

BEREC Report

Regulatory Accounting in Practice 2019

5 December 2019

Table of Contents

1. Executive summary	5
1.1 Key findings	5
1.2 Future development	7
2. Introduction	8
2.1 Background	8
2.2 Current report	9
2.3 The data collection process	9
2.4 The remedy framework in practice	10
3. Outline of the Results	17
3.1 Regulatory Accounting methodologies (definitions)	17
3.2 Price control methods	18
3.3 Cost base, annualisation and cost allocation methodologies	22
3.4 Combination of price control methods/cost base/allocation methodologies	27
3.4.1 Retail and interconnection markets	28
3.4.2 Products in Market 3a	28
3.4.3 Market 3b and 4	32
3.5 Implementation of the Non-discrimination and Costing Methodologies Recommendation ...	33
3.6 Cost model technical implementation	35
4. Additional Information: structural data	40
Population and country size	41
Market and competitive situation	44
Market shares (Broadband)	48
Annex I – Accompanying tables – Survey 2019	57
Table 1 – Ref Figure 3 – Number of NRAs applying obligations ex art. 9-13 of AD to single products/markets	57
Table 2 – Ref Figure 5 – Geographical remedies/market regulation	57
Table 3 – Ref Figure 6 – Equivalence model	57
Table 4 – Ref Figure 7 – Vectoring regulation	58
Table 5 – Ref Figure 8 – Cable regulation/Presence of wholesale-only operator	58
Table 6 – Ref Figure 12 - Price control main categories	58
Table 7 – Ref Figure 13 - Price control sub category Cost Orientation	59
Table 8 – Ref Figure 14 - Price control sub category Retail minus	59
Table 9 – Ref Figure 15 - Price control sub category Benchmarking	59
Table 10 – Ref Figure 16 – Cost base used	60
Table 11 – Ref Figure 17 – Annualization methods	60
Table 12 – Ref Figure 18 – Cost Allocation methods	60
Table 13 – Ref Figure 19 – Allocation methods LR(A)IC sub categories	61
Table 14 – Ref Figure 20 – Allocation methods LRIC sub categories	61
Table 15 – Ref Figure 22 – Combination price control / costing methodologies (M1 and M2)	61
Table 16 – Ref Figure 23 – Combination price control / costing methodologies (M3a)	62
Table 17 – Ref Figure 25 – Combination price control / costing methodologies LLU service	62
Table 18 – Ref Figure 26 – Combination price control / costing methodologies VULA FTTH/Fibre LLU	62
Table 19 – Ref Figure 27 – Combination price control / costing methods (M3b and 4)	62
5. The Weighted Average Cost of Capital (WACC)	
5.1 Introduction and main goals of the section	
5.2 WACC Nominal Pre-tax synthetic value	
5.2.1 Risk Free Rate	
5.2.2 Equity Risk Premium (ERP)	

5.2.3 Beta.....
5.2.4 The cost of debt
5.2.5 Gearing Ratio
5.2.6 Tax rate.....
5.2.7 Other Adjustments

5.3 Risk premium for NGA WACC (Annex I)
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Annex II - WACC parameter quantitative analysis

Table of Figures

Figure 1 – Market and products monitoring perimeter	10
Figure 2 – AD Art. 9-13.....	10
Figure 3 – Number of NRAs applying obligations ex art. 9 -13 of AD to single products/markets.....	11
Figure 4 – Application of retail margin squeeze test	13
Figure 5 - Geographical remedies/market regulation	14
Figure 6 - Equivalence model.....	15
Figure 7 – Vectoring regulation	15
Figure 8 – Cable regulation/Presence of wholesale-only operator	16
Figure 9 - Price control categories and sub-categories.....	17
Figure 10 - Allocation methodology: categories and sub categories.....	18
Figure 11 - Cost base categories and sub categories.....	18
Figure 12 - Price control main categories.....	19
Figure 13 - Price control sub category Cost Orientation	20
Figure 14 - Price control sub category Retail minus.....	21
Figure 15 - Price control sub category Benchmarking	21
Figure 16 - Cost base used	22
Figure 17 - Annualisation methods.....	23
Figure 18 - Cost Allocation methods	24
Figure 19 - Allocation methods LR(A)IC sub categories	25
Figure 20 - Allocation methods LRIC sub categories	26
Figure 21 - Price control and costing methodologies	27
Figure 22 - Combination price control / costing methodologies (M1/2014 and M2/2014).....	28
Figure 23 – Combination price control / costing methodologies (M3a)	29
Figure 24 – Combination price control / costing methodologies according to SMP retail market share (M3a).....	30
Figure 25 – Combination price control / costing methodologies LLU service	31
Figure 26 – Combination price control / costing methodologies VULA FTTH/Fibre LLU	32
Figure 27 - Combination price control / costing methods (M3b and 4)	32
Figure 28 - EC Recommends	33
Figure 29 - NRA implementation of EC Recommendations	34
Figure 30 - NRAs information on Recommends 37 and 40.....	34
Figure 31 - NRA information on civil infrastructure.....	35
Figure 32 - Asset base applied.....	36
Figure 33 – General network modelling approach	36
Figure 34 - Network architecture applied.....	37
Figure 35 - Network technology applied	37
Figure 36 – Estimated network coverage	38
Figure 37 – Estimated geographical coverage.....	38
Figure 38 – Source used as a base for NGA network coverage in modelling.....	38
Figure 39 - Cost averaging	39
Figure 40 - Efficiency adjustments applied.....	39
Figure 41 - Structural Data Collected	41
Figure 42 - Total Population	42
Figure 43 - Population Density	43
Figure 44 - Metro Population Density	44
Figure 45 - Mobile Broadband Penetration.....	45
Figure 46 - Fixed broadband penetration	46
Figure 47 – Technology share of fixed broadband.....	47

Figure 48 – Fixed broadband market share	49
Figure 49 - DSL broadband market share	50
Figure 50 - FTTx broadband market share.....	51
Figure 51 – Incumbent FTTB/C coverage (via SLU): % of households	52
Figure 52 – Main OAO coverage on own network FTTB/C: % of households	53
Figure 53 – Incumbent FTTH coverage: % of total households.....	54
Figure 54 - OAO coverage on own network FTTH: % of households	55
Figure 55 – OAO cable coverage on own cable network: % of households	56

List of Abbreviations

	A	LR(A)IC <i>Long Run (Average) Incremental Cost</i> LRIC <i>Long Run Incremental Cost</i>
AD <i>Access Directive</i>		
	B	
BU <i>Bottom Up</i> BWA <i>Broadband Wireless Access</i>		
	C	
CAP-M <i>Capital Asset Pricing Model</i> CCA <i>Current Cost Accounting</i>		
	D	
DEA <i>Digital Economic Agenda</i> DSL <i>Digital Subscriber Line</i>		
	E	
EoI <i>Equivalence of Input</i> EoO <i>Equivalence of Output</i> ERP <i>Equity Risk Premium</i> ERT <i>Economic Replicability Test</i> EWG <i>Expert Working Group</i>		
	F	
FDC <i>Fully Distributed Costs</i> FTTC <i>Fibre to the Cabinet</i> FTTH <i>Fibre to the Home</i> FTTx <i>Fibre to the x Connection</i>		
	H	
HCA <i>Historic Cost Accounting</i>		
	L	
LLU <i>Local Loop Unbundling</i>		
		M
		MST <i>Margin Squeeze Test</i>
		N
		NGA <i>Next Generation Access</i> NRA <i>National Regulation Authorities</i>
		R
		RA <i>Regulatory Accounting</i> Rec. <i>Recommendation</i> RFR <i>Risk Free Rate</i>
		S
		SA <i>Shared Access</i> SLU <i>Sub Loop Unbundling</i> SMP <i>Substantial Market Power (regulated operator)</i>
		T
		TD <i>Top Down</i>
		V
		VDSL <i>Very High Bit Digital Subscriber Line</i> VULA <i>Virtual Unbundled Local Access</i>
		W
		WACC <i>Weighted Average Cost of Capital</i> WLR <i>Wholesale Line Rental</i>

1. Executive summary

This is the fifteenth RA annual report which summarises the findings of a detailed survey of regulatory accounting systems across Europe. Information has been gathered from National Regulatory Authorities (NRAs) and covers the implementation of regulatory cost accounting methodologies. It includes the state of play in terms of remedies of market regulation and focuses on price control, and the way in which it is defined in practice. The report provides also (i) elements about structural parameters of each country, (ii) WACC methodologies applied by NRAs and WACC values currently in force. In the future BEREC will calculate several WACC parameters according to the methodologies outlined in the non-binding Commission's WACC Notice (published on 7 November 2019).

The document offers an up-to-date factual report on the regulatory accounting frameworks implemented by NRAs and an assessment of the level of consistency achieved. Where possible, trends and comparisons with data collected in the past years are illustrated.

The report focuses on the analysis of services in key wholesale markets: Wholesale Local Access (Market 3a/2014), Wholesale Central Access (Market 3b/2014) and Wholesale high quality access (Market 4/2014). Moreover the cost base and allocation methodologies used for fixed (Market 1/2014) and mobile (Market 2/2014) termination markets are also reported.

Furthermore, as in last years' report, in order to include factors influencing NRAs regulatory strategy, additional structural data (e.g. population, market and competitive structure, infrastructure) have been collected from NRAs..

The report also looks at annualisation methodologies provided by respondent NRAs. As in last year's report, accounting information for specific products in Market 3a, such as copper access (including LLU, SA, SLU), fibre access (LLU, VULA), dark fibre access and duct access have been further analysed.

The report includes an updated section on the actual implementation of the Termination Rates Recommendation 2009/396 of 7 May 2009.

An evaluation of the implementation of the Recommendation 2013/466/EU on consistent non-discrimination obligations and costing methodologies is also presented (par. 3.6).

The report delivers in Chapter 5 an extended survey on WACC parameters, mainly focusing on market 3a and on the mobile market. The WACC chapter summarises the main methodologies currently used by NRAs and sets out the reasons behind the estimation of single parameters needed to evaluate the cost of capital under the CAP-M model.

The Annex contains a number of tables providing further details on some of the analyses in the report.

1.1 Key findings

The overall picture of the cost accounting methodologies (chapter 3) is relatively stable in comparison to last year with just a small number of changes by NRAs since last year. There are clear preferences for price control methods (cost orientation alone or in combination with price cap, but the overall picture is more differentiated), cost base (current cost accounting – CCA) and allocation methodologies (mainly long run incremental costs (LR(A)IC), with fully distributed costs (FDC) preferred only for few products). The degree of consistent application of methodologies continues to be high and accommodates the use of elements or parameters that reflect national circumstances.

The RA report 2019 provides an analysis more oriented on single products (increasing the scope of monitoring). The 2019 report collects information on 19 main products (13 in 2015).

As a stable result during the past few years, cost orientation remains the most commonly used price control method and it is applied mainly for legacy products, while the Retail minus category, rarely chosen, refers mainly to WLR (figure 12) and to some extent to VULA products.

ERT price control methodology, in line with the Commission Recommendation (2013/466/EU), is mainly used for VULA and for NGA products, even though we observe an increase of NRAs using cost-orientation for VULA FTTH and NGA services.

The most frequent cost allocation approach is LRIC/LR(A)IC, for almost all products/markets. LRIC is the preferred approach specifically in termination markets. In the access market (market 3a) a preference for LRIC/LR(A)IC can be found. In general, when LR(A)IC/LRIC is chosen as the main category, the most common approach is Bottom-up. FDC is the preferred approach for duct access products in Market 4 and WLR. In Market 3b for legacy products both methods are used.

Accounting Separation obligation has often been removed in a quite mature and stable environment, such as LLU services in market 3a (22 NRAs apply this remedy compared to 24 last year). A particular case are termination markets, where NRAs that have determined prices via pure BU-LRIC models have in nearly half of the cases removed the Accounting Separation obligation (17 NRAs out of 33 imposing a price control obligation).

With reference to the asset base used, a top down/accounting approach is still more frequent than a bottom-up model for markets 3b and 4.

In termination markets, in line with the Commission Recommendation 2009/396/EC, a bottom-up approach is more frequent, irrespective of the kind of price control in use.

The analysis of the structural data (chapter 4) confirms that countries start from very different points in terms of population, topography, market situation etc. These factors influence the regulation strategy of NRAs for the wholesale access markets.

Regarding the WACC, the in-depth survey and the update provided in this report (chapter 5) highlights that all NRAs use the Capital-Asset-Pricing-Model (CAP-M)¹ and hence similar parameters for determining the WACC. However, the value of these parameters naturally differs reflecting different national financial market conditions and economic circumstances (e.g. inflation rates, tax rates), the timing of market reviews, and the data sources used. An analysis was made with regard to the different years NRAs took the WACC decision to show the impact of the time variable when taking a WACC decision. This year report also summarizes separately WACC information taking into account only EU countries that are subject to the Article 7 procedure.

A specific focus on fixed and mobile markets shows that there is no significant difference in the methodology used to estimate the WACC.

Overall the 2019 data confirms a consistent approach to regulatory accounting. The latter indicates that NRAs are providing predictable regulatory environments in their countries. The convergence of regulatory accounting approaches is more pronounced for the termination markets whereas we see a more differentiated picture for the wholesale access markets reflecting the different national market situations and structural factors influencing the regulatory strategy.

For the second time the report also provides information about the regulatory and competitive framework in each member state, such as the presence of a geographical regulation, the equivalence model applied, the application of retail margin squeeze test, Vectoring regulation, the cable regulation and the issue of wholesale only operators. Outcomes of the survey are simply reported in a descriptive form.

¹ Cf. BoR (13) 110.

1.2 Future development

Good progress has been made in developing effective regulatory accounting frameworks to meet the needs of NRAs. However, this is a complex and highly technical topic which requires regular maintenance and enhanced implementation of the regulatory accounting framework as competition develops, technology improves and new regulatory challenges emerge. With the upcoming Commission's WACC Notice BEREC will start to calculate certain WACC parameters according to the methodologies foreseen in the Notice to be used by NRAs.

According to the published Commission's WACC Notice as at the 38th Ordinary Plenary Meeting of the BoR BEREC agreed to estimate two of the WACC parameters, namely a country specific RFR and a European ERP in the first half of 2020, and it is foreseen that the estimation of the three company-related parameters (beta, gearing and cost of debt), based on the methodology described in the Commission Notice, will be started in the first half of 2020.

2. Introduction

2.1 Background

The BEREC Regulatory Accounting EWG has been gathering and reporting data from NRAs to provide a high level picture on the obligation of cost accounting, accounting separation and price control in European countries. The report also provides information on the regulatory context in which the obligation is imposed. The scope of the report is twofold: i) to provide a benchmark on regulatory accounting at a single access product level; and ii) to provide a view on the rationale/motivation of the decision on price control and costing methodology as adopted by NRAs.

This is the fifteen annual report summarising the results of the 2019 survey.

The report has been updated since 2005 in order to monitor trends in the degree of harmonisation of regulatory accounting systems across Europe.² By the end of the first quarter 2006 several countries had completed the first round of the market reviews for the 18 markets listed in the 2003 Recommendation; therefore it was possible to evaluate how various NRAs implemented the obligations provided for by articles 9-13 of the Access Directive (for wholesale markets), and the principles contained in the European Commission Recommendation on Cost Accounting and Accounting Separation of September 2005.³ As the Commission issued the 2007 Recommendation that reduced the number of markets susceptible to ex ante regulation, the report focused gradually on a lower number of markets and, more recently, also on how NRAs implement the principles of the Commission Recommendation on consistent non-discrimination obligations and costing methodologies.⁴ In 2014 the Commission issued a new Recommendation that further reduced the number of relevant markets focussing the report on specific products in each market.

Generally speaking, previous years' reports showed a clear trend towards an increasingly consistent approach to regulatory accounting among NRAs.

² - IRG (05) 24 Regulatory accounting in practice 2005.
 - ERG (06) 23 Regulatory accounting in practice 2006.
 - ERG (07) 22 Regulatory accounting in practice 2007.
 - ERG (08) 47 Regulatory accounting in practice 2008.
 - ERG (09) 41 Regulatory accounting in practice 2009.
 - BoR (10) 48 Regulatory accounting in practice 2010.
 - BoR (11) 34 Regulatory accounting in practice 2011.
 - BoR (12) 78 Regulatory accounting in practice 2012.
 - BoR (13) 110 Regulatory accounting in practice 2013.
 - BoR (14) 114 Regulatory accounting in practice 2014.
 - BoR (15) 143 Regulatory accounting in practice 2015.
 - BoR (16) 159 Regulatory accounting in practice 2016.
 - BoR(17) 169 Regulatory accounting in practice 2017
 - BoR(18) 215 Regulatory accounting in practice 2018

³ Recommendation 2005/698/EC replacing Recommendation 98/322/EC on Accounting Separation and Cost Accounting of 8 April 1998. In September 2005 the ERG published a Common Position containing "Guidelines on implementing the EC Recommendation 2005/698/EC", cf. document ERG (05) 29.

⁴ "Recommendation on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment (2013/466/EU)" (C(2013) 5761). BEREC provided detailed input to the public consultation, cf. Document BoR (11) 65. Furthermore it submitted the BEREC Opinion on the draft recommendation on non-discrimination and costing methodologies on March 26th 2013, cf. Document BoR (13) 41.

2.2 Current report

This report provides an update on the status of regulatory accounting systems across Europe. It monitors how regulatory accounting methods have been developed as a consequence of the adoption by NRAs of decisions regarding market analyses. This year's report confirms the trend towards the consistent implementation of accounting methods and models already observed during the last few years.

The report benefits from information collected from 34 NRAs (listed in Appendix 1) with most NRAs responding to the majority of the questions, thus providing a solid base for further analysis and comparison along the years.

The information provided in this report refers to those markets for which remedies are in force (last update 1st April 2019).

2.3 The data collection process

Under the regulatory framework of electronic communications, NRAs can, in principle, use a variety of appropriate regulatory accounting methodologies⁵.

In order to obtain a general view of cost accounting systems across Europe, the Regulatory Accounting EWG has collected a broad range of data from NRAs.⁶

Over time the number of markets considered susceptible to ex ante regulation has been reduced from 18 markets (Rec. 2003/311/EC) in 2003, to 7 in 2007 (Rec. 2007/879/EC) and 5 in 2014 (Rec. 2014/710/EC). Accordingly, the analysis of the regulatory accounting monitoring process has been adjusted.

Although there are fewer markets now subject to ex ante regulation, the number of products in markets 3a, 3b and 4 (according to Rec 2014/710/EC) has increased and has become more differentiated especially with the evolution of NGA networks. This change is reflected in the RA annual report which provides an analysis that year after year becomes more focused on single products (increasing the scope of monitoring). The 2019 report collects information on 18 main products as reported in Figure 1 (13 in 2015).

⁵ For an explanation of how to implement a regulatory accounting system see the ERG (05) 29 "Common position on EC Recommendation on Cost accounting systems and accounting separation under the regulatory framework for electronic communications" (2005/698/EC). Cf. also BEREC response to the Commission's questionnaire on costing methodologies for key wholesale access products in electronic communications, BoR (11) 65.

⁶ The full database contains confidential information and therefore is not published.

Figure 1 – Market and products monitoring perimeter

Market/products	Sketched definitions	
M1 2007	Access to the public telephone network at a fixed location for residential and non residential customers	
M2 2007	Call origination on the public telephone network provided at a fixed location	
M1	Wholesale call termination on individual public telephone networks provided at a fixed location	
M2	Wholesale voice call termination on individual mobile networks	
Market 3a	M3a_ULL	Local loop unbundling service on copper network
	M3a_SLU	Sub loop unbundling on copper network
	M3a_SA	Shared Access service on copper network
	M3a_fiberLLU	Fibre local loop unbundling
	M3a_VULA(FTTC)	VULA on Fiber to the Cabinet Network
	M3a_VULA(FTTH)	VULA on Fiber to the Home Network
Market 3a	M3a_DF (Dark Fiber in the Access segment)	Dark fibre in access network
	M3a_DA (Duct Access in the Access segment)	Duct access on access network
Market 3b	M3b_Access_legacy	Access component of bitstream service on copper access network (from the central office until the CPE)
	M3b_backhaul	Backhaul bandwidth component of bitstream service
Market 4	M4_Active_legacy	Terminating segment on legacy copper network
	M4_Active_NGA	Terminating segment on FTTx network
	M4_Passive	Access to passive infrastructure (dark fiber)
WLR	Wholesale Line Rental	

Source: BEREC RA Database 2019

Before reporting main results on regulatory accounting practices currently in force in the EU, this year's report provides more information on the regulatory and competitive framework in each member state (chapter 2.4). Therefore, the regulatory outcome for the accounting obligation - which is still the main focus of the report - will be described taking into account more evidence on the individual market situation in which remedies have been applied.

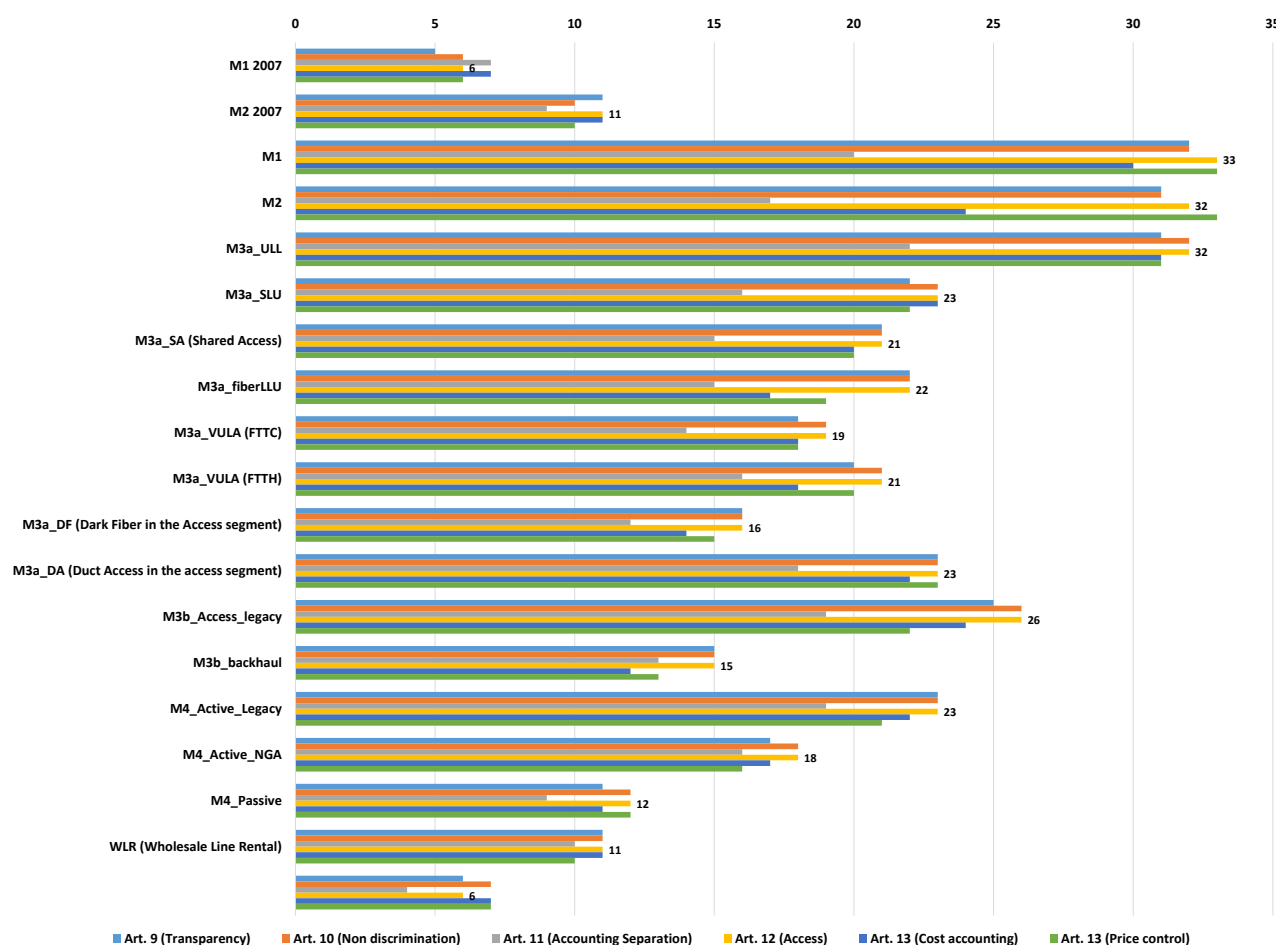
For this reason, for each product/market, the report begins with a picture of the application of regulatory accounting obligation with reference to the following elements of the regulatory context: i) Geographical regulation; ii) Equivalence model applied; iii) Application of retail margin squeeze test; iv) Vectoring regulation; v) cable regulation/wholesale only operator and; vi) main regulatory priority. In this section an overview on the application of the 9-13 articles of the Access Directive for each product included in the survey is also provided. In the motivation section a deeper analysis will follow, taking into account the combination of regulatory accounting obligation and main regulatory priority.

2.4 The remedy framework in practice

Results from the application of the remedies set out from art. 9 to 13 of the Access Directive 2009/19/EC (hereafter AD) – see Figure 2 - are reported in Figure 3 for each of the products included in the survey and shown in Table 1 for each NRA.

Figure 2 – AD Art. 9-13

Article	Obligation
Art. 9	Transparency
Art. 10	Non-discrimination
Art. 11	Accounting Separation
Art. 12	Access to and use of specific network facilities
Art. 13	Cost accounting
Art. 13	Price control

Figure 3 – Number of NRAs applying obligations ex art. 9 -13 of AD to single products/markets⁷

Source: BEREC RA Database 2019

Figure 3 shows that different sets of remedies are applied to each product. Focusing on RA, in general, accounting separation is often imposed together with the cost accounting obligation. Some NRAs consider that it is necessary to impose both these obligations in order to ensure that robust regulatory accounting information is available for each product. This rationale is related to the fact that accounting separation could be useful for vertically integrated undertakings when using cost models for price control, to prevent unfair cross-subsidy (e.g. if the result of the cost model is higher than the cost derived from the accounts of the SMP operator), and when the regulatory framework, in perspective, can become less intrusive (i.e. reducing regulatory burden such as cost orientation). In particular, in a quite mature and stable environment, such as LLU services in market 3a, 22 NRAs reported to apply accounting separation. A particular case are the termination markets where NRAs that have established prices through pure BU-LRIC models have, in some cases, removed the Accounting Separation obligation altogether; only 17 NRAs still maintain the obligation for the mobile termination market whereas 33 NRAs apply a price control obligation.

⁷ Labels report the indication of relevant markets according to the 2014 Recommendation (only M1 and M2 of Recommendation 2007 are added) and of specific access product belonging to each market.

With reference to NGA products, the number of NRAs that adopt at least one remedy has increased since last year. For example, access obligation for fibre LLU increased from 19 to 22 NRAs⁸, but also SMP obligations for VULA and duct access products are more frequent. For fibre LLU, where access obligation is imposed, price control is less frequent; instead, where VULA or duct access are imposed, the obligation of price control is usually set.

Moreover, access obligation is imposed generally together with the obligation of non-discrimination.

In the following, some elements related to obligation details – which are considered to have an important impact on pricing and regulatory accounting – are summarized.

The legal basis for the application of replicability test

The ERT or the traditional margin squeeze test have a two-fold nature: they can be set as a price control remedy (art. 13 of the AD), or as a non-discrimination remedy (art. 10 of the AD). This is in line with the principle that the replicability test must be undertaken by NRAs in light of the regulatory objective to promote sustainable competition and efficient investment and it must be based on the specific competitive concerns identified in the market analysis.

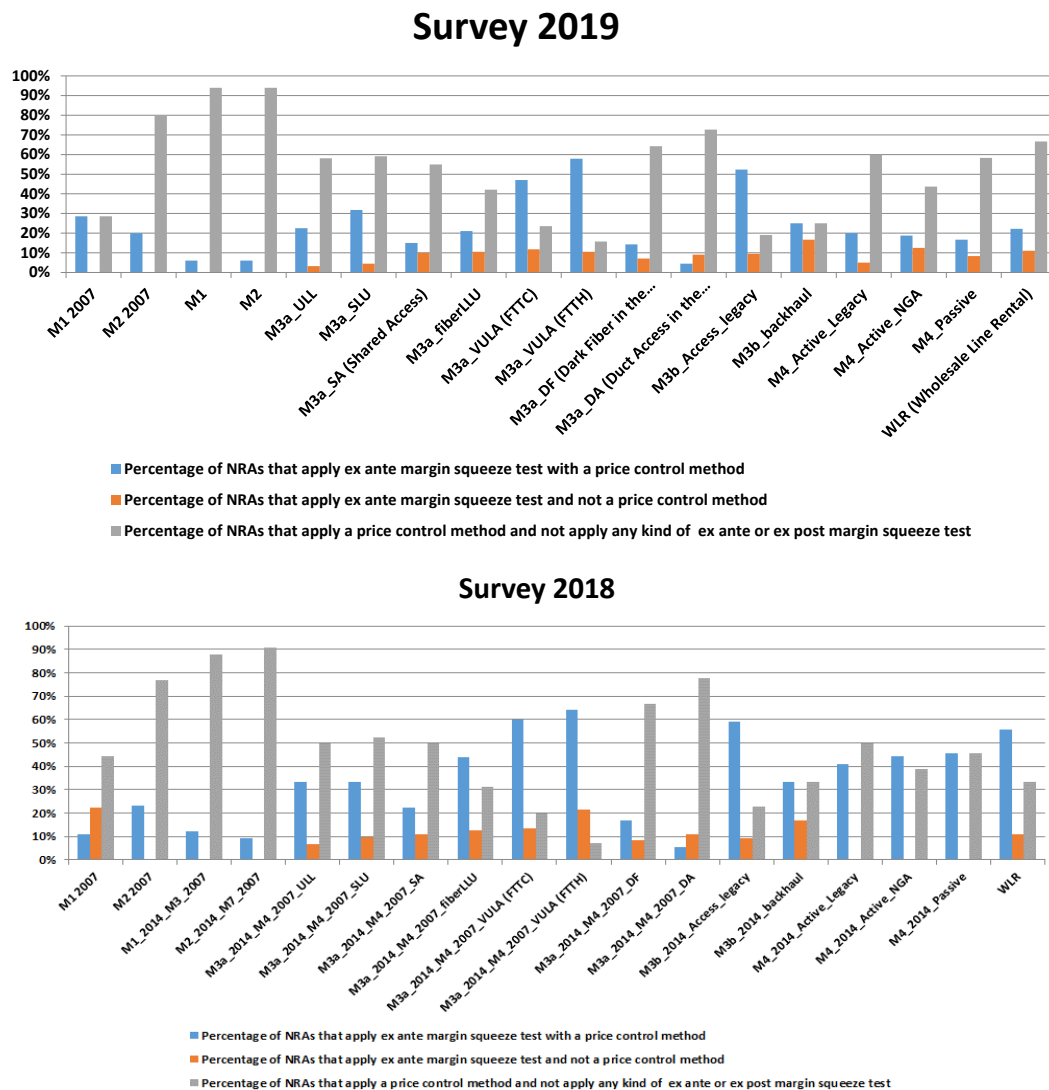
However, also a contrary case exists: art. 13 is imposed in some cases even if “No price control” is declared as a price control method. In this case art. 13 is required as a legal basis to ensure that the cost orientation obligation may be tested ex-post without an explicit imposition of an ex-ante price control methodology; in that case the general imposition of art. 13 as legal basis is a tool to enforce the non-discrimination obligation and to ensure the availability of financial information on the regulated activity with the objective to provide certainty.

It may be observed that a combination of price control and a retail margin squeeze test/ERT test is applied only for specific access products (e.g. the flagship wholesale products on which the retail margin squeeze test is applied). Last year's report shows that for example for LLU services 30% of NRAs that have a price control method apply also a form of an ex ante replicability test; this year the percentage is decreased. For VULA FTTH this percentage still reaches 60% (Figure 4), indicating that the application of the margin squeeze test becomes more relevant for products based on NGA. In general, in comparison to 2018, the percentage of NRAs that apply a price control method and do not apply any margin squeeze test is increasing (while the opposite scenario - margin squeeze test or ERT without any price control – is stable).

Up to now, the statement of the Recommendation on costing methodology on the ERT for NGA products as the alternative for ex ante price control is not fully applied. Summing up, margin squeeze tests are used mainly as complementary measure for a price control method, within the article 13 legal framework. 2019 data confirms that a retail margin squeeze test (ex-ante or ex-post) is less frequently imposed on legacy products, access to infrastructure and dark fibre, in this case consistent with the 2013 Recommendation.

⁸ One NRA (FR) applies an obligation to unbundle the fibre loop, but it is imposed via a symmetric framework regulation, which, for the purpose of this report, is not considered a SMP remedy.

Figure 4 – Application of retail margin squeeze test



Source: BEREC RA Database 2019

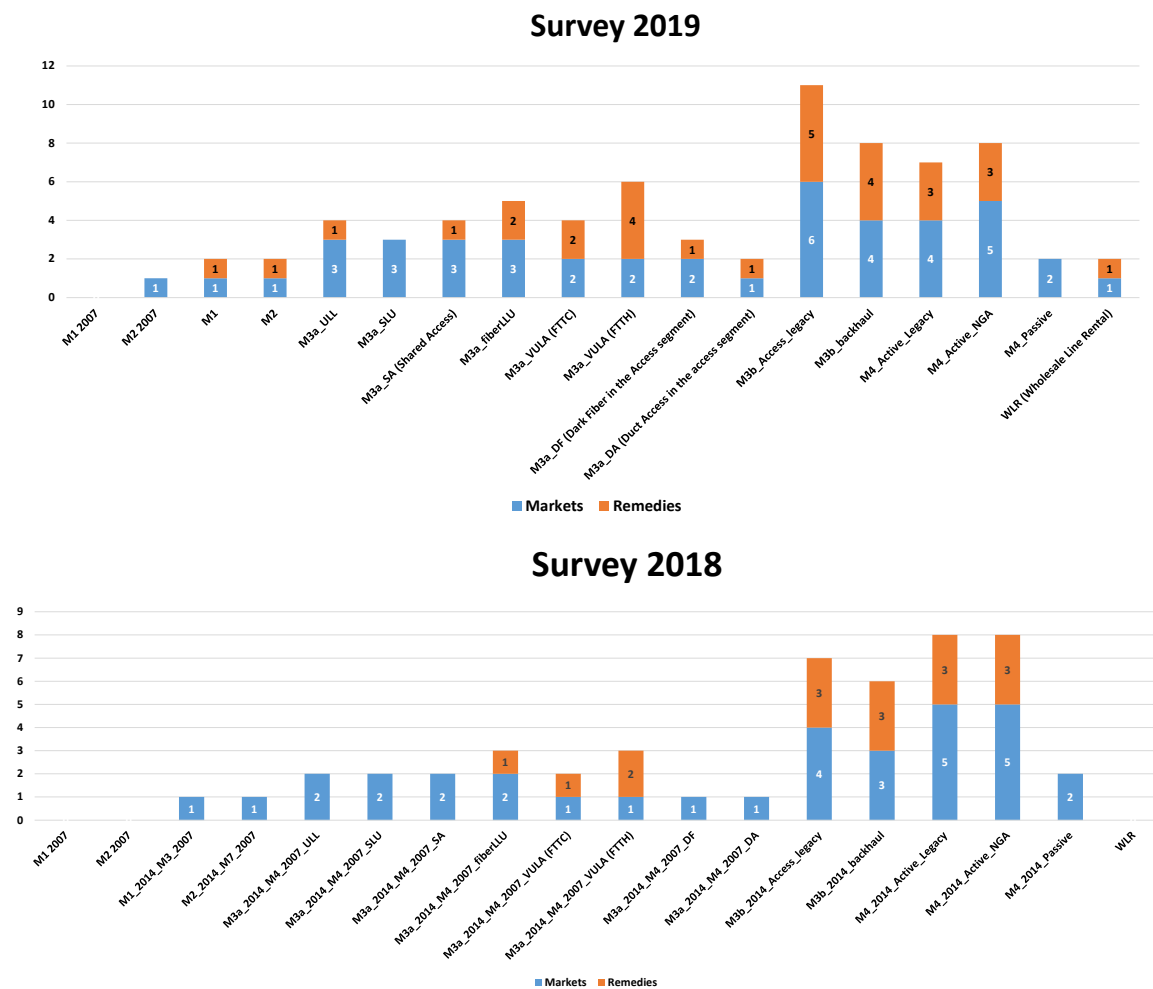
Geographical regulation

Figure 5 reports an overview of the application on geographical aspect of regulation. Some NRAs apply a geographical approach to regulation in terms of market segmentation, others in terms of remedies.⁹

Forms of geographical regulation relate primarily to markets 3b and 4. Comparing 2019-2018 data, it appears that the geographical approach to the ex-ante regulation is getting more important in all markets with a specific role taken by legacy products in market 3b.

⁹ In some cases (i. e. in BE) the geographical regulation is not yet in force although it has been approved.

Figure 5 - Geographical remedies/market regulation



Source: BEREC RA Database 2019

Equivalence model

In the 2019 questionnaire NRAs were asked to provide information on the Equivalence model in force for different products. The options provided were: EoI¹⁰, EoO¹¹ and “Other”¹². Figure 6 below shows the outcome.

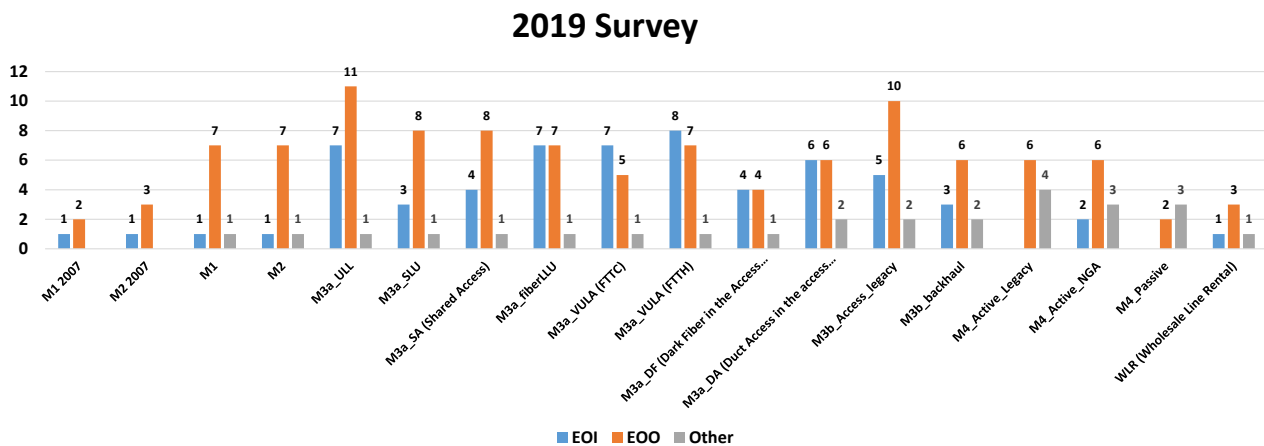
As it refers to a non-discrimination regulatory framework that needs some time to be implemented, the situation is stable with reference to the previous year.

¹⁰ ‘Equivalence of Input (EoI)’ means the provision of services and information to internal and third-party access seekers on the same terms and conditions, including price and quality of service levels, within the same time scales using the same systems and processes, and with the same degree of reliability and performance. EoI as defined here may apply to the access products and associated and ancillary services necessary for providing the ‘wholesale inputs’ to internal and third-party access seekers.

¹¹ ‘Equivalence of Output (EoO)’ means the provision to access seekers of wholesale inputs comparable, in terms of functionality and price, to those the SMP operator provides internally to its own downstream businesses albeit using potentially different systems and processes.

¹² ‘Other’ is a residual option for enhanced non-discrimination obligation not properly filed under EoI/EoO.

Figure 6 - Equivalence model

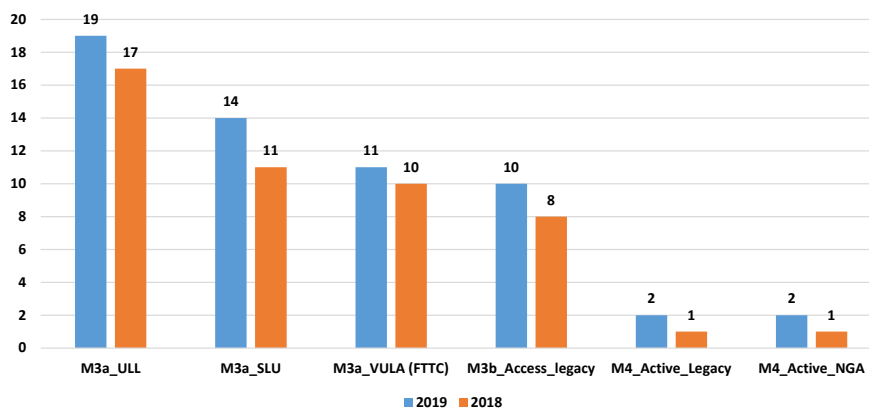


Source: BEREC RA Database 2019

Vectoring deployment

Information on vectoring regulation in case VDSL2 xDSL standard is deployed by the incumbent operator has been collected since it may have an impact on access obligation (efficiency vs. competition), on access pricing and, more in general, on the application of the ladder of investment principle. Figure 7 reports the number of NRAs that subjected to regulation the possibility to implement vectoring on relevant products for access markets 3a, 3b and 4.

Figure 7 – Vectoring regulation



Source: BEREC RA Database 2019

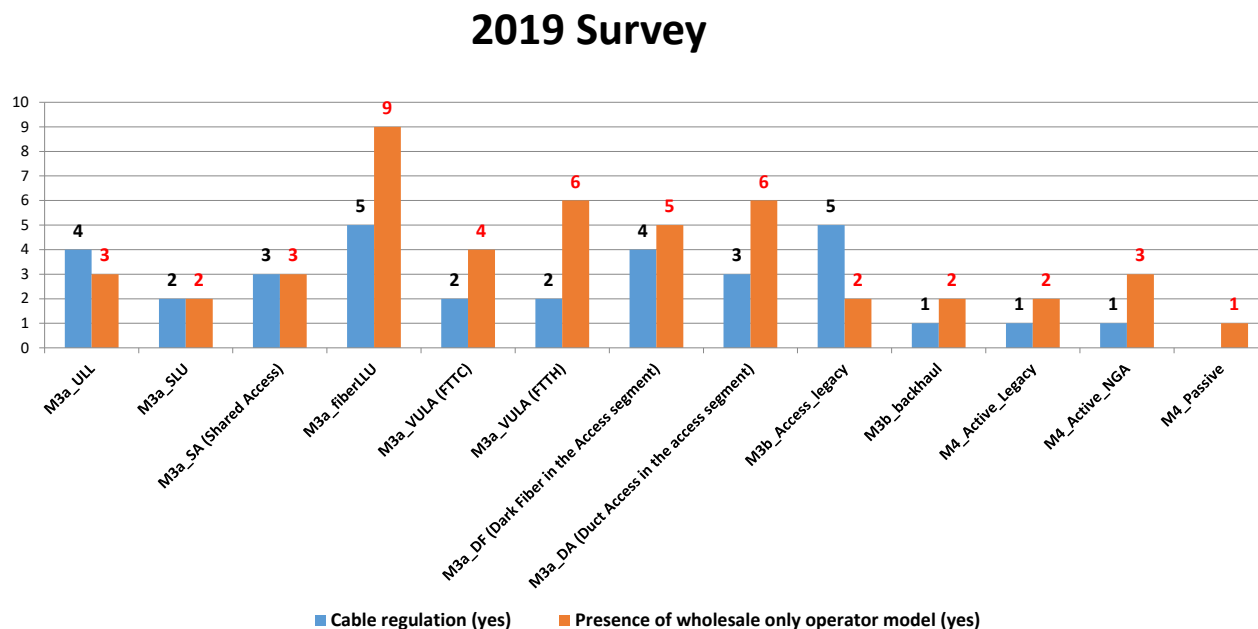
The number of NRAs that take specific decisions on vectoring allowing the use of this technology is increasing with respect to the previous year.

The most significant record is for VULA FTTC: 11 NRAs out of 18 that have imposed an access obligation have also regulated the use of a vectoring solution by the SMP operator.

Cable regulation/wholesale only operator

NRAs were asked to provide information for each product/market on (i) the regulation of cable operators and (ii) the presence of operators following a wholesale-only operator business model (Figure 8).

Figure 8 – Cable regulation/Presence of wholesale-only operator



Source: BEREC RA Database 2019

The situation remains unchanged from to the previous year.

Replies highlight that only few NRAs regulate cable operators in access markets (5 NRAs).

Operators with a wholesale-only model offer mainly fibre LLU (9 NRAs) and VULA FTTH (6 NRAs).

9 countries have a wholesale-only fibre offer; in these cases 6 NRAs imposed also fibre LLU access obligation - with a price control obligation - for the SMP integrated operator.

3. Outline of the Results

3.1 Regulatory Accounting methodologies (definitions)

With reference to regulatory accounting methodologies, a set of predefined options has been used in order to improve data comparability while providing a more detailed picture over the years.

Price control

For the price control methodology the following categories and sub categories have been considered (Figure 9).

Figure 9 - Price control categories and sub-categories

Price control Main category	Subcategory 1 Cost orientation	Subcategory 2 Retail minus	Subcategory 3 Benchmarking
Cost_Orientation	Cost orientation alone	Ex - ante retail traditional MS test	Benchmarking in compliance with Recommendation of 11 Sept 2013 (access market)
Retail_minus	Price cap alone	Ex - ante wholesale MS test	Benchmarking in compliance with Recommendation of Termination Rates Recommendation of 7 May 2009
Benchmarking		ERT (Economic Replicability Test)	
Others/Combination		Fair and reasonable pricing	
No price control		Retail minus	

Source: BEREC RA Database 2019

The sub category “price cap” is included in the sub category “cost orientation” as it is generally derived from a cost computation.

For the purpose of this report, the two sub-categories, Economic Replicability Test (ERT) and Margin Squeeze Test (MST) are defined as follows. ERT is a “lighter” test (with respect to MST) providing more price flexibility to the SMP operator (according to the relevant provisions of the Recommendation on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment 2013/466/EU). The traditional ex ante MST currently applied by NRAs mainly as a complementary tool to price control, define a strict level of parameters within which NRAs presume that alternative operators have enough scope for fair competition, i.e. if these limits are passed a margin squeeze is found (i.e. the test failed) and the price setting of the SMP operator would be considered anti-competitive.

Allocation Methodologies

With reference to the cost allocation methodology used for regulatory decisions, the following categories and sub categories have been set (see Figure 10).

Figure 10 - Allocation methodology: categories and sub categories

Main categories	Sub-categories
LR_A_IC	TD-LR(A)IC+
	BU-LR(A)IC+
LRIC	Pure LRIC
	TD-LRIC
	BU-LRIC
FDC	

Source: BEREC RA Database 2019

The LR(A)IC and LRIC categories refer in both cases to a modelling approach used for estimating the cost of the services; FDC refers to the fact that the cost of the services are determined taking into account the results of the regulatory accounting system of incumbent operators. LR(A)IC and LRIC categories are differentiated for the inclusion of common and joint cost in the final cost of services. It is expected that if an NRA chooses LR(A)IC or LRIC categories a bottom up or a top down approach are in use.

For a bottom up asset base we refer to the fact that the asset and operative costs included in the service cost calculation are taken from a theoretical network model . In a top down approach the asset and/or operating cost information is taken directly from the incumbent operator's cost accounting data, thus incorporating the level of (in)efficiency of the incumbent operator in providing the services¹³.

Cost base

For the cost base used, the traditional categories of HCA and CCA have been identified (see Figure 11 below).

Figure 11 - Cost base categories and sub categories

Cost base
HCA
CCA

Source: BEREC RA Database 2019

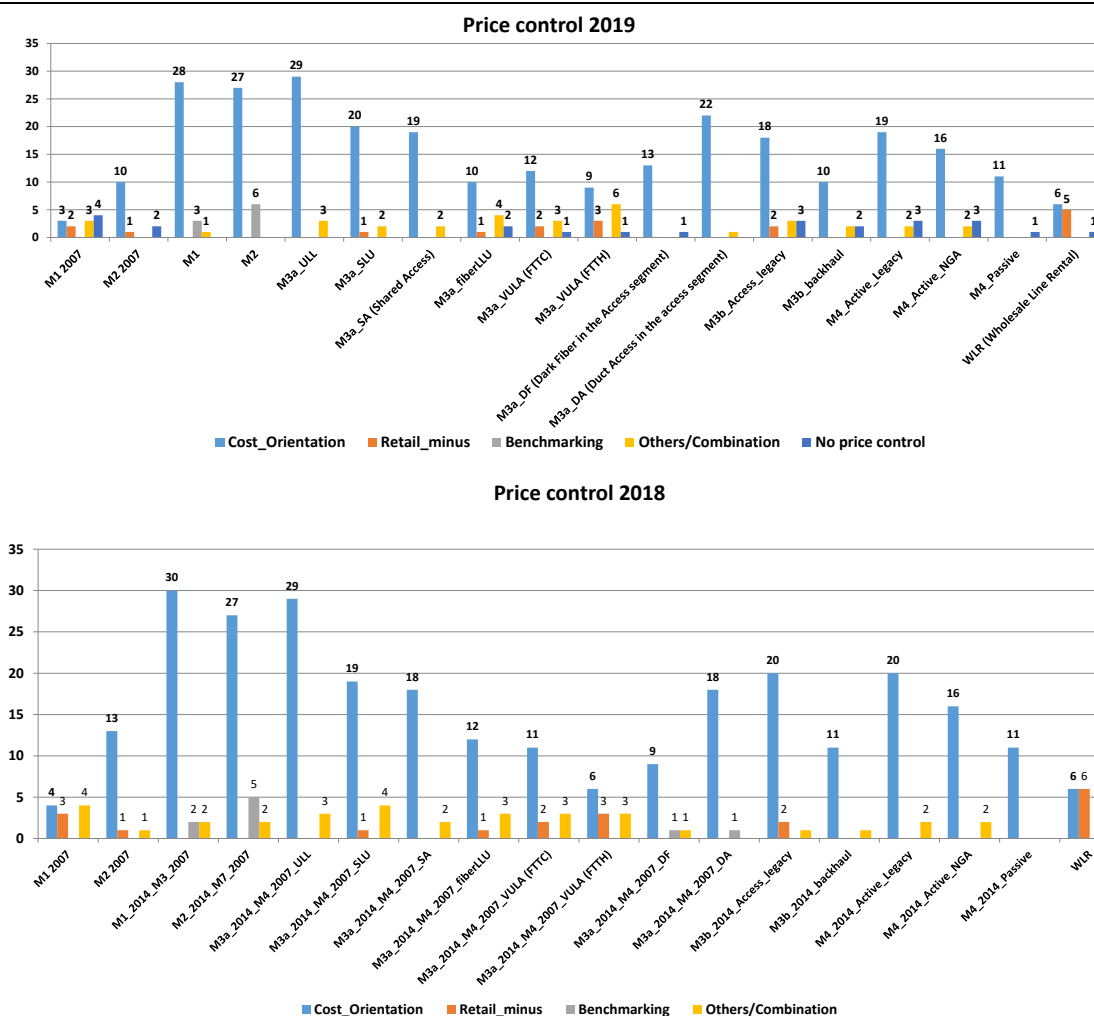
3.2 Price control methods

The following figures gives an overview - according to the main categories and sub categories previously reported - of the price control methods used by NRAs to regulate markets and products (2019 records and 2018¹⁴ are reported).

¹³ The replies to the questionnaire refer to the "main" allocation methodology in use for each product market, even if the whole approach for service calculation can be a mix of methodologies that can refer to more than one category or sub category in the final decision.

¹⁴ 2018 figures are the same as included in BoR(18) 215.

Figure 12 - Price control main categories



Source: BEREC RA Database 2019

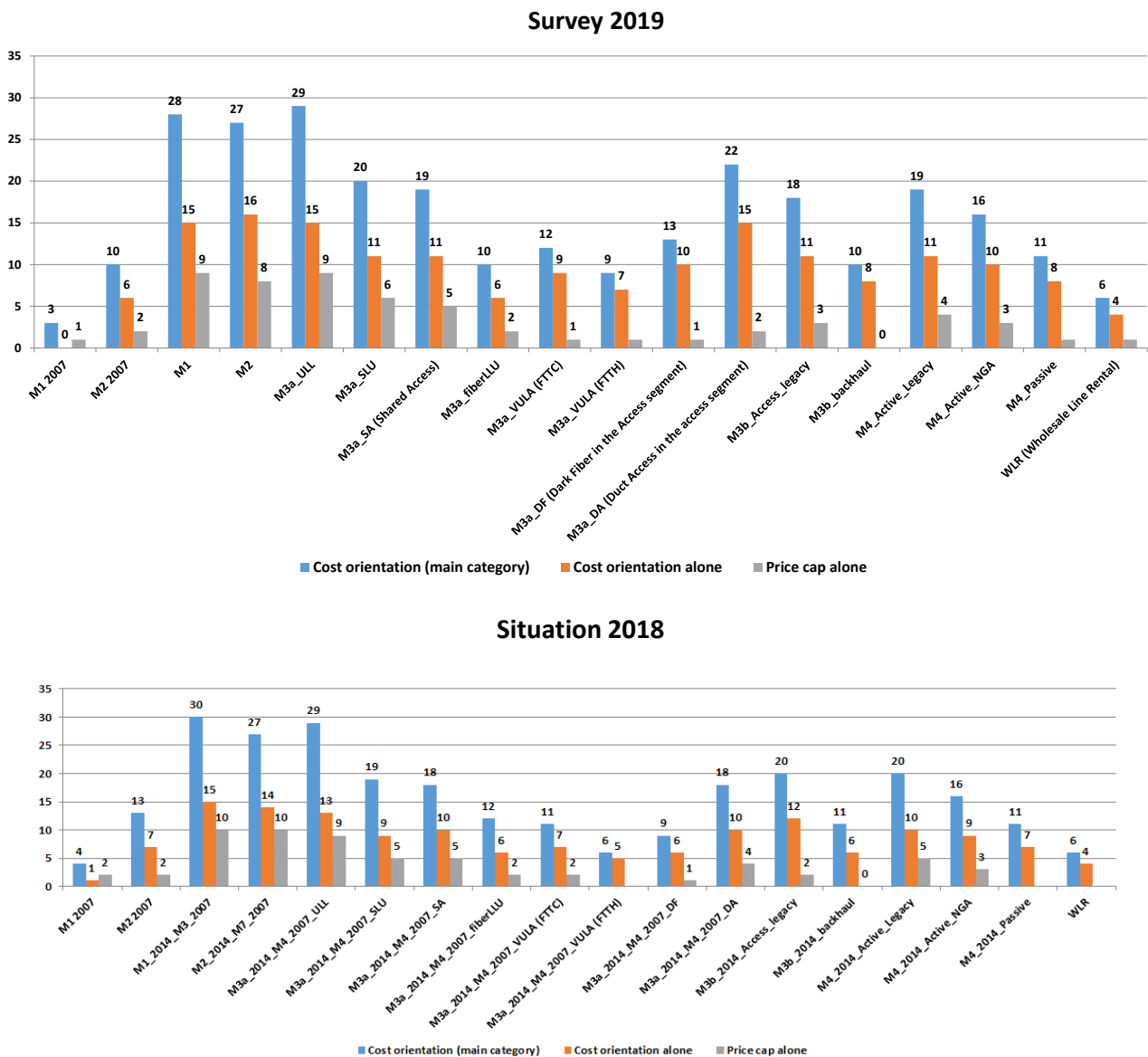
The overall situation is quite stable in comparison to the last year, that is to say that regulatory focus on price control obligation is not noticeably changing.

It may be observed that cost orientation in market 3a is still the main approach used for the LLU legacy product. There is a slow decline of those NRAs that apply price control on legacy services such as market M1/2007 and M2/2007, while there is an increase of NRAs that apply cost orientation for VULA FTTH and NGA services in general. A stable situation refers to “LLU fibre” and “duct access”.

In terms of main categories of price control, cost orientation remains the most frequently used method and it is applied mainly to legacy products (Figure 12). Retail minus has been chosen mainly for VULA products or in market 3b.

With respect to sub-categories, Figure 13 highlights that cost orientation alone is still the most frequent price control method used by NRAs, especially in case of duct access or dark fibre, but also in market 3b.

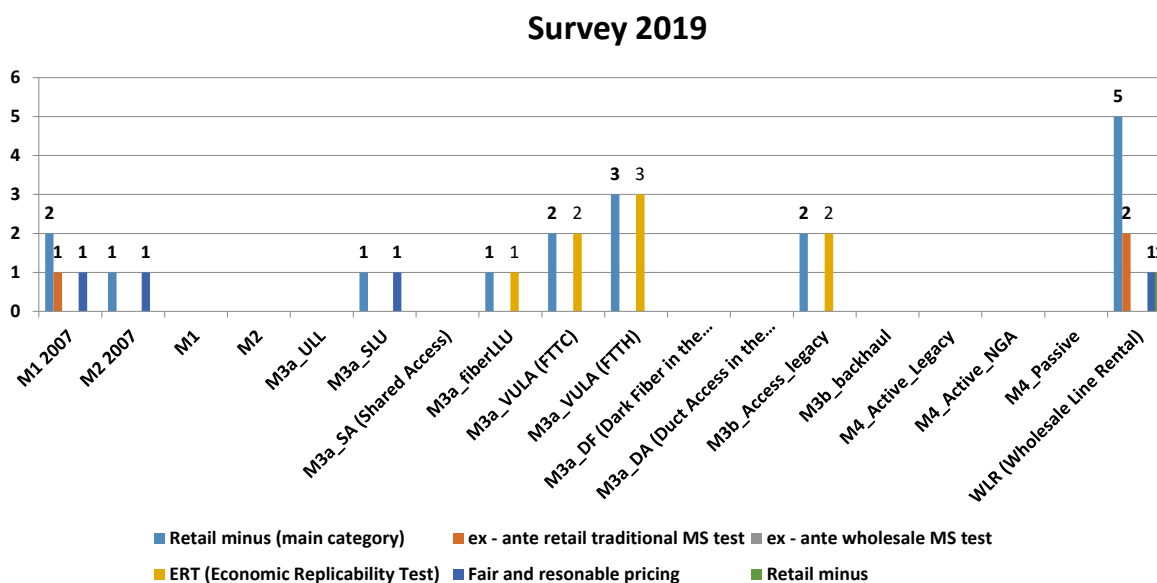
Figure 13 - Price control sub category Cost Orientation



Source: BEREC RA Database 2019

In Figure 14 the retail minus sub categories are represented.

Figure 14 - Price control sub category Retail minus



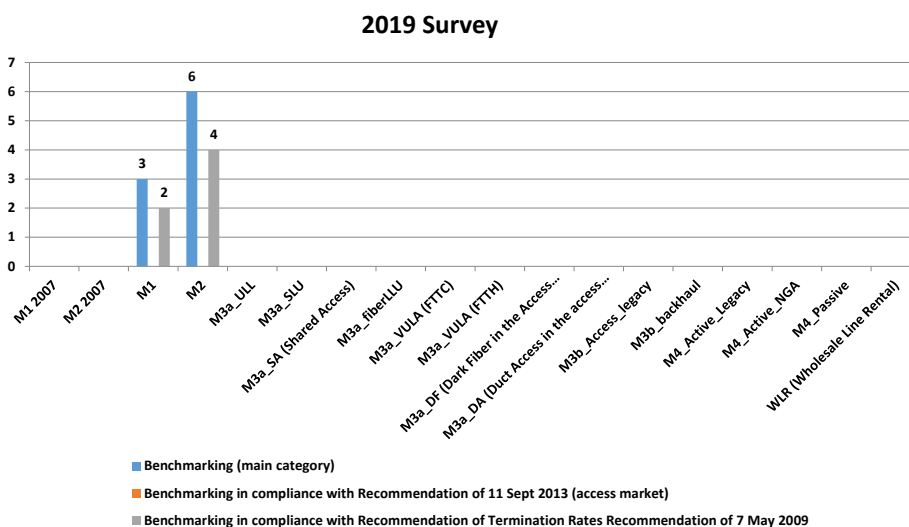
Source: BEREC RA Database 2019

In particular, the ERT price control methodology is mainly applied for VULA and NGA products in line with the Commission Recommendation on costing methodologies. An ex ante MST is mainly applied as a price control method for legacy voice services. Retail minus is currently applied only in one member state for WLR service.

In comparison to last year it may be observed that ERT is not increasing as a price control method, showing that, up to now, it is still not considered to be a substitute for the cost orientation (or price cap) approach, but more as a complementary measure.

The Benchmarking approach (Figure 15) is sometimes chosen only for termination markets.

Figure 15 - Price control sub category Benchmarking



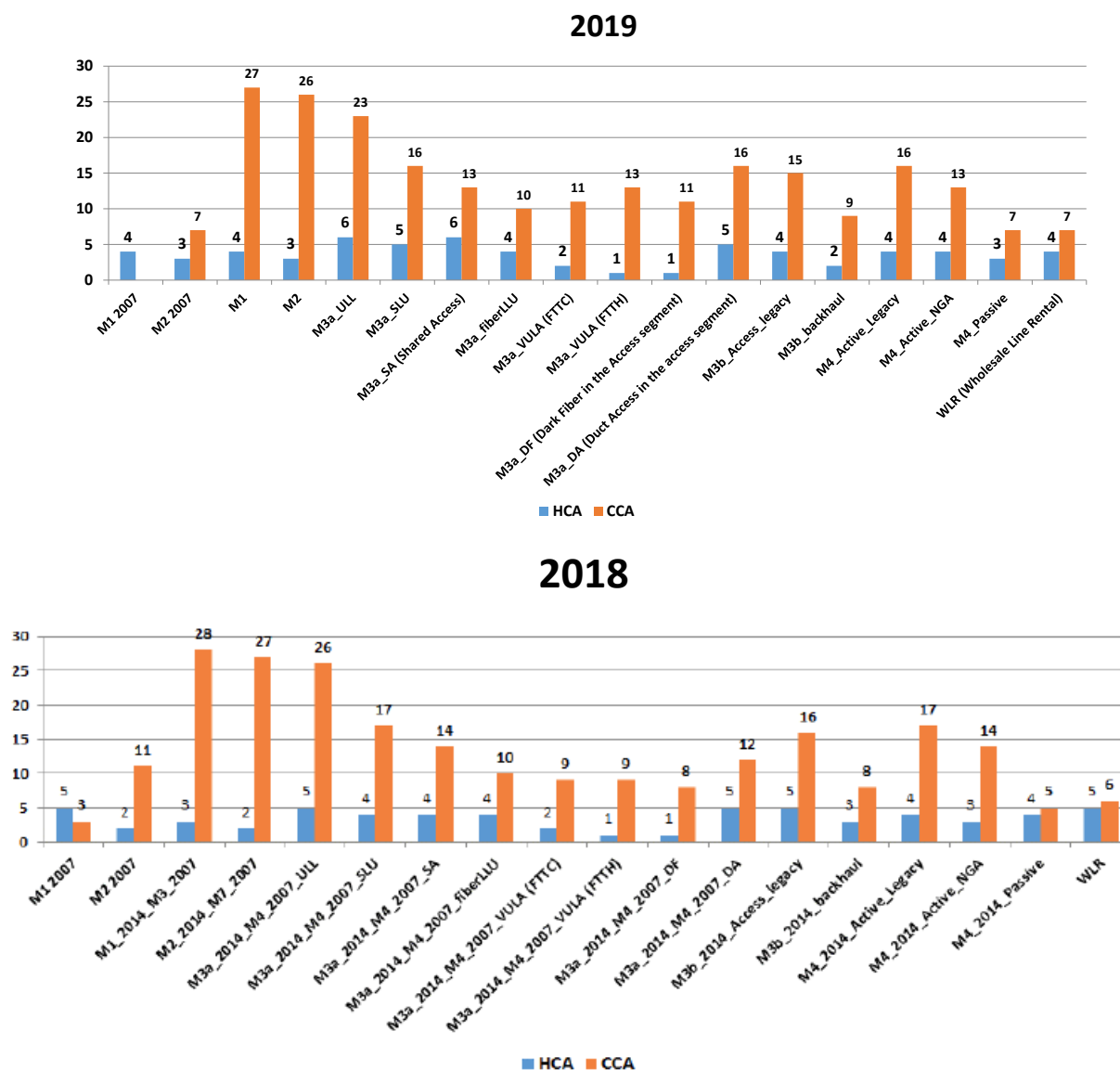
Source: BEREC RA Database 2019

3.3 Cost base, annualisation and cost allocation methodologies

Cost base

With reference to the cost base, Figure 16 shows that in 2019 CCA is by far the most commonly used methodology for all markets. Market 1/2007 and WLR are the exceptions, where HCA is frequently used. The situation is very stable in comparison to last year's survey.

Figure 16 - Cost base used

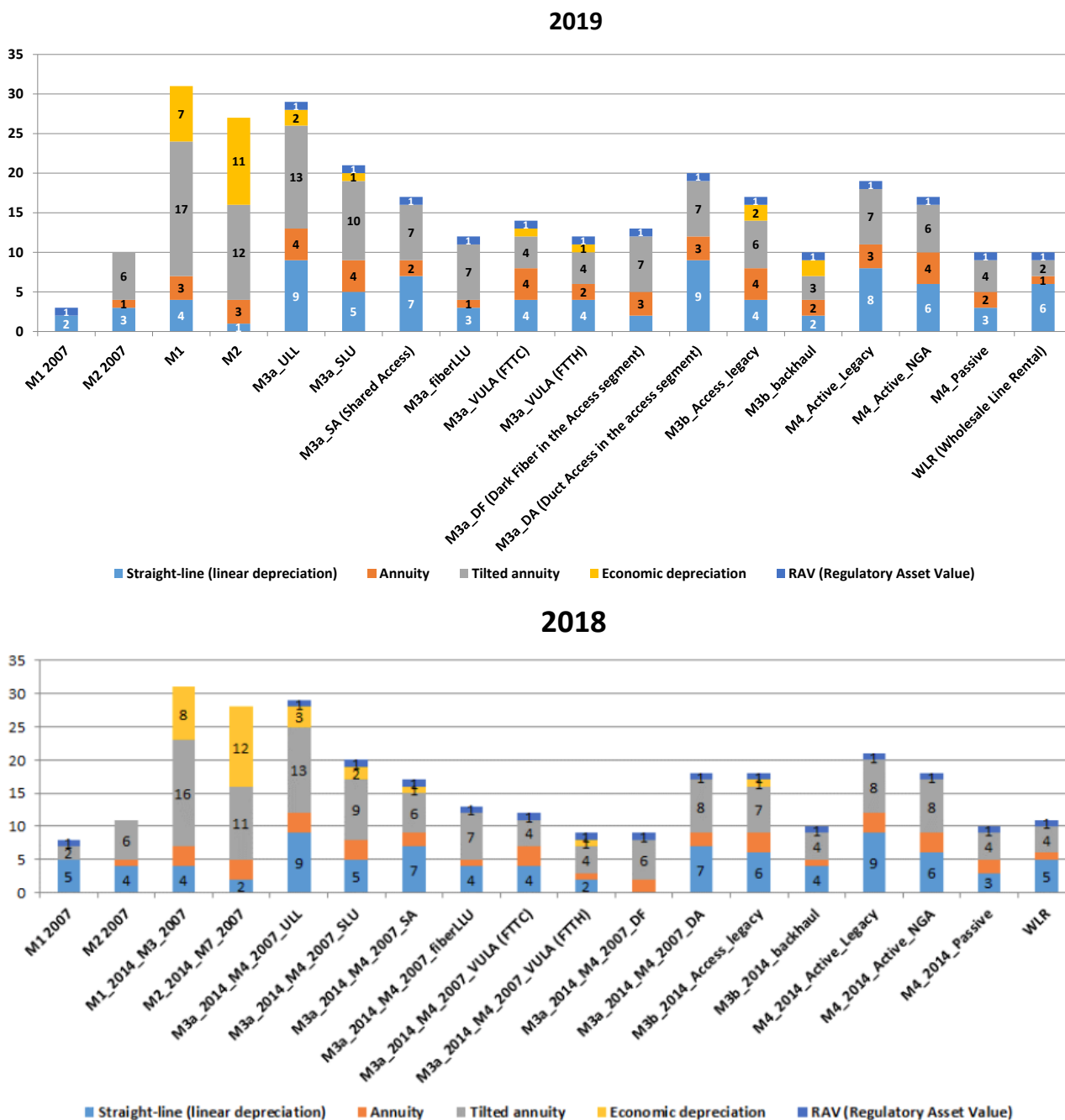


Source: BEREC RA Database 2019

Annualisation

Annualisation methodologies within the CCA category are represented in Figure 17. The most frequently used approach is the tilted annuity. Standard annuity and straight line follow. Economic depreciation is used mainly in termination markets.

Figure 17 - Annualisation methods

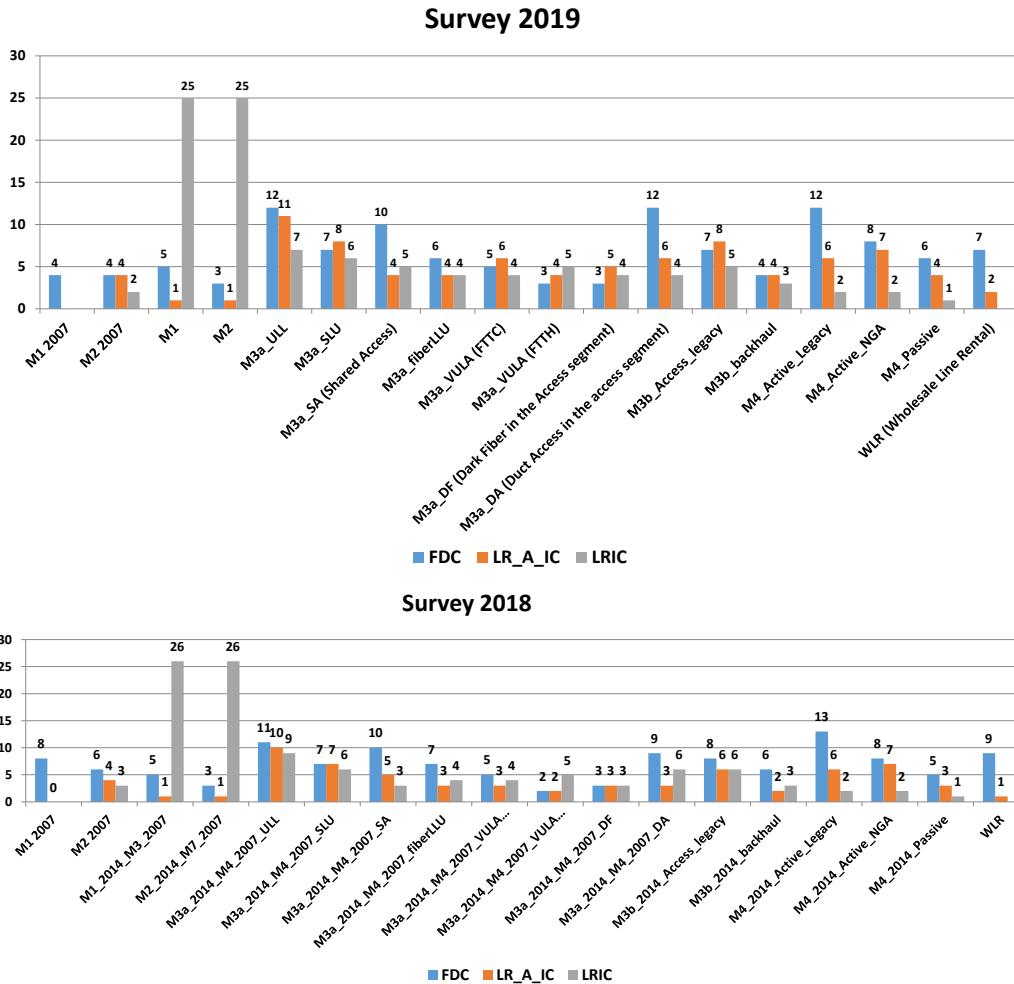


Source: BEREC RA Database 2019

Cost Allocation

Figure 18 shows the main cost allocation methodologies used in each market. In case sub categories were not selected, it generally means that a hybrid approach is in use.

Figure 18 - Cost Allocation methods



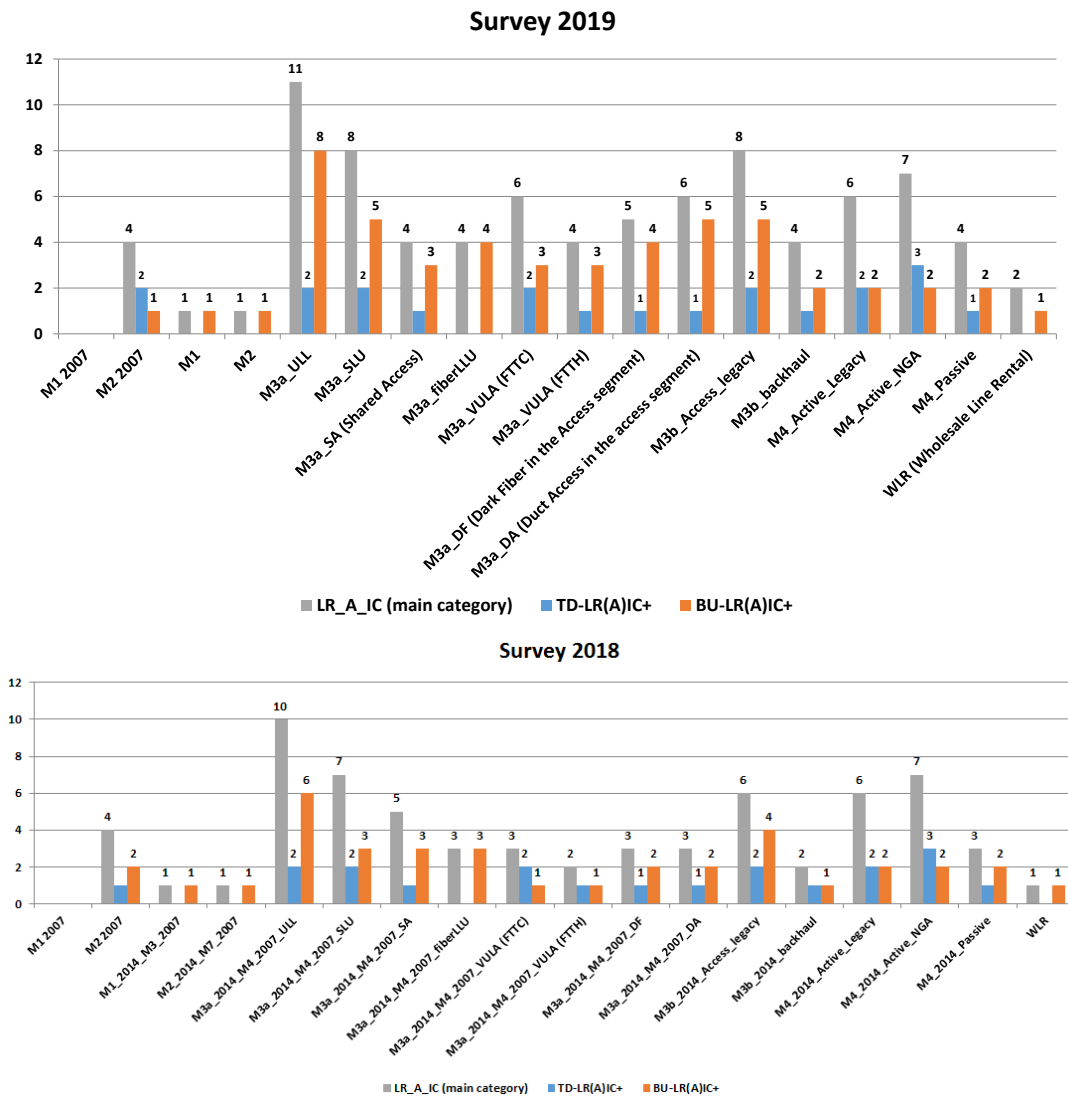
Source: BEREC RA Database 2019

The most frequent cost allocation approach remains LRIC/LR(A)IC, almost for all products/markets. LRIC is the preferred approach for termination markets. FDC is the preferred approach in Market 3b for the backhaul section, Market 4 and WLR. In Market 3b for legacy products, both methods are used. With respect to the previous year, the use of a modelling approach is increasing.

In Figure 19 and Figure 20 the sub categories of allocation methodologies are represented¹⁵. When LR(A)IC/LRIC has been chosen as the main category, the most common approach is Bottom-up. In case sub categories were not selected, it generally means that a hybrid approach is in use.

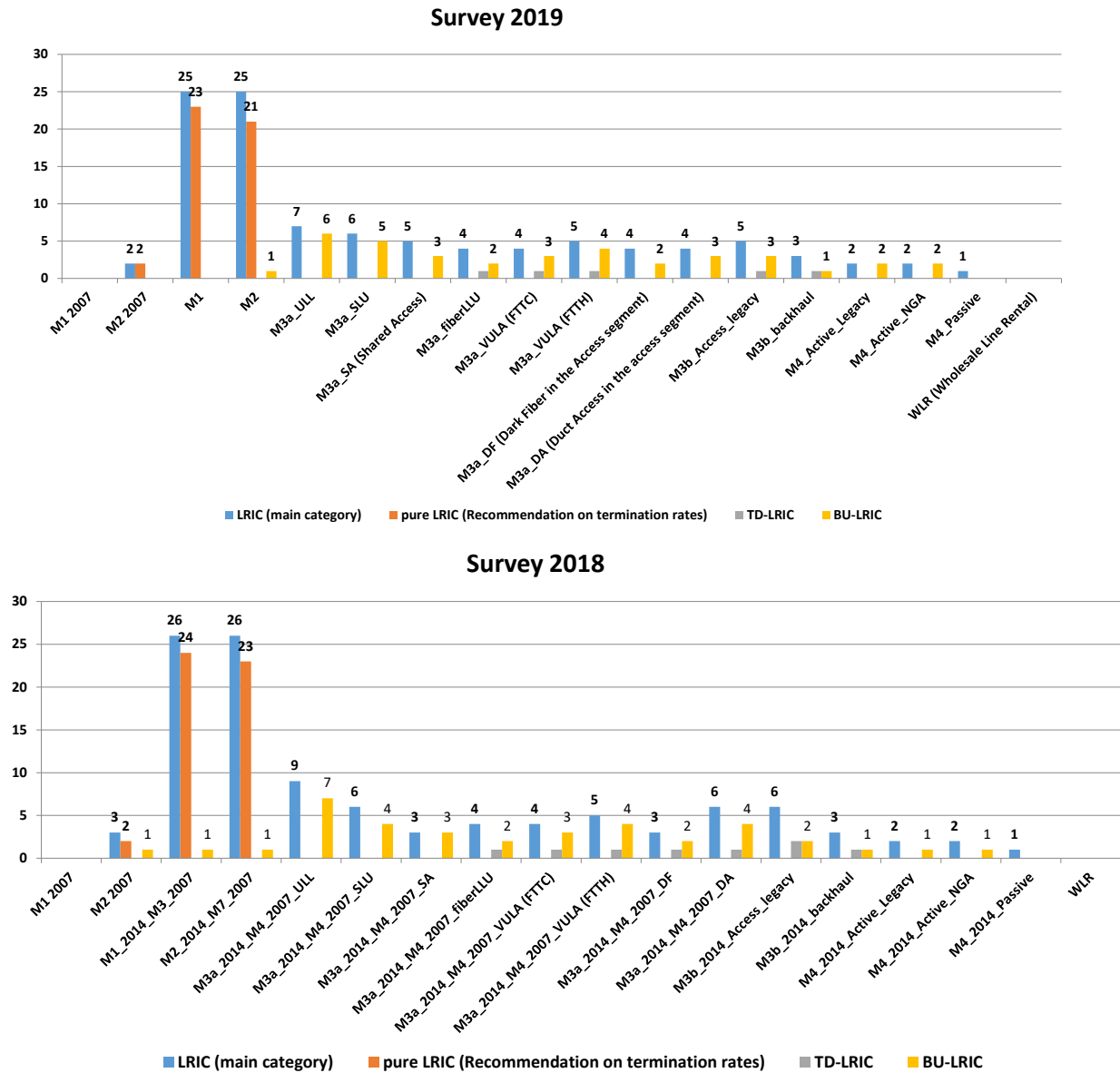
¹⁵ The sum for sub categories is lower than the record for the main category when NRAs did not provide info for sub categories.

Figure 19 - Allocation methods LR(A)IC sub categories



Source: BEREC RA Database 2019

Figure 20 - Allocation methods LRIC sub categories



Source: BEREC RA Database 2019

3.4 Combination of price control methods/cost base/allocation methodologies

To obtain a more accurate picture of the approach used by NRAs on regulatory accounting methodologies, it is interesting to analyse how price control and costing methodologies are applied according to main indicators of the competitive situation.

Figures in this section provide a view of the relationship between price control methodologies and applied costing methodologies. For this analysis, sub categories classified as LR(A)IC (TD), LRIC (TD) and LR(A)IC (BU), LRIC (BU) have been grouped together.¹⁶

The following combinations of price control and cost accounting methodologies have been considered:

Figure 21 - Price control and costing methodologies

Price control and costing methodologies take into account
Cost orientation Alone/LRIC-LRAIC (BU)/CCA
Cost orientation Alone/LRIC-LRAIC (TD)/CCA
Cost orientation Alone/Pure LRIC/CCA
Cost orientation Alone/FDC/CCA
Cost orientation Alone/FDC/HCA
Price cap/LRIC-LRAIC (BU)/CCA
Price cap/LRIC-LRAIC (TD)/CCA
Price cap /Pure LRIC/CCA
Price cap/FDC/CCA
Price cap/FDC/HCA
ERT/LRIC-LRAIC (BU)/CCA
ERT/LRIC-LRAIC (TD)/CCA
ERT /Pure LRIC/CCA
ERT/FDC/CCA
ERT/FDC/HCA

Source: BEREC RA Database 2019

The goal here is to examine if there is a relation between the way price control is imposed related to costing methodologies applied in different products/markets. Moreover, it is relevant to understand if costing methodologies are influenced by the price control methodology or if they are chosen by NRAs for other reasons. The most frequent combinations are reported.

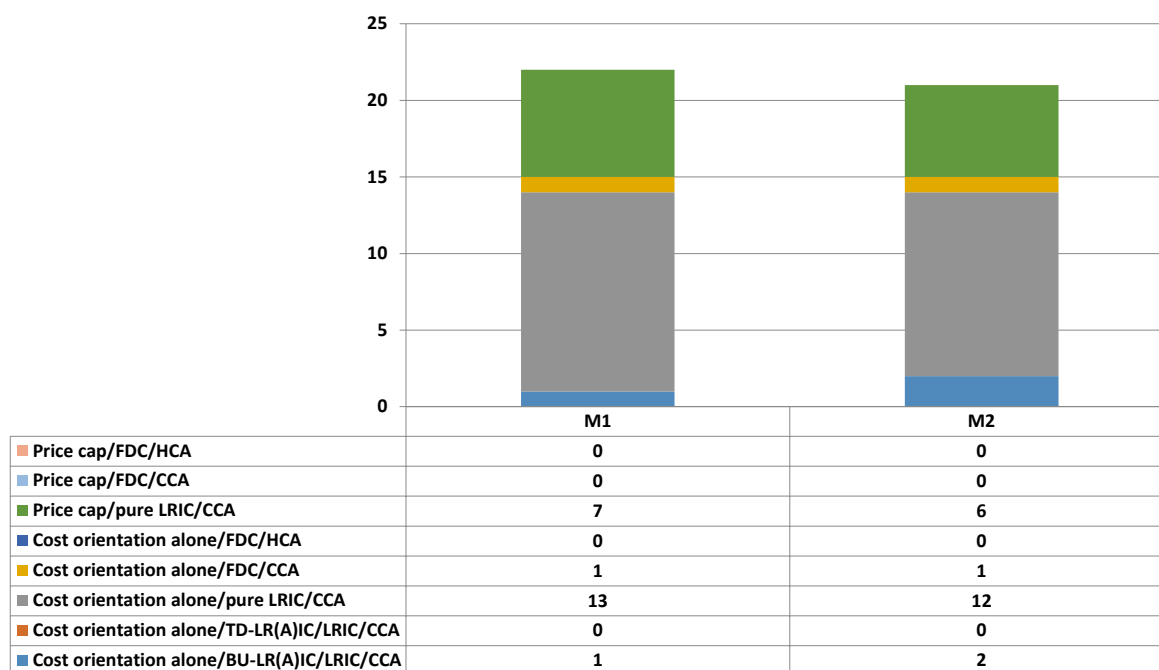
Differences among NRAs may be explained with specific country conditions, e. g. taking into account different competitive conditions in relevant markets. Forms of price regulation and accounting systems currently in force represent the “fine tuning” of regulatory instruments used by NRAs in order to address different competitive situations. This indicates that regulatory accounting has become more sophisticated over time, adapting to more complex market situations.

¹⁶ In the figures in this section NRAs that did not provide information on sub categories are not represented. For this reason the number of NRAs may be different from the number reported in the previous paragraph (overall number of NRAs that have provided information).

3.4.1 Retail and interconnection markets

In Figure 22 the combination of costing methodology and price control is represented for the retail and termination markets (only combinations with at least one record are shown). For terminations markets, a pure LRIC and CCA approach is the standard.

Figure 22 - Combination price control / costing methodologies (M1/2014 and M2/2014)



Source: BEREC RA Database 2019

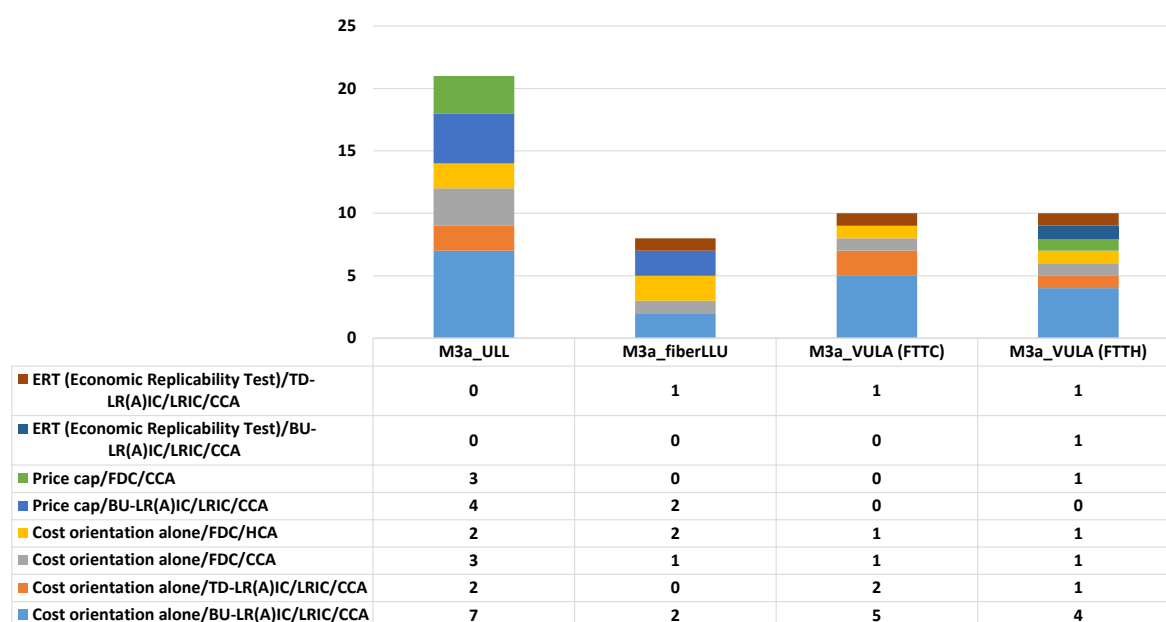
In relation to the asset base currently applied in markets where a price control obligation is in charge, the following can be summarised:

- In termination markets, in line with the Commission Recommendation 2009/396/EC, a bottom up approach is more frequent, independent from the kind of price control in use.
- In retail markets, the accounting cost base (TD/accounting methods) is used as a tool to apply price control obligations for the few cases where NRAs still regulate market 1/2007. The asset base of the SMP operator seems to remain more relevant in market 2/2007.

3.4.2 Products in Market 3a

In Figure 23 the combination of costing methodologies and price control is represented for products in market 3a (only combinations with at least one record are shown). There seems to be no clear preference of costing methodologies in relation to the kind of price control in use, a part from the main legacy product (LLU), for which most of NRAs apply a cost orientation alone/LRIC-LR(A)IC/CCA approach.

Figure 23 – Combination price control / costing methodologies (M3a)



Source: BEREC RA Database 2019

With reference to the asset base in use for these products, a bottom-up model is most common when cost orientation alone is used as price control methodology.

In general, NRAs have declared homogeneous costing methodologies for products in each market in comparison to previous years. This does not necessarily hold with respect to costing methodologies applied for duct access, where some NRAs shift the costing methodology from a bottom-up cost base to a top down/accounting approach.

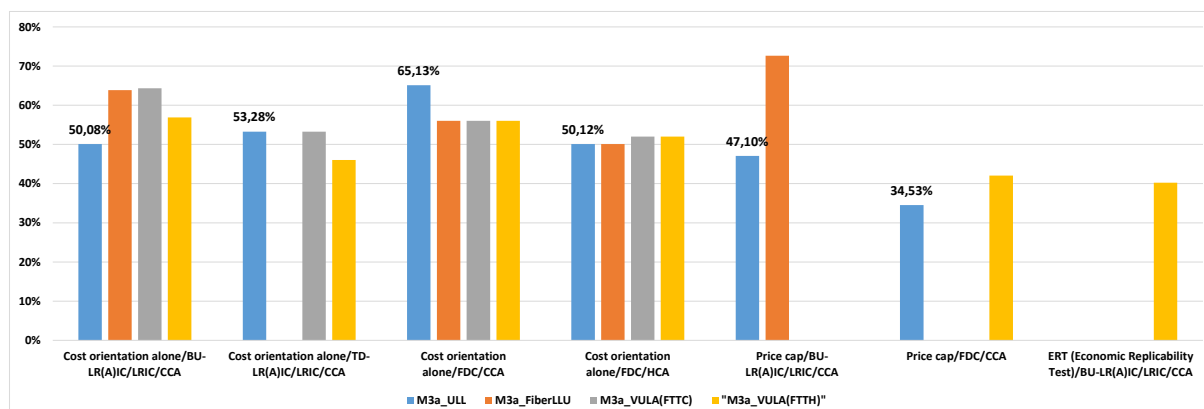
As in the 2018 report, a preliminary analysis on the relation between a measure of competition and price control/costing methodology is provided (Figure 24). The main evidence is for the “anchor product” of LLU (for which more data are available): cost orientation/price cap applied with BU/TD-LR(A)IC+ is the most frequent combination in case competition in the broadband market is at an intermediate stage (i.e. SMP retail broadband market share between 40% and 50%). On the other side, cost orientation in combination with FDC (CCA/HCA) is more frequent in a less competitive market.

The specific combination cost orientation and BU-LR(A)IC+ model in market 3a is the main methodology in charge in more competitive markets. With respect to last year’s report the number of NRAs that can be grouped in this combination for LLU service are the same, while the arithmetic average of the SMP market share increased due to the fact that in three countries (BE, SI, HU) the average SMP market share in the retail BB market has increased in the last year.¹⁷ In any case the main conclusion of the analysis can still be maintained.

For other products the outcome is less conclusive.

¹⁷ In Belgium, cable operators have been designated as SMP in the broadband market (M3b)(decision of 29 June 2018). Since 2011, the cable operators had a SMP position on the broadcast market but with ancillary obligations on the broadband market. Therefore, the overall market share of the SMP operators on the retail broadband market (DSL SMP operator and cable operators combined) is now 94.3% whereas last year only Proximus (DSL-incumbent) had a SMP position (46.2%) on this market.

Figure 24 – Combination price control / costing methodologies according to SMP retail market share (M3a)



Source: BEREC RA Database 2019

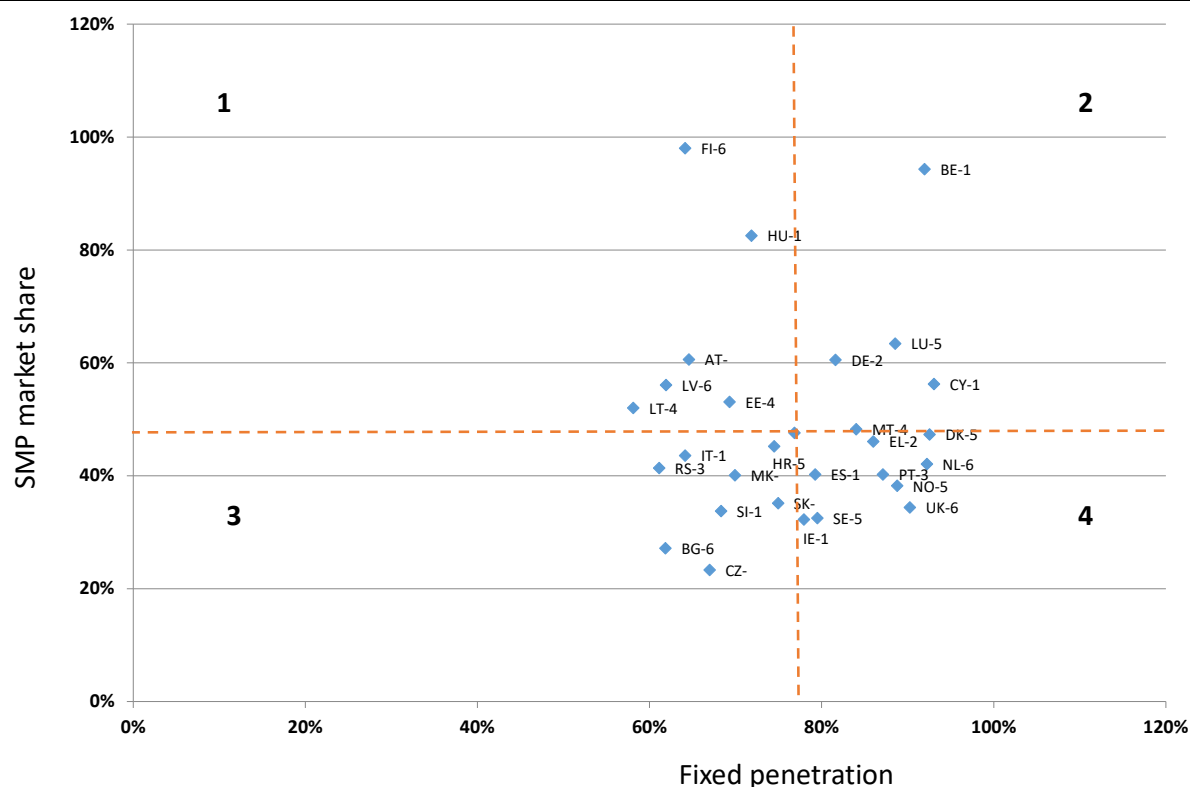
In an empirical analysis on the distribution of NRAs' approaches in terms of methodology and the intensity of competition, coverage and fixed broadband take-up (taken from the structural information survey) is provided for two main flagship products: LLU (legacy) and VULA-FTTH (NGA) - or fibre LLU in case VULA FTTH is not included as a remedy.

In Figure 25 the situation for LLU legacy product is considered. Two main structural variables - the SMP market share and the broadband take up - are analysed in combination with the kind of price control and costing methodology adopted.

On the x-axis "Fixed Broadband Penetration is reported, on the y-axis the SMP market share. In the corresponding label associated with each country in the figure, the category (from 1 to 6) of the combination of price control and costing methodology is provided (see next figure).¹⁸ Four clusters are identified by the averages of the 2 variables. In cluster 1 competition conditions are less favourable in combination with a lower fixed penetration. On the opposite, in cluster 4 higher competition is combined with a higher penetration of fixed broadband services.

¹⁸ Table 17 in the annex provides a summary of the number of countries that belong in the corresponding 6 combinations of price control and costing methodologies for each cluster.

Figure 25 – Combination price control / costing methodologies LLU service



Source: BEREC RA Database 2019

In clusters 1, 2 and 3 cost orientation seems to be the most common approach, while in cluster 4 the most common approach for price control is a price cap in combination with both BU-LRIC / FDC and CCA approaches.

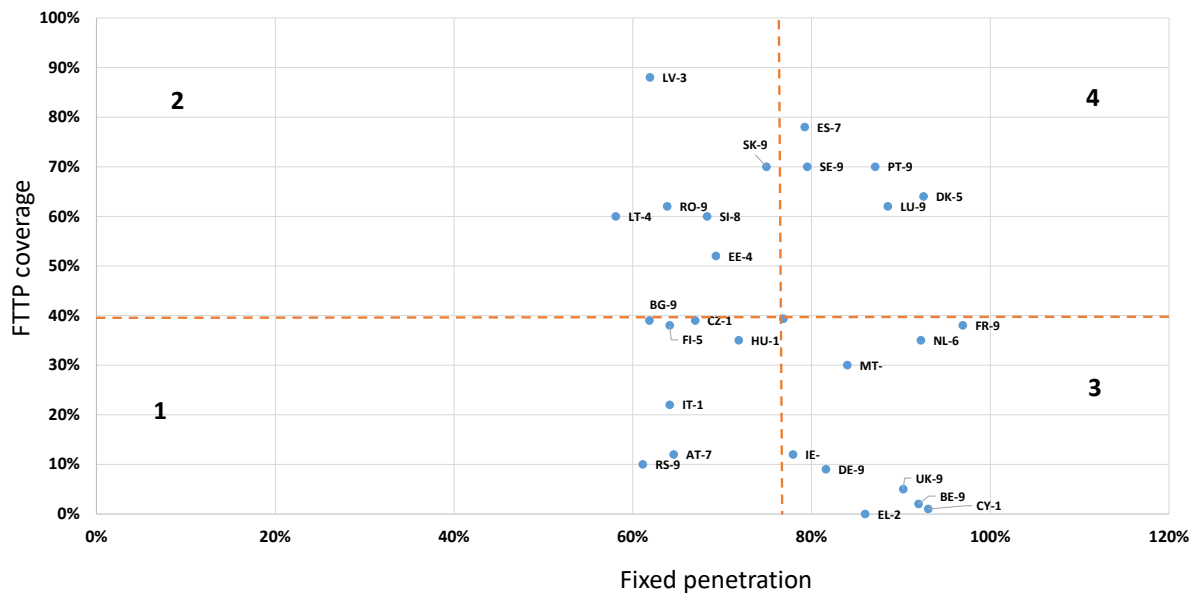
In Figure 26 the same analysis is carried out for the most important forward looking NGA service, VULA FTTH (or fibre LLU in case no VULA product is in the NRA regulatory framework). In this case the two main variables analysed are the fixed broadband (take-up) penetration (x-axis) and the corresponding FTTP coverage (y-axis), which, at this stage, is more relevant for FTTH products (than SMP market share) as a supply-side indicator.¹⁹ We consider four clusters: from cluster 1 being characterised by low penetration and low coverage, to cluster 4 with higher coverage and corresponding penetration rate.

In the latter case, the most common approach is to not regulate (or allow flexibility for) the FTTP product (this is in line with the Commission Recommendation on costing methodology). At the same time stricter obligations on price regulation of the FTTP wholesale product are more frequent in cluster 1, where both coverage and take-up are lower; in this case a BU-LRIC approach is the most frequent.²⁰

¹⁹ Data available in the Digital Agenda Scoreboard 2019. (<https://ec.europa.eu/digital-single-market/en/connectivity>)

²⁰ Table 18 in the annex provides a summary of the number of countries that belong in the corresponding 9 combinations of price control and costing methodologies for each cluster.

Figure 26 – Combination price control / costing methodologies VULA FTTH/Fibre LLU

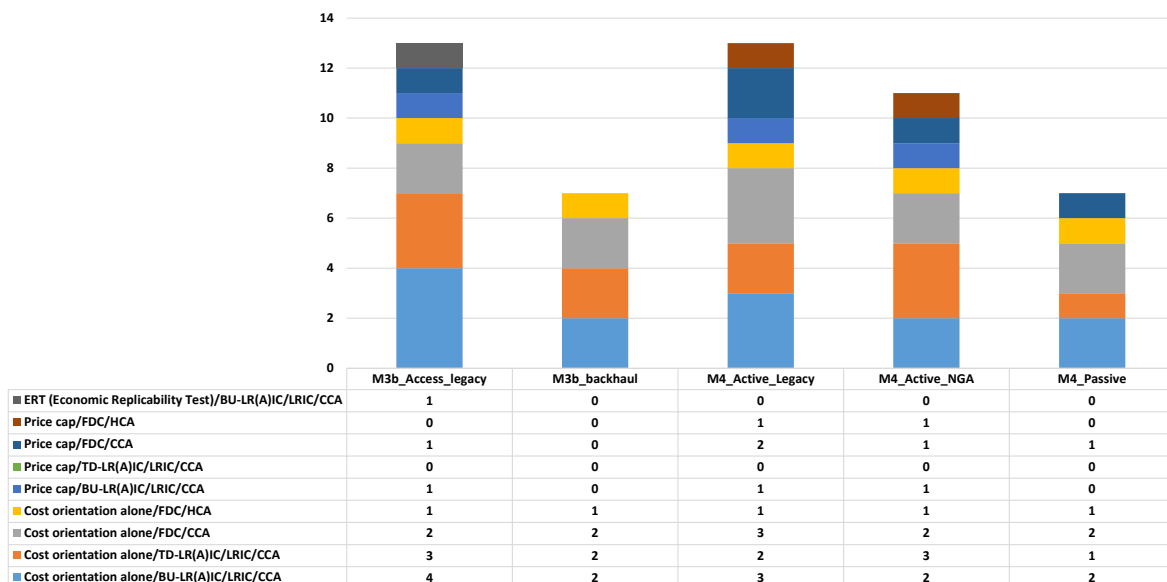


Source: BEREC RA Database 2019

3.4.3 Market 3b and 4

In Figure 27 the combination of costing and price control methodologies is presented for products in markets 3b and 4. No clear preference of costing methodologies applied with respect to price control in use can be detected.

Figure 27 - Combination price control / costing methods (M3b and 4)



Source: BEREC RA Database 2019

With respect to the cost base, there is no clear preference to use an accounting asset base instead of a bottom-up approach.

3.5 Implementation of the Non-discrimination and Costing Methodologies Recommendation

This section gives an update of the implementation of the “Recommendation on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment (2013/466/EU)”, with regard to costing methodologies.

Data assume more significance considering that 31 December of 2016 was the deadline for the implementation of the Recommendation.

NRAs were asked how they implement the framework of the Recommendation for non-discrimination obligations and costing methodologies in Market 3a, by choosing the following options: i) Rec. 30-37 (CCA-BU LRIC+); or ii) Rec. 40.

Figure 28 - EC Recommends

EC Recommendations	Content
Rec. 30-37	When “cost orientation” is imposed to legacy and NGA access services the costing methodology should follow a forward looking CCA BU-LRIC+ approach.
Rec. 40	NRAs may continue to apply beyond 31 December 2016 the costing methodology that they use at the time of entry into force of the Recommendation, if it meets the general objectives of consistency, predictability and price stability over time during the migration from legacy network to NGA network (recital 25-28) and <i>inter alia</i> : <ol style="list-style-type: none"> <li data-bbox="580 1182 1391 1249">i. it should reflect a gradual shift from copper network to an NGA network; <li data-bbox="580 1249 1391 1350">ii. it should apply an asset valuation method that takes into account that certain civil infrastructure assets would not be replicated in the competitive process; <li data-bbox="580 1350 1391 1451">iii. it should guarantee that copper network prices do not fluctuate significantly and therefore will remain stable over a long time period; <li data-bbox="580 1451 1391 1518">iv. it should require only minimal modifications with respect to the costing methodology already in place.

This year, 18 NRAs provided explicit information with respect to the proposed questions. Results are presented in Figure 29.

Figure 29 - NRA implementation of EC Recommendations

	2016	2017	2018	2019
Do you implement Recommends 30-37 (CCA BU-LRIC+)	7	9	14	14
Do you implement Recommend 40	6	5	4	4

Source: BEREC RA Database 2019

Descending from Rec. 30-37 and 40 of the Commission Recommendation, few relevant questions have been included for some elements addressed by the Recommendation referred to DEA targets and reusable infrastructures²¹.

Replies by NRAs are summarised in Figure 30.

Figure 30 - NRAs information on Recommends 37 and 40

	Number of NRAs	Do you consider the DEA target in your model	Do you take into account reusable civil infrastructure?	Do you consider copper cable to be reusable infrastructure?	Is a gradual shift from copper network to NGA network taken into account?
Recommend 37 (2018)	14 (14)	7 (7)	10 (10)	3 (3)	6 (6)
Recommend 40 (2018)	4 (4)	1 (1)	2 (2)	3 (3)	3 (3)

Source: BEREC RA Database 2019

From this analysis, we understand that DEA targets²² are explicitly implemented in the BU-LRIC model by 8 NRAs.

The majority of NRAs that implemented Rec. 30-37 or Rec. 40 have included reusable civil infrastructure in their modelling process; copper cable is considered to be reusable infrastructure by 3 NRAs. Furthermore, the analysis shows that the level of the depreciated infrastructure is derived mainly from the accounting data of the SMP operator.

²¹ Specifically in the Rec. 32 the Commission consider the following elements: "When modelling an NGA network NRAs should define a hypothetical efficient NGA network, capable of delivering the Digital Agenda for Europe targets set out in terms of bandwidth, coverage and take-up, which consists wholly or partly of optical elements. When modelling an NGA network, NRAs should include any existing civil engineering assets that are generally also capable of hosting an NGA network as well as civil engineering assets that will have to be newly constructed to host an NGA network. Therefore, when building the BU LRIC + model, NRAs should not assume the construction of an entirely new civil infrastructure network for deploying an NGA network". Recommend 40 states: "if not modelling an NGA network, it should reflect a gradual shift from a copper network to an NGA network". On the base of this statement of the Recommendation, some questions about DEA targets and reusable infrastructure have been added.

²² The coverage at least of 30 Mbps to 100% and take-up of the population at 50% at 100 Mbps.

Figure 31 summarises the responses provided on the asset life of civil infrastructure, the percentage of civil infrastructure considered reusable and the percentage of asset life already depreciated.²³ Only few NRAs provided information on this aspect.

Figure 31 - NRA information on civil infrastructure

	Rec. 30-37	Rec. 40
Civil infrastructure asset life (number of years) (minimum - maximum)	30-47 (arithmetic av.: 39%) 9 NRAs	30-40 3 NRAs
Percentage of civil infrastructures considered reusable (minimum - maximum)	18%-100% (arithmetic av. : 66%) 8 NRAs	90%-100% 3 NRAs
Percentage of asset life already depreciated of reusable civil infrastructures (minimum - maximum)	20%-66% 3NRAs	53% 1 NRA

Source: BERECA RA Database 2019

3.6 Cost model technical implementation

The 2019 report also provides information on technical cost model implementation by NRAs²⁴.

Specifically the questionnaire asked NRAs to provide information on: i) asset base used; ii) network modelling approach (scorched earth vs scorched node); iii) Topology of the network modelled and architecture; iv) the way in which the level of coverage of the network is considered; and v) adjustments adopted for capex/opex efficiency in case top down models are used.

Figure 32 summarises the information provided by NRAs for markets 3a and 3b.

Asset base

The asset base used in case a cost model is implemented is summarised in Figure 32. The options provided in the questionnaire were: Bottom-up, Top down, or Hybrid (mix of top down and bottom up).

²³ In the figure only maximum and minimum are shown as only few NRAs have provided information.

²⁴ The information reported is independent from the main price control method (such as Cost orientation/Price cap/ERT) declared by NRAs in each market.

Figure 32 - Asset base applied

Asset base	M3a_2014_M4_2007_ULL	M3a_2014_M4_2007_SLU	M3a_2014_M4_2007_SA	M3a_2014_M4_2007_fiberLU	M3a_2014_M4_2007_VULA (FTTC)	M3a_2014_M4_2007_VULA (FTTH)	M3a_2014_M4_2007_DF	M3a_2014_M4_2007_DA	M3b_2014_Access_legacy
BU	12 (12)	8 (5)	6 (5)	5 (6)	5 (5)	5 (5)	5 (5)	5 (5)	4 (6)
TD	8 (6)	4 (3)	8 (4)	5 (3)	2 (1)	2 (1)	2 (1)	5 (4)	5 (3)
Hybrid	3 (4)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (2)	0 (0)

Source: BEREC RA Database 2019

We may observe that when a cost model is applied, most NRAs adopt a bottom up asset base for all products/markets; this is most evident for VULA products.

Network modelling approach

Figure 33 summarises the main approaches used by NRAs to implement cost models. The scorched node approach assumes that the historical number of locations of the actual network node are fixed and that the operator can choose the best technology to configure the network in between these nodes. The scorched earth approach determines the efficient cost of a network that provides the same services as actual networks without placing any constraints on network configuration. A modified scorched node is in-between the two previous approaches.

Figure 33 – General network modelling approach

	M3a_2014_M4_2007_ULL	M3a_2014_M4_2007_SLU	M3a_2014_M4_2007_SA	M3a_2014_M4_2007_fiberLU	M3a_2014_M4_2007_VULA (FTTC)	M3a_2014_M4_2007_VULA (FTTH)	M3a_2014_M4_2007_DF	M3a_2014_M4_2007_DA	M3b_2014_Access_legacy
Scorched Node	11 (12)	7 (7)	6 (6)	4 (5)	6 (5)	5 (5)	3 (5)	3 (5)	4 (6)
Scorched earth	1 (2)	1 (0)	1 (0)	1 (1)	0 (0)	0 (0)	1 (0)	0 (0)	1 (1)
Modified Scorched node	6 (4)	4 (2)	2 (1)	3 (2)	0 (0)	1 (1)	2 (1)	2 (2)	1 (1)
Other	2 (1)	1 (0)	1 (0)	1 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Source: BEREC RA Database 2019

A scorched node is the most frequent approach used, also for NGA services.

Network topology and architecture

Figure 34 summarises the replies for the topology configuration used by NRAs for modelling purposes in markets 3a and 3b (2018 figures in brackets). Specifically, the questionnaire provided the following options: i) MDF/ODF area; ii) Municipality; a mix of the two; iii) other. Choosing the first option means that the model is implemented taking into account the footprint of the copper access network and/or the fibre network of the incumbent operator. The second option (municipality) means that the model considers an administrative area as a footprint for the access network (like postal codes).

The most frequent approach is the MDF/ODF area in line with the replies provided for the node location approach (scorched node). It is relevant to consider that for an NGA network the footprint of the network may differ from the one used for modelling a copper based product.

Figure 34 - Network architecture applied

	M3a_2014_M4_2007_ULL	M3a_2014_M4_2007_SLU	M3a_2014_M4_2007_SA	M3a_2014_M4_2007_fiberLLU	M3a_2014_M4_2007_VULA (FTTC)	M3a_2014_M4_2007_VULA (FTTH)	M3a_2014_M4_2007_DF	M3a_2014_M4_2007_DA	M3b_2014_Access_legacy
MDF/ODF area	19 (15)	12 (7)	9 (6)	7 (6)	4 (3)	4 (3)	4 (3)	4 (4)	6 (6)
Municipality	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1	0 (0)
Municipality/MDF-ODF area	0 (1)	0 (0)	1 (0)	0 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Other	0 (1)	0 (1)	0 (0)	1 (0)	1 (1)	1 (2)	1 (1)	0 (3)	0 (1)

Source: BEREC RA Database 2019

Figure 35 shows the technology used for modelling purposes. It is interesting to see that some NRAs that model an all FTTH network nevertheless apply price control for legacy products (CH, ES, FR, SE, SI).

Figure 35 - Network technology applied

	M3a_2014_M4_2007_ULL	M3a_2014_M4_2007_SLU	M3a_2014_M4_2007_SA	M3a_2014_M4_2007_fiberLLU	M3a_2014_M4_2007_VULA (FTTC)	M3a_2014_M4_2007_VULA (FTTH)	M3a_2014_M4_2007_DF	M3a_2014_M4_2007_DA	M3b_2014_Access_legacy
FTTH	5	3	1	0	0	2	1	2	0
FTTE-FTTC-FTTH	3	3	3	3	3	3	2	1	2
FTTH-FTTC	1	1	0	2	3	1	2	0	0
FTTE-FTTC	0	0	1	0	0	0	0	0	0
FTTE	2	1	0	0	0	0	0	0	1
Other	6	3	3	3	0	0	0	1	2

	M3a_2014_M4_2007_ULL	M3a_2014_M4_2007_SLU	M3a_2014_M4_2007_SA	M3a_2014_M4_2007_fiberLLU	M3a_2014_M4_2007_VULA (FTTC)	M3a_2014_M4_2007_VULA (FTTH)	M3a_2014_M4_2007_DF	M3a_2014_M4_2007_DA	M3b_2014_Access_legacy
GPON/P2P	4	4	1	5	3	2	4	2	1
GPON	4	3	2	2	3	4	1	0	2
P2P	4	3	1	1	0	0	0	1	1
Other	0	0	0	0	0	0	0	0	0

Source: BEREC RA Database 2019

Coverage

Figure 36 summarises the coverage network estimation used for modelling: i) forward looking; ii) as it is. The first option means that coverage is achieved in a forward looking way taking into account a medium term horizon with respect to the current situation; the second option considers that the coverage for network modelling purpose is taken as it is at the time of estimation

of service costs. Most NRAs use a forward looking estimation, only for Dark fibre and Market 3b this approach is less frequent.

Figure 36 – Estimated network coverage

	M3a_2014_M4_2007_ULL	M3a_2014_M4_2007_SLU	M3a_2014_M4_2007_SA	M3a_2014_M4_2007_fiberLLU	M3a_2014_M4_2007_VULA (FTTC)	M3a_2014_M4_2007_VULA (FTTH)	M3a_2014_M4_2007_DF	M3a_2014_M4_2007_DA	M3b_2014_Access_legacy
Forward Looking	10 (11)	8 (7)	5 (4)	3 (4)	4 (4)	4 (4)	4 (3)	4 (5)	4 (3)
As is	4 (4)	3 (2)	2 (2)	5 (3)	2 (1)	2 (2)	2 (3)	0 (2)	2 (3)

Source: BEREC RA Database 2019

The approach used for the level of coverage from a geographical point of view (spatial domain) is reported in Figure 37. Two options have been provided in the questionnaire: National and sub national. Most NRAs consider a “national” network coverage for modelling purposes in line with a forward looking estimation.

Figure 37 – Estimated geographical coverage

	M3a_2014_M4_2007_ULL	M3a_2014_M4_2007_SLU	M3a_2014_M4_2007_SA	M3a_2014_M4_2007_fiberLLU	M3a_2014_M4_2007_VULA (FTTC)	M3a_2014_M4_2007_VULA (FTTH)	M3a_2014_M4_2007_DF	M3a_2014_M4_2007_DA	M3b_2014_Access_legacy
National	19 (20)	13 (9)	11 (8)	8 (8)	7 (4)	7 (5)	5 (5)	7 (8)	6 (8)
Sub national	0 (0)	0 (1)	0 (0)	2 (2)	0 (1)	0 (1)	1 (1)	0 (1)	0 (0)

Source: BEREC RA Database 2019

Figure 38 includes elements on the main source of coverage for NGA service modelling purposes for FTTH/FTTC. In the questionnaire 6 options were provided: i) SMP coverage; ii) OAO coverage; iii) SMP+OAO coverage iv) National and v) Sub national²⁵. Most NRAs use SMP coverage in a forward looking way, in other cases a National coverage is used independently from other sources of information.

Figure 38 – Source used as a base for NGA network coverage in modelling

	M3a_2014_M4_2007_ULL	M3a_2014_M4_2007_SLU	M3a_2014_M4_2007_SA	M3a_2014_M4_2007_fiberLLU	M3a_2014_M4_2007_VULA (FTTC)	M3a_2014_M4_2007_VULA (FTTH)	M3a_2014_M4_2007_DF	M3a_2014_M4_2007_DA	M3b_2014_Access_legacy
SMP coverage	9	7	7	7	4	4	3	3	4
OAO coverage	0	0	0	0	0	0	0	0	0
SMP+OAO coverage	2	1	1	0	0	0	0	0	0
National	7	5	3	3	3	3	3	3	3
Sub national	0	0	0	0	0	0	0	0	0

Source: BEREC RA Database 2019

²⁵ Options iv and v are independent of effective coverage by operators (SMP or OAOs).

Figure 39 shows cost averaging: an average cost for the whole country or for a specific target area where regulation is in charge. The most part of the respondents consider an average price based on a national average.

Figure 39 - Cost averaging

	M3a_2014_M4_2007_UL	M3a_2014_M4_2007_SLU	M3a_2014_M4_2007_SA	M3a_2014_M4_2007_fiberLLU	M3a_2014_M4_2007_VULA (FTTC)	M3a_2014_M4_2007_VULA (FTTH)	M3a_2014_M4_2007_DF	M3a_2014_M4_2007_DA	M3b_2014_Access_legacy
National average	18	12	10	7	6	6	5	6	6
Target areas where regulation is in charge	0	0	0	1	0	0	0	0	1

Source: BEREC RA Database 2019

Efficiency adjustments in case of top down models

Figure 40 shows possible adjustments where a TD asset base is in use for modelling purposes. NRAs were asked to indicate if adjustments are included for the capex/opex component and/or other price adjustments. Generally when NRAs apply an adjustment this is applied both to the capex and opex component.

Figure 40 - Efficiency adjustments applied

		M3a_2014_M4_2007_UL	M3a_2014_M4_2007_SLU	M3a_2014_M4_2007_SA	M3a_2014_M4_2007_fiberLLU	M3a_2014_M4_2007_VULA (FTTC)	M3a_2014_M4_2007_VULA (FTTH)	M3a_2014_M4_2007_DF	M3a_2014_M4_2007_DA	M3b_2014_Access_legacy
Capex efficiency in TD model	Yes	7	3	5	4	2	2	1	2	3
	No	4	2	2	1	0	0	1	1	2
Opex efficiency in TD model	Yes	7	2	4	3	1	1	1	2	2
	No	4	3	3	2	1	1	2	2	3

		M3a_2014_M4_2007_UL	M3a_2014_M4_2007_SLU	M3a_2014_M4_2007_SA	M3a_2014_M4_2007_fiberLLU	M3a_2014_M4_2007_VULA (FTTC)	M3a_2014_M4_2007_VULA (FTTH)	M3a_2014_M4_2007_DF	M3a_2014_M4_2007_DA	M3b_2014_Access_legacy
Other efficiency assumption (in case of TD) i.e. on overall end prices	Yes	1	0	0	0	0	0	0	0	0
	No	4	3	3	2	0	0	1	3	2

Source: BEREC RA Database 2019

4. Additional Information: structural data

This section serves to identify main structural differences within European countries, for example the competitive and market situation in each country, population and population density indicators as well as existing telecommunications infrastructure.

These structural differences may have an influence on NRAs regulatory strategy and therefore the choice of price control method. The influence of factors such as infrastructure competition, demand and supply side factors is analysed in more detail in the BEREC Report on challenges and drivers of NGA rollout infrastructure competition (BoR (16) 96). However, it should be pointed out that there are a number of other important factors that may influence NRA regulation, i.e. national broadband strategy, national competitive challenges and country specific consumer behaviour.

A total of 30 NRAs²⁶ have provided data for this section. If data is confidential and can, therefore, not be shown in the analysis or if it has specificities, this will be shown in the footnotes.

The following structural data have been collected (data as at 1st April 2019 – unless shown otherwise in the footnotes):

²⁶ Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), Czech Republic (CZ), Germany (DE), Denmark (DK), Estonia (EE), Greece (EL), Spain (ES), Finland (FI), France (FR), Croatia (HR), Hungary (HU), Ireland (IE), Italy (IT), Lithuania (LT), Luxemburg (LU), Latvia (LV), Republic of Macedonia (MK), Malta (MT), Netherlands (NL), Norway (NO), Portugal (PT), Romania (RO), Republic of Serbia (RS), Sweden (SE), Slovenia (SI), Slovakia (SK), United Kingdom (UK). No data has been provided by: Albania (AL), Switzerland (CH), Iceland (IS), Liechtenstein (LI), Poland (PL), Montenegro (ME), Turkey (TR).

Figure 41 - Structural Data Collected

1	Population and surface area ²⁷
1.1	number of inhabitants
1.1a	number of private households ²⁸
1.2	number of inhabitants biggest city
	% of total population (main metropolis population density)
1.3	number of inhabitants three biggest cities
	% of total population (metro population density)
1.4	country area in square km
	number of inhabitants per square km
2	Market situation
2.1	mobile broadband penetration (subscription as % of the total population)
2.2	fixed broadband penetration (subscription as a % of the total households)
2.2.1	fixed broadband subscriptions: % of cable modems (DOCSIS 3.0 included)
2.2.2	fixed broadband subscriptions: % of DSL lines (VDSL included)
2.2.3	fixed broadband subscriptions: % FTTx
2.2.4	fixed broadband subscriptions: Other
3	Market shares
3.1	Fixed broadband subscriptions – SMP operator/incumbent
3.2	Fixed broadband subscriptions - competitors
3.2	Fixed broadband subscriptions – cable operators
3.3	DSL broadband subscriptions – SMP operator/incumbent
3.4	DSL broadband subscriptions - competitors
3.5	NGA (FTTx) broadband subscriptions – incumbent
3.6	NGA (FTTx) broadband subscriptions – competitors
3.7	NGA (FTTx) broadband subscriptions – cable operators
3.8	SMP coverage on own network> FTTB/C via SLU
3.9	Other access operator coverage on own network: FTTB/C (via SLU)
3.10	SMP coverage on own network: FTTH
3.11	Other access operator coverage on own network FTTH
3.12	SMP coverage on own network: cable
3.13	Other access operator coverage on own network: cable

Sources: Fischer Weltalmanach 2019, Eurostat, BEREC RA Database 2019

Population and country size

This data is publicly available, therefore all 37 countries²⁹ have been included in the analysis. The data, which is naturally static and remains largely unchanged in comparison to previous years, can have a considerable influence on the cost of telecommunications infrastructure. For instance: a high population density in urban areas vs. few users in sparsely populated rural areas results in different investment risk for telecommunications companies.

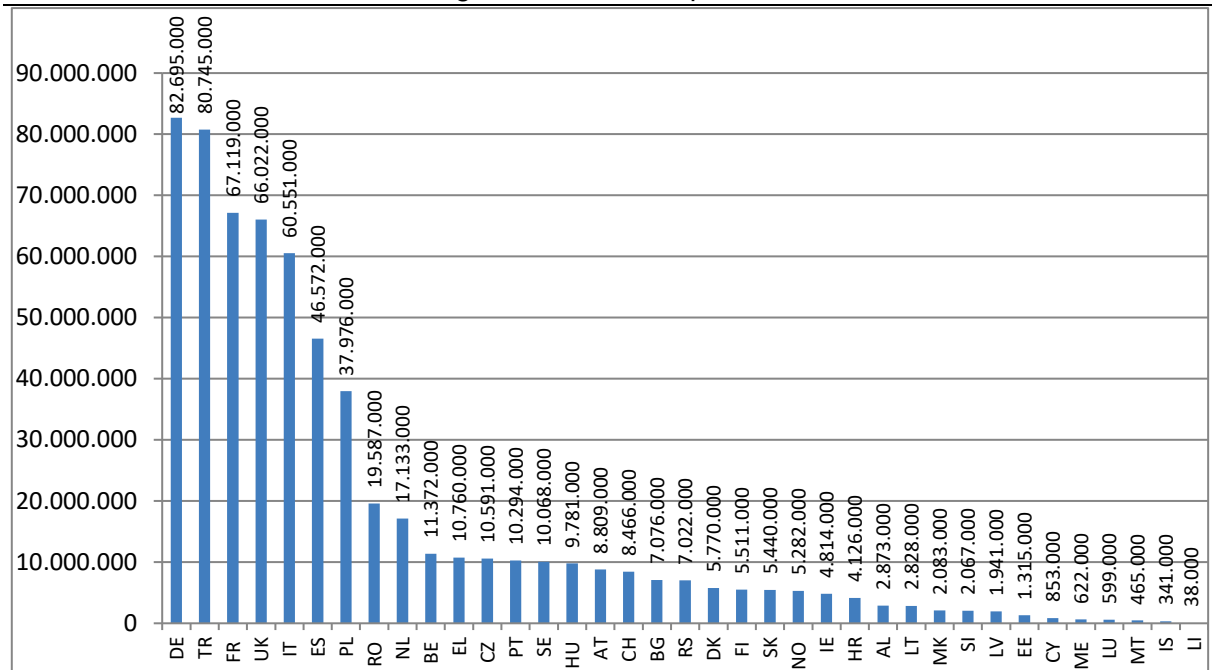
²⁷ Data source: Fischer Weltalmanach 2019, editorial deadline 01.07.2018.

²⁸ Data source: Eurostat (households in the EU 2017), national statistical bureaus (Census).

²⁹ EU members, EU candidates or countries with observer status: AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, IS, IT, LI, LT, LU, LV, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, UK, TR.

When looking at the **total population** (i. e. the total number of inhabitants per country) the top ten countries (with a population of above 11 Mio.) are: Germany, Turkey, France, UK, Italy, Spain, Poland, Romania, Netherlands and Belgium.

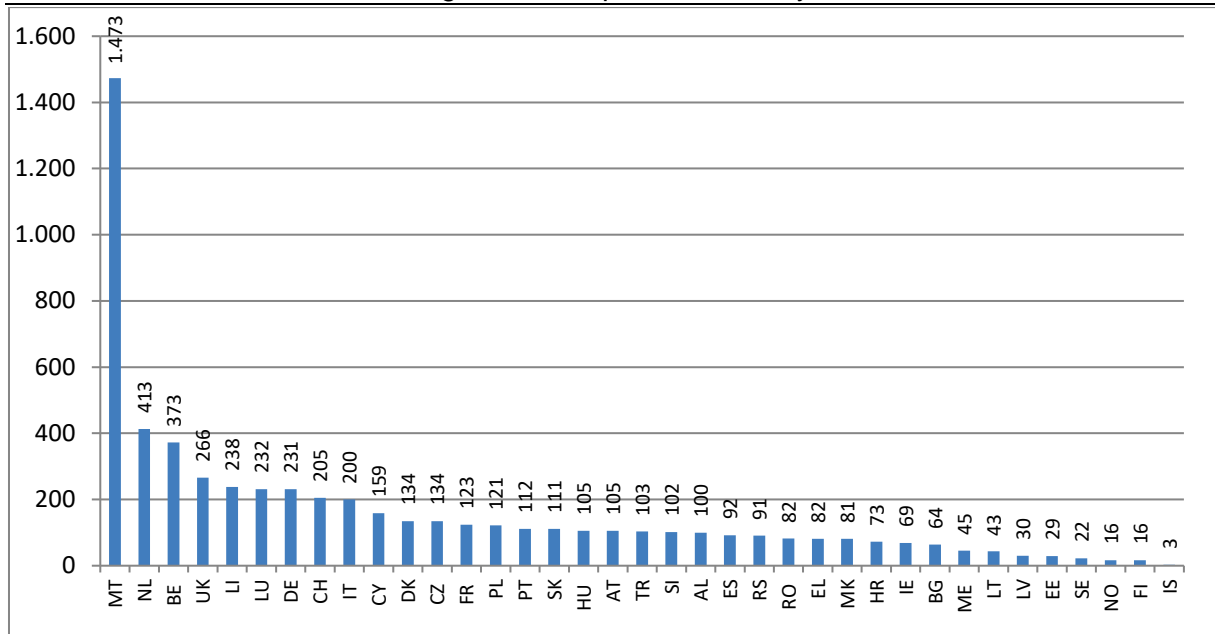
Figure 42 - Total Population



Source: Fischer Weltalmanach 2019

In terms of **population density** (i.e. the number of inhabitants per square kilometre) the top countries with at least 200 people per square km are Malta, the Netherlands, Belgium, UK, Lithuania, Luxemburg, Germany, Switzerland and Italy. Five of these countries are also amongst the countries with the largest total population (Netherlands, Belgium, UK, Germany, Italy).

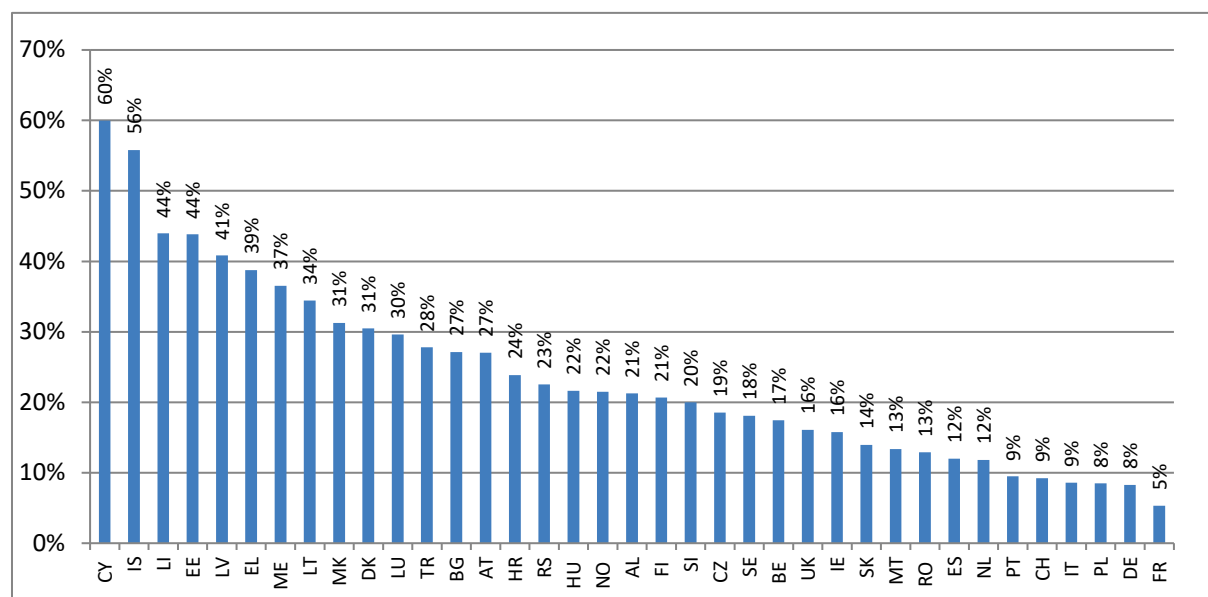
Figure 43 - Population Density



Source: Fischer Weltalmanach 2019

Looking at the **metro population density** (i.e. the number of inhabitants in the three biggest cities as a percentage of the total population³⁰) it is interesting to note that mostly smaller countries have a higher metro population density (in relation to the country size) because a sizeable part of the total population live in the major cities. In some larger countries (i.e. Germany) a low percentage may point to a more spread-out population, however this is not the case for countries with a large disparity of urban and Greater Metro areas (i.e. Paris). The top countries with a percentage of above 30 are Cyprus, Iceland, Liechtenstein, Estonia, Latvia, Greece, Montenegro, Lithuania, North Macedonia, Denmark and Luxemburg.

Figure 44 - Metro Population Density



Source: Fischer Weltalmanach 2019

Market and competitive situation

The market and competitive situation within the different countries, which has a direct influence on the regulatory regime, shows considerable disparity.

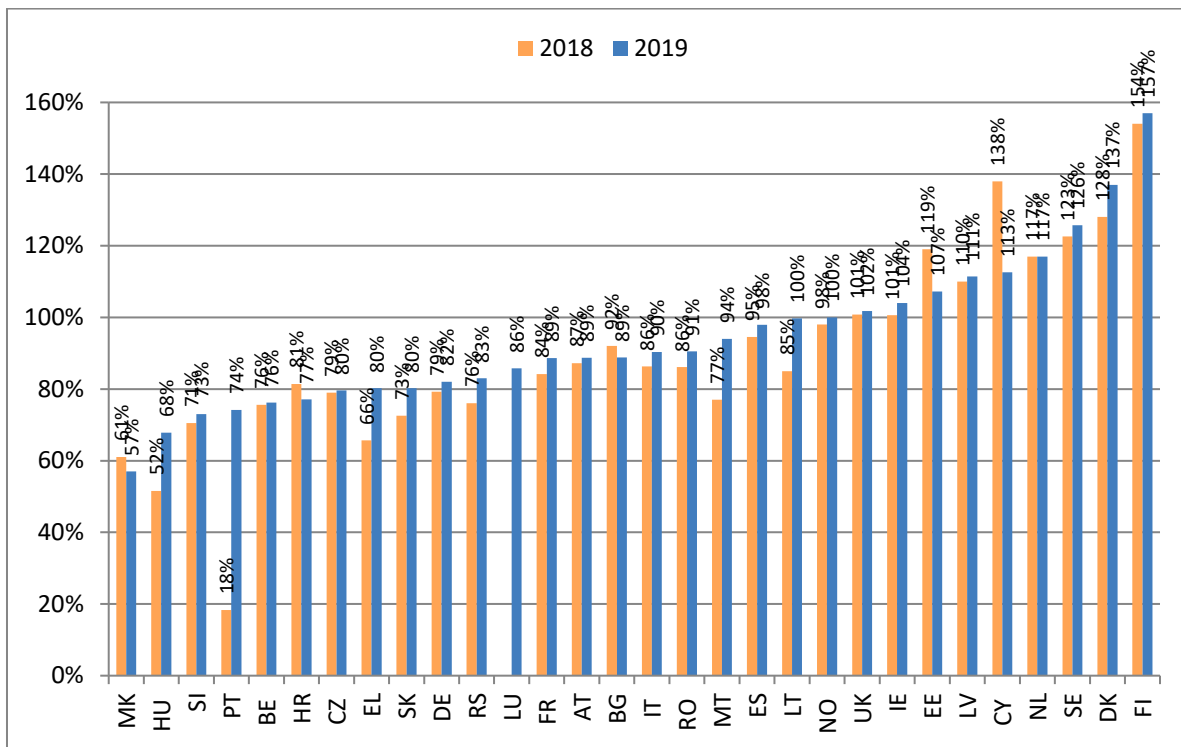
Similar to the last report, this report focusses on the increasingly important broadband subscriptions rather than subscriptions to classical fixed and mobile telephones, which are also depicted in other reports³¹.

³⁰ Shows urban, not Greater Metropolitan Areas

³¹ i.e. BEREC Report on European Termination Rates

The **mobile broadband penetration**, represents mobile broadband end users as a percentage of the total population³² (excluding M2M). Percentages shown are for 2019 data only and vary between 57 per cent in the Republic of North Macedonia and 157 per cent in Finland. The countries with a mobile broadband penetration rate in 2019 of around or more than 100 per cent are Lithuania, Norway, UK, Ireland, Estonia, Latvia, Cyprus, Netherlands, Sweden, Denmark and Finland. Shown in comparison is the penetration rate (as a percentage of the total population) in 2018³³.

Figure 45 - Mobile Broadband Penetration



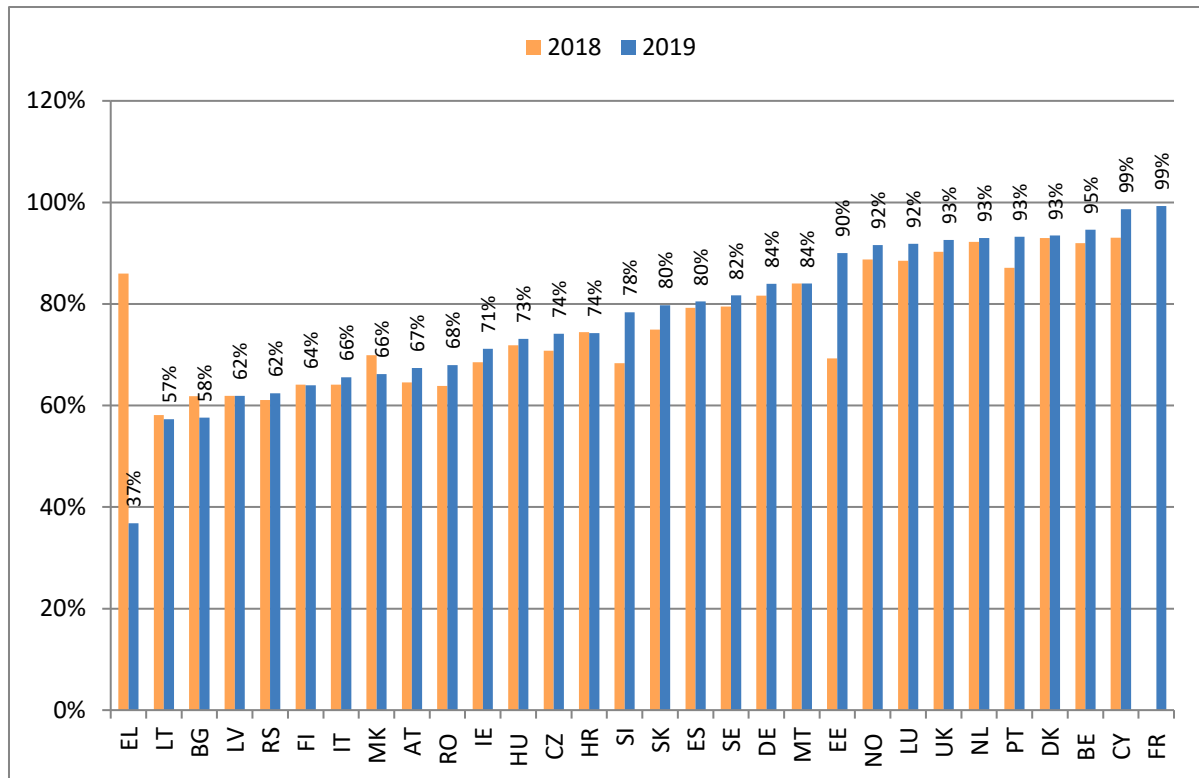
Source: BEREC RA database 2019

³² BE, BG, EL: end 2018 data. CZ: excl. fixed LTE. DE: regular UMTS and LTE users. SE: incl. data-only and voice + data subscriptions. DK: all mobile subscriptions (except prepaid cell phone cards). Pure mobile BB subscriptions = 21% (2018: 21%). UK: does not include access on mobile handsets.

³³ LU: 2018 figures not available

The **fixed broadband penetration** represents fixed broadband subscriptions as a percentage of the total number of households. Percentages vary between 37 per cent in Greece and close to 100 per cent in Belgium, France and Cyprus³⁴. Shown in comparison is the penetration rate (of the total number of households) in 2018³⁵.

Figure 46 - Fixed broadband penetration



Source: BEREC RA database 2019

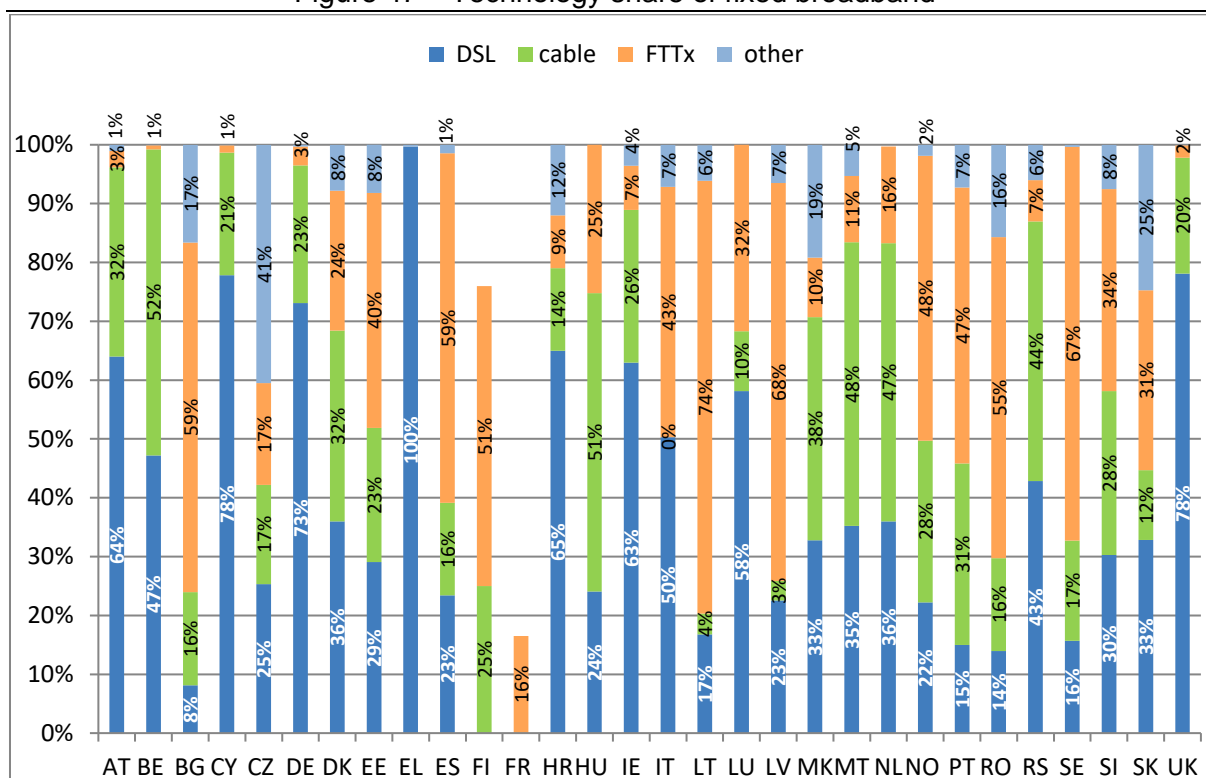
³⁴ BE, EL: end 2018 data. BG: incl. wireless access as a % of 2011 population. CZ: incl. Fixed LTE. IE: xDSL, VDSL, FTTP, cable TWA, satellite residential subscriptions. MT: total residential and registered business users (split not possible). SE: excl. LTE subscriptions (unable to differentiate between LTE mobile subscriptions used in "at home routers" and pure data subscriptions in phones, iPads and laptops). RO: incl. SIM based.

³⁵ No data available for FR.

Figure 47 shows the percentage share of fixed broadband technology³⁶:

- DSL lines (including ADSL, naked DSL, VDSL)³⁷
- Cable (via coax, HFC³⁸)
- FTTx (via FTTH, FTTB/C)
- Other technologies, BWA (satellite, fixed LTE etc.)

Figure 47 – Technology share of fixed broadband



Source: BEREC RA database 2019

DSL lines³⁹ as a percentage of fixed broadband range from just over 8 percent in Bulgaria to 100 percent in Greece. The countries with a share higher than 50 per cent are Austria, Cyprus, Germany, Greece, Croatia, Ireland, Italy, Luxembourg and the UK.

Cable⁴⁰ as a percentage of fixed broadband range from just over 3 per cent in Latvia (no cable coverage in Italy and Greece) to over 50 per cent in Belgium and Hungary. The countries with a share of above 30 per cent are Austria, Belgium, Denmark, Hungary, North Macedonia, Malta, Netherlands, Portugal and the Republic of Serbia.

The use of **FTTx**⁴¹ technology is very low in Austria, Belgium, Cyprus and Germany. A share of at least 50 per cent is recorded for Bulgaria, Spain, Finland, Lithuania, Latvia, Romania and Sweden.

³⁶ EL: data from year end 2017

³⁷ VDSL with Vectoring is included for BE (VDSL with Vectoring may sometimes be seen as FTTC)

³⁸ Hybrid fibre-coax cable

³⁹ BG: including upgraded copper network VDSL2. FR: confidential. RO: incl. DSL and fibre

⁴⁰ FR: confidential. No cable coverage in IT and EL. BG: cable only

⁴¹ IT: all NGA lines FTTH/B/C. EL: no coverage. RO: excl. HCF, DSL, fibre

Other⁴² technologies reported by some countries may include satellite, fixed LTE etc. These seem to be on the increase and may receive more focus in future reports. The Czech Republic has the highest share with over 40 per cent. Bulgaria, the Czech Republic, Croatia, North Macedonia, Romania and Slovakia record shares between 12 and 41 per cent.

Market shares (Broadband)

This section looks at the market and competitive situation⁴³ in the increasingly important broadband market, i. e. the market shares of the incumbent (not SMP in Romania) vs. the market shares of alternative operators (OAO other access operators/competitors) as well as cable operators. This includes DSL and NGA (FTTx) broadband users. The data analysis shows a considerable range in market shares and therefore points to differences in the competitive situation, ultimately influencing regulatory decisions.

The **fixed broadband** market share is split into:

- Share of the incumbent (predominantly the SMP operator): in many countries, the incumbent also operates cable⁴⁴. The incumbent share ranges from a minimum of 20 per cent in Romania to almost 100 per cent in Finland. The incumbent has a market share of greater than 50 per cent in only 8 of the 27 countries: Lithuania, Estonia, Latvia, Cyprus, Germany, Austria, Luxemburg and Finland.
- Share of competitors: market shares range from 6 per cent in Belgium to 80 per cent in Romania. In some countries, competitor data includes cable, which makes shares difficult to compare with countries that record shares separately⁴⁵.
- Share of cable operators: not all NRAs record data/record data separately from competitor data⁴⁶. Where it is recorded separately (Austria, Belgium, Cyprus, Czech Republic, Estonia, Hungary, Ireland, Lithuania, Luxemburg, Latvia, Republic of North Macedonia, Norway, Republic of Serbia, Sweden, Slovenia, UK), shares range from around 3 per cent in Lithuania/Latvia to 49 per cent in Belgium.

⁴² BG: LAN, RLAN, fixed access via mobile network & Satellite. CZ: incl. mainly BWA/FWA and fixed LTE. FR: confidential.

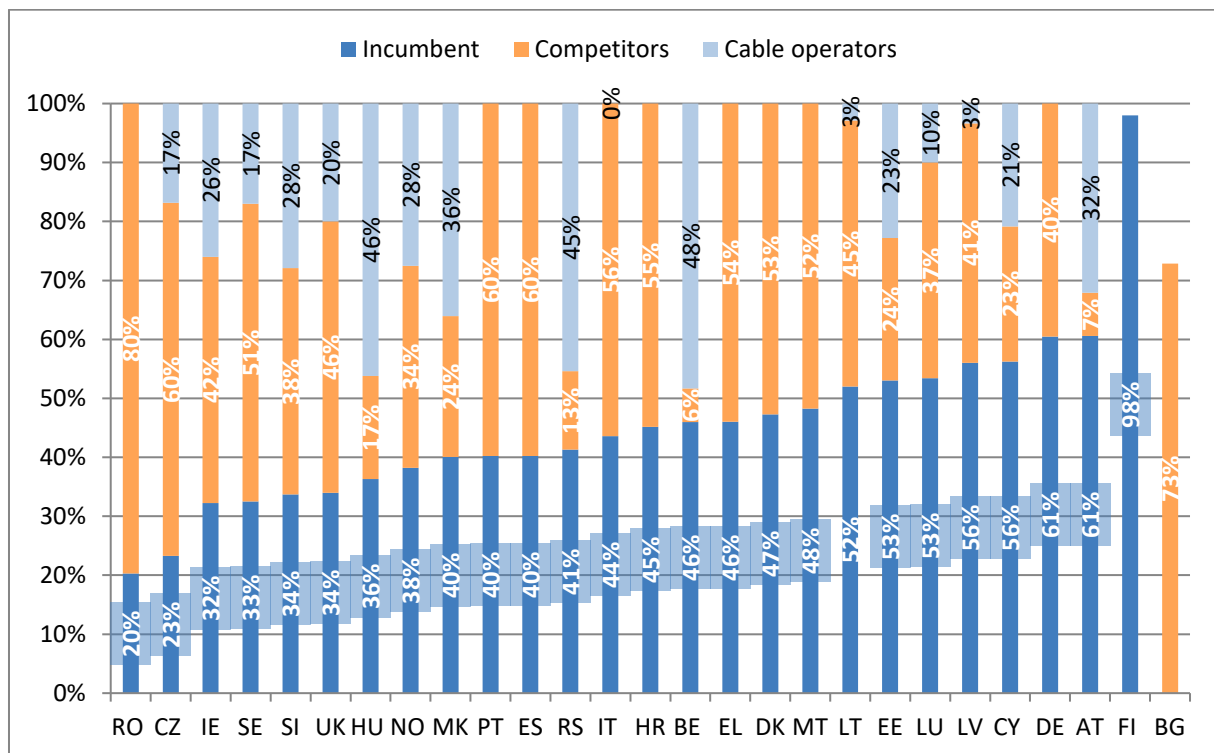
⁴³ CZ: the former SMP operator was separated into two legal entities: 1. CETIN Infrastructure and wholesale services 2. O2 retail services. Data provided in this section is O2 data and is of Q2 2018. BG: data as of 1.1.2019. SE: residential data only. Data is confidential in FR, NL, SK, BG (incumbent data).

⁴⁴ Incumbent also operates cable in DK (SMP is the biggest cable operator), ES (15,76%), MT. RO: incumbent is not SMP. SE: LTE not included.

⁴⁵ Competitors include cable operators in BG, CZ, ES, HR (competitors include two operators which are under control of the SMP operator), PT, RO. SE: not including cable TV operators.

⁴⁶ DE: cable share is not known (not regulated). No cable coverage in IT, EL.

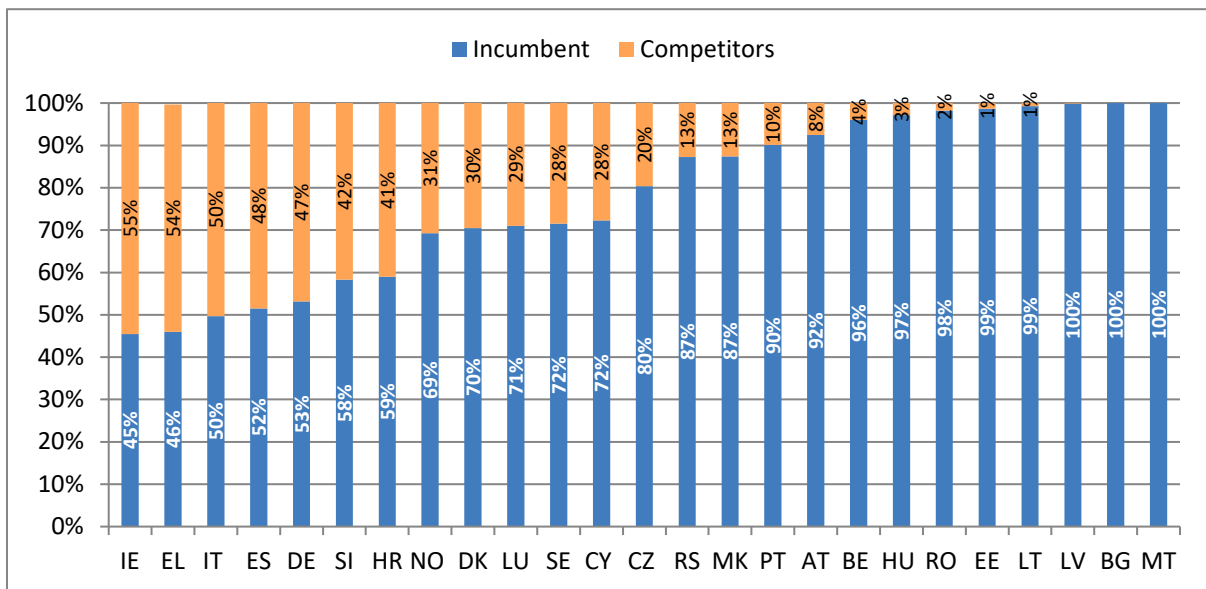
Figure 48 – Fixed broadband market share



Source: BEREC RA database 2019

The **DSL broadband** share (including docsis prior to 3.0)⁴⁷ is the traditional domain of incumbent operators. Their market share ranges from a 45 per cent in Ireland to 100 per cent in Malta and Bulgaria (only the incumbent offers DSL). Shown in the same figure are competitor market shares, ranging from around 1 per cent in the Baltics (Latvia, Lithuania, Estonia) to 55 per cent in Ireland.

Figure 49 - DSL broadband market share

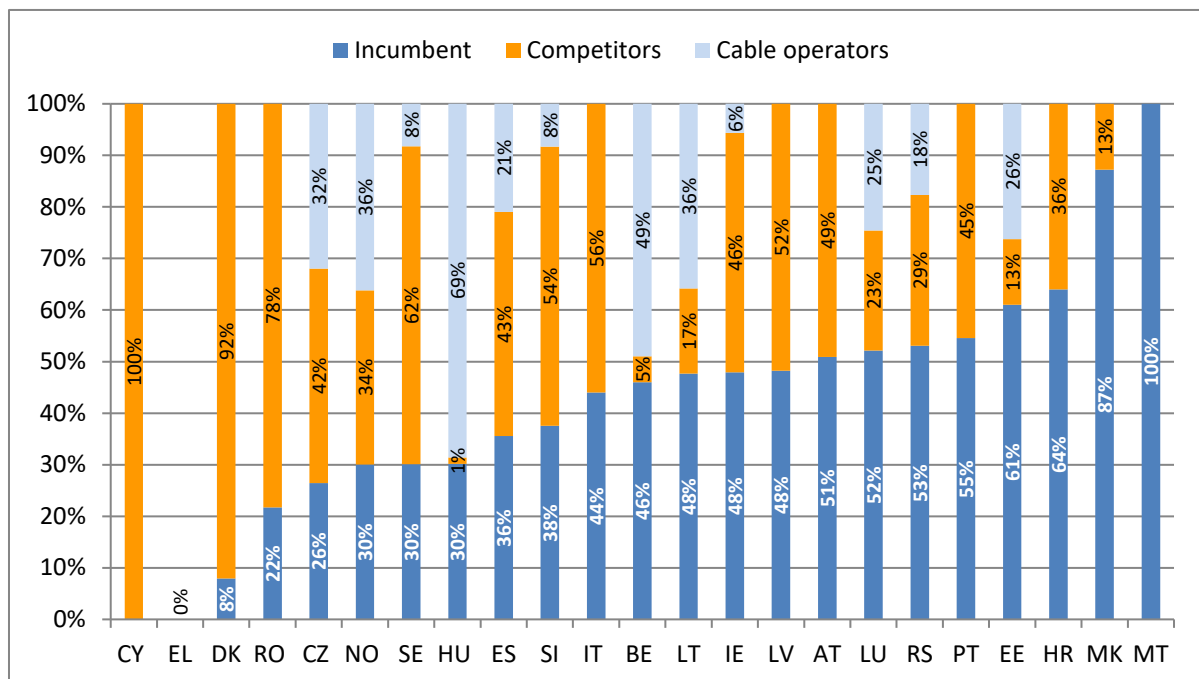


Source: BEREC RA database 2019

⁴⁷ Data is confidential in FR, NL, SK, UK.

Looking at NGA (FTTx) broadband share (including VDSL, FTTH, FTTB, cable docsis 3.0),⁴⁸ the incumbent's share ranges from 8 per cent in Denmark to 100 per cent in Malta. Shown in the same figure are the competitor and cable operator's market shares.

Figure 50 - FTTx broadband market share



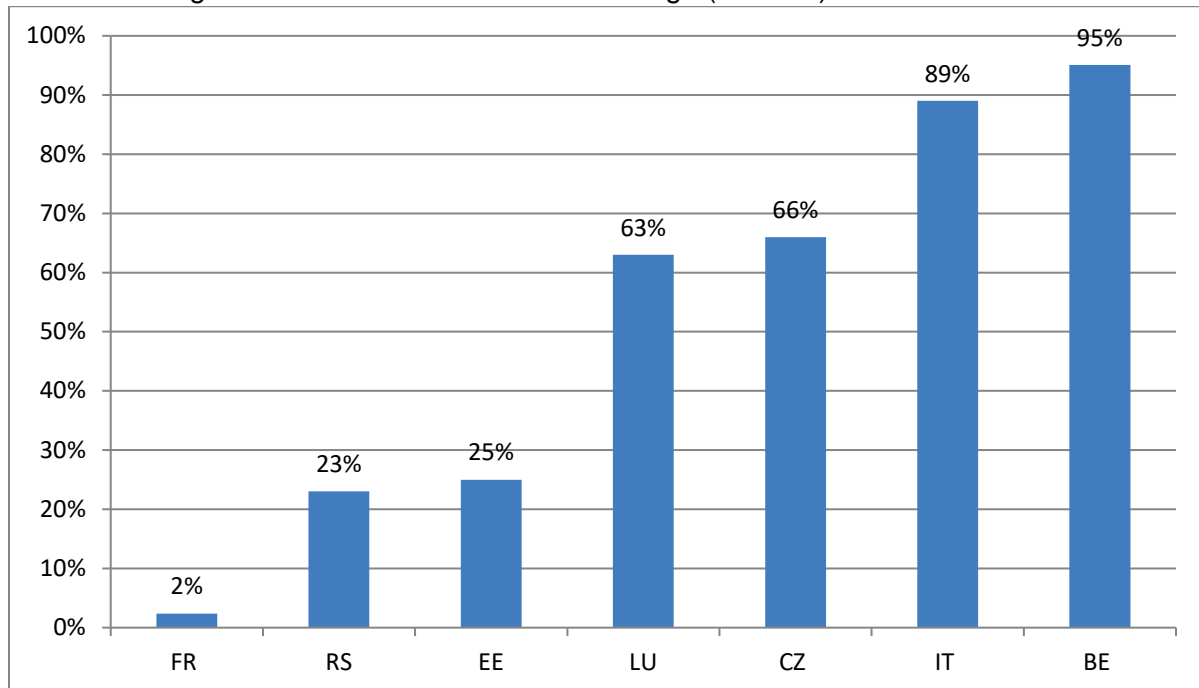
Source: BEREC RA database 2019

⁴⁸ Data is confidential in BG, FR, NL, SK, UK and not available in DE, FI. Cable operators are included in incumbent share in DK (SMP is the biggest cable operator). In HR, PT and RO cable operators are included in competitor's share. Incumbent data SE: share of SMP FTTB/H and total FTTB/H. Competitor data IE: not including FTTx provided from cable operators. Cable operator data IE: share of FTTx from cable operators as a % of total FTTx broadband. VDSL connections, and co-axial cable connections are not included.

OAO using own cable and SMP infrastructure, i. e. competitor's aggregate market share of total NGA (FTTx) and/or cable broadband subscriptions via own cable using the incumbent's passive infrastructure: only five NRAs provided information with Malta reporting a share of 59 per cent in 2019 (under 5 per cent in Italy and Austria and 0 per cent in Cyprus and Greece)⁴⁹- no graphical presentation.

When looking at the **incumbent's coverage of FTTB/C infrastructure** (via SLU)⁵⁰, which was not recorded in 2018, a total of 11 NRAs supplied data (not shown are Spain, Malta and Portugal with 0 per cent coverage).

Figure 51 – Incumbent FTTB/C coverage (via SLU): % of households



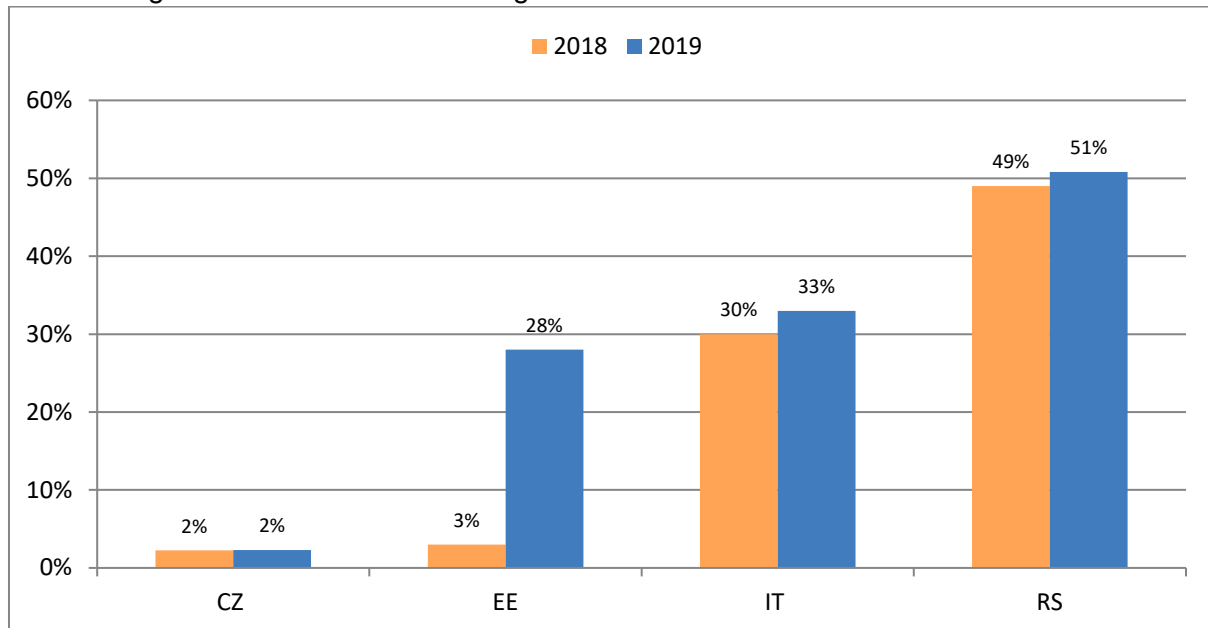
Source: BEREC RA database 2019

⁴⁹ Data is confidential in BE, BG, IE, FR, NL, UK and not available in CZ, DE, DK, EE, ES, FI, HR, HU, LT, LU, LV, MK, NO, PT, RO, RS, SE, SI, SK.

⁵⁰ Data is confidential in BG, SK and not available in AT, CY, DE, DK, EL, FI, HR, HU, IE, LT, LV, MK, NL, NO, RO, SE, SI, UK. CZ: FTTC is represented by all NGA VDSL lines (≥ 30 Mbit/s). BE: including VDSL.

The total coverage of households by the main **OAO FTTB/C on their own network**⁵¹ was provided by 8 NRAs (not shown in the graph are Spain, France, Malta and Portugal with 0 per cent). In comparison to 2018, figures are on the increase).

Figure 52 – Main OAO coverage on own network FTTB/C: % of households

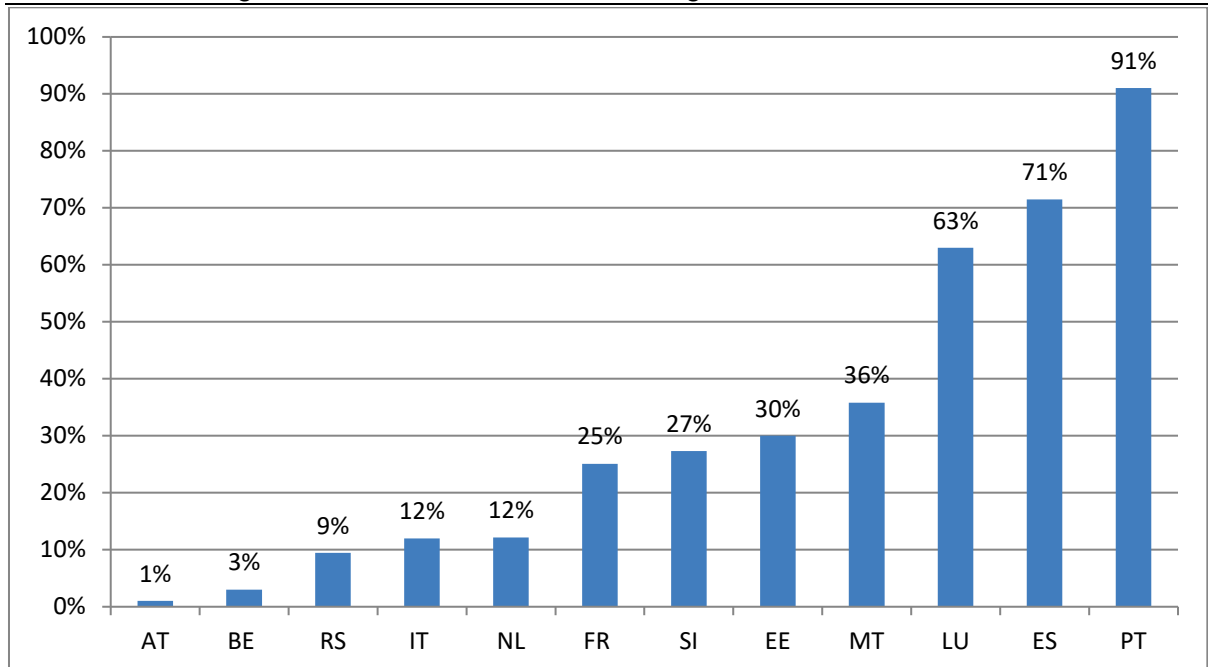


Source: BEREC RA database 2019

⁵¹ Confidential in NL and not available in AT, BE, CY, DE, DK, EL, FI, HR, HU, IE, LT, LU, LV, MK, NO, RO, SE, SI, UK. BG: residential subscriptions as a % of total HH. CZ: % of total households/premises passed SK: Data includes only FTTB and is based on the minimum coverage in the selected site, as the maximum possible coverage of one operator in the selected site is included in the calculation.

The **incumbent's coverage of Fibre to the Home (FTTH)** was not recorded in 2018 but was provided in 2019 by 12 NRAs⁵². The coverage is above 70 per cent of total households (homes connected in Sweden) in Spain, Sweden, Portugal and Estonia. The remaining NRAs record a coverage of less than half that percentage.

Figure 53 – Incumbent FTTH coverage: % of total households

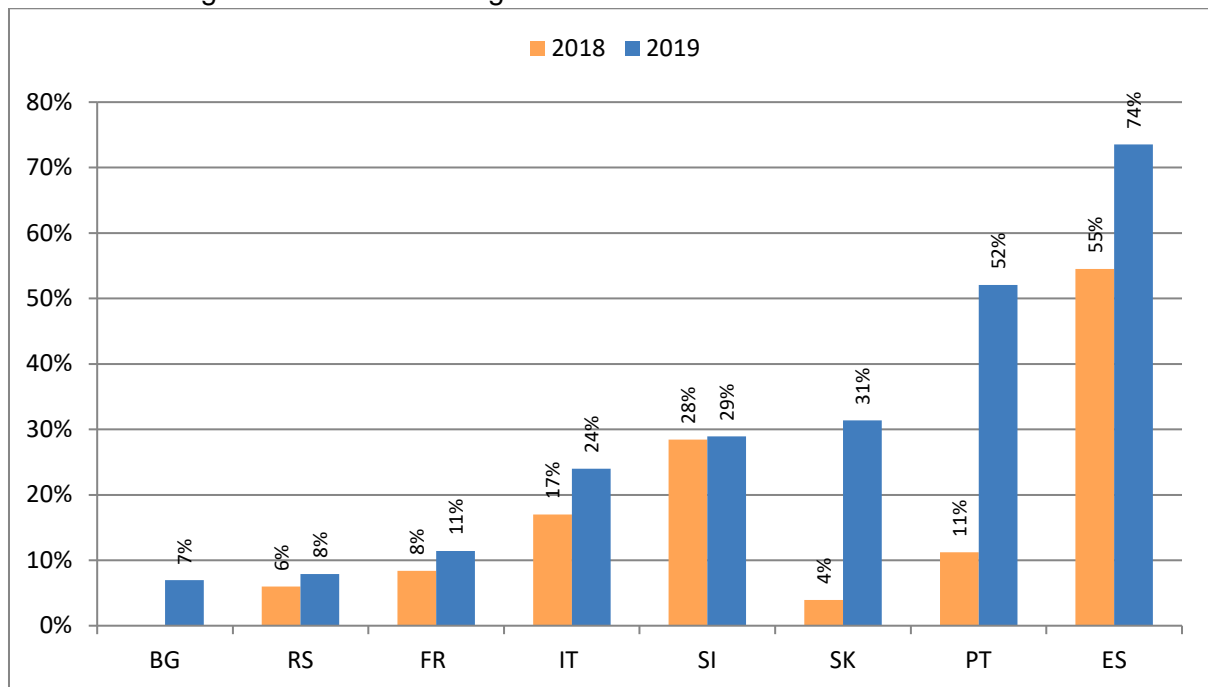


Source: BEREC RA database 2019

⁵² Confidential in BG, CZ, SK, DK and not available in CY, DE, EL, FI, HR, HU, IE, LT, LV, MK, NO, RO, SE, UK.

The total **FTTH coverage of the main OAO via their own infrastructure**⁵³ resulted in 12 NRAs reporting data (Malta, Estonia, Austria, and the Czech Republic are not shown in the graph since coverage is negligible). 2018 figures are shown in comparison.

Figure 54 - OAO coverage on own network FTTH: % of households



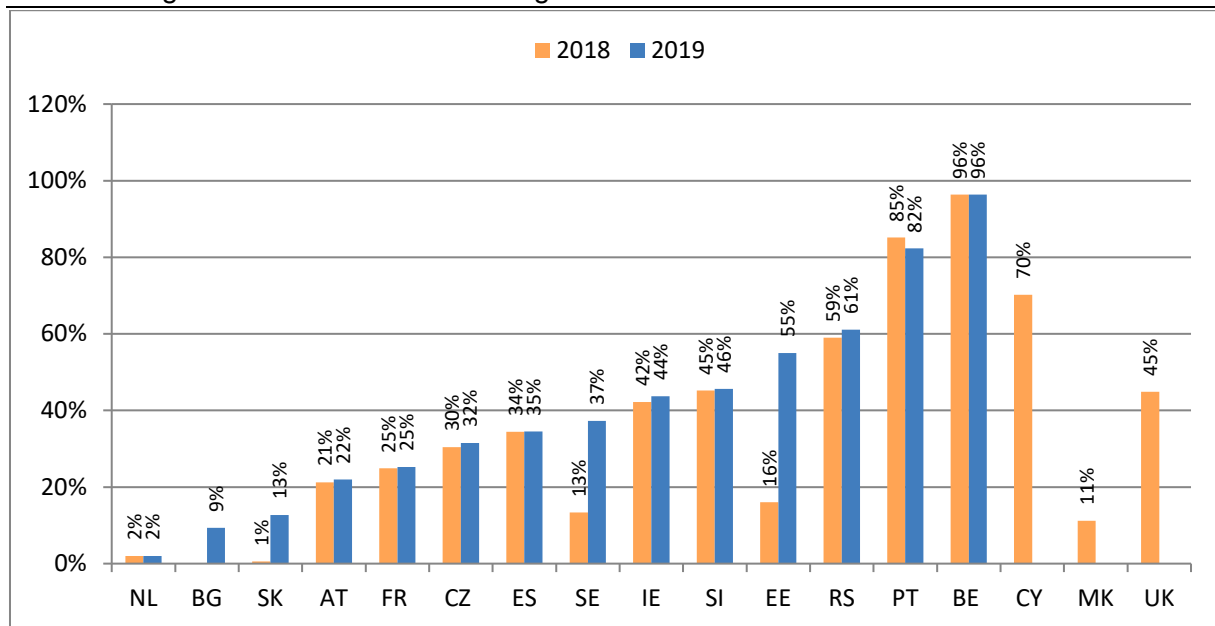
Source: BEREC RA database 2019

⁵³ Confidential in NL and not available in BE, CY, DE, DK, EL, FI, HR, HU, IE, LT, LU, LV, MK, NO, RO, SE, UK.

The total **cable coverage of the incumbent** (not recorded in 2018) resulted in a response of a total of 13 NRAs, of which only Malta reported 100 per cent coverage (0 per cent coverage in Belgium, the Czech Republic, Estonia, Spain, France, Italy, Portugal, the Republic of Serbia, Sweden, Slovenia and Slovakia) - no graphical presentation.⁵⁴

The total **cable coverage of OAO on own cable network**⁵⁵ resulted in a response of a total of 14 NRAs for 2019 (not shown are Malta and Italy with a coverage of 0 per cent in 2019 and 2018). Except for Sweden and Estonia there is no substantial development in comparison to 2018.

Figure 55 – OAO cable coverage on own cable network: % of households



Source: BEREC RA database 2019

⁵⁴ Confidential in BG and NL and not available in AT, CY, DK, EL, FI, HR, HU, LT, LU, LV, MK, NO, RO, UK. SMP has no cable network in BE, IE, SE, DE, CZ.

⁵⁵ Not available in CY, DE, DK, EL, FI, HR, HU, LT, LU, LV, MK, NO, RO, UK. BE: cable operators are SMP. BG: residential subscriptions as a % of total households. IE: based on premises passed. SE: data as of 01.10.18, total household coverage via cable TV networks.

Table 4 – Ref Figure 7 – Vectoring regulation

	M3a_ULL	M3a_SLU	M3a_VULA (FTTC)	M3b_Access_legacy	M4_Active_Legacy	M4_Active_NGA
Yes	AT BE CY CZ DE DK AT CY EE EL HR CZ DE EE AT CY HU IT IS EL HR DE EL AT DK LV NL HU IT IS HR IT IS EE EL HR NO SE LV NO LV NL IT IS LV SI SK UK SE UK SI UK NO RS HR LV HR LV					
No	LI	FR	FR SK CZ	FR HU CZ	FR HU CZ	FR HU CZ

Table 5 – Ref Figure 8 – Cable regulation/Presence of wholesale-only operator

	M3a_ULL	M3a_SLU	M3a_SA (Shared Access)	M3a_fiberLLU	M3a_VULA (FTTC)	M3a_VULA (FTTH)	M3a_DF (Dark Fiber in the Access segment)	M3a_DA (Duct Access in the access segment)	M3b_Access_legacy	M3b_bckhaul	M4_Active_Legacy	M4_Active_NGA
Cable operator regulation	DK LI LT LV LT LV		DK LT LV	DK HU LI LT LV		LT	DK LT LV MK	LV NO	BE DK HU NL			
Wholesale only operator presence	LI LT LV LT LV		LI LT LV	BE CH FR IT IS LI LT LV	BE	BE ES IT LT SI LV	BE LT LV MK	BE FR IS LI LT LV			FR	FR LV PT

Table 6 – Ref Figure 12 - Price control main categories

	M1 2007	M2 2007	M1	M2	M3a_ULL	M3a_SLU	M3a_SA (Shared Access)	M3a_fiberLLU	M3a_VULA (FTTC)	M3a_VULA (FTTH)	M3a_DF (Dark Fiber in the Access segment)	M3a_DA (Duct Access in the access segment)	M3b_Access_legacy	M3b_bckhaul	M4_Active_Legacy	M4_Active_NGA	M4_Passive	WLR (Wholesale Line Rental)	
Cost_Orientation	DK LI LT	DK FR HR IE IT LI PL	AT BE BG CH CY BG CH CY CZ DK CZ DE DK CY DE DK EE EL ES FI EE EL ES FI FR HR HU FR HR HU FR HR HU IE IT IS IE IT IS IE IT IS LU MK LT LU LV IT IS LT LU MT NL NO PL PL PT RS NO PL RO RS SE SI SK UK	AT BE BG CH CY BG CH CY CZ DE DK CZ DE DK CY DE DK EE EL ES FI EE EL ES FI FR HR HU FR HR HU FR HR HU IE IT IS IE IT IS IE IT IS LU MK LT LU LV IT IS LT LU MT NL NO PL PL PT RS NO PL RO RS SE SI SK UK				BE BG CY DK EE EL FI FR HU IE IS LT LV MT NL NO PL RS SI	DK FI HR HU LI LT LV MT PL	BE CY DE EL FR HU IE IT IS LT LV UK	CY HR IT LT LV MK NL	DK DE DE EE EL ES FR HR FR HR HU IE IT IS IT LV LV MK NO PT RS SE SI SK UK	BG CH CY DE DK EE EL FR HR HU IE IT IS IT LV LV MK NO PT RS SE SI SK UK	CY DE DK EE EL FR HR HU IE IT IS IT LV LV MK NO PT RS SE SI SK UK	EE FR HU IE IT LV PL SI	CH CY DE EL ES IT IS LT LU LV MT NL PT RO SI UK	AT CH CY DE EL HR IE IT IS LT LV LV PT RO SI UK	AT CH EL IE IT IS LV PL LT UK	ES IE IT PL
Retail_minus	HR UK	UK				UK		SI	AT SI	AT ES SI			AT ES					EL HR LI UK	
Benchmarking			EE IS	EE LI LT LV RO RS															
Others/Combination	AT IE	DE	DE		AT CZ SK	AT CZ	LI SK	BE CZ LU SK	CZ FI SK	BE FI IE NO SK			BE	BE LU SK	BE SK	BE FR	BE FR		

Table 7 – Ref Figure 13 - Price control sub category Cost Orientation

	M1 2007	M2 2007	M1	M2	M3a_ULL	M3a_SLU	M3a_SA (Shared Access)	M3a_fiberLLU	M3a_VULA (FTTC)	M3a_VULA (FTTH)	M3a_DF (Dark Fiber in the Access segment)	M3a_DA (Duct Access in the access segment)	M3b_Access_legacy	M3b_backhaul	M4_Active_Legacy	M4_Active_NGA	M4_Passive	WLR (Wholesale Line Rental)
Cost orientation (main category)	DK LI IT LT	ES FR HR IE PL	AT BE BG CH CY CZ DE DK EL ES FR HR HU IE IT LI LU LV MT NL NO PL RS SE SI SK UK	AT BE BG CH CY CZ DE DK EL ES FR HR HU IE IT LI LU LV MT NL NO PL PT RS SE SI SK UK	BE BG CH CY CZ DE DK EE EL ES FR HR HU IE IT IS LI LT LU LV MT NL NO PL PT RS SE SI UK	BG CH CY DE EE EL FR HU IE IT IS LI LT LU LV MT NL NO PL PT RS SE SI	BE BG CY DE EE EL FR HU IE IS LI LV MT NL NO PL RS SI	DK EE EL FR HU IE IT IS LI LV MT PL	DK EE EL FR HU IE IT IS LI LV MT PL	BE CY DE EL FR HU IE IT IS LI LV MT NL NO PL RS SI	DE DK EL ES FR HR HU IE IT LI LU LV MT NL NO PL RS SE SI	CH DE EL ES FR HR HU IE IT LI LU LV MT NL NO PL PT RS SI	DE DK EE EL FR HR HU IE IT LI LU LV MT NL NO PL PT RS SI	EE EL FR HU IE IT LI LU LV MT NL NO PL PT RS SI	CH CY DE EL ES FR HR HU IE IT LI LU LV MT NL NO PL PT RS SI	AT CH CY DE EL ES FR HR HU IE IT LI LV MT NL NO PL PT RS SI	AT CH CY DE EL ES FR HR HU IE IT LI LV MT NL NO PL PT RS SI	ES FR IE IT LT PL
Cost orientation alone (sub category)	DK FR	DE EL ES HR IT PL	AT BE BG CH CY CZ DE DK EL ES FR HR HU IE IT LI LU LV MT NL NO PL RS SE SI SK UK	AT BE BG CH CY CZ DE DK EL ES FR HR HU IE IT LI LU LV MT NL NO PL RS SE SI	BE BG CH CY CZ DE DK EE EL ES FR HR HU IE IT IS LI LT LU LV MT NL NO PL PT RS SE SI UK	CH CY DE EL FR HU IE IT LI LV MT PL	BE CY DE EL FR HU IE IS LI LV MT NL NO PL RS SI	DK EE EL FR HU IE IT IS LI LV MT PL	DK EE EL FR HU IE IT IS LI LV MT PL	BE CY DE EL FR HU IE IT IS LI LV MT NL NO PL RS SI	DE DK EL ES FR HR HU IE IT LI LU LV MT NL NO PL RS SE SI	CH DE EL ES FR HR HU IE IT LI LU LV MT NL NO PL PT RS SI	DE DK EE EL FR HR HU IE IT LI LU LV MT NL NO PL PT RS SI	EE EL FR HU IE IT LI LU LV MT NL NO PL PT RS SI	CH CY DE EL ES FR HR HU IE IT LI LU LV MT NL NO PL PT RS SI	AT CH CY DE EL ES FR HR HU IE IT LI LV MT NL NO PL PT RS SI	AT CH CY DE EL ES FR HR HU IE IT LI LV MT NL NO PL PT RS SI	ES FR IE IT LT PL
Price cap (sub category)	DK	DK FR	CZ DK NL NO SE SK UK	CZ DK NL NO SE SK UK	BG DK LU NO SE UK	BG FR HR LU NO SE	BG DK NL NO	DK FI	UK	NL	DK SK UK	DK FR NO	IT LU NL UK	AT LU UK	UK	FR	FR	

Table 8 – Ref Figure 14 - Price control sub category Retail minus

	M1 2007	M2 2007	M1	M2	M3a_ULL	M3a_SLU	M3a_SA (Shared Access)	M3a_fiberLLU	M3a_VULA (FTTC)	M3a_VULA (FTTH)	M3a_DF (Dark Fiber in the Access segment)	M3a_DA (Duct Access in the access segment)	M3b_Access_legacy	M3b_backhaul	M4_Active_Legacy	M4_Active_NGA	M4_Passive	WLR (Wholesale Line Rental)	
Retail minus main category	HR UK	UK				UK		SI	AT SI	AT SI	ES		AT	ES				EL HR LI SI UK	
ex-ante retail traditional MS test (sub category)	HR																		HR LI
ex-ante wholesale MS test (sub category)																			
ERT (Economic Replicability Test) (sub category)									SI	AT SI	AT SI	ES	AT	ES					
Fair and reasonable pricing (sub category)	UK	UK				UK													UK

Table 9 – Ref Figure 15 - Price control sub category Benchmarking

	M1 2007	M2 2007	M1	M2	M3a_ULL	M3a_SLU	M3a_SA (Shared Access)	M3a_fiberLLU	M3a_VULA (FTTC)	M3a_VULA (FTTH)	M3a_DF (Dark Fiber in the Access segment)	M3a_DA (Duct Access in the access segment)	M3b_Access_legacy	M3b_backhaul	M4_Active_Legacy	M4_Active_NGA	M4_Passive	WLR (Wholesale Line Rental)	
Benchmarking (main category)			IS	EE LV	EE LT LV	LI RO RS													
Benchmarking in compliance with Recommendation of 11 Sept 2013 (access market) (sub category)																			
Benchmarking in compliance with Recommendation of Termination Rates Recommendation of 7 May 2009 (sub category)			LV	DE	RO RS	LT LV													

Table 13 – Ref Figure 19 – Allocation methods LR(A)IC sub categories

	M1 2007	M2 2007	M1	M2	M3a_UL	M3a_SL	M3a_SA (Shared Access)	M3a_fiberLU	M3a_VU LA (FTTC)	M3a_VU LA (FTTH)	M3a_DF (Dark Fiber in the Access segment)	M3a_DA (Duct Access in the access segment)	M3b_Ac cess_leg acy	M3b_ba ckhaul	M4_Acti ve_Lega cy	M4_Acti ve_NGA	M4_Pas sive	WLR (Wholes ale Line Rental)
LR_A_IC (main category)		EL HR IE IT	CH	CH	AT BE CH DE DK EL HR IE IT NO SE	AT CH DE EL IE IT NO SE	BE DK EL NO	BE DK FI HR	BE DE EL HR IE IT	BE DE EL HR IT	DE DE EL HR IT	BE DE CH DE EL EL IT IT SE NO	BE DE DK EL HR IE IT NO	BE IE EL IT	BE CH DE EL HR HR RO	BE CH DE EL FR HR IT	CH EL HR RO	FR IT
TD-LR(A)IC+ (sub category)		EL HR			DE EL	DE EL	EL		DE EL	EL	DE	DE	DE EL	EL	DE EL	DE EL	EL	
BU-LR(A)IC+ (sub category)		IT	CH	CH	AT BE CH DK HR IT NO SE	AT CH DE IT IE SE	BE DK NO	BE DK FI HR	BE HR IT	BE HR IT	DE EL HR IT	BE DE CH EL IT SE	DK HR IT NO	BE IT	CH RO	CH FR	CH RO	IT

Table 14 – Ref Figure 20 – Allocation methods LRIC sub categories

	M1 2007	M2 2007	M1	M2	M3a_UL	M3a_SL	M3a_SA (Shared Access)	M3a_fiberLU	M3a_VU LA (FTTC)	M3a_VU LA (FTTH)	M3a_DF (Dark Fiber in the Access segment)	M3a_DA (Duct Access in the access segment)	M3b_Ac cess_leg acy	M3b_ba ckhaul	M4_Acti ve_Lega cy	M4_Acti ve_NGA	M4_Pas sive	WLR (Wholes ale Line Rental)	
LRIC (main category)			AT BE BG CY CZ DE DK CZ DE DK EL ES FR IE HR HU IT LU LT LU MT NL NO NO RO SE SI SK UK UK	AT BE BG CY CZ DE DK CZ DE DK EL ES FR FR HR HU IT LU LT LU MT NL NO NO RO SE SI SK UK UK	CY CZ HU HU PL PL	CY CZ HU HU PL PL	CY HU IE SI	CZ HU SI	CY CZ HU HU SI SI	CY CZ HU HU SI SI	CZ HU MK PL	HU MK SI SK	CY HU PL SI	HU PL SI	CY LU	CY LU	PL		
pure LRIC (Recommendation on termination rates) (sub category)			AT BE BG CY CZ DE DK CZ DE DK EL ES FR FR HR HU IT LU LT LU MT NL NO RO SE SI SK UK	AT BE BG CY CZ DE DK CZ DE DK EL ES FR FR HR HU IT LU LT LU MT NL NO SE SI SK UK UK															
TD-LRIC (sub category)								SI	SI	SI			SI	SI					
BU-LRIC (sub category)				EL	CY CZ HU HU LU LU SI SI	CY CZ HU HU LU LU	CY HU SI	CZ HU	CY CZ HU HU	CY CZ HU HU	CZ HU	HU SI SK	CY HU	HU	CY LU	CY LU			

Table 15 – Ref Figure 22 – Combination price control / costing methodologies (M1 and M2)

	M1 2007		M2 2007		M1_2014_M3_2007		M2_2014_M7_2007	
	BU	TD/accou nting methods	BU	TD/accou nting methods	BU	TD/accou nting methods	BU	TD/accou nting methods
Cost orientation alone	0 (0)	0 (1)	2 (3)	4 (4)	14 (14)	1 (1)	14 (14)	1 (0)
Price cap	0 (0)	2 (2)	1 (1)	1 (1)	7 (8)	0 (0)	6 (7)	0 (1)

Table 16 – Ref Figure 23 – Combination price control / costing methodologies (M3a)

	M3a_2014_M4_2007_ULL		M3a_2014_M4_2007_SLU		M3a_2014_M4_2007_SA		M3a_2014_M4_2007_fiberLLU		M3a_2014_M4_2007_VULA (FTTC)		M3a_2014_M4_2007_VULA (FTTH)		M3a_2014_M4_2007_DF		M3a_2014_M4_2007_DA	
	BU	TD/accouting methods	BU	TD/accounting methods	BU	TD/accouting methods	BU	TD/accouting methods	BU	TD/accouting methods	BU	TD/accounting methods	BU	TD/accouting methods	BU	TD/accounting methods
Cost orientation alone	7 (7)	7 (6)	4 (4)	6 (5)	4 (5)	6 (5)	2 (3)	3 (3)	5 (3)	4 (3)	4 (3)	3 (2)	4 (3)	5 (3)	4 (3)	10 (6)
Price cap	4 (3)	3 (3)	3 (1)	1 (1)	1 (1)	3 (3)	2 (1)	0 (1)	0 (0)	0 (1)	0 (0)	1 (0)	1 (1)	0 (0)	1 (2)	1 (2)
ERT	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	0 (0)	1 (1)	1 (1)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)

Table 17 – Ref Figure 25 – Combination price control / costing methodologies LLU service

	Dial 1	Dial 2	Dial 3	Dial 4
Cost orientation alone/BU-LR(A)IC/LRIC/CCA	1	1	2	2
Cost orientation alone/TD-LR(A)IC/LRIC/CCA	2	1		
Cost orientation alone/FDC/CCA	3		1	1
Cost orientation alone/FDC/HCA	4	2	1	
Price cap/BU-LR(A)IC/LRIC/CCA	5		1	3
Price cap/FDC/CCA	6	1	1	2

Table 18 – Ref Figure 26 – Combination price control / costing methodologies VULA FTTH/Fibre LLU

	Dial 1	Dial 2	Dial 3	Dial 4
Cost orientation alone/BU-LR(A)IC/LRIC/CCA	1	3	1	
Cost orientation alone/TD-LR(A)IC/LRIC/CCA	2		1	
Cost orientation alone/FDC/CCA	3	1		
Cost orientation alone/FDC/HCA	4	2		
Price cap/BU-LR(A)IC/LRIC/CCA	5	1		1
Price cap/FDC/CCA	6		1	
ERT (Economic Replicability Test)/BU-LR(A)IC/LRIC/CCA	7	1		1
ERT (Economic Replicability Test)/TD-LR(A)IC/LRIC/CCA	8		1	
No regulation	9	2	1	4

Table 19 – Ref Figure 27 – Combination price control / costing methods (M3b and 4)

	M3b_2014_Access_legacy		M3b_2014_backhaul		M4_2014_Active_Legacy		M4_2014_Active_NGA		M4_2014_Passive	
	BU	TD	BU	TD	BU	TD	BU	TD	BU	TD
Cost orientation alone	4 (4)	6 (7)	2 (2)	5 (4)	3 (2)	6 (6)	2 (1)	6 (6)	2 (2)	4 (3)
Price cap	1 (1)	1 (1)	0 (0)	0 (0)	1 (1)	3 (4)	1 (1)	2 (2)	0 (0)	1 (0)
ERT	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)