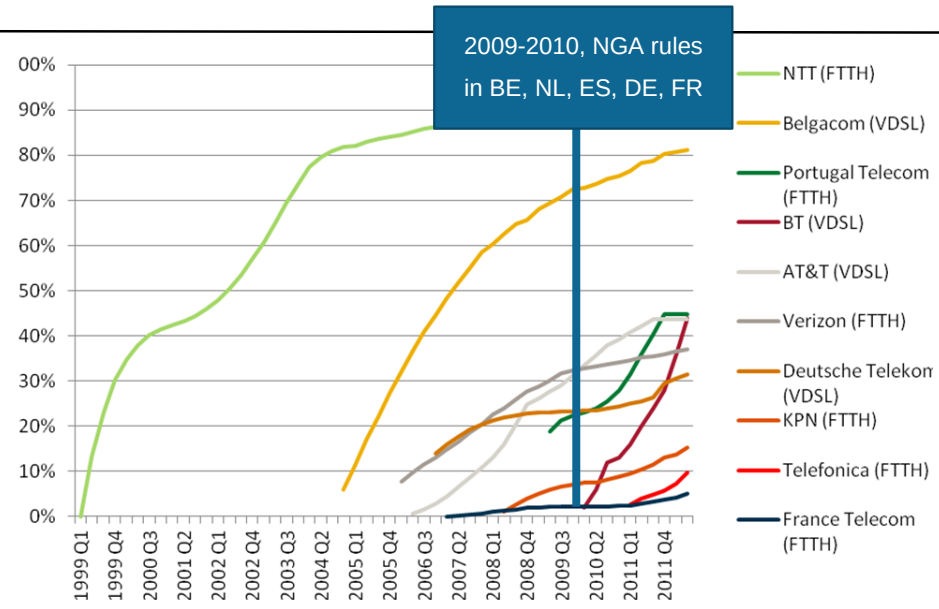
NGA deployment had already progressed in some countries before NGA specific access regulation was introduced, and therefore these deployments occurred while the main regulated wholesale products were based on current generation (copper) technology.

For example, Belgacom's FTTC deployment began in 2004, and had reached 66% of households by the time NGA-specific regulatory obligations were imposed in 2009. FTTx roll-out had also reached around 25% of households in Germany (FTTC) and 34% in Sweden (FTTH/B deployments including those by municipal providers and the alternative operator B2) by the time of the initial NGA regulatory decisions in 2010. However, as can be seen in

38 The German and Dutch NRAs made specific efforts to operationalise SLU as a means of competitive provision of FTTC/VDSL. In the Netherlands, dark fibre backhaul has been available as an associated facility to SLU since 2006 and is priced on the basis of cost-orientation.

Figure 3, NGA deployment by incumbents was still at a relatively early stage of development in the Netherlands, Spain and France when the initial NGA decisions were taken in these countries in 2009.

Figure 3: Household coverage SFBB for selected incumbent operators 1999-2011



Source: Broadband Stakeholder Group: demand for Superfast Broadband

Incumbents in the reviewed countries adopted different technological solutions for NGA initially, and over time. Prior to the initial NGA decisions, the focus in Belgium and Germany was clearly on FTTC and remained as such. However, in France and Spain, the emphasis of commercial investments lay at that time on FTTH/B.[39] In Sweden and the Netherlands, incumbents stated that they intended to pursue a mixed technological approach, but their strategies evolved over time. In the Netherlands, KPN scaled back ambitious FTTH plans[40] announced following its acquisition of a stake in Reggefiber in 2008, and subsequently placed greater focus on FTTC deployment although FTTH deployment continued to expand at a more gradual pace.[41] In Sweden notwithstanding Teliasonera's initial announcements in 2008 concerning VDSL2,[42] its focus later changed to FTTH with a target of reaching around 40% of households by 2018.[43]

39 FTTC was subsequently deployed by public initiative networks inter alia to facilitate rural coverage

40 IDATE for the EC reports that in 2010, KPN had announced an ambition to serve 60% of households with FTTH, with VDSL as an interim solution. See https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/broadband_coverage_2010.pdf

41 This changed strategy by KPN may have been supported by the prevalence of duplicate copper pairs and the potential for higher speeds made possible with vectoring

42 See http://telekomidag.se/telia-storsatsar-pa-fast-bredband/

43 See Teliasonera investor presentation 2014 http://www.teliasonera.com/Documents/Presentations/2014/CMD_2014.pdf

2.4 Market maturity was key in assessing risk

NRAs mainly based their assessment of the risks associated with NGA on market maturity, with attention to the existing status of NGA deployment and take-up and the extent to which NGA presented demand risks. In both of the countries in which FTTC was clearly the predominant incumbent NGA technology at the time of the initial regulatory decisions (Belgium and Germany), NRAs considered that it presented supernormal risks. Less focus was given to potential risks associated with FTTC in Sweden and the Netherlands. However, FTTH was already a prevalent FTTx technology in Sweden with significant take-up at the time of the initial regulatory intervention, while in the Netherlands, the key focus of FTTC regulation initially was on enabling entrants to deploy their own FTTC networks on the basis of SLU and dark fibre backhaul.

FTTH/B was viewed as a risky technology in all the countries in which it was considered,[44] with the exception of installation to multiple dwelling units in Sweden.

2.5 A variety of solutions were deployed to address perceived risk

A variety of solutions have been used to address perceived risks in the deployment of NGA technologies. The primary mechanisms used have included forbearance or limitations on the regulation of access to incumbent NGA infrastructure,[45] intervening to assess or set wholesale charges only in the event of a dispute; forbearance from charge control (subject to the application of margin squeeze tests to protect competition); co-investment, long-term pricing regimes involving a period of discounts in exchange for an upfront fee, and in cases where cost based charge controls were applied, an allowance to account for risk within the cost-based price. In some cases several mechanisms to address risk have been used simultaneously. With the exception of Germany (in which FTTH deployment is very limited), different approaches have been applied to FTTC and FTTH in the reviewed countries.

2.6 All countries setting cost based charge controls in the initial decisions made a risk allowance –those uplifting the WACC took account of non-systematic risk

In the initial NGA decisions made in 2009-2010, five of the countries considered (all except Germany), applied cost-orientation on the primary NGA wholesale access product. Reflecting guidance provided in the European Commission 2010 NGA Recommendation, in all these cases, some allowance was made within the cost-

44 FTTH/B was outside the scope of the Belgian market analysis due to low volumes
45 A key example is forbearance on mandating access to bitstream speeds above 30Mbit/s in Spain

oriented charge with the stated aim of reflecting risk associated with NGA. However, the precise approaches varied.

Two countries provided for an adjustment to the cost, without making any changes to the base WACC used within the cost-oriented charge. In Belgium the BIPT originally permitted a cost uplift of 15%[46] on FTTC-specific passive assets (cables, connectors).[47] The PTS in Sweden followed a geographic approach whereby charges for single dwelling units in urban centres were priced based on the higher cost of connections in rural areas, to reflect the greater demand risks associated with these installations compared with fibre connections to MDUs.

Meanwhile, NRAs in Spain, the Netherlands and France applied a mark-up to the WACC used for FTTH wholesale products (referred to by the NRAs concerned as 'risk premia') in order to account for cost and demand uncertainty.[48] However, different approaches were followed in this context:

1) The Spanish NRA concluded that project-specific risks for FTTH should be taken into account, and did so by comparing the effects of higher demand uncertainty in an NGA scenario with a scenario for standard broadband in a DCF model based on a Monte Carlo Simulation. The resulting uplift was 4.81%;

2) The Dutch NRA concluded that only systematic risks should be taken into account in setting the WACC for calculation of cost-oriented charges for FTTH unbundling. After finding insufficient comparators to estimate a fibre-specific beta, ACM added two mark-ups to the WACC, 1% to account for different fixed/variable cost ratios of fibre compared with standard broadband and a further 1% (specific to speculative residential as opposed to on-demand business FTTH deployments) to account for the risk of a delay in take-up due to economic shocks. The total FTTH unbundling WACC uplift used to calculate ex ante the cost-oriented charge for fibre unbundling is therefore 2%. A further 3.5% uplift (a non-systematic regulatory risk mark-up)[49] is added to the FTTH WACC (ie base WACC+5.5%) when assessing at the end of the charge control period whether returns on FTTH have been 'excessive' in relation to the FTTH WACC; [50] and

46 After application of the standard WACC within the cost-based charge. Rationale behind the 15% uplift not clear.
47 Not ducts as these were viewed as reusable
48 In France intervention is ex post only and values given are indicative
49 This excess is considered to reflect the asymmetric regulation risk. Regulatory asymmetry in the Netherlands refers to the fact that regulation only addresses potential upside risks (reduces charges to prevent excessive profits) and not the downside risks (there is no charge increase if profits are below expectations). The 3.5% is based on the decreased IRR in the DCF business case when penetration ratios fall from 80% (optimistic scenario) to 40% (pessimistic). In this sense, project-specific risk is reflected in the Dutch case when assessing whether charges are 'excessive'.
50 The Internal Rate of Return (IRR) is checked at the end of each three year charge control period, and charges may be adjusted downwards if the IRR is more than 3.5% in excess of the FTTH WACC (ie the base WACC + 2% FTTH mark-up).

3) The French NRA focused on providing indicative guidance to market players rather than providing a definitive determination of the WACC uplift,[51] but recommended in draft guidance that differentiated mark-ups should be applied depending on the timing of purchase of an IRU (before or after installation of the fibre) to account for the degree to which such co-investment would contribute to defraying investor risk. The recommended FTTH WACC uplift is 2% for the purchase of an IRU occurring prior to fibre installation.[52] A higher uplift applies for IRUs purchased later on.[53] A further 2% WACC mark-up on top of the IRU WACC uplift is proposed in the calculation of monthly rental charges for passive access to the fibre terminating segment.[54] ARCEP indicates[55] that this may result in a WACC uplift for FTTH terminating segment rental of around 4%.[56]

A summary of the applicable mark-ups and cost calculation methods is shown in the table below. A report by the Brattle Group for ACM[57] further reported that the WACC uplift provided for FTTH in Italy was 4.4%. The report concluded that uplifts in France, Spain, Italy and Lithuania (which did not disclose the size of the FTTH WACC uplift) compensate operators not only for the higher systematic risk of FTTH investment but also for non-systematic investment risks, including “uncertainty relating to the costs of deployment, civil engineering works and managerial execution”.

51 ARCEP does not set FTTH terminating segment charges up front, but only intervenes to resolve disputes
52 This is an approximation made on the basis of conducting demand sensitivities with a target IRR of 10%
53 This amount may be variable depending on when co-investments occur
54 The rental mark-up is intended to provide an incentive for (co-)investment
55 Interview October 2015
56 Assuming co-investment prior to fibre installation
57 Brattle Group study for ACM July 2015 https://www.acm.nl/en/publications/publication/14471/Study-into-the-cost-of-capital-WACC-of-KPN/

Table 5: Approaches to risk allowances on the WACC

Applicable regulation	France	NL	Spain
Regulated product	FTTH terminating segment	FTTH unbundling (ODF access)	FTTH Eth regional bitstream (capped at 30Mbit/s)
Cost-based pricing determination only following dispute	Yes	No	No
Basis for cost calculation	DCF illustrative cost model under development	DCF model based on actual costs	BU-LRIC+ model
Uplift on normal WACC	Indicative uplift value for FTTH terminating segment rental of 4% based on 2% uplift for IRU through IRU before installation + a further 2% uplift for rental	2% uplift for cost calculation purposes An additional 3.5% is added when assessing whether IRRs are excessive in relation to the FTTH WACC	4.81%
Rationale for risk allowance	2% co-investment in advance estimated through sensitivities on take-up with target IRR of 10%, Mark-up for co-investment after installation estimated through model equalising revenues of investors before and after installation. Further 2% rental uplift proposed as incentivisation for (co-) investment - no specific rationale	1% uplift (to account for greater ratio of fixed to variable costs) + additional 1% uplift to account for potential for delayed adoption due to economic shock	Difference between the minimum IRR from a scenario of standard broadband and the minimum IRR from a scenario of ultrafast broadband with demand uncertainty. With "minimum IRR" is meant the minimum value of the distribution of IRR values from a large number of Montecarlo simulations (done for each of the two types of scenario)

Source: WIK research

2.7 Regulatory controls on FTTC have tightened

Since the initial NGA decisions of 2009-2010, there has been a trend towards tighter controls on FTTC. An important development is the adoption of VULA or local Ethernet bitstream as a core regulatory solution in place of various forms of regional bitstream and/or SLU. A core rationale in the countries which adopted VULA for the first time was the planned introduction of vectoring and exchange closures which would render physical unbundling less viable. A further rationale given for regulatory tightening on FTTC in Belgium was a perceived reduction in risk. Table 6 summarises initial and changed approaches to FTTC in the four countries in which this technology has been considered relevant for commercial NGA deployment.[58] These changes are further discussed below.

58 VDSL in Spain has been deployed at the Central Office rather than in conjunction with FTTC. In France, VDSL has mainly been deployed by public initiative networks in conjunction with a shortening of the local loop and the effective relocation of the MDF location (including co-located operators).

Table 6: Regulatory approaches to FTTC-based active access (initial and most recent)

Regulatory approach	Belgium (1)	Belgium (2)	Germany (1)	Germany (2)	Netherlands (1)	Netherlands (2)	Sweden (1)	Sweden (2)
Date	2009-2011	2011-	2010-2015	2015-	2008-2012	2015	2010-2015	2015-
Active product	Ethernet bitstream	Ethernet bitstream	IP bitstream	Ethernet bitstream	Ethernet bitstream[59]	VULA	IP bitstream[60]	VULA
Relevant market (EC Recommendation)	Market 5	Market 5	Market 5	Market 3b	Market 5	Market 3a	Market 5	Market 3a
Handover	Local[61] and regional	Local and regional	Regional	Local	Local and regional	Local	Local and Regional	Local
NRA pricing intervention only in the event of a dispute or investigation			v			v		
Flexible pricing subject only to margin squeeze test (no cost-orientation			v	v	v			
Long term pricing permitted			v[62]	v		v		
Cost-based with risk allowance (eg WACC)	v							
Cost-based without risk allowance		v				v (if dispute)		v
Rationale for changed approach		FTTC no longer considered risky due to maturity of deployment, take-up, evidence that returns on investment made, exchange closures		Vectoring likely to accelerate decline in LLU - FTTC VDSL bitstream new anchor product requiring tighter regulation		Replacement product for LLU/SLU needed due to vectoring. Sufficient incentive for incumbent to agree VULA price; Market 5 remedy withdrawn in 2012		Need for replacement product where LLU no longer viable (also in view of vectoring).

59 FTTC treated as 'copper'. No explicit reference to risk, Bitstream obligation removed in 2012 due to effective competition
60 FTTC treated as 'copper'. No explicit reference to risk. Cost-based pricing includes 'economic space' to foster investment ladder
61 Local bitstream not operationalised in practice
62 Long-term pricing agreement makes available discounts over 8 year period on payment of upfront fee

In **Belgium**, an uplift was initially made on the cost-based charge for FTTC Ethernet bitstream to account for perceived risk in the installation of FTTC. However, in 2011, when deployment of FTTC had passed 80% of households and 30% of broadband subscribers took fast broadband, the Belgian NRA concluded that FTTC was no longer risky.[63] Planned exchange closures, which necessitated migration to FTTC bitstream, also contributed to this decision. Charges for FTTC Ethernet bitstream have since been set on the basis of cost-orientation without any risk adjustment.

In **Germany**, the original core FTTC wholesale product established following the 2010 NRA decision was a regional IP bitstream. The German NRA accounted for risk in this product through (i) intervening to check charges only after product launch (termed an 'ex post' intervention) either in the context of an own initiative investigation or a dispute; (ii) doing so on the basis of a margin squeeze test only and not applying charge controls; and (iii) by permitting long term pricing whereby discounts are available on payment of an upfront fee. In 2015, *local ethernet* bitstream was mandated with DT's charges to be assessed *in advance* of launch. The strengthened regulation reflects the increased importance of FTTC bitstream as an anchor product with the transition to vectoring. Risks continue to be addressed by allowing the incumbent to set charges (which would be approved by BNetzA providing they do not result in a retail wholesale margin squeeze or a margin squeeze against downstream wholesale products) rather than setting charges on the basis of cost-orientation. At the same time as strengthening FTTC regulation with the introduction of a new local Ethernet bitstream with tighter oversight on charges, BNetzA also deregulated downstream regional FTTC IP bistream in a portion of the country that was considered to be now competitively served. Charges for the IP bitstream product continue to be based only on margin squeeze tests after launch or on dispute.

In **Sweden** and the **Netherlands**, FTTC bitstream for residential markets[64] was initially introduced under the same conditions as those applying to copper bitstream. Bitstream access was available alongside a passive solution for FTTC deployment involving SLU and dark fibre backhaul. There was no explicit discussion concerning risk associated with FTTC but in the Netherlands bitstream was nevertheless not subject to cost orientation, but only a margin squeeze test. As of 2012, the Netherlands withdrew the initially introduced residential bitstream regulation on the basis that the market was now considered competitive. In 2015 the Netherlands, as well as Sweden introduced VULA, on the basis that copper unbundling would become obsolete as a result of the migration to fibre and introduction of vectoring. Although not explicitly associated with risk, the Dutch NRA permitted long-term pricing for VULA and provided for charges to be commercially agreed (with intervention to set charges only in the event of a dispute). ACM noted that this light touch approach was made possible as a result of factors which incentivised the incumbent to reach agreement. These included a prohibition on the implementation of vectoring in the absence of a VULA product, and the

63 The Belgian NRA also took into account statements by Belgacom concerning the returns made on FTTC investments and the planned closure of exchanges which would result in migration of copper-based alternative operators to FTTC bitstream

64 Low quality bitstream in NL

prospect that charges for VULA would be set on the basis of cost without any risk adjustment in the event that agreement was not reached.

2.8 There has been some trend towards pricing flexibility to address FTTH risk

There are four countries in which FTTH is a relevant or prevalent technology – France, Netherlands, Spain and Sweden. NRAs in these countries have applied and continue to apply measures to address perceived risks.

In the past they took very different approaches in this regard, but there has been some trend away from cost-orientation with risk adjustment on FTTH access and convergence towards an approach based on flexible pricing, subject only to price approval or checks based on margin squeeze tests and obligations aimed at ensuring Equivalence. This approach is similar to that pursued in the UK and advocated in the context of the European Commission 2013 Recommendation on cost methodologies and non-discrimination.[65]

- **Spain** is a particularly interesting case in that, in 2009, the NRA pursued regulatory forbearance on regional FTTH bitstream access at speeds above 30Mbit/s combined with the application of a risk allowance, calculated using monte carlo simulation, on the cost-oriented price for FTTH bitstream offered below these speeds (ie FTTH bitstream <30Mbit/s). However, in November 2015 the CNMC proposed to amend this approach by lifting regulatory forbearance on access to higher bandwidth bitstream and introducing VULA, yet addressing risk in another way. Specifically, CNMC now plans to provide appropriate investment incentives by (i) removing FTTH access obligations entirely in an area deemed to have the potential for effective NGA competition; [66] and (ii) forbearing from charge controls on FTTH wholesale products (including the newly introduced VULA) – thereby allowing pricing flexibility for the incumbent, subject only to a margin squeeze test and Equivalence of Input. CNMC noted in its consultation preceding the draft Decision that the removal of forbearance on higher speeds was justified in light of the greater maturity of FTTH deployment and increased take-up of ultrafast broadband in 2013 compared with 2009, when NGA policies were first introduced.
- **Sweden** started from a much more stringent regulatory position than Spain, having applied cost-orientation on FTTH access (fibre unbundling and bitstream) in its original NGA decision of 2010, without any risk adjustment (apart from an allowance for single dwelling units), in the context of well-developed FTTH infrastructure prior to the regulatory decision. However, it too plans in December 2016 to move away from cost-orientation and permit pricing flexibility on the fibre unbundling product,

65 EC 2013 Recommendation on cost methodologies and non-discrimination https://ec.europa.eu/digital-agenda/en/news/commission-recommendation-consistent-non-discrimination-obligations-and-costing-methodologies

66 Areas representing ~26% population

providing Equivalence of Input and a margin squeeze test are effectively established. Meanwhile, the previously mandated NGA bitstream product will be deregulated on the basis that there is sufficient competition in this downstream market.

In contrast with Spain and Sweden, which have adapted their approaches to FTTH over time, NRAs in France and the Netherlands adopted policies from the outset which aimed at long-term stability in the regulatory treatment of FTTH (including treatment of risk) to provide certainty for investors, and thereby defray regulatory risk.

- A key aspect of the long-term approach for FTTH unbundling regulation adopted in the **Netherlands** has been the use of common principles for charge controls over multiple review periods. Cost-oriented charges for FTTH unbundling are calculated on the basis of a DCF model with an adjustment to reflect risk (as described in section 2.6). However, ACM states that, providing there are no materially changed circumstances which charges for each charge control period are not recalculated, but rather are based on the charge control for the previous period, subject only to an inflation adjustment, unless charges are deemed to be excessive, following a formula further described below.
- The authorities in **France** have aimed to establish a long-term regulatory system for FTTH by promoting co-investment in fibre access networks in less dense areas. [67] It has done so by enabling alternative operators to build out their own fibre part way into the access network through attention to duct access regulation (mandated under the SMP framework) and by encouraging co-investment in the terminating segment of the network[68] through applying symmetric regulation under which all operators installing fibre in the terminating segment must offer Indefeasible Rights of Use (IRUs)[69], . IRUs are contracts conferring the right to use (and typically trade) assets over a long term period subject to payment of an upfront fee, which is typically treated as capex rather than opex within financial statements. A monthly rental option must also be offered.
- The French regulatory authority has also further sought to reflect risks in FTTH by intervening to set charges for IRUs and rental of fibre terminating segments only in the event that commercial negotiation fails, and by recommending that charges for IRU and rental[70] should include a mark-up on the WACC to account for demand uncertainty. Although ARCEP does not set charges for the fibre terminating segment upfront, it follows these principles when resolving disputes.

The original and changed approaches towards FTTH regulation are summarised in the table below.

67 In very dense areas representing ~17% population, it is considered viable for operators to duplicate the fibre terminating segment up to the base of the building, and therefore only in-building wiring is shared

68 The portion from the customer premise to the first external distribution point aggregating at least 1000 households

69 IRUs confer the right to use a given portion of lines (typically in slices of 5%) over a period of two decades or more

70 Fibre terminating segment rental must also be provided, but on less favourable terms than IRU

Table 7: Regulatory approaches to FTTH access (initial and most recent)

	France	Netherlands	Spain	Spain (new)	Sweden	Sweden (new)
Date	2009-	2009-	2009-2015	2016 (proposed)	2010-2016	Dec 2016-
Main product	FTTH Terminating segment	FTTH unbundling	FTTH bitstream	VULA (non-competitive zone)[71]	FTTH unbundling	FTTH unbundling
Relevant market	N/A - symmetric	Market 4	Market 5	Market 3a	Market 4	Market 3a
Handover	Sublocal	Local	Regional	Local	Local	Local
Forbearance on access regulation			√ (>30M)			
NRA pricing intervention only in the event of a dispute	√					
Pricing flexibility subject only to margin squeeze tests				√		√
Long term pricing permitted	√ (IRU)					
Cost-based with risk allowance (mark-up)	√ (elaborated 2014)	√[72]	√ (<30M)		√ (for single dwellings)	
Cost-based without risk allowance					√ (for multi-dwelling units)[73]	
Rationale for change				Greater market maturity allows removal of forbearance in non-competitive zone. Competitive constraints, EoI permit pricing flexibility		Competitive constraints, introduction of EoI obligation enables pricing flexibility. Light-touch regulation facilitates investment

CO: Cost Orientation

71 VULA imposed in area of no expected NGA contestability only
72 Approach also involves multi-period charging principles. Long-term approach.
73 No extra risk assumed for MDU

2.9 Treatment of current and next generation costs

The deployment of fibre in the access network alongside the traditional copper network (either up to street cabinet or building) raises important questions about how the cost of ducts housing the networks should be allocated between them. Where wholesale access to FTTx is regulated this affects the price of of LLU and ADSL bitstream, and of FTTx, respectively. Different solutions have been pursued in this regard:

- In **France**, duct costs are allocated between copper and fibre on the basis of the proportion of take-up of the respective technologies at retail level. This results in a dynamic approach whereby duct costs associated with fibre (including the rental of ducts for the installation of fibre) are low during the early deployment phase and increase as fibre becomes the predominant technology. The primary rationale for this allocation method was to foster fibre deployment in the early phase.
- In **Germany** and **Spain**,[74] within the developed BU-LRIC+ models,[75] duct costs are allocated on the basis of the space requirements of the respective technologies within the duct or trench.
- In **Sweden** a single BU-LRIC+ cost model is used to model the costs for copper and fibre,[76] whereby FTTH is assumed to be the Modern Equivalent Asset (MEA) with the exception of remote areas for which wireless is taken as the MEA. As a consequence of using a single model which does not assume the parallel operation of copper and fibre, an allocation of duct costs between technologies is not needed.
- In **Belgium** there are no ducts in the network segment between the end-user and street cabinet and no significant FTTH/B, hence allocation is not relevant in this segment. In the portion between the street cabinet and MDF site ducts have been installed for fibre only while copper cables are buried – hence these duct costs are attributed to fibre.
- In the **Netherlands**, ducts are not routinely used, and therefore duct cost allocation issues do not arise. Furthermore, copper costs are no longer modelled but set on the basis of a safety cap.

With the exception of Sweden, CCA valuation based on current (copper) technologies is applied in all countries applying cost models for copper.[77] In Sweden FTTH is used as an MEA for copper valuation purposes, alongside wireless technologies in remote areas.

As regards fibre, in France and the Netherlands, costs are modelled on the basis of a DCF model using actual costs,[78] while in Sweden[79] and Spain[80] fibre has been valued on a CCA

74 When using the overlay modelling scenario

75 BU-LRIC+ model is used to calculate the copper LLU price in Germany, FTTx not subject to charge control. The BU-LRIC+ model is used in Spain for the calculation of FTTH bitstream (capped at 30M), but not for copper LLU, which is subject to top-down modelling

76 Within the theoretical model, an efficient deployment of a single FTTH network (with wireless in remote areas) is assumed. As a result of using the same model, the cost for copper LLU is the same as the nationally averaged cost for dark fibre

77 In the Netherlands, no model is used for copper LLU. Prices are based on safety caps

basis. A summary of the approaches to duct cost allocation and asset valuation of copper and fibre is shown in the table below.

Table 8: Duct cost allocation and asset valuation methods

Country	Duct cost allocation between copper and fibre	Asset valuation
Belgium	Copper is directly buried hence no duct allocation. Ducts installed in the feeder segment for FTTC deployment are attributed to fibre	CCA based on current technologies in use - no MEA
France	Costs allocated between copper and fibre on the basis of retail take-up of the respective technologies	CCA for copper loops and ducts based on current technology (not MEA). Fibre costs not determined ex ante - illustrative DCF model available, actual costs presumed
Germany	Duct access only between street cab and MDF - duct cost allocation based on space requirements in trench	BU-LRIC+ CCA based on current technology for copper (not MEA). FTTx not cost-oriented
Netherlands	N/A most cables directly buried. Copper costs no longer modelled	Safety caps used for copper (not modelled). Actual costs used for fibre unbundling (ODF access) within a DCF model
Spain	Duct costs allocated between copper and fibre based on duct usage (fraction of total subducts used by each technology)	CCA valuation for copper and fibre based on current technology (not MEA). FTTH bitstream (capped at 30Mbit/s) costs based on a BU-LRIC+ model. LLU charge controls are based on top-down model.
Sweden	Not applicable because a common BU-LRIC+ model is used for both copper and fibre cost-oriented charge controls. This theoretical model assumes a single modern network with no co-existence between copper and fibre.	FTTH used as MEA for copper, wireless in remote areas

Source: WIK Research

2.10 Outcomes

Following the introduction of the initial NGA regulatory obligations, incumbents' deployments in NGA continued to expand in all the countries considered.

Figure 4 shows the estimated deployment of prevalent[81] NGA technologies shortly after the adoption of the first NGA decisions and in 2015, alongside the Docsis 3.0 cable coverage.

78 Indicative in the case of France – as the regulator has published a draft illustrative model, but intervenes to set prices only in the event of dispute

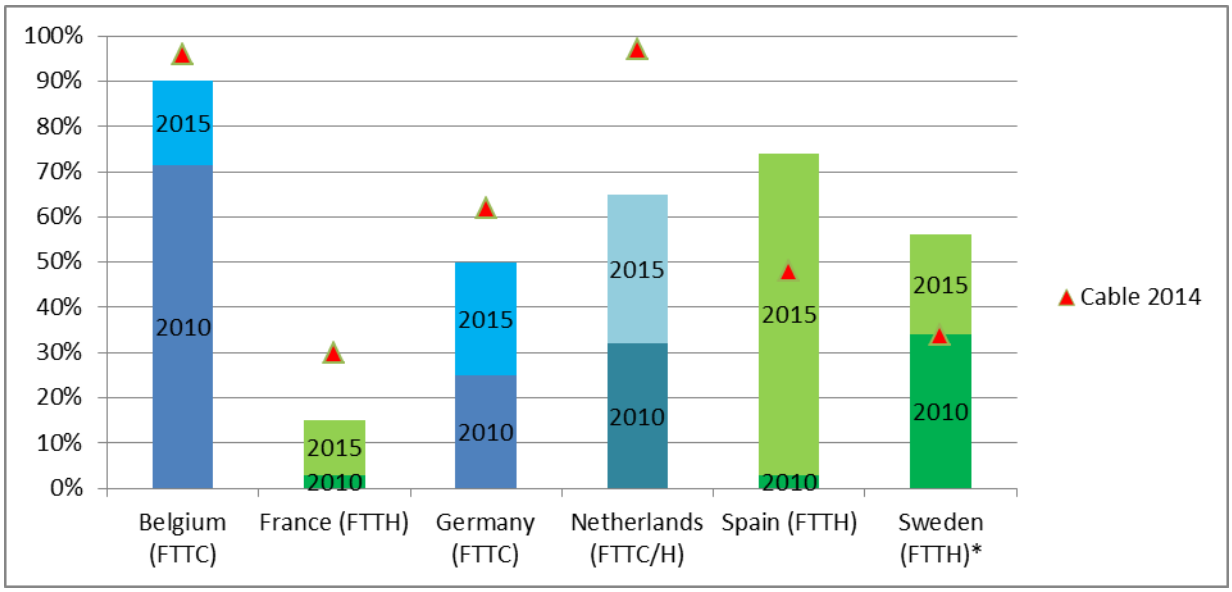
79 From Dec 2016, FTTH in Sweden will no longer be cost-oriented, provided conditions to ensure replicability have been effectively introduced.

80 Costs for FTTH bitstream restricted to speeds of 30Mbit/s – the NRA proposed in 2015 to lift cost-orientation.

81 In the Netherlands in 2015 29% of the coverage was FTTH while 36% was FTTC

The significant expansion in FTTH by Telefonica is of particular note. It is possible that this deployment may have been supported by the policy of regulatory forbearance adopted by the NRA. NGA deployments by incumbents in other countries also continued to expand following regulatory decisions, and these deployments may also have been supported by the various strategies adopted by NRAs to address risk or other aspects of regulatory flexibility. However, we note that regulation is just one amongst many factors that may affect NGA deployment. Other drivers identified in a previous study[82] include infrastructure competition such as competition from cable (which is near-ubiquitous in Belgium and the Netherlands) and municipal networks (in the case of Sweden) and demand-based factors. The higher cost of FTTH and/or differences in population density may also affect deployment. It is therefore challenging to isolate the specific role played by regulation or even more narrowly regulators' approach to risk.

Figure 4: Evolution of FTTx household coverage (predominant technologies) 2010-2015 against Docsis 3.0 cable coverage



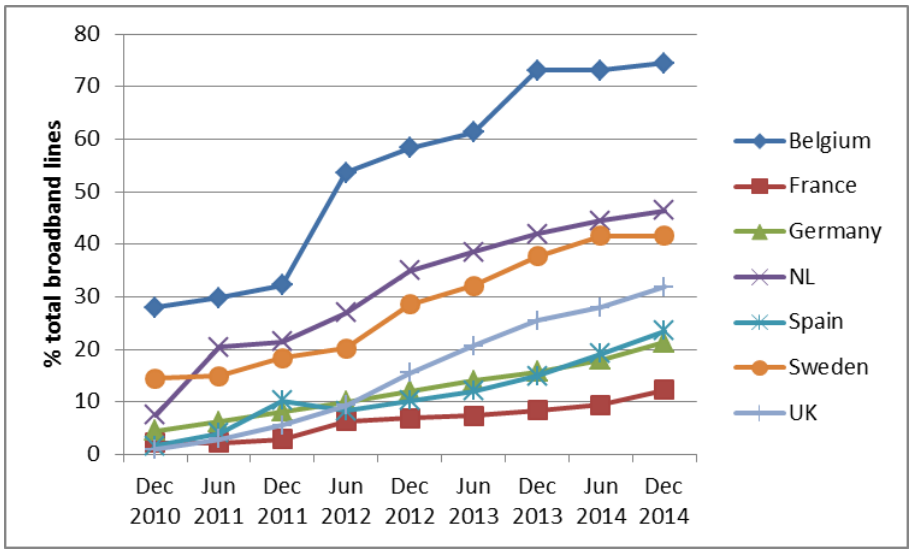
Source: WIK based on IDATE FTTx Watch, operator investor and NRA statements * The FTTH coverage of Swedish incumbent Teliasonera was 15% at the end of 2014

Consistent with the high degree of cable and incumbent NGA deployment in these countries Figure 5 shows a high take-up of broadband at speeds of above 30Mbit/s in Belgium and the Netherlands. Although its NGA coverage is lower, take-up of fast broadband in Sweden is also relatively advanced, supported in large part by historic FTTH deployments by municipalities and alternative operators.[83] Take-up of fast broadband has been more limited in Germany, Spain and France. This is not only explained by the more limited NGA coverage

82 WIK (2015) for Ofcom 'Competition and Investment; an analysis of the drivers of superfast broadband http://www.wik.org/index.php?id=702&L=1
83 Incumbent Teliasonera's FTTH deployment covered approximately 15% of households in 2014

in these countries,[84] but may also be due to demand-based factors such as lower usage of online video.[85]

Figure 5: % broadband lines at speeds >30Mbit/s



Source: WIK based on data from Digital Agenda Scoreboard

Looking to the nature of competition, we see that end-to-end infrastructure competition rather than access-based competition remains the primary source of fast broadband competition in the countries considered. Much of this competition was based on pre-existing cable networks or municipal deployments without reliance on the regulatory regime. For example, cable played an important role in driving NGA investments in Belgium and the Netherlands (where it is ubiquitous), as well as in Germany, France and Spain, while in Sweden municipalities have played a significant role in the deployment of FTTH networks.

However, there are some instances of alternative operators 'climbing the ladder of investment' with support from the regulatory regime. In France and Spain, alternative operators have deployed or co-invested in FTTH networks in certain dense urban areas. These deployments were supported by regulated duct access based on the SMP regime, as well as symmetric in-building wiring regulation and terminating segment IRUs in the case of France. ARCEP reports that 35% of FTTH lines sold in the third quarter of 2015 in France, were based on the symmetric regulatory regime applying to fibre terminating segments.[86] Take-up of subloop unbundling has been minimal in most countries. However, it has been

84 Take-up of NGA is relatively low in these countries as a proportion of coverage

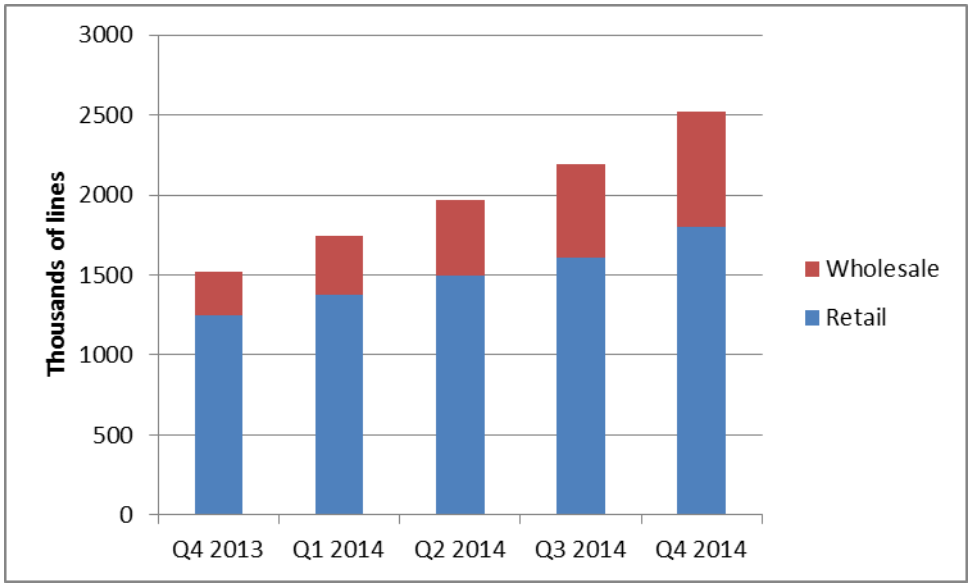
85 See discussion in WIK (2015) Competition and Investment, an analysis of the drivers of superfast broadband

86 It is not however known what proportion of these lines were within very dense areas where regulated symmetric access to the terminating segment applies only to the base of buildings or to points aggregating a limited number of households. A further small proportion of FTTH lines were based on active wholesale access.

used to deploy a small number of FTTC/VDSL lines in Germany and France,[87] it is understood primarily in rural areas.

The degree of access-based competition in NGA (including fibre unbundling, where relevant, and/or FTTx bitstream) is limited in most of the countries considered.[88] An exception is Germany. Deutsche Telekom investor statements for 2014[89] suggest that in Germany 29% of its FTTx (mainly FTTC) connections were supplied on a wholesale basis, understood to be IP FTTC/VDSL bitstream. Voluntary wholesale offers supplied by municipal networks in Sweden also play a role in that market.[90]

Figure 6: Deutsche Telekom fibre subscribers – wholesale and retail



Source: WIK based on DT Q4 2014 investor presentation

87 Germany SLU (300,000 lines at 2013) and France (35,000 lines as of 2014)

88 Access-based competition accounts for around 5% of broadband lines in Belguim, and has been declining. NRAs report fewer than 20,000 wholesale incumbent fibre access lines in the Netherlands and Spain in 2014, and in Sweden as of 2013.

89 DT investor presentation Q4 2014

90 Article 7 Case SE/2015/1687/1688 PTS reports that fibre-based urban networks are present in most Swedish municipalities, many of which supply bitstream access externally. Stokab was the second largest wholesale supplier in the Swedish market with 4% of all (copper and fibre) wholesale sales. PTS further reports in the market for wholesale central access, a substantial non-regulated market, with undertakings selling access to third parties on a commercial basis.

3 Belgium

3.1 Summary characteristics

Context

Belgium is characterised by near ubiquitous cable networks[91] alongside the network of the incumbent Belgacom (now rebranded as Proximus). Belgacom was one of the pioneers of FTTC/VDSL deployment. FTTC roll-out began in 2004 and had reached 66% of premises by the end of 2008.[92] There is minimal additional infrastructure-based competition beyond cable and incumbent networks and access-based competition has been declining (reducing from ~20% of DSL lines in 2008), resulting in a market structure that could be characterised as a duopoly.

Regulatory approach

On the basis that further duplication of NGA infrastructure is considered unlikely, BIPT's main regulatory focus has been to stimulate competition and open up markets to further operators (ie a largely access-based competition focus).

In the early years of Belgacom's deployment, FTTC was not included within the market analysis. In 2009 the regulator BIPT mandated FTTC/VDSL bitstream access and imposed a charge control including a *risk allowance within the regulated charge* in order to foster investment. This risk allowance involved a 15% uplift[93] on the cost of passive components (fibre and connectors) associated with VDSL, but not ducts.

Subsequently in 2011[94] BIPT withdrew this allowance on the basis that FTTC/VDSL was no longer risky. BIPT justified its *2011 decision to remove the risk allowance* based on (i) high take-up of fast broadband services; (ii) the closure of local exchanges and consequent migration from LLU to NGA bitstream which reduced demand risk;[95] and (iii) evidence that the regulated incumbent Belgacom was making a return on its investment.[96] FTTH has not been in the scope of BIPT's previous market analyses due to low volumes and has therefore

91 Various regional cable operators of which the most significant is Telenet
92 BIPT investor statements
93 Methodology not specified
94 http://www.bipt.be/nl/operatoren/telecom/markten/breedband/marktanalyse-2011/beslissing-van-de-conferentie-van-regulatoren-voor-de-elektronische-communicatiesector-crc-van-1-juli-2011-met-betrekking-tot-de-analyse-van-de-breedbandmarkten
95 Belgacom announced the planned closure of 10-15% of local exchanges in 2008. The closure programme began in mid-2012. See http://www.bipt.be/nl/operatoren/telecom/markten/breedband/marktanalyse-2011/beslissing-van-de-conferentie-van-regulatoren-voor-de-elektronische-communicatiesector-crc-van-1-juli-2011-met-betrekking-tot-de-analyse-van-de-breedbandmarkten. The withdrawal of the SLU remedy to foster VDSL vectoring also removed another access possibility for alternative entrants
96 Based on investor statements

been subject to de facto forbearance. In its 2011 market analysis, *BIPT stated that FTTH deployment was likely to involve greater risks than are associated with FTTC.*[97]

In the same decision of 2011, BIPT withdrew the SLU obligation on Belgacom due to the implementation of vectoring.

Although the focus of this case study is on regulation of the incumbent Belgacom's FTTC/VDSL network, BIPT has also mandated wholesale access to cable networks in Belgium, with a focus on access to analogue TV and the resale of cable broadband services (on the basis of retail minus pricing).[98]

Market outcomes

Belgacom's FTTC coverage continued to expand following the imposition of regulated access in 2009. It had risen to 81% of households in 2011 (when the risk allowance was removed) and reached 90% in 2014.

Take-up of fast broadband at speeds of more than 30Mbit/s had already reached around 30% at the end of 2010 and had further expanded to 74% at the end of 2014. Access-based competition continued to decline and stood at around 9% of DSL lines (~5% total broadband lines) in 2014. This is reflected in declining take-up of both LLU and Ethernet bitstream on the Belgacom network.

3.2 NGA objectives

The Digital Belgium plan (see *DigitalBelgium.be*)[99] launched in 2015 aims to promote the roll-out of an advanced broadband infrastructure. The plan favours a *technologically neutral* approach in which widespread Internet access is fostered using a mix of technologies.

According to BIPT[100], its main focus is to stimulate competition and open up markets to further operators, taking into account that Belgium already has two high speed broadband infrastructures with a largely ubiquitous coverage, reducing the prospect of additional infrastructure competition. The low market share of alternative operators also limits the prospects for further network duplication. Early extensive deployment of FTTC/VDSL by Belgacom (amongst other factors) served to limit the potential for competition on the basis of LLU, leading to a primary focus by BIPT on active (ethernet bitstream) access remedies to NGA networks.

97 Para 1254 BIPT 2011 Market 4/5 decision https://circabc.europa.eu/sd/d/6258f6e4-8626-4db3-8f0d-25953874f691/M4-5-decision-publication-FR.pdf
98 Further details on cable regulation in Belgium are contained in a report by Analysys Mason 2015 for Ofcom http://stakeholders.ofcom.org.uk/binaries/consultations/dcr_discussion/annexes/International_case_studies.pdf
99 http://www.digitalbelgium.be/en
100 BIPT interview October 2015

3.3 NGA regulatory obligations

BIPT supports competition by imposing active wholesale access remedies on both the FTTC/VDSL incumbent network of Proximus and cable operators' networks. Although SLU was imposed as a remedy in theory, it was never operationalised. In 2011, the BIPT withdrew the SLU obligation in response to the planned implementation of vectoring by Belgacom.

3.3.1 FTTC/VDSL bitstream

Wholesale Bitstream Access (WBA) for VDSL2 (FTTC/Vectored VDSL2) is regulated under Market 5 of the previous EC recommendation on relevant markets. VDSL2 has a coverage of 90% in Belgium.

The wholesale regulated service is an Ethernet bitstream service for which several qualities of service (4 levels ranging from Best-Effort to voice-grade) and bandwidths of up to 70Mbit/s are available as well as two options for Ethernet transport (Shared VLANs between several end-users of a same Local exchange or Dedicated VLANs for a particular end-users); access seekers are responsible for dimensioning the bandwidth of the VLANs.

Currently, only regional points of handover are used (5 areas across the country, 2 points of handover per area); however the possibility of a local point of handover is available but has never been implemented.[101]

FTTC/VDSL2 is regulated on the whole territory and is considered the most important wholesale access service given the strong trend towards higher bandwidths. By the end of 2014 94,000 lines were used based on Layer 2 Wholesale Access Products (L2 WAP) in Belgium.[102]

The following obligations are imposed:[103]

- Access to broadband services (including co-location services and backhaul by means of GigaEthernet and multicast functionality)[104]
- Non-discrimination
- Transparency (Reference Offer)
- Price control and cost accounting
- Accounting separation

101 The local PoH was introduced in 2009. See also BEREC, 2015, Common Layer 2 Wholesale Access Products in the European Union, BoR (15) 133.
102 BoR(15)133
103 http://www.bipt.be/public/files/nl/414/3540_nl_m4-5-definitiefbesluit-publicatieversie-nl.pdf
104 The obligation of providing wholesale multicast services (necessary to offer IPTV services to VDSL2 customers) is implemented. Being able to offer broadband bundles with IPTV has become a major requirement for alternative operators to compete with Proximus as more and more retail customers buy bundles containing broadband and IPTV

In BIPT's most recent market analysis (2011), FTTH was considered as not in the scope of the decision for the upcoming market review period.

3.3.2 Wholesale cable access (DOCSIS 3.0)

According to BIPT, cable regulation was considered necessary due to the high coverage (96% households)[105] and high market share of cable operators on the broadcasting market, combined with a bundling strategy (mainly TV and broadband). Broadband resale was added to the access as an ancilliary measure. Cable access obligations comprise:

- Resale of analogue television services;
- Access to the digital TV platform; and
- Resale of broadband Internet.

These services were considered necessary to enable alternative operators to compete with the cable network operators in their respective geographical area in the provision of TV, either on a standalone basis or combined with broadband internet. However, alternative operators are only enabled to provide broadband access in combination with cable TV. Thus, two kinds of retail products are possible: TV only and TV + broadband internet.

3.4 Taking account of risk in FTTC/VDSL2 Ethernet bitstream regulation

A key point of interest in the regulatory approach to NGA in Belgium, is that perceived risks involved in providing FTTC/VDSL2 bitstream access were originally addressed through a risk allowance on the cost (not the WACC) of NGA-specific assets. However, this allowance was removed in the following market review, and charges were set on the basis of strict cost-orientation, as BIPT considered that the technology no longer presented abnormal business risks.

3.4.1 The original mark-up to the FTTC/VDSL bitstream price

According to its original 2009 decision, BIPT initially decided to impose an obligation for VDSL2 costs to be 'reasonable',[106] as well as reflecting the principle of 'non-eviction' (tariffs which do not undermine incentives for alternative operators to 'climb the ladder of investment').[107] The main reason was to encourage investment [in NGA infrastructure].

105 IHS for European Commission 2014

106 BIPT noted that in principle any price which is higher than the cost may be considered as a reasonable price as the relevant costs are already compensated by the WACC.

107 http://www.bipt.be/nl/operatoren/telecom/markten/breedband/archief/vernieuwingsbesluit-van-2-september-2009-ter-correctie-van-het-analysebesluit-van-10-januari-2008-m-b-t-breedbandtoegangsmarkten

Tariffs for VDSL2 bitstream were set in a Decision of August 2010,[108] and amended during 2010-2011 to correct for certain errors, although the methodology did not change.

A 'reasonable' price was considered to represent the costs + an additional uplift on specific assets to reflect perceived risk associated with FTTC/VDSL[?]. In order to identify assets for which a risk allowance might be relevant, BIPT examined new investments made by Belgacom at the time. It distinguished between active and passive components.

As regards active components for VDSL2 rental (DSLAM and cards), BIPT derived the price by relying on the prices for the BROBA ADSL2+ (bistream) cost model. In this context BIPT did not perceive any supernormal risks as it considered that investments in active equipment were variable and linked to demand.

As regards passive components BIPT distinguished between legacy (duct and copper) and new fibre connections and deemed that only the fibre connections were associated with increased risk. When setting a reasonable price for the rental of VDSL2 passive components (fibre, connectors – not ducts) BIPT determined that an additional mark-up of 15% above the cost of these components[109] should be included in order to continue stimulating investments. The uplift of 15% was added to the cost of these NGA-specific passive assets (including the normal WACC). BIPT also noted that the WACC already provides a component for encouraging new investments.[110] A break-down of the cost-oriented prices and the additional mark-up for FTTC/VDSL passive components is shown in the table below.

Figure 7: Monthly rental fees for end-user lines, comparison cost orientation and reasonable price

WBA VDSL2 without voice (in €)	**Cost orientation**	**+15% mark-up voor "redelijke prijs"**	**Reasonable price**
Copper part	€ 5,66	-	€ 5,66
VDSL2 rental passive part	€ 4,46	+ € 0.66	€ 5,12
VDSL2 rental active part	€ 3,07	-	€ 3,07
Monthly rental – end-user line	**€ 13,19**	**+0.66**	**13,85**

WBA VDSL2 with voice (in €)	**Cost orientation**	**+15% mark-up voor "redelijke prijs"**	**Reasonable price**
Copper part	€ 0,85	-	€ 0,85
VDSL2 rental passive part	€ 4,46	+ € 0.66	€ 5,12
VDSL2 rental active part	€ 3,07	-	€ 3,07
Monthly rental – end-user line	**€ 8,38**	**+ € 0.66**	**€ 9,04**

Source: BIPT.

108 http://www.bipt.be/fr/operateurs/telecom/marches/large-bande/divers-mise-en-oeuvre/decision-du-3-aout-2010-concernant-la-rental-fee-pour-wba-vdsl2-end-user-line
109 The method for determining the 15% uplift is not elaborated
110 http://www.ibpt.be/public/files/nl/1345/3306_nl_02_wba_vdsl2_rental_fee_-_besluit_nl_publ.pdf

3.4.2 The withdrawal of the risk uplift

Following the subsequent market review in 2011, the uplift on the cost of passive assets associated with FTTC/VDSL was withdrawn.[111] In the associated market review decision,[112] BIPT noted that cost-methodologies traditionally applied by NRAs include a cost of capital (WACC), which enable regulated tariffs to permit an SMP operator to compensate its creditors and shareholders based on risk incurred. BIPT would now therefore apply a strict cost-orientation approach "taking into account the cost of providing an effective service including a reasonable rate of return on investment".

As justification for this approach, BIPT cited Annex I of the 2010 European Commission Recommendation on NGA, which states that NRAs should analyse whether the cost of capital reflects the higher risk relative to investment in copper networks *in cases where the profitability of NGA investment depends on uncertain factors such as increasing revenues per subscriber or larger market shares.*

BIPT then concluded that these super-normal risks did not apply to VDSL2, and provided a number of justifications in this regard:

- The planned closure (from mid-2012) of local exchanges would force unbundling operators to switch to WBA VDSL2 – thereby increasing take-up and reducing investment risk
- During the presentation of the 2010 Annual Report, Belgacom told its investors that each investment decision on VDSL had already generated the required return on investment and that the decision to deploy VDSL and increase its coverage had been validated in view of the success achieved by services based on VDSL technology (ie high take-up had been achieved).

BIPT also observed that there was less uncertainty about the amount of bandwidth provided via FTTC/VDSL and overall capital requirements are lower than FTTH: "The risk involved should not therefore be assumed to be as significant as that associated with the provision of wholesale access products based on FTTH".[113]

BIPT further noted that there was a risk due to the absence of effective competition that Belgacom could maintain excessive prices or reduce margins to the detriment of competitors. This justified the imposition of cost-orientation and obligations concerning cost accounting systems. The cost-oriented tariffs for VDSL2 WBA include the standard fixed access WACC, which reflects systematic risks (but not any NGA specific risks).

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111 http://www.bipt.be/public/files/nl/1345/3306_nl_02_wba_vdsl2_rental_fee_-_besluit_nl_publ.pdf
112 https://circabc.europa.eu/sd/d/6258f6e4-8626-4db3-8f0d-25953874f691/M4-5-decision-publication-FR.pdf
113 Para 1254 BIPT 2011 Market 4/5 decision https://circabc.europa.eu/sd/d/6258f6e4-8626-4db3-8f0d-25953874f691/M4-5-decision-publication-FR.pdf

3.5 Treatment of current and next generation assets

BIPT uses bottom-up cost modelling to calculate cost-based charges. The same LRAIC methodology is used for copper-NGA (VDSL) and (legacy)-copper (LLU/ADSL) wholesale access products. SLU prices are used for the copper passive part of the VDSL2 wholesale charge and are derived from the same cost model as for LLU. A separate FTTC/VDSL model is used to compute the cost of VDSL2 active and passive (fibre) assets. In these cost models currently in place, both copper and fibre are valued based on Current Cost Accounting (CCA), but no MEA for copper is assumed.

Regarding the allocation of duct costs between copper and fibre, in Belgium there are no ducts in the network segment between the end-user and street cabinet and no significant FTTH/B, hence allocation is not relevant in this segment. In the segment between the street cabinet and MDF site ducts have been installed for fibre only while copper cables are buried – hence these duct costs are attributed to fibre.

BIPT follows the assumption that when extending fibre deployment to provide VDSL2, an efficient operator would use ducts available since 1997 (the date of the first VDSL rollout in Belgium). [114] This implies that digging new trenches and laying out ducts in areas where first generation VDSL is available is not widely necessary for the rollout of fibre for VDSL2 lines. Rather old ducts are assumed to be re-used.

In 2010-2011 Analysis Mason developed an NGN/NGA BU-LRAIC+ cost model for the BIPT,[115] which has however not yet been applied to LLU/SLU or bitstream rental prices. This model contains a revised approach towards valuation and depreciation that would affect FTTC costing as follows.

- Before 2001: Straight-line HCA
- From 2001 onwards: MEA and economic depreciation
- For FTTC, assets are deployed from 2005 onwards and thus would be subject to economic depreciation
- During the period 2017-2037, the model assumes that FTTH will gradually replace copper as the MEA

Although the draft model has been consulted upon, it is not reflected in any formal Decision of the NRA concerning LLU or FTTC bitstream.

3.6 Reflecting risk in the regulation of Cable DOCSIS 3.0

In the case of DOCSIS 3.0 the charge for the resale of cable broadband (which is offered as an adjunct to TV) is set based on a retail minus mechanism. This intristically enables the

114 See discussion in http://www.bipt.be/public/files/nl/1553/3200_nl_2010-wbarental-ontwerpbesluit-nl-publ.pdf
115 See presentation at http://www.bipt.be/en/operators/telecommunication/Markets/price-and-cost-monitoring/ngn-nga-cost-model

cable operators to be rewarded for any risk taken as well as guarding against margin squeeze.

When determining the retail price, BIPT considers that services which are not directly related to the electronic communication market (e.g. VAT and copyright for content) should not be included.[116]

Costs subtracted from the retail price in order to determine the wholesale price include: billing costs, the cost of bad debts, customer service costs, marketing costs and sales. This list is not exhaustive.

In order to allocate the cost to the different service elements, BIPT has identified allocation keys, such as income, subscribers and service units.[117]

BIPT is in the process of reviewing wholesale charges for cable broadband resale. BIPT indicates[118] that it plans to modify some parameters of the retail minus model, but the approach is likely to remain broadly the same. Initially the Commission encouraged the Belgian regulator, when revisiting its approach to regulation of the market for the delivery of broadcasting signals and access to broadcast networks in Belgium, to reassess – in the case continued regulation was justified – whether an alignment of the current cable access price regulation with the wholesale broadband costing methodology would be more appropriate.[119]

3.7 Market structure

The context to the NRA's focus on access-based competition and the removal in 2011 of the 'risk mark-up' for FTTC/VDSL2 is an NGA market that developed and matured relatively early, with limited competition beyond the incumbent Belgacom and cable companies, resulting in a de facto duopoly.

The first widespread FTTC/VDSL deployment in Europe was initiated by Belgacom (now Proximus)[120] in Belgium in 2004 . By the end of 2008, shortly before the original NRA decision was taken requiring access to FTTC/VDSL with a risk allowance, FTTC/VDSL coverage had already reached 66%,[121] and by the end of 2011 when the NRA decided to remove the risk allowance, coverage had reached 79%.[122] As of the end of 2014,

116 http://www.bipt.be/public/files/nl/21116/Wholesale+tarieven+kabel+-+BIPT+in+CRC+versie+-+final+-+OPENBAAR.pdf
117 In case a customer has a subscription on analogue and digital TV, it uses two service units.
118 BIPT interview October 2015
119 See Case BE/2013/1511
120 The Proximus Group is the largest telecommunications company in Belgium and remains majority state owned. Since September 2014, Proximus has become the commercial brand of all Belgacom products. In 2009 Proximus acquired Belgium's main access-based DSL provider Scarlet.
121 Belgacom 2008 investor statements http://www.proximus.com/sites/default/files/Documents/Investors/Reports/2008/en/2008_AR_activities_EN.pdf
122 Point Topic for the European Commission

FTTC/VDSL covered 95% of households in Belgium, and total NGA coverage including cable had reached 99%. However, there has been very limited FTTH/FTTB deployment, with FTTH/FTTB networks covering only 0.8% of households.[123]

Another feature of the Belgian market which may have influenced the NRA's regulatory strategy, is the relatively small and declining scale of access-based entrants, which has limited the potential for operators to climb the investment ladder. In July 2008 alternative operators using wholesale access provided around 22% of DSL lines in Belgium. However, this share had fallen to 18% in 2011 (when the BIPT removed the risk allowance on the FTTC/VDSL price) and alternative operators accounted for only 9% of DSL lines in 2014[124] (~5% of total broadband lines). Recently, KPN announced its intention to withdraw from the fixed-line business and is currently negotiating the sale of its Belgian (primarily mobile) business to Telenet. Between January 2014 and January 2015 alternative operators recorded a reduction of 29,207 subscriptions.

Although it has lost ground to cable, incumbent Proximus maintained a leading position in the broadband market in Belgium with 43% market share at the end of 2014. The main reasons are the fragmentation of the cable market, the acquisition by Proximus of competitor Scarlet in 2009 and network upgrades such as vectoring which have enabled it to better compete with cable. Between January 2014 and January 2015 Proximus recorded an additional 110,439 subscriptions.

Cable operator Telenet is the second largest fixed broadband provider in Belgium with 38% market share in 2014. The smaller cable operators have also increased their market shares over the past years.

123 IHS for European Commission (2014)
124 Figures on access-based competition from Cocom

4 France

4.1 Summary

Context

France is characterised by relatively limited cable coverage (28% in 2008), and a high degree of competition based on local loop unbundling. Alternative operators accounted for more than 50% of DSL lines in mid-2008.[125]

In 2008, prior to the adoption in 2009-2010 of ARCEP's original Decisions concerning the NGA regulatory regime, NGA deployments were limited. However*, the cable operator Numericable as well as the largest three retail broadband providers had already begun FTTH/B deployments in densely populated areas*.[126] Deployments by alternative operators Iliad and SFR (now acquired by cable operator Numerciable) were facilitated through the availability of access to sewers in the Paris area, as well as more generally the large scale of alternative operators.

Regulatory approach

The main objective of French broadband policy in commercially viable areas has been to promote the widespread deployment of very high speed broadband via FTTH (ie a technologically specific policy), by incentivising all operators including alternative operators to invest (or co-invest) in FTTH access infrastructure.

ARCEP's adopted its initial FTTH decisions in 2009-10 on the basis of a specific national law developed for this purpose. Its approach has been subject to refinement, but remained stable over time. The regime provides that that outside very dense areas (~17% population), which ARCEP considers can be served via end-to-end infrastructure-based competition to the base of each building,[127] all operators deploying FTTH must deploy networks in a manner[128] which enables them to offer access to fibre terminating segments[129] at connection points which aggregate at least 1,000 households. Fibre installers must offer both 'co-investment' in the fibre terminating segment and monthly rental.

Duct access and dark fibre backhaul mandated as SMP remedies on Orange, the incumbent operator, via the market analysis process, provide an essential complement to the 'symmetric' terminating segment regulatory regime, enabling alternative operators to invest

125 Cocom08-41REV1 Broadband access
126 IDATE reports that FT had deployed 500,000 FTTH/B lines, Iliad/Free 300,000 and SFR 250,000 by the end of 2008. The cable company Numericable had also deployed 3.4m lines http://www.infohightech.com/IMG/pdf/idate45.pdf. However, the classification of Numericable's lines as FTTB or Docsis 3.0 is handled differently depending on the source
127 There are some exceptions for smaller buildings and single dwelling units
128 Through point to point fibre connections in the final segment
129 Equivalent to a fibre subloop

in FTTH up to the building or connection point for the terminating segment. There are no downstream active access obligations on FTTH networks under the SMP regulatory regime.[130]

ARCEP addresses risk in the symmetric regulatory regime for the fibre terminating segment in the following ways:

1. There are *no specific ex ante 'charge controls'*. Agreement is reached bilaterally. However, ARCEP is preparing guidelines concerning what it would consider fair pricing terms for access and can and has intervened 'ex post' to resolve disputes – most notably between Orange and SFR and Orange and Iliad, during the course of 2011.
2. *ARCEP favours long-term co-investment arrangements* on the basis of Indefeasible Rights of Use (IRU), which serve to defray the risk to the investor by providing financing and reducing its demand-risk. Co-investment must be available (i) through IRU before the investment; and (ii) through IRU after the investment. In addition to IRU, (iii) monthly line rental of the terminating segment must also be offered.
3. ARCEP has noted in draft guidance that charges for the terminating segment should in principle be cost-oriented, but with *an adjustment on the WACC to reflect risk*. ARCEPs draft guidance recommends a different mark-up on the WACC, with the lowest mark-up for upfront co-investors, and the highest for access seekers wishing to rent lines after the investment on a monthly basis. The differentiation of the mark-up aims to reflect the degree to which alternative operators share investment risk.

ARCEP also recommends that IRU charges are structured so as to include a small recurring fee alongside the upfront fee. This would allow for *later adjustments to the recurring price if the IRR is found to be significantly above or below the predicted WACC*. Such adjustment mechanisms are however not mandated, but left for negotiating parties to agree.

<u>Market outcomes</u>

As of mid-2015, according to ARCEP's figures,[131] Numericable's Docsis 3.0 cable network served 27% of premises, while FTTH/B coverage had reached 19% premises, driven by deployments by Orange as well as Numericable (now merged with SFR) and Iliad. France also has a number of public initiative NGA networks which serve various suburban and rural areas by means of FTTH and VDSL.[132] Total NGA coverage (offering speeds above 30Mbit/s) is 55%, while 26% of households have access to speeds of 100Mbit/s or more.

According to ARCEP, 17% of premises mainly in the Paris area are now considered competitively served through cable and parallel FTTH infrastructures, while the remaining

130 However, competition law remedies require the cable operator to offer active access for a temporary period
131 ARCEP wholesale broadband observatory Q2 2015
132 The model for FTTC deployment in France focuses on shortening the copper loop and moving the location of the co-location point for alternative operators to the former street cabinet.

83% of premises are subject to the rules described concerning symmetric access to the fibre terminating segment.

ARCEP reports that in June 2015 35% of the total FTTH active lines were provided on the basis of terminating segment co-investment or access with a further 4% supplied on the basis of active wholesale offers.

4.2 ARCEP's objectives as regards NGA

A key aim in ARCEP's regulatory approach to NGA has been to foster FTTH investment – in particular by first-movers supported by co-investment, in order to achieve sustainable competition in very high speed broadband services. It has done so by recognising the risk inherent in FTTH deployment. ARCEP also aims at ensuring a consistent approach amongst the large number of private and public network operators installing FTTH throughout the country.

The regulatory and pricing approach to FTTH been stable over time. However, ARCEP has been elaborating on this approach through individual cases and the upcoming guidelines.

4.3 NGA regulatory obligations

The French regulatory regime for NGA is focused on (i) nationwide regulated access to Orange's ducts in the local access network under asymmetric SMP regulation[133] (with strict cost-orientation, no risk premium and equivalence of input) and (ii) a symmetric regulatory regime applying to the terminating segment of FTTH networks,[134] which varies according to geography. With some exceptions,[135] in very dense areas (primarily Paris ~17% premises) access must be made available to in-building wiring at the base of the building. Elsewhere, access must be offers at points aggregating at least 1000 premises. The regime was established through legislation and a series of NRA Decisions in the period 2008-2010.

There is no downstream active access on NGA networks mandated by ARCEP under the SMP framework. However, as one of the conditions for its merger, the French national competition authority required cable operator Numericable-SFR to offer bitstream access to its cable network for an interim period of 5 years[136] at prices which are subject to the

133 Duct access was imposed on FT-Orange for the deployment of fibre local loops in July 2008 ARCEP decision n ° 2008-0835 of 24 July 2008 ("GC BLO")

134 The legislation governing symmetric access was approved in 2008-2009 Law n ° 2008-776 of 4 August 2008 on the modernization of the economy Law n ° 2009-1572 of 17 December 2009 against the digital divide**.** The symmetric access regime was elaborated in Decisions by the NRA in 2009-2010 Decisions of the Authority No. 2009-1106 and n ° 2010-1312 of 22 December 2009 and 14 December 2010 respectively, adopted pursuant to Article L. 34-8-3 CPCE

135 Aggregation points of 100 households are required for buildings composed of less than 12 households or offices

136 Authorite de la Concurrence approves Numericable SFR merger with conditions http://www.autoritedelaconcurrence.fr/user/standard.php?id_rub=592&id_article=2445

approval of the authority and do not create a margin squeeze. Cable bitstream access was provided on a voluntary basis by Numericable to Bouygues Telecom prior to the merger. Unregulated active NGA access (bitstream) is also available on some NGA networks constructed by local authorities.

ARCEP is also developing guidelines[137] at the request of the Government which aim to prevent public initiative networks from setting voluntary fibre bitstream charges too low – in order not to disincentivise network investment and ensure the long-term viability of that investment.

In this case study, we focus on the approaches taken to reward risk in the symmetric regulation of the fibre terminating segment outside very dense areas.

4.4 Reflecting risk in the pricing regime for the FTTH Terminating segment

ARCEP's 2009-2010 Decisions provide that tariff conditions for access to fibre at the mutualisation point should be 'reasonable and comply with the principles of objectivity, relevance, efficiency, transparency and non-discrimination'.[138] In addition, ARCEP notes[139] that the rate of return on capital employed for the determination of the tariff conditions must take into account risk and give an incentive to the investing operator.

According to ARCEP, these principles imply that the access supplier should publish an access offer which sets out technical and pricing conditions which do not discriminate against third parties in comparison with its own services and which are *justifiable according to the cost of relevant network elements* as adjusted for risk.

To allow these principles to be verified, ARCEP introduced a cost-accounting obligation whereby operators installing fibre must provide investment details to the Authority.[140] ARCEP is also close to finalising a reference cost model which could be used by negotiating parties to settle prices for access.

Although ARCEP does not intervene to set fibre terminating segment prices in advance, it may step in to resolve disputes and conducts informal discussions with the main FTTH operators. ARCEP would be likely to use its cost model as a basis for settling pricing disputes.

137 ARCEP press release accompanying the consultation on guidelines for the pricing of access to public initiative networks http://www.arcep.fr/index.php?id=8571&tx_gsactualite_pi1%5Buid%5D=1784&tx_gsactualite_pi1%5Bannee%5D=&tx_gsactualite_pi1%5Btheme%5D=&tx_gsactualite_pi1%5Bmotscle%5D=&tx_gsactualite_pi1%5BbackID%5D=26&cHash=a329002e955883477fe864abe8431b85&L=1

138 Article 3 Decision 2009-1106, Article 9 Decision No 2010-1312

139 Article 4 Decision 2009-1106

140 Article 4 Decision 2009-1106 and Article 10 Decision 2010-1312

4.4.1 Co-investment tariffs (via Indefeasible Rights of Use)

A key element of the pricing regime that aims to defray the risks involved in FTTH installation is its focus on a long-term pricing approach (referred to as co-financing or co-investment) whereby operators do not rent access on a per line basis, but purchase up-front the right to utilise a proportion of the lines (in slices of 5%). ARCEP expects that co-investment payments would be reflected as capex on the balance sheet of co-investing operators and depreciated accordingly. These offers usually grant permanent rights of use over a period of several decades (=>20 years), with the option for renewal.[141]

The co-investment offer must be made available in two types (i) ab initio (before the investment); and (ii) a posteriori (after the investment). The a posteriori offer implies tariffs which guarantee, through the application of a 'mark-up', remuneration which accounts for the risk undertaken by a 'first mover'. ARCEP notes that first movers in FTTH deployment are subject to significant risks relating to uncertainty concerning the take-up of fibre services.

The IRU payment system proposed by ARCEP in its draft cost model is in practice not entirely capex-based, but consists of:

1. A non-recurring tariff – which is paid in two instalments. ARCEP notes from experience in approving previous offers that *the general market price for this tariff has been set at €500 per line* for the segment from the building to the first distribution point aggregating 300-1000 lines over the term of the IRU; and
2. A monthly recurring tariff, which is paid monthly for each activated access line. This allows the recovery of costs for the non co-financed lines as well as the rental and exploitation of ducts and the maintenance of the lines. *The general market price for this tariff has been around €5 per line.*[142]

The presence of the recurring part allows adjustments to be made over time in cases where the actual IRR is lower or higher than the anticipated return allowed in the model.

In addition to co-investment offers via IRU, the fibre installing operator must make available a rental offer to cater for operators which have limited investment capability. Rental is billed on a monthly basis per line and includes elements for the rental and exploitation of ducts and a contribution to the costs of constructing the network (depreciation and return on fixed capital). The approach to pricing line rental is however constructed so as to incentivse investment or co-investment in FTTH.

141 ARCEP's draft pricing guidelines do not discuss the specific terms for renewal and therefore it is assumed these arrangements are agreed as part of the contractual process.

142 The figures of €500 and €5 are market-based tariffs set by Orange and Numericable/SFR in their FCF model which covered a 20 year period. The €500 is understood to represent co-investment before fibre deployment. The €5 recurring tariff may include an 'ex post' payment mechanism for co-investment, to compensate for non co-financed slices. This tariff would eventually be adjustmented if the required IRR is not met or is exceeded.

4.4.2 Allowance for risk in the cost estimation

In order to provide greater clarity on appropriate tariff structures for IRUs before or after installation (and the relationship between the IRU cost and the cost of rental), ARCEP has been developing a reference cost model, and in December 2014, published a further iteration of this draft cost model[143] for consultation. The aim of the model is to provide a 'template' for bilateral negotiations on charges for the terminating segment of the fibre loop, thereby ensuring the consistency of charges amongst operators and between public and private investors in FTTH. After reflecting stakeholder comments, ARCEP aims to finalise the model and publish it, and associated explanatory memorandum, by the end of 2015.

The model is based on discounted cashflows (DCF), which allows a 'prospective' view of costs and revenues. The total cost for investment in each of the network elements is matched with total revenues including those from wholesale access (co-financing and rental). The aim of the pricing approach is to ensure a fair and stable return on investment over time. The model is intended to be usable for both commercially funded and publicly funded FTTH deployments. In the case of publicly funded deployments, the amount of subsidy should be reflected in the modelling.

A summary of some of the key parameters in the base case model are shown in

Table 9. The main premise for the model is to allow the building operator to make a set IRR (which ARCEP indicates at 10%).[144] The draft cost model considers profitability of the fibre terminating segment over a period of 25 years. However, it does not prejudge the fibre asset lifetime, which ARCEP notes may be longer than this period.[145] ARCEP notes that the period could be adjusted upwards or downwards depending on the envisaged return periods for given public sector or private investors making use of the model.[146] A key aspect within the illustrative cost model is the use of differentiated mark-ups on the base WACC which aim to (i) provide assurance of a fair return for the 'first mover' in fibre installation; and (ii) appropriately reward earlier co-investors (those investing before installation) for the additional demand risk they take – compared with later co-investors. Further detail is provided in the following section.

Table 9: Key starting assumptions used in FTTH terminating segment cost model

Timeframe for cost recovery	25 years
Risk premium included in ex ante co-financing	2% premium ensuring an IRR of 10.07% net of inflation to the installing operator at the end of the investment

143 ARCEP Dec 2014 draft generic model for pricing of access to mutualised FTTH networks outside dense zones http://arcep.fr/fileadmin/uploads/tx_gspublication/2014-12-17_Consultation_modele_tarifs_FttH.pdf

144 This is an indicative value which is not further elaborated

145 Sensitivity tests show that gradually increasing the time horizon towards 50 years results in convergence to stable IRR of around 11%

146 Public sector investors might invest over a longer time horizon than private investors

tariff	period
Ex post co-financing premium	4.6% over 3 years reducing over time with depreciation – set at minimum 0.4 by the end of the investment period
Supplementary risk premium for rental of fibre terminating segment	2% above the co-financing premium (eg 2% (ex ante co-investment) + 2% rental premium = 4%
Demand evolution	Based on the evolution of demand for ADSL between 2002-2013 and subsequent projections
Market share for generic operator	20%
Risk premium for the construction of in-building wiring	1%
Churn rate	10%

Source: ARCEP Dec 2014 consultation, Oct 2015 interview

4.4.2.1 Estimation of the WACC mark-up for fibre IRU and rental

The base 2013-2015 WACC level for regulated fixed access tariffs on the Orange network was set by ARCEP in a decision no. 2013-0001. However, ARCEP notes that this rate is specific to the local copper access network of a former incumbent operator.

ARCEP notes that for the fibre terminating segment a risk adjustment should be made to ensure a fair return on capital. ARCEP proposes that this risk adjustment should be differentiated depending on the segment of the network (terminating segment and in-building wiring[147]) and the type of offer (ex ante and ex post co-financing and rental). ARCEP states that the risk premium should reflect all uncertainties regarding the market demand at wholesale and retail level, deployment costs, technical progress and the macroeconomic environment in which the project is undertaken.

ARCEP presents suggested mark-up values estimated on the basis of these principles, but it should be noted that the values used in the ARCEP model are indicative, and that the main purpose of the model is to provide a structure against which tariffs could be settled rather than setting precise values for the parameters. ARCEP notes that precise values may be specific to different companies and cannot be proscribed ex priori.

147 ARCEP considers that the risk associated with the terminating segment (between the ODF and building) is different from (and higher than) that associated with in-building wiring, as in-building wiring is constructed only to meet the demand of the client – and therefore is subject to less uncertainty. However, the risk for in-building wiring is not zero because uncertainties remain around evolution of penetration rates and cost.

Risk adjustment for co-financing

ARCEP's template pricing model includes an indicative risk premium of 2% for the co-financing of the terminating segment prior to installation. This was estimated by ARCEP on the basis of sensitivities conducted around the penetration rate with the aim of securing an IRR of ~10%.[148]

For co-financing operators which invest after network installation, ARCEP considers it reasonable to add an 'ex post co-efficient' (late entry risk allowance) on top of the risk-adjusted WACC associated with co-financing before the installation of fibre. This risk allowance should be set so as to reflect the option value of waiting, while ensuring that it does not constitute a barrier to entry in the market. ARCEP has proposed a possible model for determining the risk allowance whereby the revenues for a co-investor participating before installation and one participating after installation (in a mature market) are equalised, taking into account the discount rate and time horizon for the return on investment. ARCEP notes that the lower boundary of the risk allowance for late co-investment is the level which ensures that a co-investor entering before fibre installation makes an IRR on the remaining period of at least that obtained by the co-investor entering after installation. This is set in the model at 0.4 – for illustrative purposes – but is not finalised. The upper boundary of the risk allowance for late co-investment is the level beyond which the co-investing operator no longer has a sufficient IRR to incentivise co-financing for that period.

Alongside the late entry risk allowance, ARCEP notes that operators may include other mechanisms in the tariff structure to reward early investors such as payments by later co-investors to those already involved in the project in proportion to their commitment. These are however not reflected in the model.

Risk adjustments for rental

To provide a guideline price for rental, ARCEP's models the costs of a generic operator buying the co-financing offer and then supplying rental to third parties. The guideline recommends 2% as an additional risk adjustment to the WACC for rental – this yields an approximate uplift of 4% on the base WACC for rental, assuming the operator supplying rental co-invests before installation of the fibre and therefore pays an uplift of around 2%. ARCEP notes that the main objective in setting this rental WACC adjustment was to ensure co-investment is more profitable than line rental, and therefore provide appropriate incentives to 'climb the ladder of investment'.[149] Although the proposed rate is not based on benchmarks or other specific calculations, ARCEP notes this uplift is similar to the risk-adjustment for FTTH applied in countries such as the Netherlands. The resulting monthly rental charge for FTTH terminating segments is around €13 without in-building wiring.[150]

148 The value of 10% is not explained
149 ARCEP interview Oct 2015
150 This fee reflects only rental. Some connection fees are not modelled and are common to both co-investment and rental offers. For the in-building wiring, a renting operator will pay the same connection fee as a co-

4.4.2.2 Addressing the risk to consumers and competitors

ARCEP notes that its recommendation that charges for fibre terminating segments should be cost-based, provides safeguards against excessive charges to consumers. At the same time, the tiered design of the risk-adjustment to the WACC ensures that investors – and in particular first movers - are adequately rewarded.

4.4.2.3 Checking expectations for WACC against actual returns (ROCE)

ARCEP notes that profitability is highly dependent on penetration (as well as accurately projecting costs), and has proposed mechanisms whereby adjustments to the price (and specifically the recurring part of the price) can be made if projections turn out not to be correct.

Specifically, if penetration is below expectations, the recurrent fees can be increased to compensate for the deficit from the fixed charges to ensure long-term viability and achieve the target IRR. Conversely, if penetration exceeds expectations, variable charges could be reduced to maintain a fair and stable return, taking into account the whole of the period from the project's inception to the present.

Similarly, if the fibre deploying operator has projected greater investments than it makes in practice, this could also be addressed through a reduction in the recurrent fees. Charging for in-building wiring could also be varied based on practical experience over time concerning churn.

There is no requirement for the projections to be trued up with actuals. However, this could be incorporated within the contractual conditions agreed between the parties.

4.5 Pricing for in-building wiring

Construction of fibre in-building wiring is typically only completed following a customer's subscription to the fibre service and is therefore considered to present less risk than the terminating segment. However, a risk mark-up of 1% for this element is suggested in the context of the illustrative model. ARECP notes that a key issue in pricing this network segment is how to apportion the cost of an element which will be shared by successive operators over a long period of time. Different approaches have been taken in very dense and less dense areas.

investing operator, which ARCEP indicates is a payment of between €200-€800 depending on the home. The building operator may choose to distribute this cost by billing on a monthly basis.

4.5.1 Very dense zones

The standard principle is that the operator recruiting the client (typically an apartment or office building) for the first time has the advantage of benefiting from assured revenues and therefore bears the majority of the cost – typically 90%, with the remainder supported by cofinancing operators.

4.5.2 Less dense zones

In less dense zones the typical approach is that the operator recruiting the client for the first time supports the whole cost, and the costs are progressively shared over time, as customers switch and the 'following operators' make a contribution to the installing operator. ARCEP notes that it considers it reasonable that the contribution costs would decline over time to account for the depreciation of this asset, and that any retail payments (ie where the customer pays the constructing operator for the installation of a new fibre line) should be deducted before considering the remaining cost that could be recovered by subsequent operators.

Over time, ARCEP indicates that this second approach will generalise to both zones.

4.5.3 Cost relationship between copper and fibre networks

Copper loop and ducts for fibre deployments are both valued on a CCA basis. This ensures consistency between current and next generation access technologies.

Duct access under market 4 is required to be available on cost-oriented rates. In Nov 2010 ARCEP adopted a decision[151] which significantly reduced the charges by amending some of the key parameters. ARCEP's stated rationale was to enable competitors to deploy fibre networks under favourable conditions, in high density areas as well as in rural areas.

The approach towards duct costs has the effect of allocating these costs from copper to fibre in a dynamic manner over time, which reflects the state of maturity of fibre uptake. Three stages are involved in the costing process:

1. Civil engineering costs are allocated between local loops installed in ducts and local loops which are directly buried

2. Costs are allocated between local loop access and core network according to the lengths of cable infrastructures deployed in these segments

151 http://www.arcep.fr/index.php?id=8571&L=1&tx_gsactualite_pi1%5Buid%5D=1331&tx_gsactualite_pi1%5BbackID%5D=1&cHash=30fb7a7d5e

3. *The costs of local loops installed in ducts are allocated between copper and fibre according to the number of retail access lines based on copper and fibre* (ie the respective take-up) using the duct network. Such retail access lines include those used for residential and business purposes as well as other types of access such as mobile base stations.

4.6 Guidelines on NGA bitstream pricing for public initiative networks

Public initiative networks are likely to play a significant role in France's fast broadband strategy as 43% of the population is considered to inhabit areas of limited or no commercial viability. Like commercial operators, public initiative networks present in France are subject to symmetric obligations concerning the terminating segment of the fibre loop, and are encouraged to make use of the reference cost model (suitably calibrated) in setting charges for these elements. In addition, several of these public investors have voluntarily offered active bitstream access to fibre networks. Following instructions given in an August 2015 Act on Growth, Business and Equal Economic Opportunity,[152] in October 2015 ARCEP launched a public consultation on public initiative network pricing.[153] ARCEP published its final Guidelines in December 2015.[154]

Key aims of this exercise are to create conditions that will enable homogenous retail market products nationwide, as well as preserving the viability of public fibre initiatives in the longer term. An underlying concern is that low fibre take-up coupled with buyer power by some ISPs has driven down bitstream prices in some public initiative networks below those which would be sustainable in commercial areas. The focus of the guidelines (and preceding legislation) is therefore to set a lower boundary on applicable charges, and provide limits on discounts for fibre wholesale access. ARCEP plans to align wholesale fibre access charges in public initiative areas with those in commercial areas in three stages whereby termporary discounts would be allowed in an initial phase to support marketing, while in the final phase charges would be benchmarked against those in commercial areas.

4.7 NGA market structure

It is important to note that, in 2008, prior to the adoption of ARCEP's original Decisions concerning the NGA regulatory regime, the cable operator Numericable as well as the

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152 ***Act*** No. ***2015***-990 of 6 ***August 2015***

153 ARCEP press release accompanying the consultation http://www.arcep.fr/index.php?id=8571&tx_gsactualite_pi1%5Buid%5D=1784&tx_gsactualite_pi1%5Bannee%5D=&tx_gsactualite_pi1%5Btheme%5D=&tx_gsactualite_pi1%5Bmotscle%5D=&tx_gsactualite_pi1%5BbackID%5D=26&cHash=a329002e955883477fe864abe8431b85&L=1

154 http://www.arcep.fr/index.php?id=8571&no_cache=1&L=1&tx_gsactualite_pi1%5Buid%5D=1814&tx_gsactualite_pi1%5Bannee%5D=&tx_gsactualite_pi1%5Btheme%5D=&tx_gsactualite_pi1%5Bmotscle%5D=&tx_gsactualite_pi1%5BbackID%5D=26&cHash=688bf6e3919a7e70dd02a257170ff373

largest three retail broadband providers had already begun FTTH/B deployments.[155] Deployments by alternative operators Iliad and SFR (now acquired by cable operator Numerciable) had been facilitated through the availability of access to sewers in the Paris area, as well as their scale. Alternative operators accounted for more than 50% of DSL lines in mid-2008.[156]

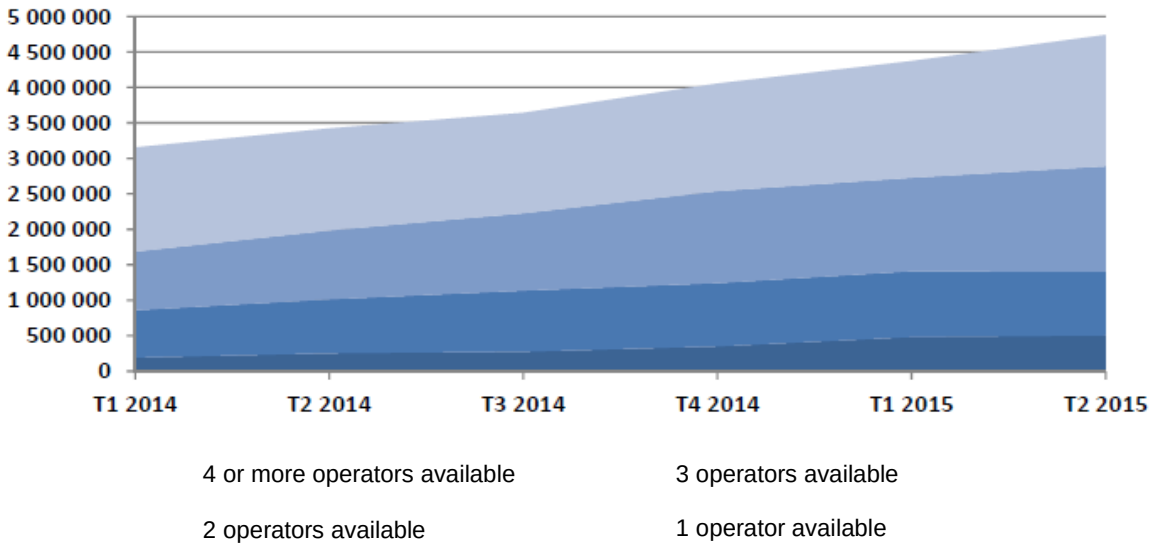
As of mid-2015, according to ARCEP's figures,[157] the supply of wholesale *NGA* lines in France was characterised by Numericable's Docsis 3.0 cable network serving 27% of premises, the supply of FTTH (coverage 19% premises) by mainly Orange, and Iliad to an extent and public initiative NGA (FTTH and VDSL) networks which serve various suburban and rural areas. Total NGA coverage (offering speeds above 30Mbit/s) is 55%, while 26% of households have access to speeds of 100Mbit/s or more.

The proportion of premises considered by ARCEP[158] to have 'natural monopoly' characteristics in the fibre terminating segment approximately 83% of premises. These are the households subject to the symmetric obligations concerning fibre terminating segments, which is the main focus of this case study. In contrast 10% of premises are considered to be viable for infrastructure competition to the base of the building, while a further 7% of premises are considered to require some extension of access beyond in-building wiring. The majority of FTTH coverage today (65%) is in very dense areas, although the proportion of coverage in less dense areas is increasing (from 20% at the end of 2013 to 35% in mid-2015).

As shown in Figure 8, as of June 2015, 39% of households served with FTTH had a choice of only one supplier, while the remaining 61% of households could be reached by 2 or more FTTH providers under the symmetric terminating segment regime.

155 IDATE reports that FT had deployed 500,000 FTTH/B lines, Iliad/Free 300,000 and SFR 250,000 by the end of 2008. The cable company Numericable had also deployed 3.4m lines http://www.infohightech.com/IMG/pdf/idate45.pdf
156 Cocom08-41REV1 Broadband access
157 ARCEP wholesale broadband observatory Q2 2015
158 http://www.arcep.fr/index.php?id=11310

Figure 8: Households eligible for FTTH – number of operators present through the passive access mutualisation regime



Source: ARCEP Q2 2015 wholesale broadband observatory

ARCEP reports that at June 2015, there were 1.14m FTTH subscriptions (4.3% of total broadband subscriptions).[159] Of these, 61% were provided by the FTTH builder (in most cases Orange) and 35% (0.4m) by alternative operators (Numericable/SFR and Iliad) through own construction in the Paris area or agreement under the passive access mutualisation regime.[160] A further small number of FTTH retail lines (40,000) were supplied on the basis of active access (potentially including access made available on public initiative networks). Bouygues had a small share of high bandwidth retail lines, which are understood to be based on bitstream access over the Numericable cable network (which was previously offered on a voluntary basis and has now been subject to regulation as a condition of the merger between Numericable and SFR.

Looking at speed, 3.8% of retail broadband connections were at speeds of 100Mbit/s or more, while 10.3% of connections were at speeds of 30Mbit/s or more.[161] France lies below the EU average in this respect.

159 ARCEP retail broadband observatory Q2 2015 http://www.arcep.fr/index.php?id=12924
160 Figures from Analysys Mason research suggest that the majority of FTTH lines provided by alternative operators were supplied by SFR, prior to the acquisition of SFR by cable operator Numericable.
161 ARCEP retail broadband observatory Q2 2015

5 Germany

5.1 Summary characteristics

Context

Deutsche Telekom (DT) began its deployment of FTTC in 2006, in response to strengthened competition from cable following consolidation of a previously regionally fragmented cable industry.[162] In 2009, shortly before the introduction of regulatory obligations, DT's FTTC/VDSL network covered around one third of households.[163]

Regulation

When the German NRA BNetzA introduced its initial NGA regulatory decision in 2010,[164] it focused on promoting competition in FTTC through SLU and duct access, while also mandating active bitstream access to DT's FTTC/VDSL network at the regional level (which was in practice implemented through layer 3 (IP) bitstream).

BNetzA addressed perceived risk in the regulation of DT's NGA-based[165] bitstream access through (i) *permitting pricing flexibility* on wholesale charges for regional IP NGA bitstream including the potential for bespoke commercial agreements (alongside the requirement to publish a Reference Offer); and (ii) *permitting the use of long term discounts* whereby risk is defrayed through upfront payments in exchange for reduced rental charges.[166] At the same time, BNetzA sought both to protect competition and to ensure that incentives to 'climb the ladder of investment' were preserved through applying margin squeeze tests across the value chain[167] on DT's NGA bitstream offers, which could be applied after product launch on BNetzA's own initiative or on the basis of a dispute brought by a third party.

In October 2015, BNetzA adopted a new Decision which has the effect of tightening regulatory controls on NGA. Key aspects are that (i) for the first time BNetzA is explicitly mandating NGA bitstream with a local access[168] handover on the basis of Ethernet technology;[169] and (ii) BNetzA will apply a margin squeeze test[170] before (rather than after) product launch and approve charges for a given period on that basis, with the continued possibility to conduct further margin squeeze tests if disputes are raised. BNetzA justified

162 Cable covers around 60% of German households, but was initially geographically fragmented
163 DT investor statements
164 See article case C(2010)6215
165 While FTTC/VDSL was DTAGs primary choice, BNetza did not make a distinction between FTTC or FTTP/B
166 Reduced per unit charges are available for a period of 8 years on payment of an upfront fee
167 Involving retail wholesale margin assessments as well as assessments between wholesale products
168 900 point of interconnection compared with 73 for regional IP NGA bitstream
169 Similar to, but not described as VULA. Mandated in the context of the market for Wholesale Central Access (market 3b). Ethernet had previously been mandated (regional access), but not applied
170 Not yet specified, but expected to be based on adjusted EEO system, and involve the assessment of margins between the retail and wholesale service and between the wholesale service and current generation access (LLU)

this strengthened approach on the basis that FTTC/VDSL is expected to become a new 'anchor' product replacing LLU over time especially as the implementation of vectoring is expected to result in a further decline in physical unbundling, thus limiting the ability of unbundlers to continue to compete downstream.

At the same time as introducing new obligations for local Ethernet bitstream access subject to pricing approval on the basis of margin squeeze tests, BNetzA will deregulate the previously introduced regional layer 3 (IP) bitstream in 20 cities representing 6% of the German population which are considered to be effectively competitive. Pricing for IP bitstream in the remainder of the territory would continue to be based on the previous approach of applying a margin squeeze test only after launch or in the event of a dispute.

Although FTTH is limited in Germany, and no remedy has been introduced in practice, BNetzA's regulatory decisions on NGA bitstream apply in principle to all forms of FTTx including FTTH, without distinction.

Market outcomes

Since the introduction of regulation, DT's FTTC/VDSL deployment continued to expand at a gradual pace. Around 40% of homes were served in 2014 and DT plans to extend coverage to 65% of households by 2016. A specific feature of the German market is the presence of 'city carriers' providing FTTH/B or in some cases FTTC-based services in certain local areas. Their coverage is however limited.

Access-based competition in Germany has historically been significant and constituted more than 50% of DSL lines in 2008. However, physical access via LLU has been declining in recent years, reaching 38% of DSL lines (30% all broadband lines) in 2014.[171] In tandem there has been increasing take-up of wholesale NGA IP-bitstream access supplied by DT,[172] which it is understood is mainly on the basis of commercial deals.[173] SLU take-up is limited (around 300,000 lines in 2013).[174] It has been used by some operators to extend NGA coverage into more remote areas which are not otherwise served.

171 Source: WIK NRA survey March 2015
172 Representing 28% of DT's total NGA lines at end 2014 according to DT investor statements
173 Between DT and Telefonica and Vodafone respectively
174 Data from NRA, supplied March 2015

5.2 NRA objectives

The German government's broadband strategy, originally announced in 2009 and updated in August 2014 calls for broadband access with transmission rates of at least 50 Mbps to all German households by 2018.[175] Promoting modern NGA infrastructure investment is a central objective of the BNetzA.[176] BNetzA follows a technological neutral approach in meeting this objective. At this time, BNetzA's regulatory regime mainly incentivizes the roll-out of/ upgrade to VDSL-Vectoring, by both DT and alternative operators (via subloop unbundling).

5.3 NGA regulatory obligations[177]

Since 2010,[178] the incumbent Deutsche Telekom has been subject to SMP regulatory obligations under market 5 of the 2007 EC Recommendation on Relevant Markets, to provide layer 2 (ethernet) and layer 3 (IP) wholesale bitstream access to its NGA infrastructure at a regional handover point. Regulation applies to all technologies (including VDSL and FTTH), but in practice the Deutsche Telekom has mainly deployed FTTC/VDSL.

The original (2010) regulatory obligations on NGA bitstream access included (i) access, (ii) non-discrimination; (iii) transparency; (iv) accounting separation and (v) the ability for BNetzA to conduct margin squeeze tests on specific products *after product launch* either on its own initiative or in the event of a dispute, Agreements on access and co-location must be based on objective criteria, be transparent, grant equally effective access and meet the requirements of fairness and reasonableness.

The layer-3 bitstream product with regional[179] and national handover has been available in the market for several years while the Reference offer for the layer-2 bitstream is under development and therefore is not operational.

5.4 Addressing risks in the regulation of FTTC/VDSL bitstream

The main mechanisms through which BNetzA originally sought to address risks associated with the NGA bitstream remedy[180] were the use of pricing flexibility (rather than setting or approving charges on the basis of cost-orientation) and BNetzA's explicit support for long-term discounts (termed 'risk sharing') whereby lower rental charges could be secured

175 By mid-2014, 64 % of German homes had access to broadband speeds of more than 50 Mbps (TÜV Rheinland, July 2014).
176 https://www.rwe-highspeed.de/rwe-bringt-schnelles-internet-elf-ortsgemeinden-der-verbandsgemeinde-wittlich-land/Präsentation Jahresbericht (2014) Homann: "Wir gewährleisten, dass die Unternehmen die erforderlichen Investitionen in die Zukunft der Netze tätigen können", 08.05.2015.
177 The information is based on Decisions by Beschlusskammer 3 of the Bundesnetzagentur.
178 See Case DE/2010/1116
179 73 points of interconnection
180 These conditions apply in principle to both IP and ethernet bitstream, but only IP bitstream was made operational

through the payment of higher up-front fees. These long-term discounts served to reduce the demand-risk to DT in its NGA deployments. Alongside the obligation to provide a Reference Offer, bespoke commercial agreements were also expressly permitted although they were required to be notified to BNetzA.[181]

At the same time however, BNetzA made DT's NGA bitstream charges subject to a pricing check after launch.[182] This check took the form of a 'strict margin squeeze test'.[183] Through these tests, BNetzA aimed to ensure both (i) that NGA bitstream charges did not unduly impact competition (through a retail wholesale test), and (ii) that the charges allowed sufficient economic space to enable alternative operators to compete on the basis of LLU and climb the ladder of investment to SLU and deploy their own FTTC/VDSL access infrastructure (through the use of wholesale to wholesale margin tests).

5.4.1 Long-term discounts

Deutsche Telekom first proposed a Reference Offer 'Contingent model' for long term discounts on NGA IP bitstream in January 2012, but was subsequently prohibited by BNetzA from selling VDSL bitstream under this model.[184] The main reasons given were that:

- The volume-based discount in conjunction with the term of the lease would disincentivise investment by alternative operators in their own fibre infrastructure; and
- the pricing proposed in the model could not be justified in terms of investment-related risks or capacity utilization risks; and
- there was a concern that the margin between the layer 3 bitstream offer and LLU was insufficient to enable competition on the basis of LLU

BNetzA subsequently addressed these concerns by increasing the monthly fee and changing the contractual terms for contract termination. The resulting 'VDSL-IP-Bitstrom-Kontingentmodell' ('contingent model") was formally published as a Reference Offer open to all access seekers in 2014.[185] The main feature of the pricing model is that it enables access-seekers to reserve a certain contingent of bitstream lines, either nationwide or at regional level for a period of 8 years by making an upfront payment. In return such access seekers obtain the right (but not the obligation) to purchase VDSL IP bitstream access within the framework of the agreed contingent subject to a discounted monthly fee, depending on the type of VDSL connection. Termination of the contract is possible every two years without

181 Under transparency obligations
182 Termed an ex post price control in the context of German telecommunications law. The NRA may intervene on its own initiative or to resolve a dispute
183 The margin squeeze test calculations are understood to be on the basis of REO. However, the margin squeeze test calculations are not publicly available.
184 See Commission Decision concerning Case DE/2012/1350
185 See http://www.bundesnetzagentur.de/DE/Service-Funktionen/Beschlusskammern/1BK-Geschaeftszeichen-Datenbank/BK3-GZ/2014/2014_0001bis0999/2014_001bis099/BK3-14-005/BK3-14-005_Anlage1_BF_Download.pdf?__blob=publicationFile&v=2.

having to re-negotiate with DT or whenever the access seeker wishes to migrate its customers to a new NGA network rolled out by itself or a third party.

The table below provides an example of how prices vary between the standard offer and different forms of contingent models.

Table 10: Standard offer and contingent price model for layer 3 VDSL bitstream

	Standard offer – monthly fee	1st Contingent model – monthly fee	1st Contingent model – incl. upfront payment	2nd Contingent model – monthly fee	2nd Contingent model – incl. upfront payment
VDSL Classic	25.32 €	12.88 €	18.03 €	13.38 €	18.53 €
VDSL 50 Mbit/s	26.04 €	13.60 €	18.75 €	14.10 €	19.25 €

Source: BNetzA

Separate from the 'Reference Offer' Contingent Model, DT has concluded bilateral commercial arrangements for NGA wholesale access with some of the largest access-based competitors in Germany (subject to the scrutiny of BNetzA). DT and Vodafone concluded a bilateral NGA wholesaling deal in 2013.[186] In 2014 DT and Telefonica concluded a special migration/transition model whereby Telefonica commited to migrating by 2019 its customer base from its current LLU-based ADSL2+ platform to an NGA bitstream platform. In exchange, DT commited to ensuring an NGA roll-out of 65% VDSL / VDSL vectoring coverage by 2016 and paying an up-front fee to Telefonica for expected efficiency gains.[187]

In its review of the DT Telefonica deal, BNetzA focused on assessing whether the arrangement would (i) have a negative effect on competitive conditions in Germany (for example by unduly favouring Telefonica); (ii) whether the payment conditions could lead to a wholesale margin squeeze (ie a squeeze for operators offering services on the basis of LLU or SLU); and (iii) whether the volume discounts were permissible under existing rules such as those laid down in the 2010 Commission Recommendation on NGA. BNetzA concluded that these concerns were not warranted. BNetzA found sufficient margin between the VDSL bitstream offer and both SLU and LLU that the wholesale bitstream charge no longer had the effect of providing insufficient margin for operators competing on the basis of upstream remedies.

186 See DT press notice http://www.telekom.com/company/186052
187 See Commission Decision concerning Case DE/2014/1566

As regards compliance with Recommendations relating to volume discounts, BNetzA concluded that the proposed discounts were objectively justified in that they "*lead to an appropriate and adequate long-term risk sharing of the higher risk for NGA roll-out*" and did not exclude other access seekers from benefiting from this kind of discount. In this context BNetzA referenced points 7 and 8 of Annex I of the Commission's 2010 NGA Recommendation concerning long-term and volume discounts – and observed that although the NGA Recommendation highlighted the risks relating to FTTH, analogous risks could be assumed to apply to VDSL and VDSL vectoring investment. BNetzA also referred to recital 49 of the 2013 Commission Recommendation (on non-discrimination and cost methodologies[188]) in this context which states that:

> *Due to current demand uncertainty regarding the provision of very high speed broadband services it is important… to allow those operators investing in NGA networks a certain degree of pricing flexibility to test price points and conduct appropriate penetration pricing. This would allow SMP operators and access seekers to share some of the investment risk by differentiating wholesale access pricing according to the access seekers' level of commitment. This could result in lower prices for long-term agreements with volume guarantees, which could reflect access seekers taking on some of the risks associated with uncertain demand.*

5.4.2 Tightening NGA regulation

In October 2015, BNetzA adopted a Decision[189] concerning remedies for market 3b (Wholesale Central Access). The new Decision covers both layer 2 and layer 3 bitstream and mandates Ethernet NGA bitstream at a local handover,[190] for the first time. An additional feature of the decision is that BNetzA will assess and approve charges for the new wholesale product in advance of their introduction, rather than subjecting charges to pricing checks only after launch (or in the event of a dispute).

BNetzA justifies the requirement for prior pricing approval on the grounds that the local access NGA bitstream wholesale service will become the closest substitute to the existing physical access products provided to alternative operators, which are currently in decline[191] and will be further challenged by the planned introduction of vectoring technology by DT. This change represents a tightening of the current approach to regulated NGA wholesale access. However, downside risk to DT will continue to be addressed for all NGA technologies by forbearing from cost-orientation and making pricing approval subject only to passing a margin squeeze test.[192]

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188 http://ec.europa.eu/digital-agenda/en/news/commission-recommendation-consistent-non-discrimination-obligations-and-costing-methodologies

189 http://www.bundesnetzagentur.de/SharedDocs/Pressemitteilungen/EN/2015/151029_Bitstrom.html

190 A new local access ethernet bitstream is envisaged with handover at around 900 points. Regional access ethernet bitstream (available at 73 regional interconnection points) would still be subject to ex post charge controls and would be deregulated in a portion of the territory

191 The number of unbundled loops fell from 9.7m in 2011 to 8.8m in 2014

192 Methodology not yet elaborated

In its Decision, BNetzA notes that it considers that assessing charges on the basis of a margin squeeze test rather than cost-orientation is likely to result in appropriate outcomes for both investment and consumers because:

- BNetzA will ensure that there is an adequate margin (reflecting costs) between FTTC/VDSL bitstream and ADSL bitstream, which is already regulated on the basis of cost-orientation (BU-LRIC+). Thus ADSL bitstream provides a cost anchor ensuring that charges for FTTC/VDSL bitstream will be at least cost-oriented; and
- DT's retail charges NGA are subject to competitive constraints from cable operators limiting the potential for abusive (excessive) pricing to the detriment of consumers

BNetzA further notes that the use of pricing approaches which focus on relative prices as assessed through margin squeeze tests rather than a stricter LRIC+ price determination will provide a degree of pricing flexibility for DT, thereby providing some space for risk adjustment.

Alongside price approval based on margin squeeze tests, BNetzA will introduce an obligation of non-discrimination in the form of Equivalence of Output (EoO)[193] alongside KPIs.[194].

At the same time as introducing new obligations for local Ethernet bitstream access with ex ante pricing checks, BNetzA will deregulate the previously introduced regional layer 3 (IP) bitstream in 20 cities representing 6% of the German population which are considered to be effectively competitive. Pricing for IP bitstream in the remainder of the territory would continue to be based on the previous approach of applying a amargin squeeze test only after launch or in the event of a dispute.

In its October 2015 comments letter on the draft BNetzA Decision[195] the European Commission queried BNetzA's proposed new approach to regulating NGA bitstream. Specificcally, the Commission questioned whether VULA-like remedies should be applied in market 3b (Wholesale Central Access) rather than market 3a (Wholesale Local Access). The Commission also queried whether BNetzA's proposal to pursue EoO as opposed to EoI[196] was sufficient to justify permitting pricing flexibility (ie the non-imposition of cost-orientation) in line with the EC (2013) Recommendation on cost-orientation and non-discrimination. It also invited BNetzA to conduct a combined analysis of markets 3a and b rather than notifying specific remedies in isolation.

193 Equivalence of Output implies that the same service standards should be received by third parties as by the incumbent's downstream retail arm, as measured on the basis of internal and external 'Key Performance Indicators'. However, unlike in the case of Equivalence of Input, the incumbent is not required to use the same systems.

194 KPIs have not previously been required for bitstream in Germany

195 See Case DE/2015/1781 and press release http://www.bundesnetzagentur.de/cln_1412/SharedDocs/Pressemitteilungen/EN/2015/151029_Bitstrom.html?nn=404422

196 BNetzA's justification is based on costs estimated in the tens of millions ofeuro

5.5 Relationship between copper and fibre

Duct access is mandated only between the street cabinet and Main Distribution Frame. Duct cost allocation in this portion of the network reflects the space requirements respectively for copper and fibre of the trench.[197]

BNetzA uses a BU-LRIC+ model for the pricing of copper LLU and ADSL bitstream. Copper is still used as the relevant asset for this model. As previously noted, FTTC-bitstream is not subject to cost-orientation.

5.6 Market structure

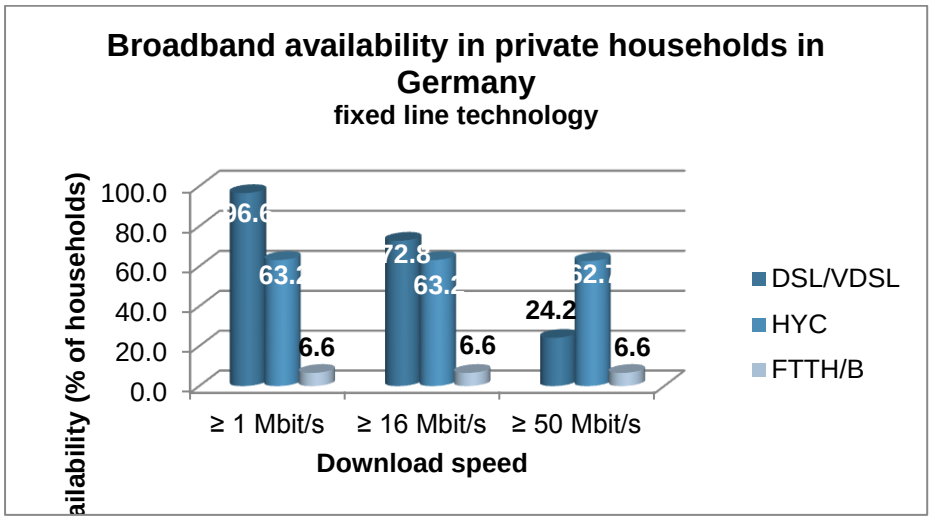
The context for BNetzA's decisions on FTTC/VDSL is an early, but relatively gradual deployment by the incumbent. The incumbent Deutsche Telekom began installing FTTC/VDSL in 2006 in response to upgrades from cable operators, whose networks cover 62% of the national territory. As of 2009, shortly before the NRA's NGA regulatory Decision, DT's FTTC/VDSL network reached around one third of German homes.

DT's deployment has continued to expand, but at a gradual pace. Around 40% of homes were served in 2014 and DT plans to extend coverage to 65% of households by 2016. A specific feature of the German market is the presence of 'city carriers', in some cases associated with utility groups, providing FTTH/B or in some cases FTTC-based services in certain local areas. Their coverage is however limited.

Figure 9 shows NGA coverage in Germany differentiated by speed and technology as of 2014.

197 See http://www.thüringen-online.de/fileadmin/dateien/pdf-dateien/BNetzA/Vorleistungspreise_130701_Vollversion_BK3_13-003.pdf

Figure 9: Fixed line broadband coverage for private households in Germany (differentiated according to DSL/VDSL, HYC, FTTH/B) in 2014



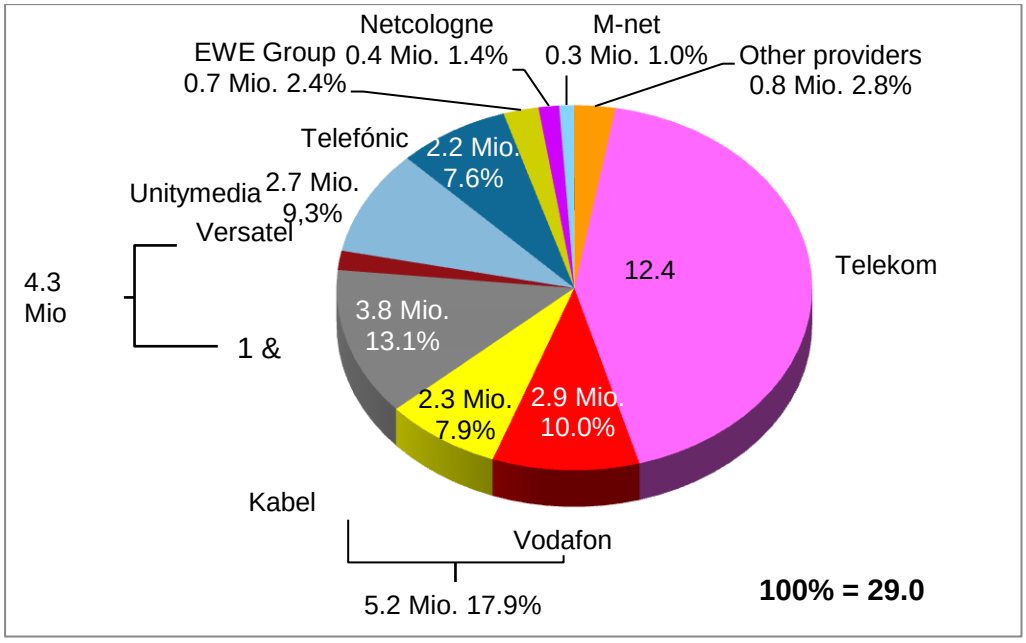
Source: Bundesministerium für Verkehr und digitale Infrastruktur (2015)

Take-up of fast broadband in Germany has been growing, but remains below the EU average. At the end of 2010 4.5% of broadband subscribers subscribed to speeds of >30Mbit/s, with marginal take-up at >100Mbit/s.[198] In 2014 take-up of high speeds reached 21% of broadband connections (for speeds >30Mbit/s) and 5% (for speeds >100Mbit/s).

As regards competition in broadband, the incumbent DT is the market leader with a share of 43%, while Vodafone (now merged with cable operator Kabel Deutschland) is the second-largest operator with a market share of 18%. Significant access-based operators include 1&1/Versatel and Telefonica. The largest city carriers, focused on NGA access deployment in specific areas, EWE Gruppe, NetCologne and M-net each had a small overall market share, although their position is considerably stronger within their regional footprint.

198 Source: Digital Agenda Scoreboard based on Cocom data

Figure 10: Retail broadband market shares Germany June 2014



Source: VATM/DIALOG Consult 2015

Access-based competition in Germany has historically been significant and constituted more than 50% of DSL lines in 2008.[199] However, physical access via LLU has been declining in recent years, falling from 41% of DSL lines in 2011 to 38% in 2014.[200]. At the same time, there has been a gradual shift to NGA-based retail services. In 2014, approx. 20% of DTs broadband connections were NGA (2.5m connections), 28% of which were sold by alternative operators on the basis of bitstream access or resale.[201]

199 Source Cocom
200 Source: WIK NRA survey March 2015
201 DT Investor statements

6 The Netherlands

6.1 Summary characteristics

Context

Prior to the intial NGA regulatory decisions of the NRA (then OPTA) in 2008-2009, the Netherlands benefited from near-ubiquitous cable coverage, but had limited FTTx roll-out. In 2009, following its acquisition of a minority stake in the independent FTTH investor Reggefiber, incumbent KPN announced significant FTTx deployment plans based on VDSL at the Central Office, followed by a mix of FTTH, FTTC and wireless technologies.[202]

Regulatory approach

The Dutch NRA OPTA addressed both FTTC and FTTH in its regulatory strategy. Access to the KPN/Reggefiber network was implemented through fibre unbundling (referred to as ODF[203] access), which was made possible due to point to point architectures. Competition in FTTC was promoted through SLU and dark fibre backhaul[204] alongside bitstream access remedies.[205]

The approach towards FTTH has remained broadly stable over time. Risk in the deployment of FTTH has been addressed through (i) the use of a *long term price cap* (over multiple review periods) to provide investor certainty;[206] and (ii) the application of a 2% *risk allowance on the base WACC (hereafter referred to as the FTTH WACC)* when setting cost-oriented charges for fibre unbundling,[207] with the aim of reflecting systematic risks associated with deployment of a new network (summarised below).

202 KPN's fibre intentions 2009 http://corporate.kpn.com/press/press-releases/kpn-will-proceed-with-fiber-on-a-regional-basis.htm
203 Optical Distribution Frame – the point at which physical access is handed over
204 Mandated in 2009 in the former market 4 (physical infrastructure access)
205 Mandated in 2008 in the former market 5 (wholesale broadband access)
206 Charge controls are carried over from one period to the next (adjusted for inflation) unless charges are deemed to be excessive as further discussed below
207 Based on DCF model – actual costs

Table 11: Netherlands – summary of FTTH risk adjustment mechanism

Value of NGA risk adjustment to WACC	Assessment method	Cross-check against IRR
Fibre WACC = base WACC + 2% uplift (2015)	1% uplift (to account for greater ratio of fixed to variable costs) + additional 1% uplift to account for potential for delayed adoption (specific to speculative residential deployments)	IRR checked against WACC at end of charge control period. If IRR > fibre WACC + 3.5% (asymmetric regulation risk – based on demand sensitivities) charges are adjusted down

Source: WIK based on market reviews

To avoid excessive charges, the NRA also *checks the IRR against the WACC at the end of each charge control period*. Wholesale charges for the subsequent review period are reduced if the IRR exceeds the FTTH WACC as further uplifted by a mark-up which aims to reflect asymmetric regulation risk.[208] The so-called 'all-risk' WACC including the base WACC, 2% fibre uplift and 3.5% uplift for asymmetric regulation risks was assessed in 2015 at 9.9%.

In contrast to FTTH, the Dutch position on FTTC active and passive remedies has changed significantly. In its 2008 Wholesale Broadband Access[209] decision, the Dutch NRA mandated residential[210] FTTC bitstream on 'copper' (including FTTC networks) at local and regional handover points. Bitstream was subject to margin squeeze tests, but not cost-orientation, as OPTA considered that sufficient competitive constraints existed to ensure reasonable pricing. OPTA did not make any explicit reference to FTTC risk. In a subsequent 2012 Decision, OPTA found the market for residential wholesale broadband access to be effectively competitive and therefore withdrew the obligation (again with no reference to risk). However, in 2015, active FTTC access was reintroduced as ACM issued a draft Decision requiring the provision of FTTC VULA as a condition for permitting KPN to progress with its planned vectoring deployment. ACM left VULA prices to commercial negotiation, subject only to certain checks, and a commercial agreement was reached in July 2015. However, ACM observes[211] that this 'light touch' regulatory approach favouring commercial agreement was possible because KPN was given sufficient incentives to reach a settlement – due to the prohibition on vectoring deployment and ACM's statement[212] that it would set charges for VULA on the basis of cost-orientation[213] without any risk adjustment in the event of a

208 In this context – project-specific NGA risk is taken into account
209 Market 5 of the 2007 EC Recommendation on Relevant Markets
210 Since 2005, OPTA has segmented the wholesale broadband access market between high-quality (business) and low-quality (mass-market) bitstream.
211 Interview October 2015
212 See Case NL/2015/1794 and associated draft Decision
213 Embedded Direct Cost (EDC) methodology – similar to Fully Distributed Costs, where costs are allocated top down to specific services with assets valued at current cost

dispute. At the same time as fostering the introduction of VULA, ACM also proposed the removal of the previous obligations for SLU and associated dark fibre backhaul.

Market outcomes

The Netherlands today has near complete NGA coverage via two extensive NGA infrastructures - the near-ubiquitous cable network and incumbent KPN's FTTx network, *which has in practice primarily implemented through FTTC*. There is some degree of broadband access-based competition on KPN's network. The number of entrant lines based on LLU has been in decline since 2011 and IP bitstream now makes up nearly half of access-based broadband lines.[214] Take-up of fibre unbundling (ODF access) remains limited. SLU has been essentially unused.

6.2 NGA objectives

At the time when NGA regulation was initially introduced in 2008-2009, the NRA OPTA pursued a twin-track approach of enabling access to the KPN (and Reggefiber) FTTx network, while also facilitating entrants to climb the ladder of investment through attention to SLU.

More recently, with two nationwide NGA infrastructures (VDSL/FTTH and Cable) now in place, ACM acknowledges[215] that take-up of SLU has been limited in practice and that it is not likely that a third NGA infrastructure will arise on a large scale. The regulatory focus has therefore shifted to ensuring that effective access is available at a local level to the incumbent's NGA network.

ACM does not favour specific technologies but merely responds to the market choosing a certain technology. For example, fibre unbundling was possible from the time of the initial NGA regulatory decision because of the point to point architecture of the FTTH network deployed by Reggefiber, while VULA has been introduced in 2015 as a response to VDSL2 with vectoring on KPN's copper network. The Docsis 3.0 cable network is not considered technically capable of offering services with VULA functionality.

While it supports the principle of technological neutrality, ACM has noted that physically unbundled access is still the most closely aligned with its objectives to stimulate infrastructure-based competition as it enables alternative operators to deploy their own networks and equipment to the maximum degree. ACM has also noted that although virtual unbundled access may substitute to some degree, it does not provide as much flexibility to alternative operators as physical access.[216]

214 WIK data request to NRAs March 2015
215 Interview October 2015
216 July 2015 draft market analysis regarding unbundled access Art 7.3.1

6.3 NGA regulatory obligations

The first Dutch regulatory decisions concerning NGA were issued in 2008 (on wholesale broadband access – bitstream) and 2009 (on wholesale physical infrastructure access). In October 2015, ACM notified to the European Commission a draft Decision on the Wholesale Local Access market,[217] which is in the process of being finalised.

6.3.1 FTTH

Regulatory obligations applying to FTTH have been stable over time since their introduction in 2009. As of its draft Decision of October 2015, KPN continues to be subject to obligations of access, transparency (including the publication of reference offers), non-discrimination (Equivalence of Input) and price control (cost-orientation). The main FTTH access obligation is the requirement to supply fibre unbundling (ODF access). Dark fibre backhaul is also mandated as an associated facility to ODF access.

ACM previously also mandated access to dark fibre for office buildlings (Fibre-to-the-Office) at cost-oriented rates, but this obligation was withdrawn on 18 December 2013,[218] as the court concluded that there was insufficient evidence to find that KPN had SMP in this particular market

Duct access is not imposed as a remedy because there are few ducts deployed in the Netherlands.

6.3.2 FTTC

The Dutch NRA's approach towards FTTC regulation has changed over time. Initially OPTA combined both passive and active remedies.

- SLU and dark-fibre backhaul (as an associated facility) were mandated on cost-oriented terms under the former market for 'physical infrastructure access'; and
- Low quality (consumer-grade) FTTC VDSL bitstream was mandated as a form of 'copper' bitstream in OPTA's 2008 Wholesale Broadband Access Decision.[219]

For the bitstream product, (as with other copper-based bitstream access) charges were not set on the basis of cost-orientation, but a margin squeeze test was applied. OPTA justified this approach on the basis that there were sufficient competitive constraints to control prices. The low-quality 'copper' (including FTTC) bitstream obligation was withdrawn in 2012 on the

217 See https://circabc.europa.eu/sd/a/a84a6e94-4412-47ef-b2a1-5272b5c1d48e/Notification%20WLA%20draft%20decision%20October%202015,%20Public%20Version.pdf

218 See http://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:CBB:2013:273, court ruling ruling on 18 December 2013

219 OPTA Dec 2008 WBA Decision https://circabc.europa.eu/sd/a/530756de-12e3-48ca-b8d3-26c2e06fd8cf/OPTA%20marktbesluit%20ULL%2019%20december%202008%20OPENBARE%20VERSIE.pdf

grounds that competition in the market was sufficiently developed.[220] No reference was made to FTTC risk.

By 2015, market circumstances had changed, as the planned upgrades of the copper network and introduction of vectoring by KPN threatened to create technical challenges for physical unbundled access. In response to these developments, in its draft 'Wholesale Local Access' decision of 2015, ACM proposed to permit KPN not to offer physical unbundling in cases where copper upgrades were in prospect, but only if KPN could reach commercial agreement on a VULA product. Otherwise, ACM stated that it would intervene to ensure that a suitable VULA product was made available ahead of the phasing out of unbundling. SLU and associated dark fibre backhaul obligations were also withdrawn.

ACM notes that the VULA should be offered at all metro core locations (currently 196, but subject to possible revision), and should offer the same functionalities as LLU and SLU access- with the minimum being the product characteristics used by KPN's downstream retail aim, with sufficient control over product parameters to enable access-seekers to differentiate products.

A summary of the current (2015) broadband and wholesale next generation access products is given in the table below.

Current and next generation access regulation in the Netherlands		
Unbundled access and virtual equivalents	LLU (including ancilliary service MDF co-location). SLU including ancilliary service SLU backhaul.[221] VULA for virtual unbundled copper lines. ODF access FTTH (fibre unbundling for KPN Reggefibre network) including ODF backhaul from ODF to local network level.[222]	From 2006, maintained in last market analysis from 1/1/2012[223]. SLU access proposed to be withdrawn from 1/1/2016. From 24 July 2015[224] Obligation stems from 2009, maintained in last market analysis of 1/1/2012.
Bitstream access	High Quality Wholesale Broadband access for copper	Latest market analysis 1/1/2013[225]

220 See Article 7 case NL/2012/1299. OPTA cited increasing competition in this market segment, although the Commission questioned this analysis. Obligations for the supply of high-quality bitstream access were maintained

221 See http://www.kpn-wholesale.com/en/our-products/data-networks/physical-access/m/mdf-sdf-(1).aspx

222 See article 518 of OPTA's Marktanalysis 2011 – unbundelde toegang.

223 See https://www.acm.nl/nl/publicaties/publicatie/10307/OPTA-stelt-marktanalyse-ontbundelde-toegang-2011-vast/

224 See https://www.kpn-wholesale.com/nl/over-kpn-wholesale/nieuws/introductie-vula-aanbod-en-uitrol-vdsl-binnenringen.aspx

225 See https://www.acm.nl/nl/publicaties/publicatie/11049/Besluit-marktanalyse-hoge-kwaliteit-wholesale-breedbandtoegang-en-wholesale-huurlijnen-HKWBT-HL-2012/

6.4 Addressing risk in the regulation of FTTH unbundling (ODF access)

ODF access is subject to cost-orientation, based on a DCF cost model drawn from the KPN business case for its fibre division Reggefiber (a separate entity, prior to its acquisition of a 60% majority share by KPN in October 2014). This resulted in different CAPEX classes which reflects regional cost differences. These different CAPEX classes were weighted to derive one national tariff.

The main mechanisms to address the perceived risk in the regulatory approach for ODF access are (i) the use of a multi-period charge control approach and (ii) the implementation of an uplift to the WACC to reflect increased systematic risk associated with FTTH.

6.4.1 Multi-period charge control

With the aim of keeping the tariff for ODF FTTH access as stable as possible, ACM set the ODF access FTTH tariff ceilings not only for the complete 3 year regulation period but in principle over multiple review periods (after formal approval of the EC and the Court). Specifically, if subsequent market reviews confirm the SMP status of KPN, the previous wholesale price cap will be used to calculate a price cap for the next regulation period, adjusted for inflation,[226] unless returns are found to be excessive (see discussion concerning the WACC).

6.4.2 Uplift on the WACC

The WACC is used to ensure a fair return on capital when calculating the costs for any services subject to cost-orientation on the basis of DCF or other modelling approaches.

A 2% uplift on the normal KPN WACC has been proposed for FTTH in 2015. The values are based on two distinct assessments – one in 2013 to review risk associated with Fibre-to-the-Office deployments (FTTO), and the second in 2015 to review risk associated with FTTH. ACM commissioned the Brattle group to assist in these assessments – their most recent analysis was published in July 2015.[227]

6.4.2.1 WACC uplift for 'fibre-on-demand' (FTTO)

In order to calculate a WACC for dark Fibre-to-the-Office (a regulatory obligation that has subsequently been withdrawn in the Netherlands), the Brattle Group initially aimed to conduct a peer review amongst worldwide telecom companies focusing on FTTO. However

226 See para 617 https://circabc.europa.eu/sd/a/a72dee73-0cdb-4fa4-8b4c-11a89b5e0c97/Besluit%20Ontbundelde%20toegang%20(openbare%20versie)%20def%2029dec11.pdf,

227 See See The Brattle Group, The WACC for KPN and FttH, Prepared for ACM. 1 July 2015.https://www.acm.nl/nl/publicaties/publicatie/14469/Onderzoek-naar-de-vermogenskostenvoet-WACC-van-KPN/

no data could be found. Therefore, it modified the current WACC to make it suitable for FTTO while focusing on the systematic risk only.

Specifically, the Brattle Group noted that there was a higher ratio of fixed to variable costs associated with a fibre-to-the-office deployment because it is newer and therefore may have a higher level of debt compared to a copper network. As the debt level increases, the sensitivity of equity cashflows to revenue (out-payment to shareholders) and therefore the sensitivity of the share price to revenue, also increases. ACM then amended its calculation model, used for the general WACC, with a higher gearing (a ratio debt/equity of 70% instead of 55% for copper) and observed the results. The real pre-tax WACC increased from 4.72% to 5.79%, an increase of 1.07%, which was rounded to 1%.

The Brattle Group also assessed whether there were any differences in demand sensitivity for FTTO compared with copper-based services, but did not find sufficient evidence to continue this approach.

6.4.2.2 Additional WACC uplift for FTTH

In 2015, the Brattle Group was further assigned to assess the specific WACC applied to FTTH. It noted that other regulators in Europe have used the EC recommendation to implement a risk premium on the WACC for investments in FTTH (France-5%, Spain-4.81%, Italy-4.4% and Lithuania-not disclosed), but also observed that the risk premium set by these countries includes in addition to the systematic risk (the risk an investor cannot reduce by holding a diverse portfolio of projects and shares) the non-systemic risk (uncertainty regarding deployment costs, civil engineering works and managerial execution).

ACM decided to focus on the systemic risk only and to use the Discounted Cash Flow (DCF) model of KPN regarding its investments in Reggefibre's FTTH to see whether an applied risk premium would be reasonable. This DCF model is a financial model of the FTTH investment in the Netherlands, which simulates capital investments, rate of fibre network build out and take up, operating costs and revenues for the period 2008 to 2032.

By varying the parameters in the DCF model, ACM calculated what the decrease in internal rate or return (IRR) in the KPN business case would be for two scenarios:

1. The final adoption rate (the take up rate of fibre passed homes) is <u>reduced from 60% to 40%.</u>
2. The final adoption rate of 60% <u>is reached three years</u> later due to economic circumstances.

In the first scenario the IRR declined from 7.85% to 3.5% so a decrease of 4,35%, which seems consistent with the risk premia offered by other European NRAs. In the second 'delay' scenario, the IRR decreased by 2%.

Scenario 1-lower adoption rate

ACM investigated the systematic risk for KPN in respect to a lower adoption rate, but could not find any evidence linking the economic crisis and take up of FTTH services based on available data in annual reports. ACM noted that NRAs in Spain and Italy did consider higher systematic risk for FTTH in comparison with copper and FTTC, because macro-economic conditions affect the demand and profitability of FTTH services. Sensitivity analysis was conducted on the KPN DCF model to see how the IRR could be reduced by around 4.5% to compare it with the risk premiums set by other EU NRAs. The key variable in the DCF model is demand, in practice adoption rate, as capital and fixed operating costs are more or less fixed. ACM found that the adoption rate from 2027 onwards would have to be around 40% instead of 60% to reduce the IRR by 4.5%.

However ACM noted that this drop not only covered systematic risk but also non-systematic risk (overestimation of demand) and this could happen irrespective of economic situations. Furthermore, in practice an operator would amend its approach when observing lower adoption rate up by reducing or postponing capital expenditures or at least focusing on areas with higher adoption rates. Therefore, a delay scenario of 3 years due to the economic downturn seemed more realistic while the maximum adoption rate of 60% in 2027 was maintained.

Scenario 2-delay in adoption until 2027

ACM noted that the expected IRR is actually the weighted average of the IRR in case of delayed demand and demand and IRR without delay. Therefore it is linked to the chance of another economic crisis in the next regulation period. This chance was set at 50% and hence the risk premium at 1% (0.5 * 2%).

In addition, it was noted that the systemic risk for rolling out FTTH is larger than for FTTO as FTTH is more generally rolled out in anticipation of customer demand whilst FTTO is often deployed in response to a specific request.

In order to calculate the total risk premium for FTTH, it was therefore proposed to add the 1% risk premium identified for FTTO in 2013 to the 1% risk premium identified for FTTH activity, as FTTH was considered to have the same systematic risks as identified for FTTO. This results in a 2% risk premium for FTTH in total. This risk premium was then added to the general WACC of 4.49% leading to 6.49% for FTTH.

6.4.3 Guarding against excessive returns

ACM performs an annual check to assess whether the actual realised rates of return are consistent with the estimated WACC for FTTH (6.49%). ACM bases its assessment of whether returns are excessive on whether the IRR exceeds the already uplifted WACC with another uplift of 3.5% - ie 6.49%+3.5%=9.99% (the all-risk WACC).

The 3.5% reflects ACM's assessment of the asymmetric regulation risk for KPN. The 3.5% is based on the decreased IRR in the DCF business case when penetration ratios fall from 80% (optimistic scenario) to 40% (pessimistic). In the case of excessive profits, charges are adjusted downwards. In this sense project-specifics for NGA are taken into account when considering whether wholesale charges are excessive.

An overview table of the general and FTTH WACCs is shown in the following table.

Table 12: Overview table for 2011-2015 WACC values (real, pre tax)

2013		2015	
2011 WACC	5.88%	General WACC	4.49%
Current WACC	4.72%		
FTTO DCF WACC	5.79%	FTTH WACC	6.49%
		All risk WACC	9.99% (6.49+3.5)

Source: WIK-Consult based on ACM

6.5 Pricing of VDSL/VULA

Unlike FTTH, FTTC/VDSL has not been considered by ACM to represent specific risks above normal business risks. This is indicated by OPTA's decision in 2008 to treat FTTC under the framework for 'copper' when regulating bitstream access.[228] Nonetheless, the recent pricing approach taken to FTTC/VDSL VULA (introduced in 2015) is of interest.

As previously described, ACM incentivised KPN to reach a commercially negotiated settlement by proposing inter alia[229] that, in the absence of a commercial agreement, it would apply cost-oriented charges to FTTC/VDSL based on the cost for LLU (safety caps) with the addition of VULA-related costs using the EDC methodology[230] and the generic WACC. ACM also permitted long-term discounts and tariff differentiation certain conditions (transparent, non discriminatory, not amounting to a loyalty discount).

228 See https://circabc.europa.eu/sd/a/530756de-12e3-48ca-b8d3-26c2e06fd8cf/OPTA%20marktbesluit%20ULL%2019%20december%202008%20OPENBARE%20VERSIE.pdf. Copper low quality WBA was subject to margin squeeze tests. Fibre low quality WBA was not subject to regulation on the basis that fibre unbundling was available.

229 ACM also refused permission for the use of VDSL2 vectoring in the absence of a VULA agreement

230 A top-down approach similar to Fully Distributed Costs, an accounting method to distribute all costs among a firm's various products and services.

In practice in the presence of these incentive mechanisms, the industry was able to commercially agree VULA charges, and on 28 July 2015, ACM acknowledged[231] the negotiated tariffs for VULA as the regulated price caps.

The negotiated VULA pricing contains two kinds of volume discounts related to risk sharing (see below tables):

- Access seekers pay an initial investment share of €2.5 million with a lifetime of 7 years. In addition, they pay a one time investment per connected Metro Core (MC) node. This investment amount varies depending on the number of connected MC locations (max 161).
- Access seekers can obtain a discount of 8.7% on the normal list price when ordering a block of 10,000 ports.

Table 13: VULA long-term discounts

Number of connected MC nodes	One time investment per MC per category (€)	Discount percentage %
I: 1-40	35.000	0%
II: 41-80	31.500	10%
III: 81-120	28.000	20%
IV: 120-161	24.500	30%

Minimum Number of ports	Price per port (€)	Discount percentage %
5.000	190	0%
10.000	173,50	8.7%

231 See https://www.acm.nl/nl/publicaties/publicatie/14545/Aanbod-KPN-virtuele-ontbundelde-toegang-kopernetwerk-VULA/ As noted, ACM was not involved in setting these prices, but only checked to ensure that the pricing was not discriminatory in a manner than could harm competition, before acknowlegding the pricing as the regulated price cap.

6.6 Approach between current and next generation networks

Allocation of common duct costs between NGA and CGA services is not a discussion in the Netherlands as there are almost no ducts used. The different NGA networks (FTTC, FTTH, Cable) each use their respective cable separately buried in the ground.

Charge controls for copper and fibre follow different approaches. In particular charges for LLU are based on safety caps rather than modelling, while fibre charges are based on a DCF model based on the real costs of the incumbent KPN.

6.7 Market structure

Prior to the Dutch NRAs' initial NGA decisions in 2008-2009, the main NGA deployments had been made by cable operators and to a more limited extent by Reggefiber, [232] through point-to-point FTTH technology, which enabled unbundling. In 2008, incumbent KPN acquired a minority stake in Reggefiber. KPN subsequently completed trials of FTTH and FTTC at the end of 2009, and announced an upgrade plan based initially on VDSL from the Central Office, followed by a mix of FTTC, FTTH and wireless deployments.[233] By 2011, FTTH deployments had reached more than 10% of households, while FTTC/VDSL was estimated at 27%.[234]

As of 2014, the Netherlands is characterised by the near universal availability of NGA, over two nationwide NGA infrastructures. Incumbent KPN operates an xDSL network, which is being upgraded to VDSL2 with vectoring, as well as a point to point fibre network (previously Reggefiber). Ziggo operates a Docsis 3.0 cable network. KPN's claims speeds up to 120 Mbit/s for its VDSL2 network and Ziggo offers customers up to 200 Mbit/s.

In October 2014, KPN gained full control of Reggefibre (60% of shares, previously 51% but with veto powers for Reggeborgh). On 13 October 2015 the last appeal (by Ziggo) was rejected for the court and the decision was made final[235] as the court judged that ACM had sufficient argumentation that the resulting increase in concentration in the fibre market would not limit competition. The Reggefiber FTTH network currently covers 25-30% of the population. In addition to Reggefiber there are several other small local fibre companies covering an additional 5% of the households (around 380,000). One of the players involved in local FTTH deployments is the Communication Infrastructure Fund (CIF). Its strategy has been to take over local cable networks (previously managed by municipalities) and upgrade these to FTTH networks.[236]

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232 350,000 homes at end 2008 according to IDATE
233 KPN's fibre intentions 2009 http://corporate.kpn.com/press/press-releases/kpn-will-proceed-with-fiber-on-a-regional-basis.htm
234 IDATE FTTx Watch service
235 See https://www.acm.nl/nl/publicaties/publicatie/14814/Uitspraak-CBb-in-concentratiebesluit-KPN-Reggefiber/
236 See http://www.cifinfrastructure.com/press-releases.php?newsID=25

Cable coverage in the Netherlands was previously divided amongst two geographically separate deployments. However, Liberty Global, which already owned cable operator UPC gained national coverage in 2015 by acquiring cable competitor Ziggo.

As of October 2015, the Netherlands had 16.8 million habitants and around 7.6 million households.[237] According to the latest market monitor of regulator ACM, there are 6.9 million broadband subscriptions. The household penetration rate is estimated to be around 95%.

As reflected in the table below, cable is the most popular platform with 47% of all retail broadband subscriptions, followed by DSL (including VDSL) with 42% and Fibre with 11%.

Broadband subscriptions (x 1000)[238]		
	Q1 – 2015	%
Cable	3,259	47
DSL	2,923	42
Fibre	737	11
Total	6,919	100

In addition to infrastructure providers KPN and Ziggo, Tele2 and Vodafone compete on the residential broadband market on the basis of wholesale access.

In 2008, access-based competition represented 18% of all DSL lines.[239] This proportion was similar by the end of 2014.[240] However, an interesting development is that local loop unbundling began to decline, falling from 14% of broadband lines on the KPN platform in 2011 to 11% in 2014. The remaining access-based lines are mostly on the basis of IP-bitstream. Take-up of Ethernet bitstream and fibre unbundling (ODF access) remains limited.

See below the latest estimated market shares of the Dutch broadband market from ACM.

237 See http://statline.cbs.nl/StatWeb/publication/?VW=T&DM=SLNL&PA=37296ned&D1=a&D2=0,10,20,30,40,50,60,(l-1),l&HD=130605-0924&HDR=G1&STB=T
238 Source: https://www.acm.nl/nl/publicaties/publicatie/14596/Telecommonitor-eerste-kwartaal-2015/
239 Data from Cocom
240 NRA data request March 2015

Marketshare broadband Q1 2015 (%)[241]	%
KPN	40-45
Ziggo/UPC	40-45
Tele2	0-5
Other	5-10

7 Spain

7.1 Summary characteristics

Context

Prior to the CMT's original NGA decision in 2009, cable networks covered 60% of households. There was limited deployment of FTTH/B with around 250,000 lines deployed by Telefonica at the end of 2008.[242]

Regulatory approach

CNMC's primary focus in NGA wholesale access regulation since 2009 has been to foster infrastructure-based competition in NGA (primarily FTTH in practice). As such it has aimed to incentivise entrants to climb the ladder of investment by focusing wholesale access regulation on duct access and in-building wiring.[243] Regional FTTH Ethernet bitstream (termed NEBA) was also mandated[244] in its 2009 decision. However the CNMC aimed to incentivise investment by *forbearing from mandating the provision of bitstream access above speeds of 30Mbit/s.*[245] Additionally, for the FTTH Bitstream wholesale product available at speeds of up to 30Mbit/s, CNMC addressed perceived risk through the application of a *mark-up on WACC* within a cost-oriented[246] price to account for project-specific risk.

The WACC mark-up was assessed by calculating the difference between the Internal Rate of Return (IRR) of an FTTH network with demand uncertainty and competition in the ultra-fast broadband market (scenario 1) and the IRR of less risky ADSL broadband services and

241 Source: https://www.acm.nl/nl/publicaties/publicatie/14596/Telecommonitor-eerste-kwartaal-2015/
242 IDATE for FTTH Council
243 Both mandated on the basis of cost-orientation
244 In the context of market 5 of the former EC Relevant Market Recommendation
245 No regulatory obligations were imposed above this speed
246 Based on a BU-LRIC+ model

uncertainty only regarding competition (scenario 2). The result of this assessment was a 4.81% fibre-based risk-adjustment to the standard WACC of 9.6%. Before choosing this method, CNMC also considered two other methods for calculating the NGA risk premium (October,2012) and explicitly rejected the option of addressing risk through the β within CAPM, because it considered that project-specific risk needed to be considered in addition to systematic risk.[247] Prior to applying the WACC mark-up, the Spanish regulator had proposed an alternative method of addressing risk on FTTH bitstream (<30Mbit/s) which relied on a retail minus approximation based on Telefonica's 100Mbit/s offer. However, this approach was changed following objections from the European Commission.

In November 2015, the CNMC issued a draft Decision[248] in which it plans to modify its approach to NGA regulation to reflect differing competitive constraints in different regions, while continuing to incentivise NGA investment. Key aspects of the proposed new approach are that (i) *forbearance on speeds above 30Mbit/s will be lifted* and a new VULA product[249] will be introduced on the basis of Equivalent of Input (thereby tightening NGA wholesale regulation); <u>but</u> (ii) NGA wholesale access regulation will be removed entirely in an area deemed to have the potential for effective NGA competition;[250] and (iii) price regulation for NGA wholesale products will be on the basis of a margin squeeze[251] test rather than cost-orientation – thereby allowing pricing flexibility for the incumbent. CNMC's justification for its proposed tightening of the regulatory approach was that – unlike the situation in 2009 – ultrafast broadband services were more widely deployed,[252] and had increased in penetration, accounting for 15% of broadband access lines in Dec 2013.

<u>Market outcome</u>

In the period following the NRA's initial decision, FTTH/B coverage expanded rapidly, increasing to 10% by 2011 and reaching 45% by the end of 2014.The majority of the lines have been deployed by Telefonica, stimulated by competition from cable operators. However, alternative operators including Orange (now merged with Jazztel) and Vodafone (also a cable operator following the acquisition of ONO) have constructed their own FTTH infrastructure in certain cities.[253] Take-up of speeds above 30Mbit/s increased from less than 2% of broadband connections at the end of 2010 to 24% at the endof 2014, while take-up of speeds >100Mbit/s is above the EU average a 11% of broadband subscriptions.[254]

247 Consulta pública acerca del cálculo de la prima de riesgo en tasa de retorno nominal para servicios mayoristas de redes de acceso de nueva generación. (Expte. 2012/2155)
248 Resolución por la cual se acuerda notificar a la comisión europea, al ORECE, al Ministerio de Industria Energía y Turismo y al Ministerio de Economía y Competitividad el proyecto de medida relative a la definición y análisis del Mercado de acceso local al por mayor facilitado en una ubicación fija y los mercados de acceso de banda ancha al por mayor. (ANME/DTSA/2154/14/MERCADOS 3a 3b 4)**.**
249 In practice on FTTH
250 Areas representing ~26% population
251 Anticipated to be applied ex ante, EEO standard
252 Para IV 4.4.2.1 Dec 2014 consultation on market analysis 3a and 3b
253 CNMC proposes to deregulate a portion of the territory covering 26% households on the basis of existing and anticipated infrastructure-based competition in NGA
254 Digital Agenda Scoreboard based on Cocom

Alternative operators mainly relying on LLU provided 39% of DSL lines in July 2008 and 51% in January 2015.[255] Despite the fibre deployments by alternative operators, their market share in the fibre-based environment, has been considerably lower than for standard broadband and take-up of the existing NEBA FTTH bitstream offer (capped at 30Mbit/s) has been limited.

255 Data from Cocom/Digital Agenda Scoreboard

7.2 NRA objectives

CNMC's approach to NGA regulation has from the outset focused on infrastructure rather than service competition. According to CNMC,[256] infrastructure competition and incentivising investments are objectives that should be prioritized when there is a presence of strong operators with likely investment capacity and important incomes deriving from their high unbundling penetration. They note that this situation can be observed in the Spanish market.

CNMC states that it aims to incentivise NGA investments of both the incumbent and the alternative operators (through providing incentives to 'climb the ladder of investment'). CNMC notes that it has imposed measures that are technologically neutral. Yet, CNMC has observed that in Spain operators have clearly opted for FTTH topologies.

7.3 Historic NGA regulatory obligations

Since 2009, NGA regulatory obligations in Spain have been focused on passive access remedies (duct access[257] and in-building wiring[258]).

An active access remedy, FTTH bitstream (NEBA)[259] was also mandated, but with forbearance on regulation of speeds greater than 30Mbit/s in order to provide appropriate incentives for infrastructure-based competition. NEBA is subject to ex ante charge controls on the basis of cost-orientation. This has been implemented through a BU-LRIC+ model and includes an allowance for risk. CMT and its successor CNMC had previously pursued other methods to set wholesale charges (such as a retail minus approach with the Telefonica 100Mbit/s retail broadband service as a reference), but charged this approach to cost-orientation with an allowance for risk to address comments raised by the European Commission (see Annex 3).

7.4 Addressing risk in the pricing approach for NEBA (FTTH bitstream)

The CNMC Resolution of 22 January 2009 on markets 4 and 5[260] notes that, in according with the Commission (2010) NGA Recommendation,[261] the wholesale price for fibre must adequately reflect the specific risk of investing in fibre.

256 CNMC interview October 2015
257 SMP regulation. Subject to cost-orientation since 2009 (top-down approach cross-checked through bottom-up model). No risk adjustment.
258 Mandated under symmetric regulation since 2009– 'fair and reasonable' pricing (interpreted to mean that the charges cover costs and do not provide a competitive disadvantage deterring sharing. Prices were subsequently settled through a dispute brought by Orange and Vodafone in June 2014
259 Available at regional interconnect points
260 The markets formerly defined in the 2007 Commission Recommendation on Relevant Markets for wholesale physical access and wholesale broadband access
261 2010/572/EU

In practice, the risk associated with FTTH deployment is addressed through the addition of a mark-up on the WACC used for FTTH bitstream (NEBA). In a Resolution of February 28 2013[262] CNMC described[263] how the risk premium in the WACC for fibre wholesale services should be calculated.

The methodology applied is based on a discounted cash flow (DCF) model. In order to assess the appropriate risk premium, the CNMC established two business cases, one with NGA (scenario 1) and another with conventional broadband technology (scenario 2).

In both cases there is competition, with alternative providers having a share of 30% with possible deviations of +/- 10%. In the NGA case there are forecasts of demand with an uncertainty factor. In the other case there is no uncertainty regarding demand. The period within which NGA demand develops varies by a factor of 15.75 %.[264]

For both business cases, 50,000 Monte Carlo simulations are run in which the uncertain factors are assigned random values. For both business cases there are then 50,000 results regarding the IRR which bring the present value to zero. CNMC determines the range within which 90% of the values of the IRR lie. Finally they compare the lower limits of the two ranges, and take the difference as the expression of the higher risk of the NGA business case.

The value for the risk premium was set at 4.81%, and is valid during three years after the publication of the resolution. The FTTH WACC including the risk premium is : 9.6%+4.81%=14.41%.

The risk premium is only considered for the NGA access network, and therefore excludes xDSL equipment, monitoring and information systems.

Further details of the methodology used to calculate the mark-up are described in annex 1.

It is notable that in choosing thie methodology, CNMC rejected an approach of addressing FTTH risk through an uplift of the parameter β within a CAPM approach. The reasons given were that:

- β is an appropriate indicator of systemic risk business, but ignores other factors of uncertainty (non-systematic risk)
- The choice of economic sectors with similar risk is considered an abritrary exercise; and
- The parameter β has a high explanatory power of WACC but is not the only factor. Even if existing information from β comparable to the fibre business were available, its application to the calculation of WACC would not entirely reliable, given

262 Resolución sobre el procedimiento de cálculo de la prima de riesgo en la tasa de retorno nominal para servicios mayoristas de redes de acceso de nueva generación (MTZ 2012/2155)
263 See Annex
264 The method for estimating this value is unclear

that uncertainty and volatility directly affects the capital structure of investment projects thus impacting the average cost of the weighted capital itself. In this circumstance, an adjustment of the parameter β would not correctly capture the full impact of uncertainty on project-based investment.

Annex 2 describes the other methodologies considered to address FTTH risk, and the reactions of stakeholders to these proposed methodologies.

7.5 The 2015 approach – lifting of forbearance

After reviewing the outcomes of its primarily 'passive access' approach, in November 2015 CNMC issued a draft Resolution concerning its market review of markets 3a and 3b[265] in which it has proposed to withdraw the previously applied forbearance on regulation of higher speeds, but at the same time introduce geographic segmentation in the regulatory approach. Specifically, CNMC has proposed complete forbearance (ie withdrawal of NEBA) on NGA active access in 34 major cities[266] where NGA infrastructure-based competition (considered to be regions with at least 3 NGA networks present with each operator individually having at least 20% coverage) is established or could be expected to develop. CNMC notes in this context that "*The extension of regulatory obligations in these municipalities… by imposing, for example, virtual access to the fibre loop, would affect the profitability and economic feasibility of investment plans in NGA networks.*" It views duct access and in-building wiring obligations alongside LLU and SLU as being sufficient to preserve investment incentives and encourage effective competition in these areas.

Outside these 'NGA competitive' zones, CNMC has proposed the introduction of VULA (a form of local NEBA).[267] In uncompetitive areas (characterised by limited LLU-based competition), both VULA and regional access NEBA are proposed to be applied and the speed restriction for NEBA would be withdrawn. The resulting geographically segmented approach to NGA regulation is shown in the following table.

Table 14: Planned geographic segmentation of NGA access regulation in Spain 2015

265 Markets for Wholesale Local Access and Wholesale Central Access within the Commission 2014 Recommendation on Relevant Markets

266 Representing around 26% of the Spanish population.

267 The VULA product is based on NEBA, but with local access. According to CNMC, the main reason to impose VULA in the upcoming market review is that the fibre network rollout of Telefónica is based on a GPON topology which does not permit physical unbundling. Following the Common Postion on WLA, from BEREC and the Comission Recommendation, VULA is considered the most flexible local access option for ANOs.

	Area 1.1 (34 cities) Competitive in NGA and broadband		Area 1.2 Competitive in broadband		Area 2 Non-competitive	
	Copper	Fibre	Copper	Fibre	Copper	Fibre
VULA				Economic Replicability Test		Economic Replicability Test
FTTH bitstream residential (NEBA)		*		*	Cost-oriented	Economic Replicability Test
FTTH bitstream business (NEBA)	Cost-oriented	Economic Replicability Test	Cost-oriented	Economic Replicability Test	Cost-oriented	Economic Replicability Test

* Previously applied remedy to be withdrawn

Source: WIK based on CNMC draft Resolution Nov 2015

In its Dec 2014 consultation, the CNMC justified the planned introduction of VULA and lifting of regulatory forbearance in non-competitive zones on the basis that - unlike the situation in 2009 – ultrafast broadband services are widespread,[268] and had increased in penetration, accounting for 15% of the broadband access market in Dec 2013.

In justifying the non-imposition of VULA in the NGA competitive zone (Area 1.1), CNMC noted that it would undermine the objectives of (i) promoting network deployment and provision of electronic communications services and (ii) efficient investment in infrastructure.[269]

7.6 Addressing risk in the pricing approach for VULA

The pricing methodology for the newly proposed VULA product is an economic replicability (margin squeeze) test,[270] supported by the introduction of an EoI regime. By allowing pricing flexibility, this approach inherently provides scope for the regulated operator to set wholesale charges in a way which will provide assurance of a fair return. As regards risk, CNMC notes[271] that *products based on FTTH are 'novel' and include features which are clearly*

268 Para IV 4.4.2.1 Dec 2014 consultation on market analysis 3a and 3b
269 CNMC market consultation, p. 78.
270 Margin squeeze test with EEO standard testing 'flagship' retail services. Methodology to be described in further detail at a later stage
271 Section III.4.7.5

superior to those present with uncertain consumer demand, and that FTTH requires a high investment requirement than standard broadband services.

CNMC also justifies the use of a margin squeeze test rather than the previous approach of cost-orientation with WACC mark-up (as taken for NEBA) on the basis that it follows the 2013 Recommendation of the Commission concerning non-discrimination and cost methodologies,[272] and accounts for retail pricing constraints from cable and copper-based broadband including unbundling which apply in a large part of the territory.

A final decision on the VULA pricing regime is expected in 2016.

7.7 Relationship between current and next generation networks

The value of copper and fibre network assets is assessed using current cost accounting based on existing technologies.

Duct cost allocation between copper and fibre networks is based on duct usage - namely the fraction of subducts in the total number of subducts for each street segment used by the given technology.

7.8 Market structure

Prior to the CMT's original NGA decision, there was limited deployment of FTTH/B with around 250,000 lines deployed by Telefonica at the end of 2008.[273] FTTH/B coverage expanded rapidly thereafter, increasing to 10% by 2011 and reaching 45% by the end of 2014. The majority of FTTH lines have been deployed by Telefonica, stimulated by competition from cable operators. However alternative operators have constructed their own FTTH infrastructure in certain cities.[274]

The main operators involved in the widespread deployment of NGA networks are the incumbent Telefónica (FTTH) and the cable operators (including ONO which was acquired by Vodafone in 2014). Additionally, in dense urban areas there are FTTH deployments from Jazztel (subsequently acquired by Orange Spain) and Vodafone.

The following table describes the evolution of NGA rollout by operator and technology between 2013 and 2014. The leading roles of Telefonica and ONO as well as the smaller, but still extensive deployment by Jazztel, can clearly be seen.

272 C(2013) 5761 final
273 IDATE
274 CNMC proposes to deregulate a portion of the territory covering 26% households on the basis of existing and anticipated infrastructure-based competition in NGA

Table 15: NGA rollout in Spain by operator and technology, june 2013-june 2014

RED NGA	Operador	jun-13	Cuota %	jun-14	Cuota %
FTTH	Telefónica	3.907.171	98,7%	7.381.091	71,6%
	Jazztel	6.914	0,2%	1.959.792	19,0%
	Vodafone		0,0%	623.000	6,0%
	Orange	26.975	0,7%	329.988	3,2%
	TeleCable	13.032	0,3%	15.879	0,2%
	Resto	3.650	0,1%	4.125	0,0%
TOTAL FTTH		**3.957.742**	**100%**	**10.313.875**	**100%**
DOCSIS 3.0	Ono	7.102.115	74,0%	7.272.763	73,7%
	R	885.171	9,2%	928.096	9,4%
	Euskaltel	907.870	9,5%	910.954	9,2%
	TeleCable	406.711	4,2%	409.402	4,2%
	Procono	297.624	3,1%	342.596	3,5%
TOTAL DOCSIS 3.0		**9.599.491**	**100%**	**9.863.811**	**100%**

Source: CNMC.

Take-up of speeds above 30Mbit/s increased from less than 2% of broadband connections at the end of 2010 to 24% at the end of 2014, while take-up of speeds >100Mbit/s is above the EU average a 11% of broadband subscriptions.[275] These changing market dynamics were cited by the CNMC as justifying its planned change in regulatory approach.

By technology, DOCSIS 3.0 has the largest share of fast broadband connections with 49.3%, followed by FTTH with 36.7% and VDSL2[276] with 14.1% The subscriptions by technology and resulting market shares for each of the main operators are shown in the following table. It is clear from the data that Telefonica retains the majority of FTTH retail connections.

275 Digital Agenda Scoreboiard – data via Communications Committee
276 VDSL in Spain is mainly deployed at the Central Office, rather than in conjunction with FTTC

Table 16: Fixed broadband subscriptions by operator and technology, June 2014

Operador	xDSL	HFC	FTTH	WiMAX-LMDS	Otros	Total accesos	Cuota
Telefónica	4.865.273		860.526	58	14.344	**5.740.201**	**46,1%**
Orange	1.816.949		12.863			**1.829.812**	**14,7%**
Ono	70.191	1.505.191				**1.575.382**	**12,6%**
Jazztel	1.411.907		61.144			**1.473.051**	**11,8%**
Vodafone	1.071.040		4.447			**1.075.487**	**8,6%**
Euskaltel	1.965	259.918		3.514	9	**265.406**	**2,1%**
R	20.116	192.937				**213.053**	**1,7%**
TeleCable	1.655	112.998	8.843		600	**124.096**	**1,0%**
Resto	37.967	51.937	3.353	64.364	119	**157.740**	**1,3%**
Total accesos	**9.297.063**	**2.122.981**	**951.176**	**67.936**	**15.072**	**12.454.228**	**100,0%**

Source: CNMC.

As of end 2014, take-up of the fibre-based bitstream product NEBA was less than 2% of Telefonica's total FTTH lines.[277] This is in contrast with significant access-based competition in standard broadband, where LLU accounted for 38% of xDSL lines and 32% of all broadband lines.

277 NRA questionnaire March 2015 – data as of end 2014

Annex 1 – WACC calculation methodology

WACC: calculation methodology.

In Spain the Weigthed Average Cost of Capital is calculated following the next formula:

$$WACC = K_e * E/(D+E) + K_d * (1-t) * D/(D+E)$$

Where:

K_e: Cost of the own resources
K_d: Cost of debt
E: Value of the own funds
D: Value of debt
t: Tax rate

Where:

$$K_e = Rf + \beta_l * Pm$$

Where:

Rf: Risk free rate
β_l: Unlevered Beta
Pm: Market risk Premium

Figure 5 shows the values of each parameter in the mentioned formula considered by the incumbent operator, Telefónica

TELEFÓNICA FIJO Y MÓVIL 2014			
Parámetros	WACC 2012	WACC 2013	WACC 2014
Risk free rate [Rf]	5,53%	6,02%	4,34%
Market risk premium [Pm]	5,80%	6,10%	6,98%
Unlevered Beta [β_u]	0,4920	0,4985	0,5065
Leverage ratio [D/E]	0,90	0,98	0,93
Nominal tax [t]	30,00%	30,00%	30,00%
Re-levered Beta [β_l]	0,8021	0,8394	0,8373
Average cost of debt before taxes [K_d]	5,96%	5,78%	4,30%
D/(D+E)	47,38%	49,42%	48,27%
E/(E+D)	52,62%	50,58%	51,73%
Cost of the own resources [K_e]= Rf+(Pm*β_l)	10,18%	11,14%	10,18%
Cost of debt [K_d`]= K_d*(1-t)	4,17%	4,05%	3,01%
WACC after taxes [WACC = (E/(D+E)*K_e)+(D/(D+E)*K_d')]	7,33%	7,64%	6,72%
WACC before taxes = WACC/(1-t)]	10,48%	10,91%	9,60%

Source: CNMC: Resolución relativa a la tasa anual de Coste de capital a aplicar en la contabilidad de costes de Tesau, TME,Vodafone y Orange del ejercicio 2014. WACC/DTSA/1819/14/WACC 2014 OP INTEGRADOS

Risk premium: calculation methodology.

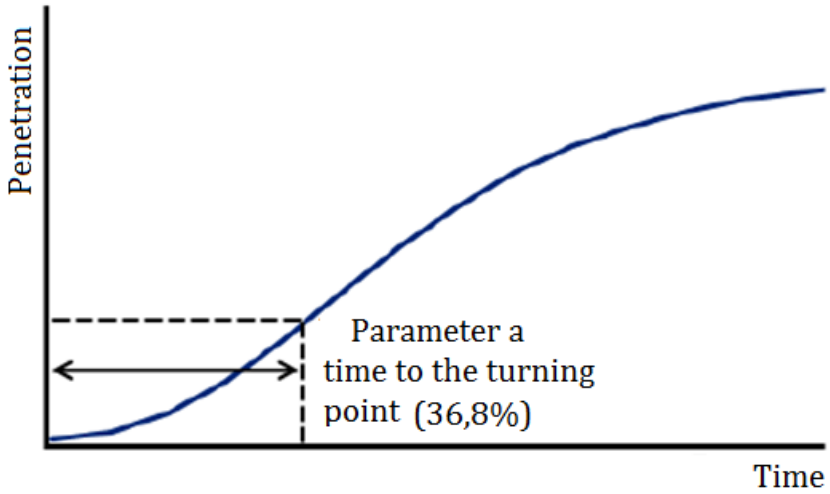
For the Montecarlo simulations, the demand projections are estimated over Gompertz curves which are briefly described in the following lines:

Gompertz model: $$d(t) = m \times e^{-e^{-b(t-a)}}$$

Where:

- d Service penetration in year t
- m Potential market
- a is the time in years for the DFC model
- b parameter to define the elongation and shape of the curve

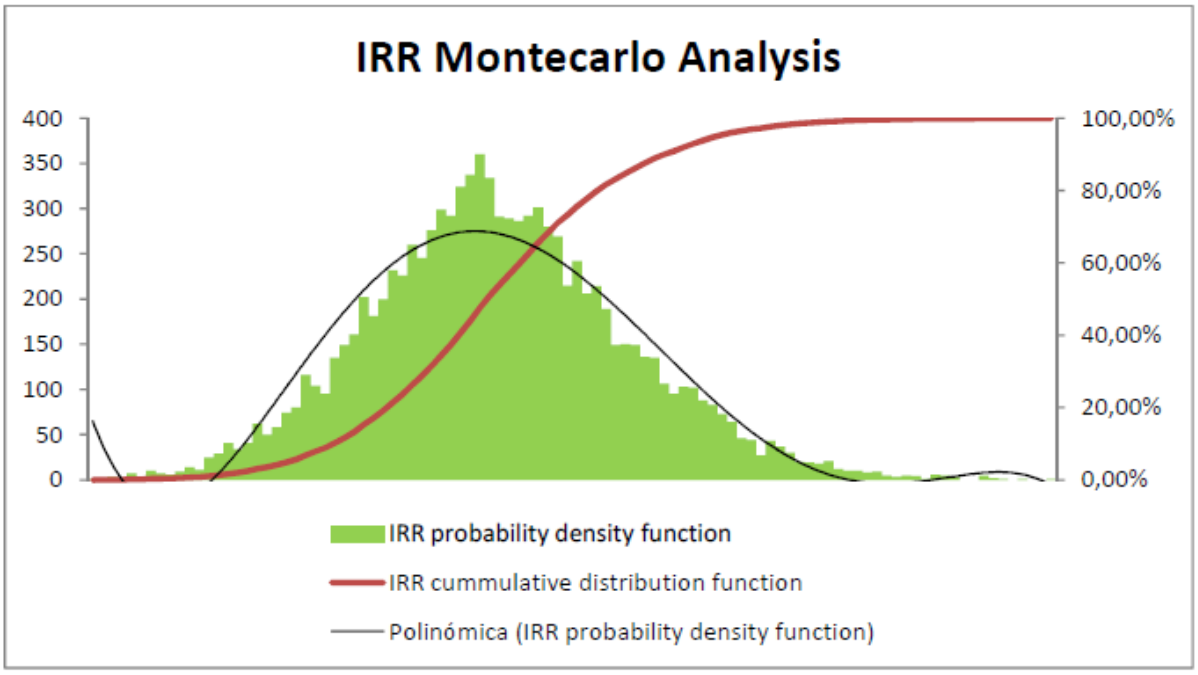
Example of the Gompertz curve:



Source: CNMC.: Resolución sobre el pocedimiento de cálculo de la prima de riesgo en la tasa de retorno nominal para servicois mayoristas de redes de acceso de nueva generación. (MTZ 2012/2155)

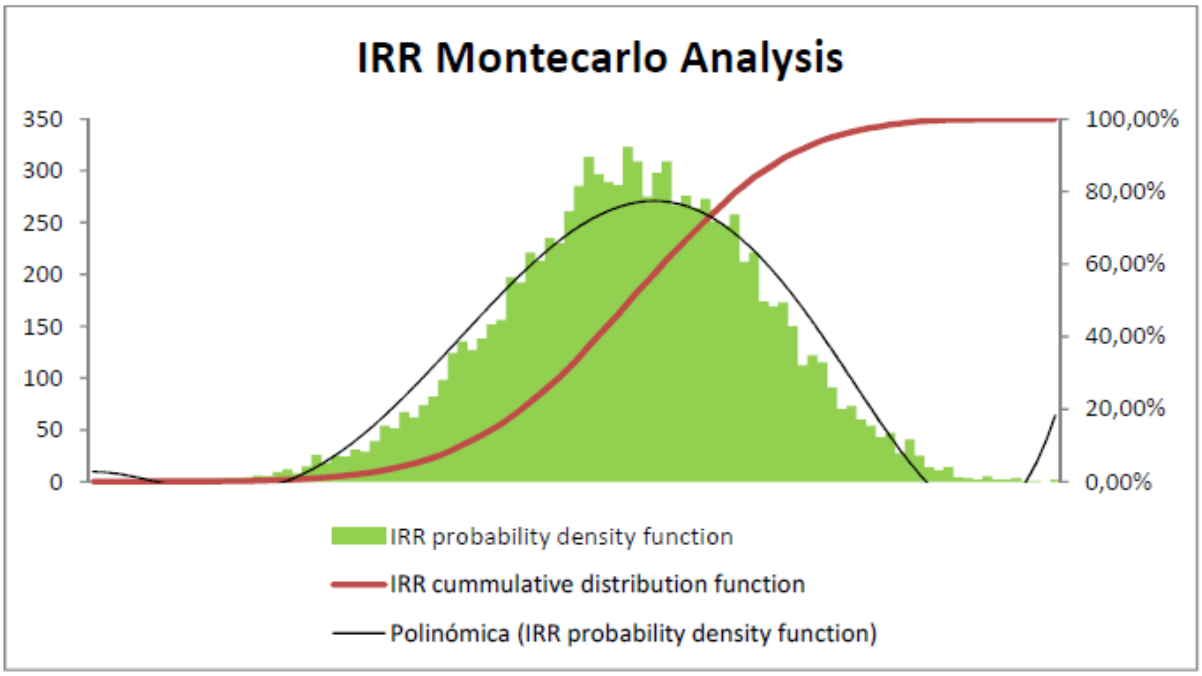
Figures 6 and 7 show the Montecarlo simulations.

Figure 6.Scenario 1: where uncertainty is applied to demand and competition



Source: MTZ 2012/2155

Figure 7: Scenario 2, where uncertainty is applied only to competition



Source: MTZ 2012/2155

The CNMC considers a confidence interval for the IRR measure of 90%, obtaining the risk premium value as the difference between the minumun IRR in scenario 1 and scenario 2, with a value of 4,81%.

Annex 2 – choice of risk premium model

To quantify the impact of sources of uncertainty indicated by the Commission Recommendation[278], CNMC initiated a process of Public Consultation (October,2012[279]), proposing three possibilities for calculating the NGA risk premium:

1. A methodological approach involving the incorporation in the WACC calculation of one value of the parameter β which reflects the risk inherent in NGA assets in comparison with the WACC in a traditional telecommunications business.

2. An approach based on a model that calculates the Discounted Cash Flow(DCF)and the internal rate of return investment (IRR) of an operator deploying FTTH networks in Spain and considers two different demand scenarios, one conservative and one neutral, reflecting the uncertainty. In this case, the NGA risk premium is obtained as the difference of the IRR for each scenario.

3. The third approach is also based on a DCF model which calculates the IRR. One scenario is defined with uncertainty in demand and competition on ultra-fast broadband services and is compared with another scenario with lower risk and uncertainty only on competition (comparable to a ADSL business case).The larger risk of one scenario over the other, results in a larger dispersion of the values of the resulting IRR of Monte Carlo simulations carried out on the model. The NGA risk premium is calculated by comparing the confidence intervals of the chosen IRR of both scenarios.

In the public consultation, five operators (Telefónica,Vodafone, ONO, Jazztel and Orange) discussed the different methodologies:

Vodafone rejected the use of the proposed models because it considered them too theorical and academic. It also highlighted concerns over the lack of availability of the data used to run the models.

The other four operators prefered a method based on a DCF model. The reasons for not considering the parameter β as a risk indicator are:

- The parameter β is an appropriate indicator of systemic risk business, but ignores other factors of uncertainty (non-systemic risk)
- The choice of economic sectors with similar risk is considered an abritrary exercise; and
- The parameter β has a high explanatory power of WACC but is not the only factor. Even if existing information from β comparable to the fibre business were

278 2010/572/UE
279 Consulta pública acerca del cálculo de la prima de riesgo en tasa de retorno nominal para servicios mayoristas de redes de acceso de nueva generación. (Expte. 2012/2155)

available, its application to the calculation of WACC would not entirely reliable, given that uncertainty and volatility directly affects the capital structure of investment projects thus impacting the average cost of the weighted capital itself. In this circumstance, an adjustment of the parameter β would not correctly capture the full impact of uncertainty on project-based investment.

ONO had no preference between the two DFC models.

Jazztel, Telefónica and Orange prefered the third method

Jazztel argued that this method is closer to the desired target, because it compares the higher business uncertainty for NGA with other with lower risk technologies (ADSL). Jazztel adds that the Montecarlo simulation would provide a more robust model.

Orange observed that the method of comparing scenarios with different uncertainty, reflects the competitive environment resulting from alternative deployments, which for the operator, is the main risk factor.

Telefónica considers that the method based on the uncertainty analysis in DCF is the most suitable method although proposes different corrections in the parameters in order to improve it.

Given these answers, CNMC considered that the most suitable method for estimating the NGA risk premium is method 3.

Annex 3 – chronology of NEBA charge control methods and outcomes

The NEBA service has been subject to a charge control on the basis of cost-orientation.

However, traditionally, the CNMC has always considered that prices do not necessarily need to be fully aligned with costs but could be corrected by means of the application of a certain additional margin or mark-up. These corrections are intended to set prices above costs so as to avoid excessively low wholesale broadband access prices disincentivising the implementation of unbundled access or the construction of own infrastructure by alternative operators.

In 2013 CNMC set FTTH bitstream (<30Mbit/s) prices with reference to a) the results of a new BU-LRIC+ model; b) Telefónica's cost accounting results and c) regulated prices in certain Member States. For the determination of the fibre NEBA price, CNMC ultimately applied a retail-minus approximation. This approximation was based on Telefónica´s 100Mbit/s retail offer “Movistar Fibre”.[280]

The Commission commented on the need to conduct a new market review and expressed serious doubts with regard to the lack of sufficient evidence supporting the choice of the price regulation applied in the market. On 28 October 2013 the Commission adopted a Recommendation requesting CNMC to amend or withdraw and notify a new draft measure reconsidering whether a departure from cost-oriented prices was indeed necessary, appropriate, and proportionate. CNMC was further asked to align prices more closely with the cost model.

Consequently, the model was revised and updated in 2015, and prices were aligned with the assessed cost.[281] The revised input parameters included an:

- Update on broadband demand(wholesale and retail) and deployment of Telefonica´s fibre(with data from 2014),
- New WACC value (2014) and lifetime for civil infrastructure,
- Reduction of NEBA demand estimation for 2015 (10,000-15,000 monthly lines for NEBA FTTH and 11,555 lines for NEBA xDSL)
- Update of Telefónica´s IPTV parameters and VoD services.

The charges resulting from the different approaches to charge controls are shown below.

280 CMT states that it uses the Movistar offer of 100Mbit/s (compared to the 30Mbit/s for NEBA fibre) because such reference is available on the retail market.

281 Resolucion sobre la revisión del precio de la capacidad en PAI del servicio de banda ancha mayorista NEBA (OFE/DTSA/1840/14/Precio capacidad NEBA.

On July 2012,[282] CMT published the original prices for the three NEBA service qualities: Best effort, Gold and Real Time.

The prices are related to the recurrent fee by capacity (traffic) contracted by PAI (indirect access Point) *),* i.e. the capacity based price at the hand-over point for the wholesale bitstream service NEBA.

- 32,62€/Mbps/month for Best Effort,
- 48,93€/Mbps/month for Gold,
- 65,24€/Mbps/month for Real Time,

On January 2014,[283] after the Commission adopted a Recommendation[284] requesting CMT to amend or withdraw and notify a new draft measure. The prices were updated as follows:

- 14,56€/Mbps/month for Best Effort,
- 16,89€/Mbps/month for Gold,
- 19,07€/Mbps/month for Real Time,

In Its final adopted measure,[285] in July 2015, CMT took account of the Commission´s Recommendations. The result was a reduction of 45,2% in the recurrent fee by capacity by PAI. This reduction affects the three NEBA service qualities:

- 7,98€/Mbps/month for Best Effort,
- 9,26€/Mbps/month for Gold,
- 10,45€/Mbps/month for Real Time,

282 Resolución por la cual se acuerda la adopción de una medida provisional relativa los precios del servicio mayorista de banda ancha de Telefónica (NEBA) DT 2011/739
283 Resolución por .la que se revisan los precios de los servicios mayoristas de nada ancha GIGADSL, ADSL-IP y NEBA (Expte. DT 2011/739)
284 C(2013) 7067 final
285 Resolución sobre la revision del precio de la capacidad en PAI del servicio de banda ancha mayorista NEBA. OFE/DTSA/1840/14/Precio capacidad NEBA.

8 Sweden

8.1 Summary characteristics

Context

Sweden is characterised by early deployment of FTTH led by municipal networks such as Stokab, which was formed in 1994[286] to serve the capital city Stockholm, and commercial fibre pioneer Bredbandsbolaget (B2), which was acquired by Telenor in 2005. In December 2008, prior to the completion of the NRA's first market NGA market analysis, Sweden already had FTTH/B coverage of more than 20% of total households[287] (corresponding to about 1m homes). In March 2008, Teliasonera announced announced a 5 year programme to install FTTH and FTTC/VDSL2 to between 1.5 and 2m homes.[288]

Regulatory approach

The Swedish NRA PTS's original NGA decisions date from 2010. These covered both FTTH and FTTC/VDSL. The main remedy for FTTH was fibre unbundling (ODF access), which was possible due to the installation of point to point infrastructure by the incumbent Teliasonera. Remedies for FTTC/VDSL included SLU, dark fibre backhaul and bitstream access. All copper and fibre wholesale access products were required to be cost-oriented[289] on the basis of a BU-LRIC+ model in which FTTH[290] was taken as the MEA.[291] Fibre access prices were geographically segmented.

Due to the widespread deployment of fibre and tendency for fibre to be deployed in response to demand, PTS did not in 2010 consider that fibre installations to multi-dwelling units presented abnormal business risks. It did not therefore apply any risk allowance on the WACC. FTTC is also not explicitly described as presenting abnormal risks. However, in the context of the development of the LRIC+ model for wholesale pricing in 2011, PTS introduced an alternative adjustment to account for perceived risk associated with deploying FTTH to detached houses.[292] PTS permitted the incumbent to charge a price for single dwellings in urban areas based on the rural (mainly detached houses) geotype, because this cost was considered to be more representative of the cost of fibre deployment in any detached house area and reflects the fact that fibre access to single dwellings within cities remain under-served and the risks of underutilisation greater than for multi-dwelling units.

286 See Stokab case study http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=5037
287 IDATE for FTTH Council
288 See http://telekomidag.se/telia-storsatsar-pa-fast-bredband/
289 Charges for bitstream were cost-oriented with the addition of 'economic space' to promote sustainable infrastructure competition
290 Wireless was deemed to be the modern equivalent asset in remote areas
291 Modern Equivalent Asset
292 See Commission decision concerning case SE/2011/1205 – further details of price control remedies

In 2015, the NRA updated its NGA market analyses. In this new decision PTS decided to change its wholesale charging approach for fibre away from cost-orientation towards pricing flexibility subject only to obligations of Equivalence of Input and a margin squeeze test,[293] as recommended in the Commission's 2013 Recommendation.[294] This change will occur from 1 December 2016, on condition that there are sufficient competitive constraints deriving from the successful and timely implementation of Equivalence of Inputs and the margin squeeze test. The rationale given was increased competitive constraints from wholesale access to municipal fibre networks[295] as well as constraints from cable (in a portion of the territory)[296] and copper-based broadband. However, PTS also noted that this approach would help to incentivise further NGA investment.

In addition to adapting fibre unbundling remedies, in its February 2015 market decision, PTS also introduced a new obligation for 'local virtual access to copper infrastructures'. This product is presented as an additional access option which may be useful in circumstances where physical access is no longer economically or practically possible, as scale economies for LLU reduce with the move from copper to fibre or with the introduction of VDSL vectoring. This product is envisaged to be cost-oriented,[297] without any specific risk adjustment. However, no charges have yet been set.

Market outcomes

Following PTS' NGA decisions of 2010, FTTH coverage continued to expand. By the end of 2011, coverage had reached 35%[298] and as of 1 October 2015, FTTH/B coverage in Sweden had reached 54%. At the end of 2010, 14% of connections were already at speeds of 30Mbit/s and above, while in 2014 42% of broadband subsciptions were at speeds of 30Mbit/s or more while a significant 34% were at speeds of 100Mbit/s or more.

293 A margin squeeze test on an EEO basis calculated in accordance with a BU-LRIC+ methodology. Price for wholesale inputs will be calculated as a national average for fibre access. Retail products will be chosen as the two most relevant products in the single unit and multi-dwelling unit segment respectively in terms of volumes and values. New or changed products will be assessed no more than 3 months after launch. the period over which margins are assessed is 12 months – with one-off costs and revenues amortised over the average customer lifetime of 36 months

294 See http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013H0466&from=EN.

295 Although many municipal networks had been based on open access from the outset, a more recent development which has supported the development of competition on municipal networks is the emergence of the so-called 'communications operator' (CO) model, whereby a CO invests in active network equipment and provides virtual access connections to service providers as well as a service portal which enables consumers to select their service provider.

296 Article 7 case SE/2015/1687 - The Swedish market is characterised by significant NGA infrastructure-based competition and voluntary wholesaling from municipal fibre networks. Although cable covers only 38% of households, PTS has indicated that 50% of households have access via two NGA infrastructure providers including the incumbent, while around 10% have access to three infrastructures (eg incumbent, cable and municipal networks).

297 Set by the incumbent in accordance with LRIC+ principles

298 Point Topic for EC broadband coverage 2011

8.2 NRA objectives

PTS' long-term objective is to promote sustainable competition in the electronic communications market. Key mechanisms are to incentivise investment in NGA infrastructures by existing infrastructure providers as well as new entrants. PTS aims to promote infrastructure competition regardless of the network structure, following a *technologically neutral* approach.

Although the existing regime is based on ex ante SMP regulation, due to the presence of many local municipality networks, several of which have a strong position locally, PTS sees a need for more symmetric regulation in the future.

8.3 NGA regulatory obligations

In its original 2010 decision, PTS mandated fibre unbundling (ODF access), SLU and dark fibre backhaul, alongside bitstream access (including fibre-based) (in the context of market 5 of the former EC Recommendatoin on Relevant Markets).

The recent market analysis for market 3a (PTS decision of February 19[299]), 2015 (only in Swedish) on Wholesale Local Access replaces PTS's earlier decision of May 24, 2010. ODF unbundling was maintained. However, key developments were the deregulation of bitstream as the relevant market (3b) was now considered effectively competitive, and the introduction of an obligation to supply VULA on 'copper' (understood to include FTTC). operator summary of the current required wholesale products is shown in the table below:

Table 17: Mandatory wholesale services and pricing obligations (market 3a)

Wholesale service	Determination of the wholesale service
Shared and full copper access	Copper prices are set by the NRA cost oriented according to a BU-LRIC+ model (the same as used for fibre)
Dark fibre access at ODF (Optical Distribution Frame) and other suitable access points	Until EoI (Equivalence of Input) is implemented by the incumbent, dark fibre prices are set by NRA cost oriented- according to a BU-LRIC+ model. After EoI is implemented, prices should be non-discriminatory and set in accordance with the Economic Replicability Test (ERT)[300]
VULA local access for 'copper' (incl FTTC) (a non-contended bitstream service with	To be set by the incumbent according to LRIC principles

299 http://www.pts.se/sv/Dokument/Beslut/Tele/2015/Beslut-om-faststallande-av-foretag-med-betydande-inflytande-pa-marknaden-for-lokalt-tilltrade-till-natinfrastruktur-marknad-3a/)

300 In line with the Commission Recommendation of 11.9.2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment, C(2013) 5761 final.

hand-over in, or in the immediate vicinity of, the local exchange)	Currently no demand, no cost-oriented price has been calculated yet
Duct access	To be set by the incumbent according to LRIC principles
Backhaul from colocation (dark fibre, wavelength or capacity)	Until EoI (Equivalence of Input) is implemented by the incumbent, dark fibre prices are set by NRA on the basis of cost-orientation.

Source: WIK-Consult / PTS (2015)

As of February 2015 market 3b (wholesale central access) became deregulated. PTS found no substantial barriers to entry and a tendency towards effective competition (PTS's decision of February 19, 2015).[301]

8.4 Pricing approach to ODF access (fibre unbundling)[302]

8.4.1 Current approach – calculation of ODF access costs

Currently, all prices for *fibre* wholesale services are cost-oriented following the LRIC+ cost standard. Cost-based charges for both fibre and copper-based services are determined through the same BU-LRIC+ model, which uses fibre technology (assumed to be the Modern Equivalent Asset) to calculate costs for both, with wireless technology assumed to replace copper in low density areas. PTS observed in 2011 that the use of fibre and wireless as the MEA for copper reflects the practice of operators building local access infrastructure in Sweden today and would minimise the forward-looking costs of the infrastructure,[303] and therefore be an efficient choice. The model developed in 2011 used CCA values for all assets including ducts (therefore not reflecting fully depreciated assets). Charges for copper wholesale access are based on an average cost across all geotypes, whereas charges for fibre are distinguished according to different geotypes, which was considered important to reflect varying geographic costs and incentivise infrastructure investment.

The use of the same bottom-up cost-model for copper and fibre based on a single access network[304] with fibre as the MEA avoids the need to apportion duct costs between the two technologies.

301 http://www.pts.se/en-GB/Industry/Telephony/SMP---Market-reviews/Wholesale-broadband-access/.

302 See PTS decision of February 19, 2015 (only in Swedish) on Wholesale Local Access which replaces PTS's earlier decision of May 24, 2010 (only in Swedish):.http://www.pts.se/sv/Dokument/Beslut/Tele/2015/Beslut-om-faststallande-av-foretag-med-betydande-inflytande-pa-marknaden-for-lokalt-tilltrade-till-natinfrastruktur-marknad-3a/

303 PTS estimated that the costs for fully unbundled access based on copper would be similar to or slightly higher than the costs for fully unbundled access based on fibre. The cost increase would mainly be dependent on the decrease in the number of active copper subscriptions – resulting in costs being recovered over a smaller user base.

304 In the theoretical model no co-existence between copper and fibre is assumed

8.4.1.1 Geographic approach to address risks

Since ODF access was first mandated in 2010, PTS has found no specific risk for investments in NGA networks in Sweden because take-up of superfast broadband already stood at 20% at the time. Thus, the WACC underlying the LRIC calculations is the same for all wholesale services, and does not include any risk premium.

However, when the BU-LRIC+ cost model was originally developed in 2011, PTS introduced an alternative approach to address the specific risk relating to the installation of fibre to single dwelling units (standalone houses, in contrast with apartment blocks), which it considered were still be underserved, including in urban areas.

In order to address the perceived higher roll-out risk to this type of housing, PTS concluded that the costs per line of deploying a new fibre network to a detatched house area in urban areas could be set to match to the roll-out costs for such a deployment in geotype 3 (a rural geotype with 5-50 line/km2 mainly consisting of detatched houses). This would result in a higher cost per subscriber in urban areas than would otherwise be the case.

In its 2015 decision, PTS confirmed that this pricing approach would persist for the remaining period of cost-orientation applied to ODF access. The justification given by PTS for this approach is that (unlike fibre to multi-dwelling-units) “fibre to homes is still a relatively undeveloped market, which is associated with high risks, high costs per villa and uncertainty surrounding take-up”. PTS therefore consideres that there is justification for an adjustment to the price of fibre for single dwellings (to reflect low initial usage), and that such an adjustment would serve to promote the expansion of fibre to homes. PTS notes that by using the ‘geotype 3’ cost for all single housing including those in urban areas, TeliaSonera will be compensated for their expense including the higher risk associated with initially lower take-up of these installations.

Volume and long-term discounts on pricing are permitted provided they respect the principle of non-discrimination and thereby avoid favouring individual operators at the expense of others.

8.4.2 New ODF access approach – economic replicability test

In its February 2015 Decision, PTS determined wholesale charges for ODF access until November 2016. However, from 1 December 2016, PTS has decided to change its wholesale charging approach for fibre away from cost-orientation towards pricing flexibility, subject only to Equivalence of Input and an economic replicability (margin squeeze) test (ERT), as recommended in the Commission’s 2013 Recommendation.[305]

305 See http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013H0466&from=EN.

A key rationale for this approach is to incentivise NGA investment, while taking due account of the competitive constraints on NGA pricing which will serve to protect consumers from excessive charges. This change will occur on condition that there are sufficient competitive constraints deriving from the successful and timely implementation of EoI and the ERT. PTS considers that retail prices will be sufficiently constrained by the presence of competing copper-based products, the inputs for which (including VULA) will continue to be price regulated on the basis of cost-orientation, and alternative infrastructures including cable and municipal networks, many of which offer wholesale access on a voluntary basis.

The Economic Replicability Test will consist of a margin squeeze test based on the costs of an Equally Efficient Operator (EEO) and calculated in accordance with a BU-LRIC+ methodology. The price for wholesale inputs will be calculated on the basis of the national average for fibre access. The test will be conducted against two 'flagship' retail products which will consist of the two most relevant products in the single unit and multi-dwelling unit segment respectively in terms of volumes and values. New or changed products will be assessed no more than 3 months following launch. The period over which margins are assessed will be 12 months, which has been justified on the basis of the maturity and relative stability of FTTH services in Sweden. One-off costs and revenues will be amortised over the average customer lifetime of 36 months

8.5 Pricing approach to VULA

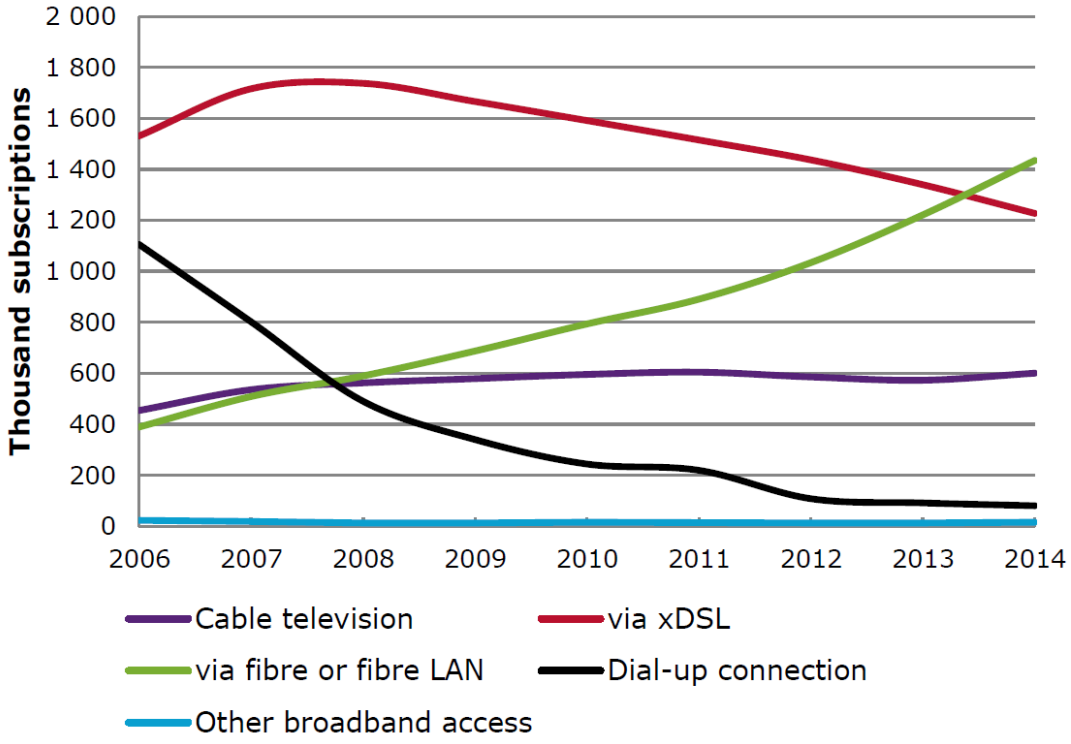
The VULA service is intended to be priced on the basis of cost-orientation, whereby the incumbent will set the price on the basis of LRIC+ principles, without any specific risk adjustment. This service will only be launched when there is demand. However, no cost oriented price has been calculated yet. The VULA will not be subject to an ERT.

8.6 Market structure

The reason for the current high level of maturity for fibre in Sweden is the early deployment of fibre by pioneers in this field such as B2 and municipal networks such as Stokab, which was formed in 1994[306] to serve the capital city Stockholm. In December 2008, prior to the completion of the NRA's first market NGA market analysis, Sweden already had FTTH/B coverage of around 20% of households (around 1m homes),[307] and at the end of 2010, 14% of connections were already at speeds of 30Mbit/s and above. By the end of 2011, coverage had reached 35%[308] and as of 1 October 2015, FTTH/B coverage in Sweden had reached 54%, and was the most prevalent technological solution as can be seen from the figure below.

306 See Stokab case study http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=5037
307 IDATE for FTTH Council
308 Point Topic for EC broadband coverage 2011

Figure 11: Number of fixed internet subscriptions



Source. PTS (2015), The Swedish Telecommunications Market 2014, p. 24

As a result of the FTTH/B developments, speeds of 100Mbit/s or more have also now become the most popular speed range for the first time. There is also an increasing number of Gigabit subscriptions. At the end of 2014 18,000 subscriptions had a speed of 1 Gigabit/s or more, the majority supplied by Broadband2.

PTS reports that there are around 100 undertakings which supply access connections in Sweden. The following table pesents the main NGA fixed network operators in Sweden and the NGA technology they use.

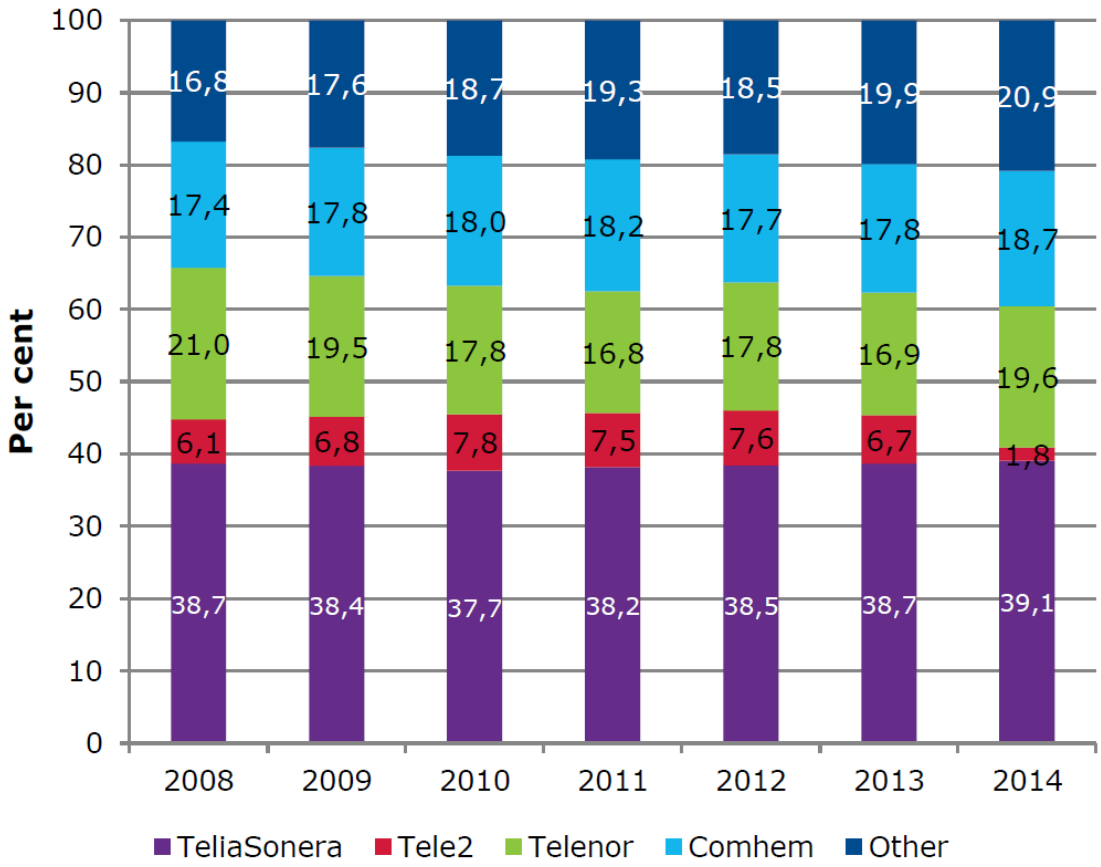
Table 18: NGA fixed network operators in Sweden

Main fixed NGA network operators	Technology used
Telia (wholesale provider via Skanova)	VDSL, FTTH/B
Bredbandsbolaget (Telenor)	VDSL, FTTH/B and wholesale based
Comhem	Fibre Coax, Fibre LAN, FTTB/H
City netwoks (Stadsnet***)	FTTB/H

Source: WIK-Consult, homepages of the network operators

The three largest operators, TeliaSonera, Telenor Com Hem (cable), held a combined 77.4 per cent of the total market for fixed broadband as of the end of 2014. Com Hem's market share increased from 17.8% on Dec 31 2013 to 18.7% over the same period. The acquisition of Tele2's private broadband customers in January 2014 was a major factor in the increase of Telenor's market share from 16.9% to 19. 6%, making Telenor the second largest operator in the market. The transaction also caused Tele2's market share to decline from 6.7% to 1.8%. The combined market share of the other operators increased from 19.9% to 20.9%. The largest of these were Bahnhof and Broadband2, each with 4.2% of subscriptions, followed by AllTele with a market share of 3.4%.

Figure 12: Market share – fixed broadband subscriptions



Source: PTS (2015), The Swedish Telecommunications Market, p. 55

Commercial wholesale offers play a relatively significant role in the Swedish market, influenced by the prevalence of open access municipal networks. PTS reports[309] that in December 2013, the incumbent Teliasonera maintained a 61% share of the total market for external sales of local physical access (copper and fibre unbundling) – ie sales excluding self-supply. This implies that nearly 40% of physical access lines were wholesaled by

309 Article 7 Case SE2015/1687/1688

municipal players and alternative investors such as Stokab. PTS also reports a high degree of commercial wholesaling in bitstream access, supported by the growth of operators which specialise in providing active access on municipal dark fibre networks and selling bitstream offers to retail broadband service providers.