

BEREC Report

Regulatory Accounting in Practice 2018

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1. Executive summary

This is the fourteenth 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.

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), Wholesale Central Access (Market 3b) and Wholesale high quality access (Market 4). Moreover the cost base and allocation methodologies used for fixed (Market 1) and mobile (Market 2) 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. Not surprisingly, differences in the market/competitive situation as well as infrastructure in place can be observed among responding countries, reflecting different external and technical requirements which NRAs need to take into account.

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 an extended survey on WACC parameters, focusing on market 3a and, for the first year, also 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.

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 new RA annual report provides an analysis more oriented on single products (increasing the scope of monitoring). The 2018 report collects information on 19 main products (13 in 2015).

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 9) and to some extent to VULA products.

ERT price control methodology in line with the Commission Recommendation (2013/466/EU) is still not widely used for NGA products.

The most frequent cost allocation approach is LRIC/LRAIC, almost for all products/markets. LRIC is the preferred approach specifically in termination markets. In the access market (market 3a) a preference for LRIC/LRAIC can be found. In general, when LRAIC/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 been widely removed in a quite mature and stable environment, such as ULL services in market 3a (only 17 NRAs apply this remedy, vs. 32 last year). A particular case are termination markets, where NRAs that have determined prices through pure BU-LRIC models have in some cases removed the Accounting Separation 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) shows 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 sources of evidence used. This kind of evidence reflects and supports the arguments in the opinion given to the Commission's WACC consultation (BoR (18) 167). A specific focus for fixed and mobile markets shows that there is no significant difference in the methodology used to estimate the WACC.

Overall the 2018 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 first 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 just 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.

2. Introduction

2.1 Background

The BEREC Regulatory Accounting EWG has been gathering and reporting data from National Regulatory Authorities (NRAs) with the aim of describing how regulatory accounting systems are implemented in European countries with respect to cost-orientation or non-discrimination obligations or to assist price control decisions. This is the fourteenth annual report summarising the results of the 2018 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 Subsequently, 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, more recently, also on how NRAs implemented the principles of the Commission Recommendation on consistent non-discrimination obligations and costing methodologies.⁴ In 2014 the Commission issued a new Recommendation that reduced further the number of relevant markets pushing the report on focussing more on products in each market..

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

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

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

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.

the consistent implementation of accounting methods and models already observed during the last few years.

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

The information provided in this report refers to those markets for which the market analyses are concluded with a reporting date of 1st April 2018.

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 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 some markets has increased and become more differentiated especially with the evolution of NGA networks. This change is reflected in the RA annual reports which provides an analysis which is year by year more oriented on single products (increasing the scope of monitoring). The 2018 report collects information on 19 main products as reported in Table 2 (they were 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_2014_M3_2007		Wholesale call termination on individual public telephone networks provided at a fixed location
M2_2014_M7_2007		Wholesale voice call termination on individual mobile networks
Market 3a	M3a_2014_M4_2007_ULL	Local loop unbundling service on copper network
	M3a_2014_M4_2007_SLU	Sub loop unbundling on copper network
	M3a_2014_M4_2007_SA	Shared Access service on copper network
	M3a_2014_M4_2007_fiberLLU	Fibre Local loop unbundling
	M3a_2014_M4_2007_VULA	VULA on FTTx Network
	M3a_2014_M4_2007_DF	Dark fibre in access network
	M3a_2014_M4_2007_DA	Duct access on access network
Market 3b	M3b_2014_Access_Legacy	Access component of bitstream service on copper access network (from the central office until the CPE)
	M3b_2014_Access_NGA	Access component of bitstream service on FTTx access network (from the local central office until the CPE)
	M3b_2014_Backhaul_Legacy	Backhaul bandwidth component of bitstream service on copper access network (from a regional point of presence until the local central office)
	M3b_2014_Backhaul_NGA	Backhaul bandwidth component of bitstream service on FTTx access network (from a regional point of presence until the local central office)
Market 4	M4_2014_Active_Legacy	Terminating segment on legacy copper network
	M4_2014_Active_NGA	Terminating segment on FTTx network
	M4_2014_Passive	Access to passive infrastructure (dark fibre)
WLR		Wholesale Line Rental

Source: BEREC 2018

This year's report provides more information about the regulatory and competitive framework in each member state. By this way the regulatory outcome for accounting obligations - which is still the main focus of the report - will be described taking into account more evidence about the situation in which remedies have been applied.

For this reason, for each product/market, the report will provide a picture of the application of regulatory accounting obligations 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 introduction 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

Results from the application of art. 9-13 of the Access Directive for each of the products included in the survey are reported in Figure 1 and shown in the following table for each NRA.

For each product/market the report drafts a picture of the application of the remedies set out in Art. 9 to Art. 13 of Access Directive 2009/19/EC (AD) as follows:

Figure 2 - Access Directive (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- Obligations ex art. 9-13 of AD applied to single products/markets

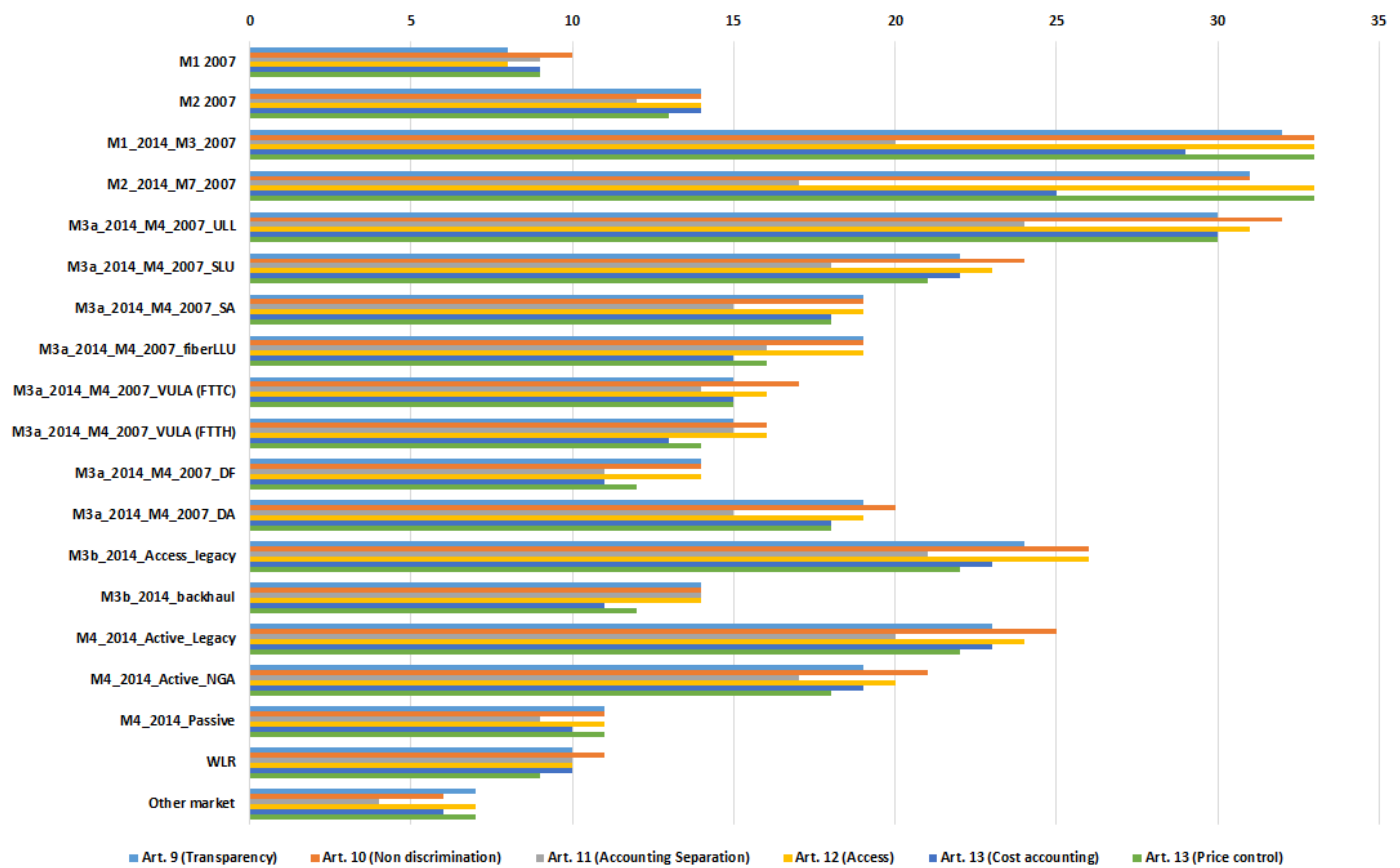


Figure 1 shows that not the same set of remedies is applied to each product. In general, accounting separation is often imposed together with the cost accounting obligation, and some NRAs consider that it is necessary to impose both of these obligations in order to ensure that robust regulatory accounting information is available for each product. The rationale is related to the fact that Accounting Separation could in this regard still be useful for vertically integrated undertakings even 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). For instance, in a quite mature and stable environment, such as ULL services in market 3a, only 24 NRAs reported to apply this remedy (32 last year). A particular case is the termination markets where NRAs that have established prices through pure BU-LRIC models have, in some cases, removed the Accounting Separation obligation.

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

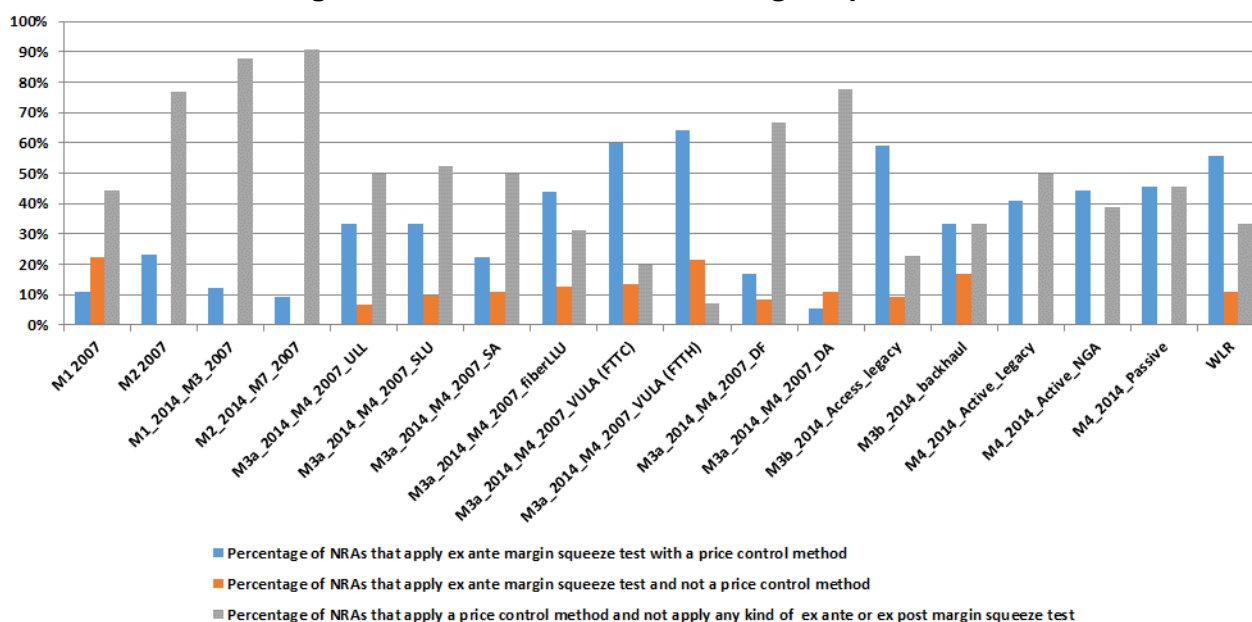
The legal basis for the application of replicability test

Economic Replicability Test (ERT) or traditional margin squeeze tests can be set as a price control remedy (art. 13 of the AD), or as a non-discrimination remedy (art. 10 AD). This is in line with the principle that the replicability test must be made by the NRAs in light of the regulatory objectives to promote sustainable competition and efficient investment and it must be based on the specific competitive concerns identified in the market analysis.

However, also the opposite may be detected: 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 a price control methodology; in that case the general imposition of art. 13 as legal basis it 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 combination of price control and an ex ante retail margin squeeze test/ERT test is applied only for specific access products. For example for ULL service 30% of NRAs that have a price control method apply also a form of an ex ante replicability test; for VULA this percentage reaches 60% as shown in the following picture. Ex ante margin squeeze tests are thus used mainly as complementary measure for a price control method, mainly within article 13 legal framework. Data show also that retail margin squeeze test (ex ante or ex post) is less frequently imposed on legacy products and on access to infrastructure and dark fiber.

Figure 4- Situation about retail margin squeeze test



Source: BEREC 2018

Geographical regulation

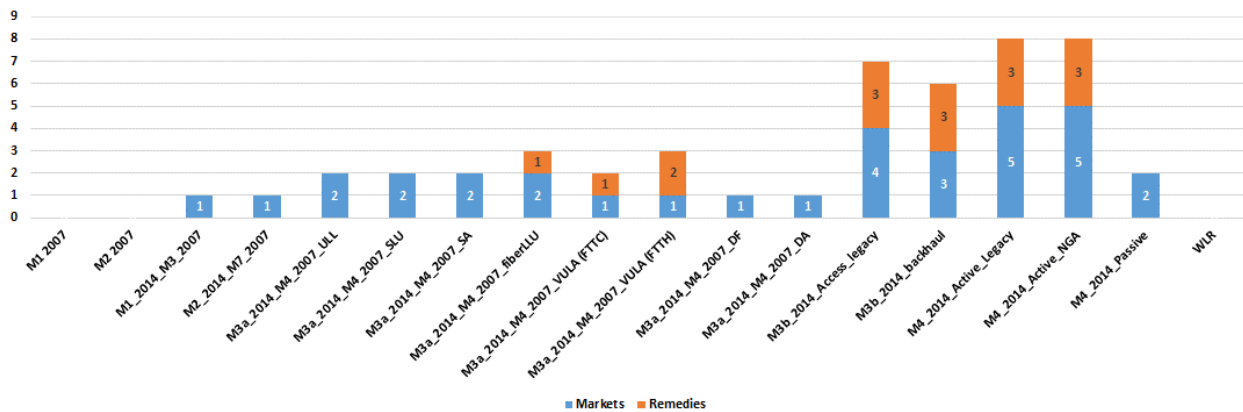
The information collected for the geographical regulation is reported taking into account the BEREC Report on the application of Common Position on geographical aspects of market analysis⁷.

In figure 5 an overview on the application on geographical aspect of regulation is shown. Some NRAs apply a geographical approach to regulation in terms of market segmentation, other in terms of remedies differentiation for different market products.

Forms of geographical regulation relate primarily to market 3b and market 4.

⁷ BoR (18) 213.

Figure 5- Geographical remedies/market regulation



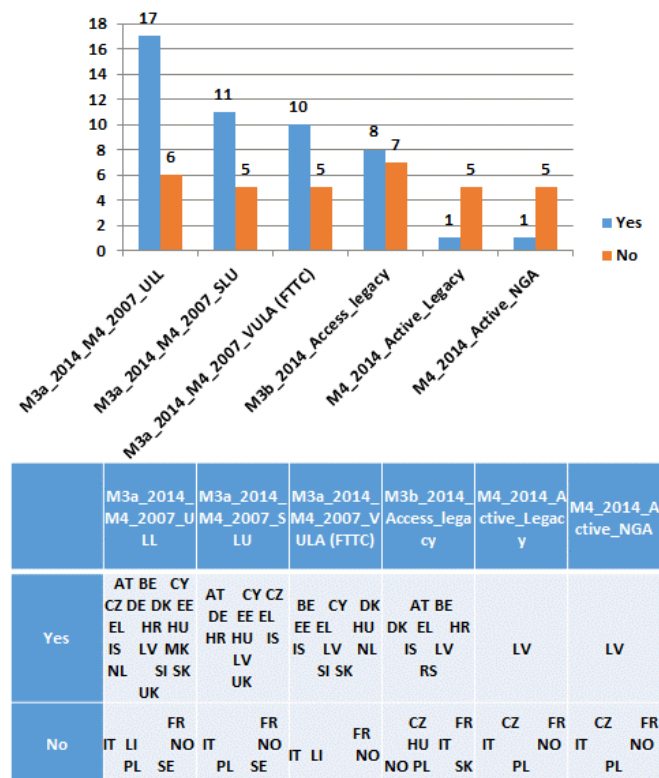
	M1_2007	M2_2007	M1_2014_M3_2007	M2_2014_M7_2007	M3a_2014_M4_2007_UL	M3a_2014_M4_2007_SL	M3a_2014_M4_2007_SA	M3a_2014_M4_2007_fiber	M3a_2014_M4_2007_VULA (FTTC)	M3a_2014_M4_2007_VULA (FTTH)	M3a_2014_M4_2007_DF	M3a_2014_M4_2007_DA	M3b_2014_Access_legacy	M3b_2014_backhaul	M4_2014_Active_legacy	M4_2014_Active_NGA	M4_2014_Passive	WLR	
Market			HU	HU	FI HU	FI HU	FI HU	FI HU	HU	HU	HU	HU	ES HU PL PT	ES HU PL	AT PL PT	FI UK	AT FI PL PT UK	AT PL	
Remedies								DK	CY	CY ES			FR IE SI	FR IE SI	BE CH	FR	BE CH FR		

Source: BEREC 2018

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 pricing and, more in general, on the application of the ladder of investment principle. Reported in the figure are the replies provided by NRAs on the question about the possibility to implement vectoring on relevant products for access markets 3a, 3b and 4.

Figure 6- Vectoring regulation



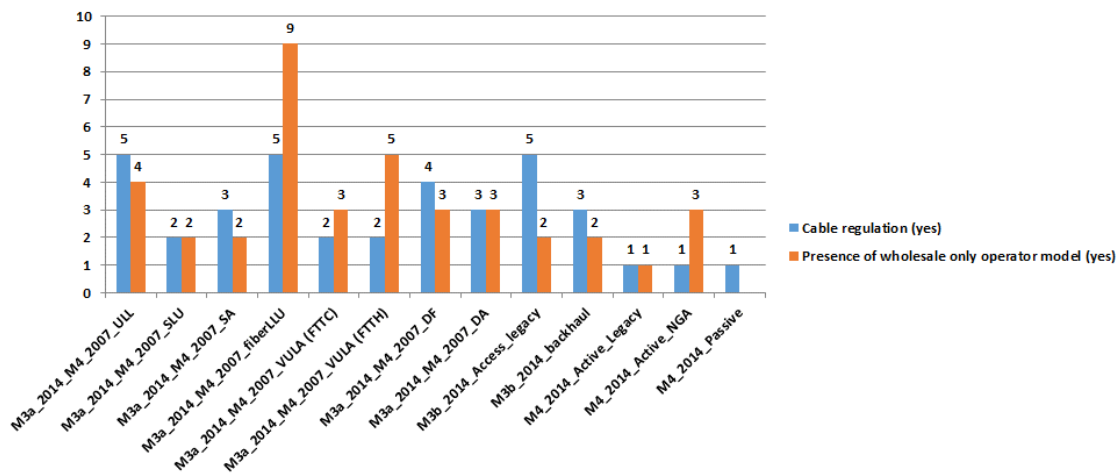
Source: BEREC 2018

The most relevant information is about VULA FTTC: 10 NRAs out of 16 that have imposed access obligation and price control have also allowed the use of a vectoring solution by the incumbent operator.

Cable regulation/wholesale only operator

NRAs were asked to provide information for each product/market about the regulation of cable operators and the market presence of operators following a wholesale-only operator business model (Figure 7).

Figure 7- Cable regulation/Presence of wholesale-only operator



	M3a_2014_M4_2007_ULU	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	M3a_2014_M4_2007_Access_legacy	M3b_2014_backhaul	M4_2014_Active_Legacy	M4_2014_Active_NGA	
Cable operator regulation	DK LI LT LV	DK LI LT LV	DK LI LT LV	DK HU LI LT LV	DK LI LT LV				DK LV MK	DK LV MK	BE HU DK LV MK	BE LV MK	
Wholesale only operator presence	AT LI LT PT	AT LT	LI LT	CH HR IT IS LI LT NL PT	SI LT	AT SI	AT LT	ES IT SI	FR IS LT	SE	LI LT AT	FR PT	FR PT RS

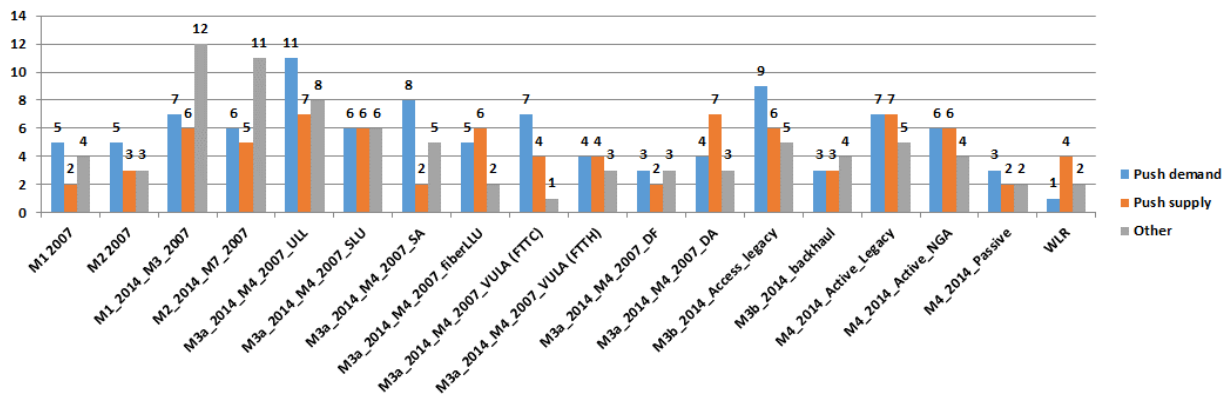
Source: BEREC 2018

Replies highlight that only few NRAs regulate cable operators (5 NRAs) in access markets. Operators with a wholesale-only model offer mainly fiber LLU (9 NRAs) and VULA FTTH (5 NRAs). In the 9 countries with a wholesale-only fiber offer, 5 NRAs imposed also fiber LLU obligation with a price control obligation for the SMP integrated operator.

Regulatory priorities for access products

NRAs were asked to provide a synthetic information for the main regulatory priority in each market within a predefined set of options: i) push supply; ii) push demand; iii) other (Figure 8).

Figure 8- Regulatory priority



	M1_2007	M2_2007	M1_2014_M3_2007	M2_2014_M7_2007	M3a_2014_M4_2007_UJL	M3a_2014_M4_2007_SLU	M3a_2014_M4_2007_SA	M3a_2014_M4_2007_fiberLLU	M3a_2014_M4_2007_VUJA (FTTC)	M3a_2014_M4_2007_VUJA (FTTH)	M3a_2014_M4_2007_DF	M3a_2014_M4_2007_DA	M3b_2014_Access_legacy	M3b_2014_backhaul	M4_2014_Active_legacy	M4_2014_Active_NGA	M4_2014_Passive	WLR				
Push demand	BE DK IE LI SI	BE DE DK ES UK	CZ DE DK FR IS LV	CZ DK FR IS LV	AT BE CY DE DK LV IS NO NL SK	AT DE CY DK LV NO NL SK	BE CY DK LV IS NL NO SK	DK LU LV NL	CY DE NL SK	IS LV LV	CY LV SK	DK LV LV	DE FR LV LV	BE DE LV NL NO	IS SK LV	BE SK IS	AT BE DE LV LV NL	AT BE LV LV PT	AT LV LV	ES		
Push supply	DE PL	HR LI PL	HR LI NO PL SK UK	HR NO PL SK UK	CZ HR IT LV SE UK	CZ HR IT LV SE UK	IT LI	CZ FR HR IT PL LV	AT CZ UK	IT	AT CZ IT NO	CZ DE	BG LI	EE ES SE SK UK	AT CZ PL PT	HR IE IE	CZ PL	FR HR IE PL UK	FR HR IE PL UK	FR HR IE PL UK	IE PL	HR IE LV PL
Other	AT FR RS	FR IE RS	EE HU IE NL RS SE SI	BE BG CH EE HU IE LV NL RS SE SI	BG CH EE ES FR HU RS SI	BG CH EE ES FR HU RS	EE HU	EE HU	HU	ES HU MT	FR HU RS	CH HU RS	EE ES FR HU RS	EE ES FR HU	CH CY ES RS	CH CY ES RS	CH CY ES RS	CH CY UK	FR			

Source: BEREC 2018

It may be observed that usually NRAs consider that regulation of fiber product to be more relevant for pushing supply side, while, on the other side, in case of the legacy copper product, regulation is mainly driven by pushing demand side.⁸

Regulatory Accounting Methodologies

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.

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

⁸ The replies provided by NRAs for statistical reason have been addressed in a simple way in three main categories; in any case, motivations behind the regulatory priority are provided by NRAs in relevant decision published.

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 2018

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 (MS) are defined as follows.⁹ ERT is a “lighter” test providing more price flexibility to the SMP operator; moreover it deals with 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 margin squeeze tests currently applied by NRAs mainly as a complementary tool, 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 and thus forbidden.

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).

⁹ In continuity with Report BoR (14) 190

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 2018

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 calculation cost are taken from a theoretical model of the network. In a top down approach the asset and/or operative 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 producing the services¹⁰.

For the **cost base** used, the following traditional categories have been identified.

Figure 11 - Cost base categories and sub categories

Cost base
HCA
CCA

Source: BEREC 2018

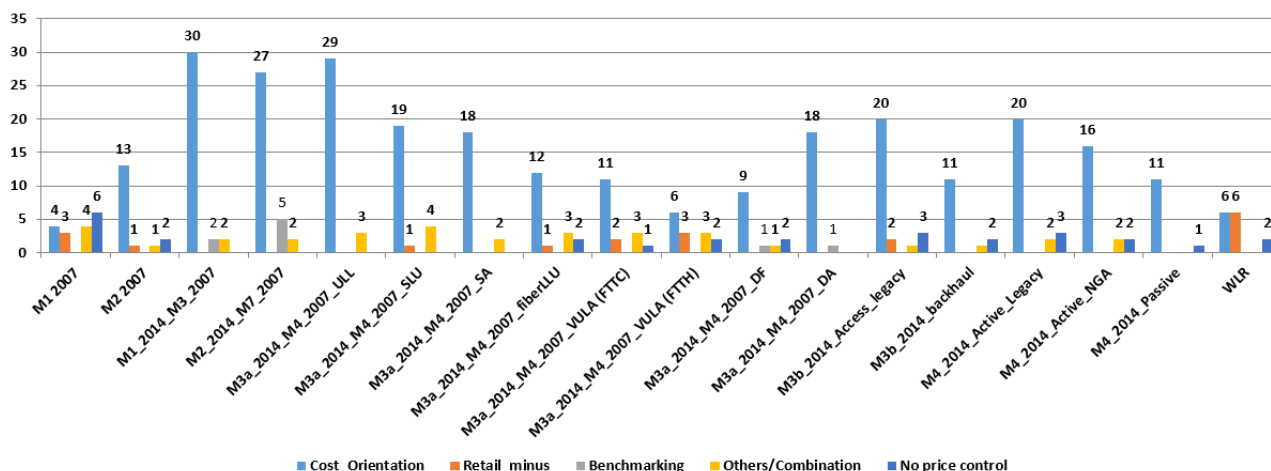
3. Outline of the Results

3.1 Price control methods

The following figures give an overview - according to the main categories and sub categories previously reported - of the price control methods used to regulate markets and products.

¹⁰ 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.

Figure 12- Price control main categories



	M1_2007	M2_2007	M1_2014_M3_2007	M2_2014_M7_2007	M3a_2014_M4_2007_UL	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	M3b_2014_backhaul	M4_2014_Active_Legacy	M4_2014_Active_NGA	M4_2014_Passive	WLR
Cost_Orientation	DK, LI, LT, RS	BE, DE, FR, HR, IE, IT, LI, MK, PL, RS	AT, BE, BG, CH, CY, CZ, DE, DK, EL, ES, FI, FR, HR, HU, IE, IT, LI, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, UK	AT, BE, BG, CH, CY, CZ, DE, DK, EL, ES, FI, FR, HR, HU, IE, IT, IS, LI, MK, MT, NL, NO, PL, PT, SE, SI, SK, UK	BE, BG, CH, CY, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, IT, IS, LI, LU, LV, MT, NL, NO, PL, SE, SI, UK	BG, CH, CY, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, IT, IS, LI, LU, LV, MT, NL, NO, PL, SE, SI, UK	BE, BG, CY, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, IT, IS, LI, LU, LV, MT, NL, NO, PL, RS, SI, UK	BG, CH, CY, DE, EE, EL, ES, FI, FR, HR, HU, IE, IT, IS, LI, LV, LVIT, MT, NL, PL, NL	DK, EE, EL, ES, HR, HU, IE, EL, LVIT, IS, LT, LV, UK	CY, DE, HR, HU, IE, LV, UK	CY, HU, IT, LT, LV	CZ, DE, HU, LT, LV	BG, CH, DE, EE, ES, FR, HU, IE, IT, LT, LV, NO, SE, SI, SK, UK	BE, CY, DE, DK, EE, EL, FR, HR, IE, IT, IS, LV, MK, NL, NO, PL, RS, SI, UK	BE, FR, HU, IE, IT, LT, PL, SI	AT, CH, CY, DE, EE, EL, ES, HR, IE, IT, IS, LT, LU, LV, PL, RO, RS, SI, UK	AT, CH, CY, DE, EL, ES, IE, IT, IS, LT, LV, PL, RO	FR, ES, IE, IT, LT, LV
Retail_minus		HR, SI, UK				UK		SI	AT, SI	AT, SI	ES		AT, ES					EL, HR, LI, PL, SI, UK
Benchmarking			EE, IS	EE, LI, LT, RO, RS								RS	RS					
Others/Combination	AT, BE, DE, IE	NL	DE, LV	LV, PL	AT, CZ, SK	AT, CZ, HR, SK	LI, SK	CZ, LU, SK	CZ, IE, SK	CZ, IE, SK		FR		SK	SK	BE, FR	BE, FR	
No price control	BG, CH, CY, EL, ES, PL	BG, CH						BG, NO	BG	BG, NO	BG, NO		BG, CZ, FI	BG, CZ	BG, CZ, FI	BG, CZ	BG	BG, CY

Source: BEREC 2018

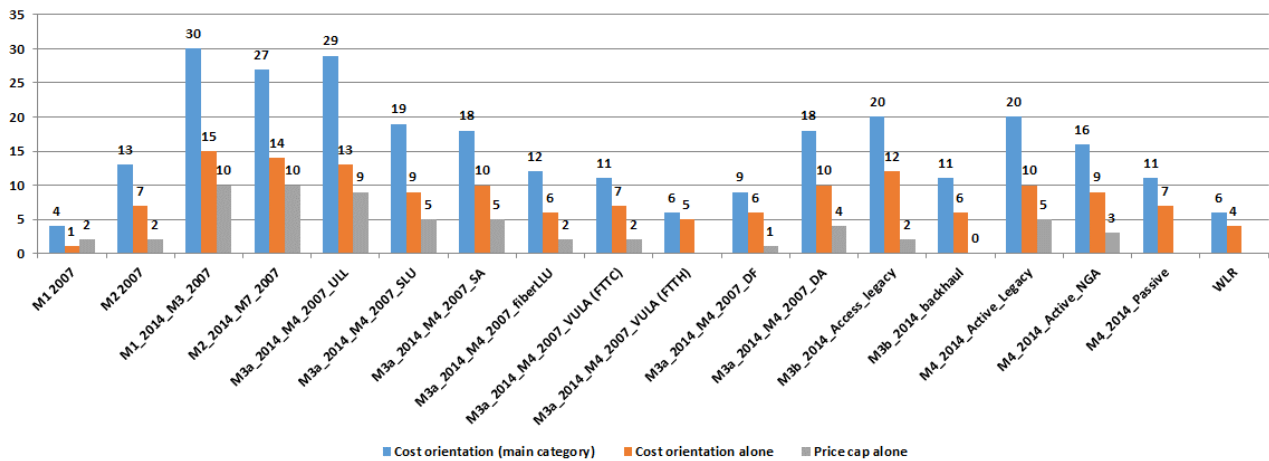
The category “No price control” has been taken into account only when at least one regulatory obligation was in force.

The overall situation is stable in comparison to 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 ULL legacy products. A stable situation can be found for VULA products and bitstream services. For “ULL fiber” there is an increase in the number of NRAs that have chosen “cost orientation” as price control method, while at the opposite end there is a reduction of the number of NRAs that have applied a price control method for “duct access” (from 25 to 18). This may suggest that SMP regulation on duct access is in the process of being somehow substituted by symmetric regulation.

Cost orientation remains the most frequently used price control method and it is applied mainly to legacy products (Figure 12). Retail minus has been chosen mainly for VULA products or in market 3b. No price control is declared in some cases for NGA products (and market 1).

With respect to sub categories, in Figure 13 it may be observed that cost orientation alone is still the most frequent price control method used by NRAs, even in market 3b, with a stronger emphasis observed in case of duct access or dark fibre.

Figure 13- Price control sub category Cost Orientation

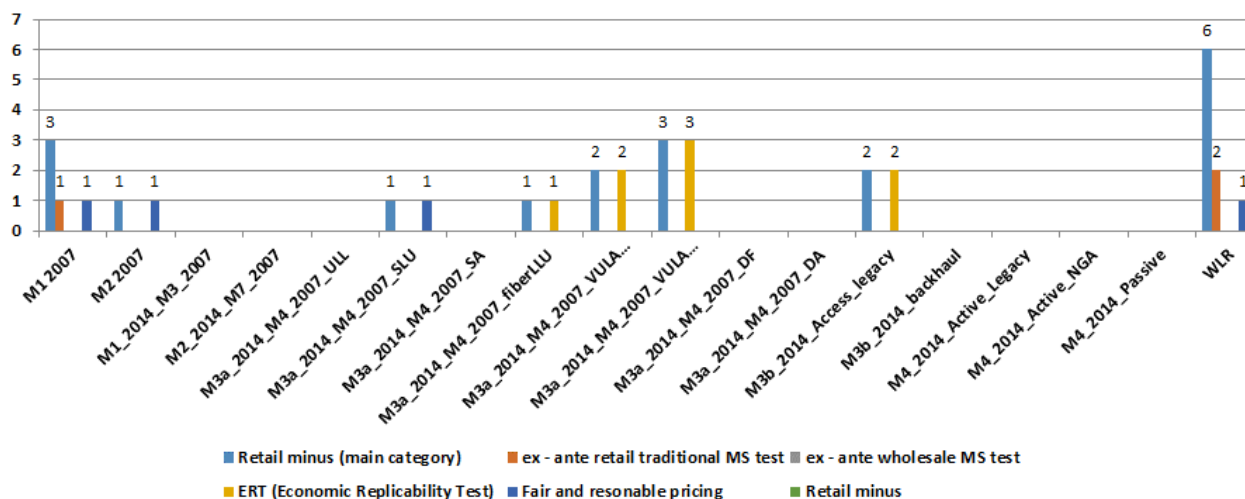


	M1_2007	M2_2007	M1_2014_M3_2007	M2_2014_M7_2007	M3a_2014_M4_2007_UU	M3a_2014_M4_2007_SLU	M3a_2014_M4_2007_SA	M3a_2014_M4_2007_fiberLU	M3a_2014_M4_2007_VULA(FTTC)	M3a_2014_M4_2007_VULA(FTTH)	M3a_2014_M4_2007_DF	M3a_2014_M4_2007_DA	M3b_2014_Access_legacy	M3b_2014_backhaul	M4_2014_Active_Legacy	M4_2014_Active_NGA	M4_2014_Passive	WLR	
Cost orientation (main category)	DK LI RS	BE DE DK EL FR HR IE IT LI MK PL RS	AT BE BG CH CY CZ DE DK EL ES FI FR HR HU IE IT LI LT LU MK MT NL NO PL PT RO RS SE SI SK UK	AT BE BG CH CY CZ DE DK EL ES FI FR HR HU IE IT IS LU MK MT NL NO PT SE SI SK UK	BEBG CH CY CZ DE DK EL ES FI FR HR HU IE IT IS LU MK MT NL NO PL PT SE SI SK UK	BG CH CY CZ DE DK EL ES FI FR HR HU IE IT IS LU MK MT NL NO PL PT SE SI SK UK	BEBG CH CY CZ DE DK EL ES FI FR HR HU IE IT IS LU MK MT NL NO PL PT SE SI SK UK	BG CH CY CZ DE DK EL ES FI FR HR HU IE IT IS LU MK MT NL NO PL PT SE SI SK UK	BEBG CH CY CZ DE DK EL ES FI FR HR HU IE IT IS LU MK MT NL NO PL PT SE SI SK UK	CY DE EL HR HU IE IT IS LT LV NL UK	CY EL HU IT LT LV	CZ DE DK EL ES FI FR HR HU IE IT IS LT LV NL UK	BG CH DE EE ES FR HU IE IT LI LT LV MK NL NO PL RS SI	BE CY DE DK EE EL FR HR HU IE IT IS LT LV MK NL NO PL RS SI	BE EE FR HU IE IT LT PL SI	AT CH CY DE EL ES FI FR HR HU IE IT IS LT LV MK NL NO PL RS SI UK	AT CH CY DE EL ES FI FR HR HU IE IT IS LT LV MK NL NO PL RS SI UK	AT CH CY EL IE IT LT LV	ES FR IE IT LT LV
Cost orientation alone	RS	BE DE EL HR IT RS	AT BE BG CH CY CZ DE DK EL ES FI FR HR HU IE IT IS LU MK MT NL NO PL PT RO RS SE SI SK UK	AT BE BG CH CY CZ DE DK EL ES FI FR HR HU IE IT IS LU MK MT NL NO PL PT SE SI SK UK	BEBG CH CY CZ DE DK EL ES FI FR HR HU IE IT IS LU MK MT NL NO PL PT SE SI SK UK	BG CH CY CZ DE DK EL ES FI FR HR HU IE IT IS LU MK MT NL NO PL PT SE SI SK UK	BEBG CH CY CZ DE DK EL ES FI FR HR HU IE IT IS LU MK MT NL NO PL PT SE SI SK UK	BG CH CY CZ DE DK EL ES FI FR HR HU IE IT IS LU MK MT NL NO PL PT SE SI SK UK	BEBG CH CY CZ DE DK EL ES FI FR HR HU IE IT IS LU MK MT NL NO PL PT SE SI SK UK	CY DE EL HR HU IE IT IS LT LV NL UK	CY EL HU IT LT LV	CZ DE DK EL ES FI FR HR HU IE IT IS LT LV NL UK	BG CH DE EE ES FR HU IE IT LI LT LV MK NL NO PL RS SI	BE CY DE DK EE EL FR HR HU IE IT IS LT LV MK NL NO PL RS SI	BE EE FR HU IE IT LT PL SI	AT CH CY DE EL ES FI FR HR HU IE IT IS LT LV MK NL NO PL RS SI UK	AT CH CY DE EL ES FI FR HR HU IE IT IS LT LV MK NL NO PL RS SI UK	AT CH CY EL IE IT LT LV	ES FR IE IT LT LV
Price cap	DK SI	DK FR	CZ DK NL NO PT SK UK	LT SELU	CZ DK NL NO PT SK UK	BG DK FR LU NL NO SE HR	FR NL NO SE	BG DK FR LU NL NO	BG DK FR LU NL NO	DK NL	NL UK	DK	FR SK UK LU	DK NL	IT LU NL UK	AT LU NL UK	AT LU NL UK		

Source: BEREC 2018

In Figure 14 the retail minus sub categories are represented.

Figure 14- Price control sub category Retail minus



	M1_2007	M2_2007	M1_2014_M3_2007	M2_2014_M7_2007	M3e_2014_M4_2007_Ull	M3e_2014_M4_2007_Slu	M3e_2014_M4_2007_Sa	M3e_2014_M4_2007_fiberLLU	M3e_2014_M4_2007_VULA (FTTC)	M3e_2014_M4_2007_VULA (FTTH)	M3e_2014_M4_2007_DF	M3e_2014_M4_2007_DA	M3b_2014_Access_Lease	M3b_2014_backhaul	M4_2014_Active_Legacy	M4_2014_Active_NGA	M4_2014_Passive	WLR	Other market	
Retail minus main category	SI	HR UK				UK		SI	AT SI	AT ES SI			AT ES					HR PL SI UK	EL LI SI	0
ex - ante retail traditional MS test		HR																		HR LI
ex - ante wholesale MS test																				
ERT (Economic Replicability Test)								SI	AT SI	AT ES SI			AT ES							
Fair and reasonable pricing		UK	UK			UK														UK
Retail minus																				SI

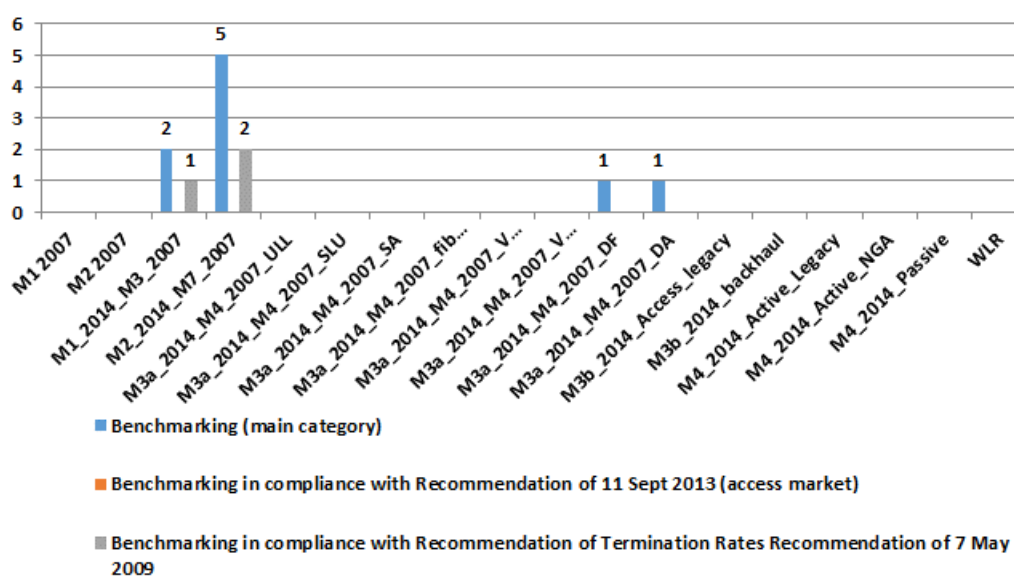
Source: BEREC 2018

In particular, the ERT price control methodology is mainly applied for VULA products and NGA products in line with the Commission Recommendation on costing methodologies. An ex ante MS test is 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 as a substitute of the cost orientation (or price cap) approach, but more as a complementary measure.

The Benchmarking approach (figure 15) is chosen only for termination markets and in one country for Duct access and Dark fiber.

Figure 15- Price control sub category Benchmarking



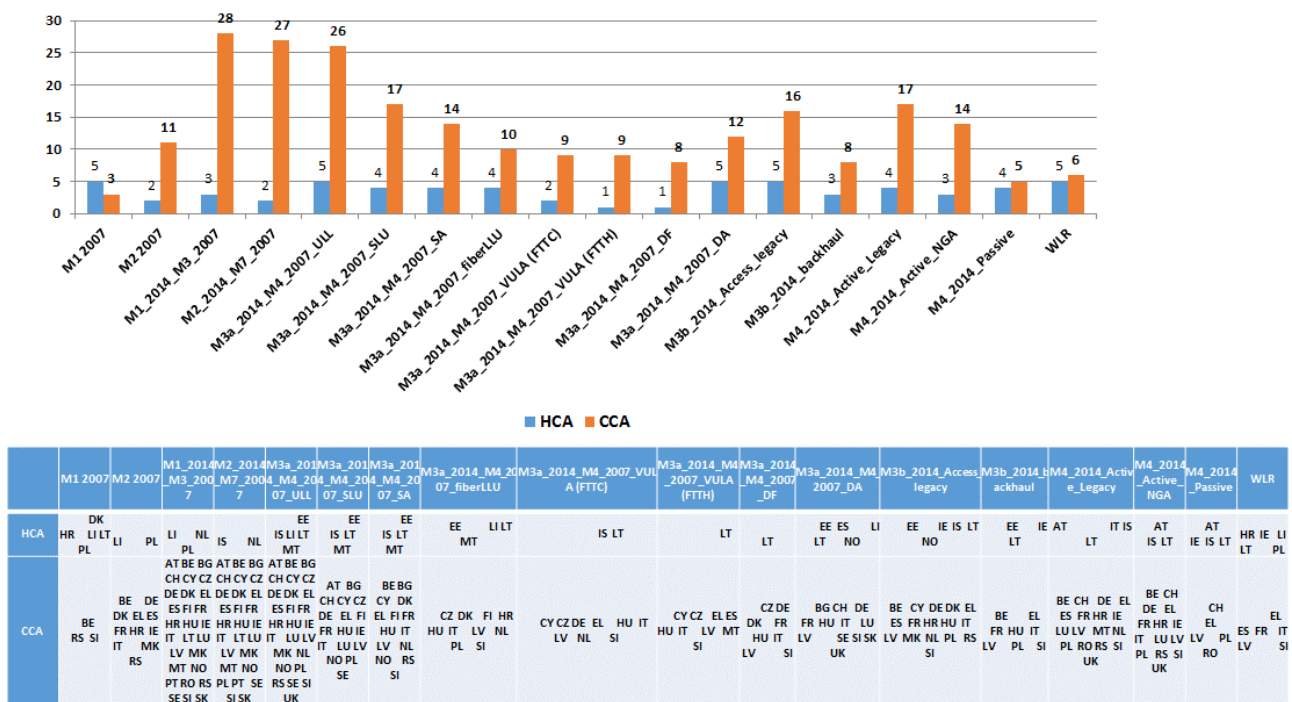
	M1_2007	M2_2007	M1_2014_M3_2007	M2_2014_M7_2007	M3a_2014_M4_2007_UL	M3a_2014_M4_2007_SLU	M3a_2014_M4_2007_SA	M3a_2014_M4_2007_fiberLU	M3a_2014_M4_2007_VULA (FTTC)	M3a_2014_M4_2007_VULA (FTTH)	M3a_2014_M4_2007_DF	M3a_2014_M4_2007_DA	M3b_2014_Access_legacy	M3b_2014_A4_backhaul	M4_2014_Active_Legacy	M4_2014_Active_NGA	M4_2014_Passive	WLR
Benchmarking (main category)			EE IS	EE RO	LI LT RS						RS	RS						
Benchmarking in compliance with Recommendation of 11 Sept 2013 (access market)																		
Benchmarking in compliance with Recommendation of Termination Rates Recommendation of 7 May 2009			DE		LT RO													

Source: BEREC 2018

3.2 Cost base, annualisation and allocation methods

With reference to the cost base, Figure 16 shows that in 2018 Current Cost Accounting (CCA) is by far the most commonly used methodology for all markets. Market 1/2007 and WLR are exceptions, where Historical Cost Accounting (HCA) is frequently used.

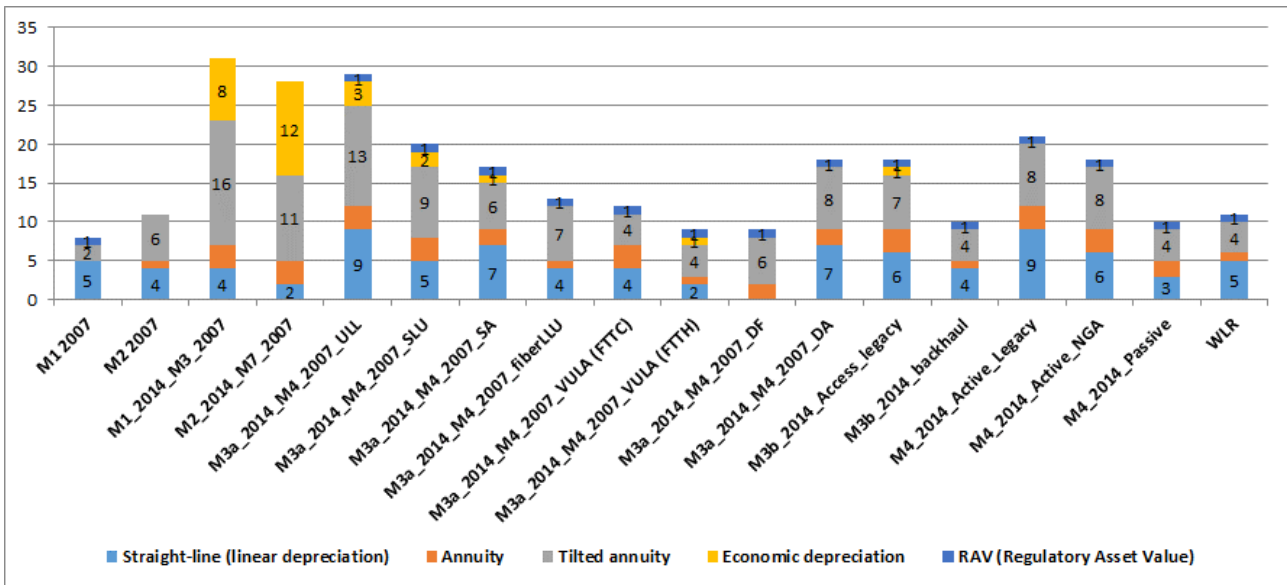
Figure 16- Cost base used



Source: BEREC 2018

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

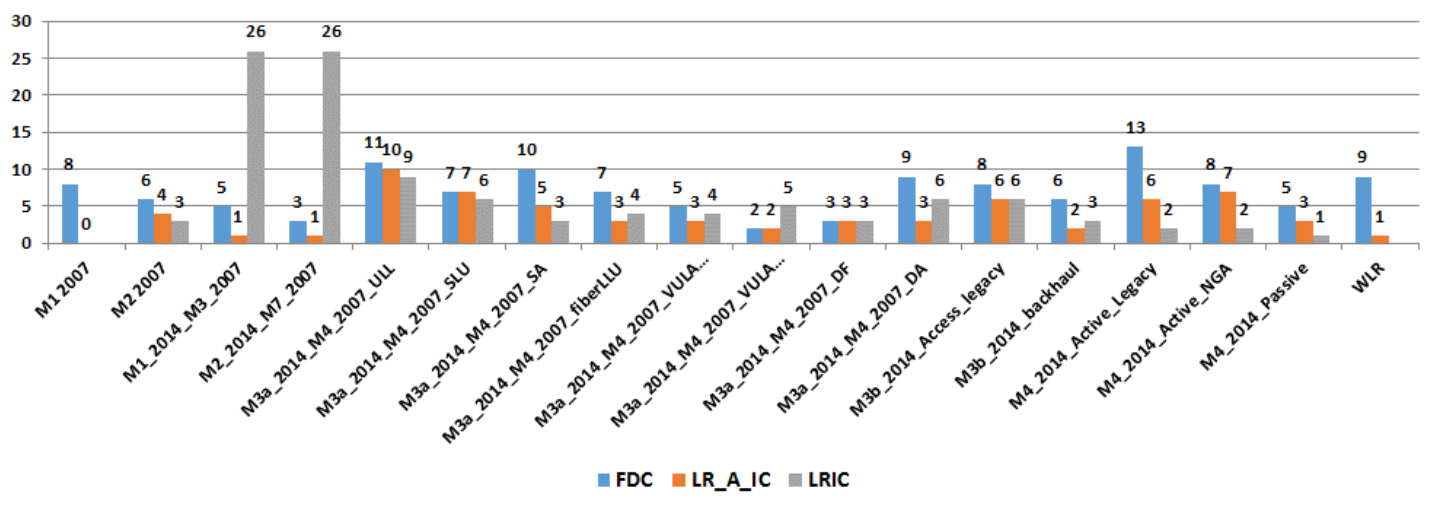


	M1_2007	M2_2007	M1_2014 _M3_2007	M2_2014 _M7_2007	M3a_2014 _M4_2007_ULL	M3a_2014 _M4_2007_SLU	M3a_2014 _M4_2007_SA	M3a_2014 _M4_2007_fiberLU	M3a_2014 _M4_2007_VULA (FTTC)	M3a_2014 _M4_2007_VULA (FTTH)	M3a_2014 _M4_2007_DF	M3a_2014 _M4_2007_DA	M3b_2014 _Access_legacy	M3b_2014 _backhaul	M4_2014 _Active_Legacy	M4_2014 _Active_NGA	M4_2014 _Passive	WLR	
Straight-line (linear depreciation)	DK HR LI RS SI	EL ES LI RS	EL FI LI RS	CY FI	BG CY EE EL FI LI NL RS UK	BG CY EE EL FI	BG CY EE EL FI NL RS	EE LI	CY EL NL UK				BG CH EE ES LI NO UK	CY EE EL IE NL RS	EE EL IE IT	AT CY EL ES NL RS SI UK	AT CY EL SI UK	AT CY EL	EL ES HR LI SI
Annuity		DE	CY DE LV	DE IS LV	DE IS LV	DE IS LV	DE IS LV	LV	DE IS LV	LV	DE LV	DE LV	DE IS LV	DE LV	DE IS LV	DE IS LV	IS LV	LV	
Tilted annuity	BE PL	BE DK FR HR IE PL	BG CH CZ DK FR HR IE IT LT LU MT PL RO SE SI SK	BG CH CZ DK FR HR IT MT PL SI SK	BE CH CZ DK FR HR HU IE IT LU PL SE SI	CH CZ FR HU IE IT LU PL SE	BE DK FR HU IT HR HU IT PL SI	CZ DK HU IT SI	CZ HU IT SI	CZ HU IT SI	FR HU IE IT LU SE SI SK	BE DK FR HR HU PL	BE FR HU PL	BE CH FR HR IE LU PL RO	BE CH FR HR IE IT LU PL	CH IE PL RO	FR IE IT PL		
Economic depreciation			AT BE ES HU NL NO PT UK	AT BE EL ES HU LU NL NO PT SE UK	AT ES NO	AT NO	NO			ES			ES						
RAV (Regulatory Asset Value)	LT				LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT

Source: BEREC 2018

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



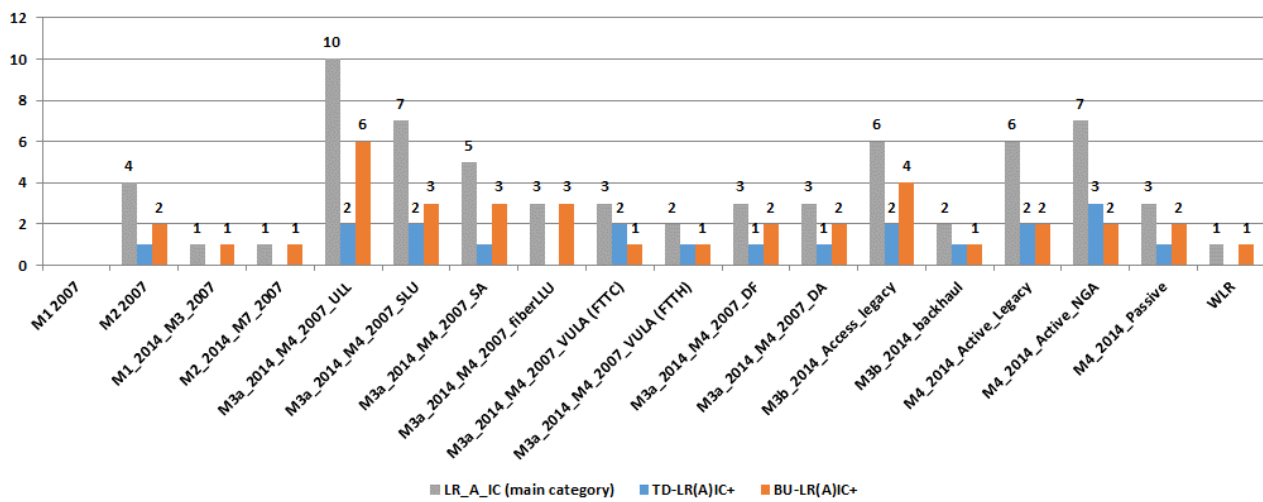
	M1_2007	M2_2007	M1_2014_M3_2007	M2_2014_M7_2007	M3a_2014_M4_2007_Ull	M3a_2014_M4_2007_Slu	M3a_2014_M4_2007_Sa	M3a_2014_M4_2007_fiberLLU	M3a_2014_M4_2007_Vula_FTTc	M3a_2014_M4_2007_Vula_FTTH	M3a_2014_M4_2007_DF	M3a_2014_M4_2007_Da	M3b_2014_Access_Le_gacy	M3b_2014_backhaul	M4_2014_Active_Leg_acy	M4_2014_Active_NG_A	M4_2014_Passive	WLR
FDC	BE DK HR LI LT PL RS SI	BE ES FR LI PL RS	FI LI LV PL RS	FI IS LV	BG EE FI IS LI LT LV MT NL RS UK	BG EE FI IS LT LV MT	BG EE FI FR IS LT LV MT NL RS	EE FI LI LT LV MT NL	IS LT LV NL UK	LT LV	FR LT LV	BG EE FR FR LI LT LV NO UK	EE FR IE IS LT LV NO RS	FR EE FR IE IT LT LV	AT ES FR IE IT IS LT LV MT NL RS SI UK	AT IE IS LT LV RS SI UK	AT IE IS LT LV	EL ES FR IE LI LT LV PL SI
LR_A_JC		EL HR IE IT	CH	CH	AT BE CH DE DK EL HR IE IT NO	AT CH DE EL IE IT NO	BE DK EL IT NO	DK HR IT	DE EL IT	EL IT	DE DK IT	CH DE IT	BE DE DK EL HR IT	BE EL	BE CH DE EL HR RO	BE CH DE EL FR HR IT	CH EL RO	IT
LRIC		DE DK MK	AT BE BG CY CZ DE DK EL ES FR HR HU IE IT LT LU MK MT NL NO PT RO SE SI SK UK	AT BE BG CY CZ DE DK EL ES FR HR HU IE IT LT LU MK MT NL NO PL PT SE SI SK UK	CY CZ ES HU LU MK PL SE SI	CY CZ HU LU PL SE	CY HU SI	CZ HU PL SI	CY CZ HU SI	CY CZ ES HU SI	CZ HU SI	CY HU LU SE SI SK	ES HU MK NL PL SI	PL HU SI	LU PL	LU PL	LU PL	PL

Source: BEREC

The most frequent cost allocation approach is LRIC/LRAIC, almost for all products/markets. LRIC is the preferred approach for termination markets. In access markets (market 3a) a preference for LRIC and LRAIC can be found. Whereas 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.

In figure 19 and 20 the sub categories of allocation methodologies are represented. When LRAIC/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.

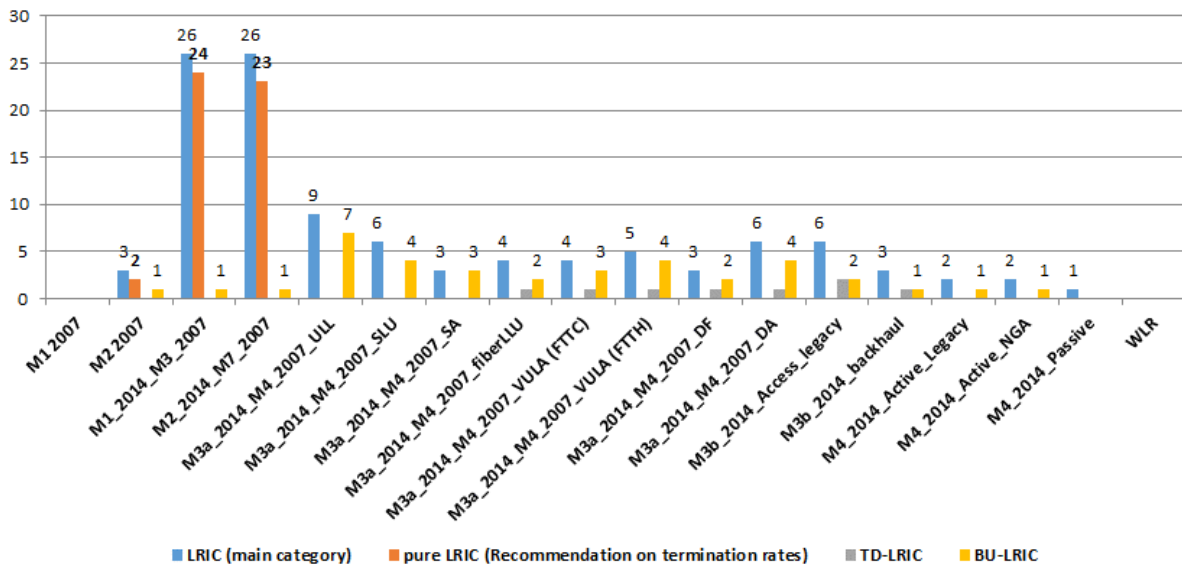
Figure 19- Allocation methods LRAIC sub categories



	M1_2007	M2_2007	M1_2014 M3_2007	M2_2014 M7_2007	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	M3b_2014 backhaul	M4_2014 Active_legacy	M4_2014 Active_NGA	M4_2014 Passive	WLR
LR_A_IC (main category)		EL HR IE IT	CH	CH	AT BE CH DE DK EL HR IE IT NO	AT CH DE EL IE IT NO	BE DK EL IT NO	DK HR IT	DE EL IT	EL IT	DE DK IT	CH DE IT	BE DE DK EL HR IT	BE EL	BE CH DE EL HR RO	BE CH DE EL FR HR IT	CH EL RO	IT
TD-LR(A)IC+		EL			DE EL	DE EL	EL		DE EL	EL	DE	DE	DE EL	EL	DE EL	DE EL IT	EL	
BU-LR(A)IC+		HR IT	CH	CH	AT BE CH DK HR IT	AT CH IT	BE DK IT	DK HR IT	IT	IT	DK IT	CH IT	BE DK HR IT	BE	CH RO	CH FR	CH RO	IT

Source: BEREC 2018

Figure 20- Allocation methods LRIC sub categories



	M1_2007	M2_2007	M1_2014_M3_2007	M2_2014_M7_2007	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	M3a_2014_M4_2007_Access_legacy	M3a_2014_M4_2007_backhaul	M3b_2014_Access_legacy	M3b_2014_backhaul	M4_2014_Active_Legacy	M4_2014_Active_NGA	M4_2014_Passive	WLR	
LRIC (main category)		DE DK MK	AT BE BG CY CZ DE DK EL ES FR HR HU IE IT LT LU MK	AT BE BG CY CZ DE DK EL ES FR HR HU IE IT LT LU MK																	
pure LRIC (Recommendation on termination rates)		DE DK MK	AT BE BG CY CZ DE DK EL ES FR HR HU IE IT LT LU MK	AT BE BG CY CZ DE DK EL ES FR HR HU IE IT LT LU MK																	
TD-LRIC																					
BU-LRIC		MK	MK	EL																	

Source: BEREC 2018

3.3 Combination of price control methods/cost base/allocation methods and motivation

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 will provide a view of the relationships between price control methodologies and applied costing methodologies. For this analysis, sub categories classified as LRAIC (TD), LRIC (TD) and LRAIC (BU), LRIC (BU) have been grouped together.¹¹

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

The goal is to examine if there is a relation between the way price control is imposed related to costing methodologies applied in different products/markets (e. g. if NRAs base their pricing decisions upon data derived from a regulatory accounting system such as a TD or a bottom-up model or an FDC approach). 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 approaches are investigated, highlighting the space for harmonization.

Differences among NRAs may arise due to specific country conditions 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 according to the leeway available by the regulatory framework. This indicates also that regulatory accounting has become more sophisticated over time, adapting to more complex market situations from the pure liberalisation paradigm.

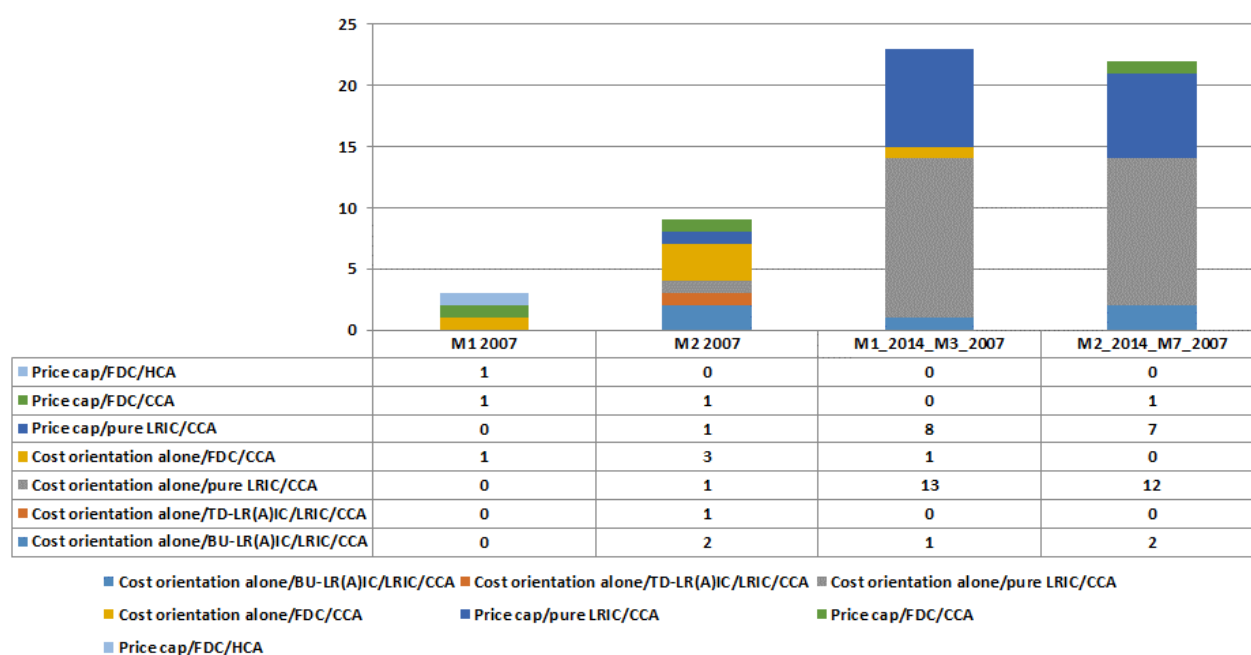
In order to analyse the motivation behind the regulatory accounting obligation/price control choices, the previous categories of combination of price control/costing methodologies obligation have been analysed taking into account the main motivation declared by NRAs as reported in figure 8.

¹¹ 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 (NRAs that have provided information).

3.3.1 Retail and interconnection markets

In Figure 22 the combination of costing methodology and price control approaches is represented for the retail and the interconnection markets (only combinations with at least one record are shown).

Figure 22- Combination price control / costing methodologies (M1 and M2) 2017/ 2018



Source: BEREC 2018

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

- 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 be more relevant in market 2/2007.
- 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.

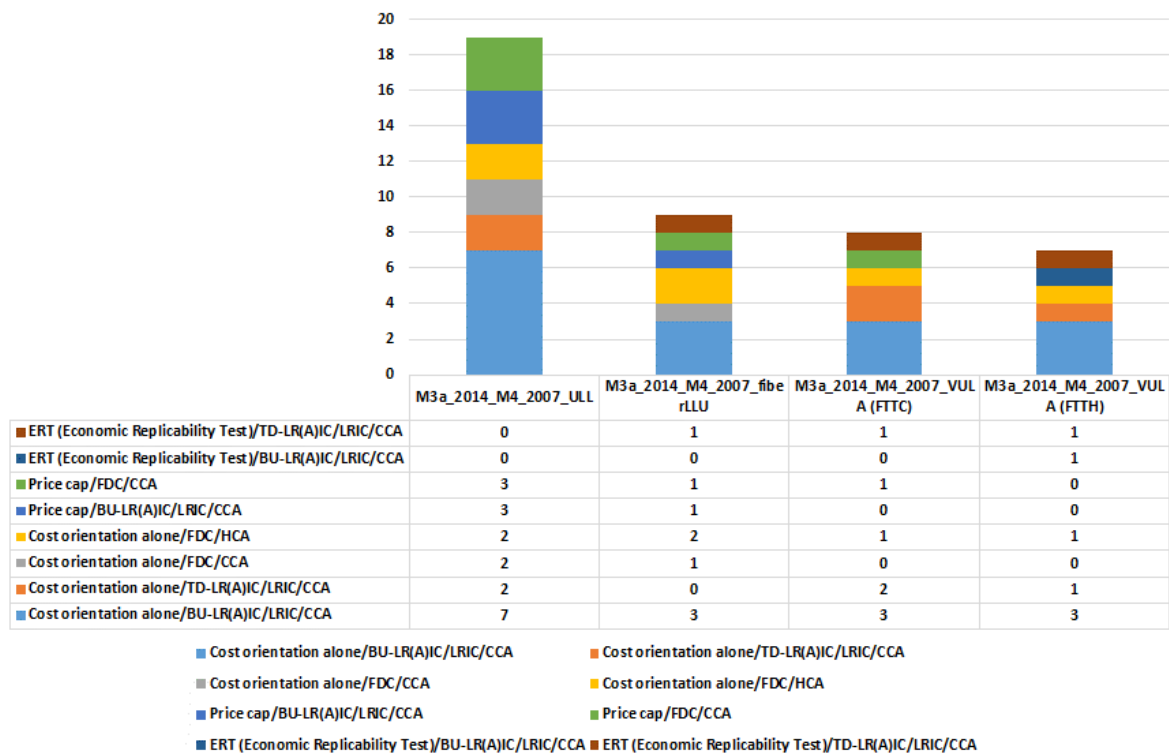
	M1 2007		M2 2007		M1_2014_M3_2007		M2_2014_M7_2007	
	BU	TD/accounting methods	BU	TD/accounting methods	BU	TD/accounting methods	BU	TD/accounting methods
Cost orientation alone	0	1	3	4	14	1	14	0
Price cap	0	2	1	1	8	0	7	1

For the termination markets the objective to be in line with the 2009 EC Recommendation is more relevant.

3.3.2 Products in Market 3a

In Figure 23 the combination of costing methodologies and price control approach 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. However, looking at the main legacy product (ULL), we see that most NRAs apply a cost orientation alone/LRIC-LRAIC/CCA approach.

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



Source: BEREC 2018

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. 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.

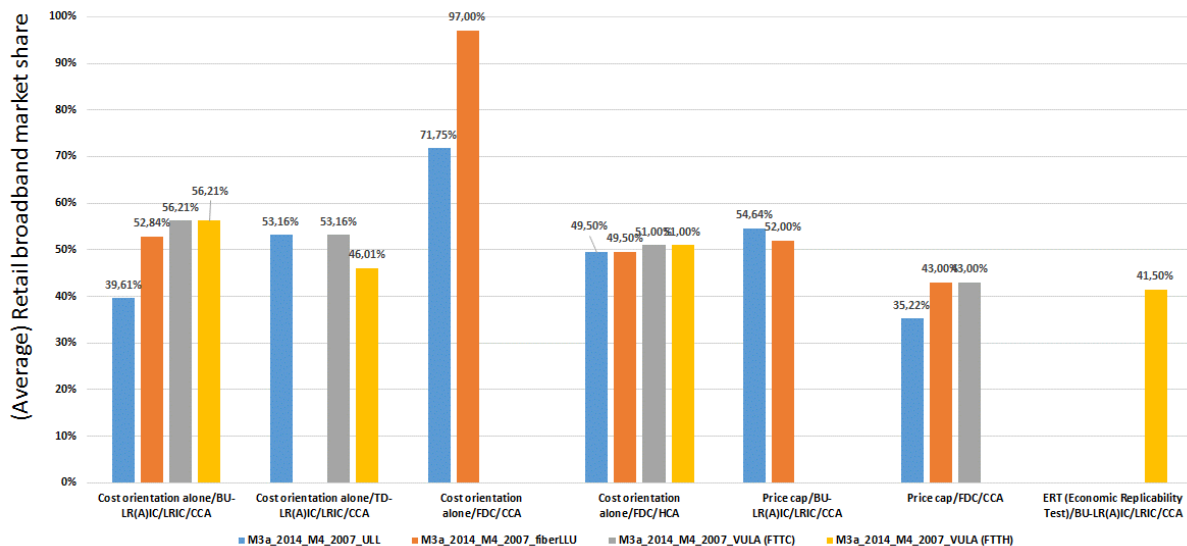
	M3a_2014_M4_2007_ULL		M3a_2014_M4_2007_SLU		M3a_2014_M4_2007_SA		M3a_2014_M4_2007_fiberLLU		M3a_2014_M4_2007_VULA (FTTC)		M3a_2014_M4_2007_VULA (FTTH)		M3a_2014_M4_2007_DF		M3a_2014_M4_2007_DA	
	BU	TD/accounting methods	BU	TD/accounting methods	BU	TD/accounting methods	BU	TD/accounting methods	BU	TD/accounting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

As in last year report, an analysis about the relation between structural data and price control/costing methodology is also provided (figure 24). The main outcome for the “flagship product” of ULL (for which more data are available) is that cost orientation alone/price cap applied with BU/TD-LR(A)IC+ is frequent in case competition in the broadband market is at an intermediate stage (SMP retail broadband market share between 40% and 50%). Cost orientation alone in combination with FDC approach (CCA/HCA) is more frequent in less competitive market.

The specific combination cost orientation alone in combination with BU-LR(A)IC+ model in market 3a is the main methodology in charge in more competitive markets: with respect to last year report the number of NRAs that can be grouped in this combination for ULL service increased by one, while the arithmetic average of SMP market share decreased about four points (39.6% with respect to 43% of last year).

For other products the outcome is less conclusive.

Figure 24– Combination price control / costing methodologies (M3a)



Source: BEREC 2018

As in the last year report, the following table reports the information about the frequency of the chosen price control/costing methodology combinations according to the main motivation declared by NRAs.¹²

¹² The replies provided by NRAs for statistical reason have been addressed in a simple way in three main categories: push demand, push supply, other. In any case, motivations behind the regulatory priority are provided by NRAs in relevant decision published.

	Push demand						Push supply						Other					
	M3a_2014_M4_2014	M3a_2014_M4_2014	M3a_2014_fiberLL	M3a_2014_VULA	M3a_2014_VULA	M3a_2014_DA	M3a_2014_M4_2014	M3a_2014_M4_2014	M3a_2014_fiberLL	M3a_2014_VULA	M3a_2014_VULA	M3a_2014_DA	M3a_2014_M4_2014	M3a_2014_M4_2014	M3a_2014_fiberLL	M3a_2014_VULA	M3a_2014_VULA	M3a_2014_DA
Cost orientation alone/BU-LR(A)IC/LRIC/CCA	2	1	0	1	1	0	1	1	2	1	1	0	4	2	1	1	1	2
Cost orientation alone/TD-LR(A)IC/LRIC/CCA	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Cost orientation alone/FDC/CCA	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
Cost orientation alone/FDC/HCA	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Price cap/BU-LR(A)IC/LRIC/CCA	2	1	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0
Price cap/FDC/CCA	1	0	1	1	0	1	1	0	0	0	0	1	1	1	0	0	0	0
ERT (Economic Replicability Test)/BU-LR(A)IC/LRIC/CCA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

In the following table the information about the arithmetic average of SMP retail market share is provided for each combination/motivation.

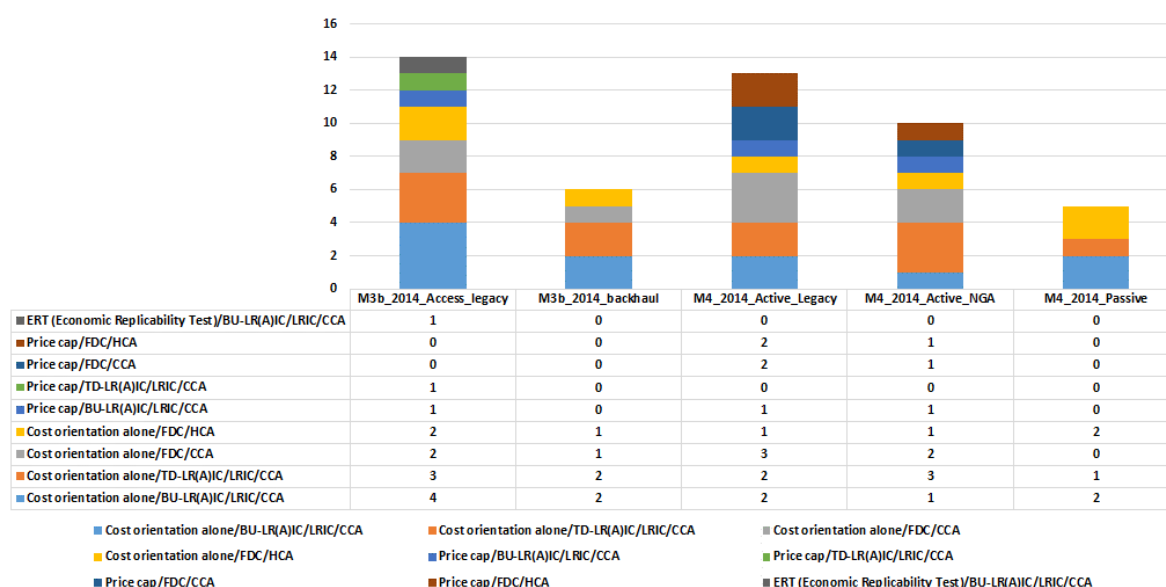
	Push demand						Push supply						Other					
	M3a_2014_M4_2014	M3a_2014_M4_2014	M3a_2014_fiberLL	M3a_2014_VULA	M3a_2014_VULA	M3a_2014_DA	M3a_2014_M4_2014	M3a_2014_M4_2014	M3a_2014_fiberLL	M3a_2014_VULA	M3a_2014_VULA	M3a_2014_DA	M3a_2014_M4_2014	M3a_2014_M4_2014	M3a_2014_fiberLL	M3a_2014_VULA	M3a_2014_VULA	M3a_2014_DA
Cost orientation alone/BU-LR(A)IC/LRIC/CCA	51.60%	57.00%		57.00%	57.00%		45.60%	45.60%	46.26%	45.60%	45.60%		32.12%	33.01%	66.02%	66.02%	66.02%	33.01%
Cost orientation alone/TD-LR(A)IC/LRIC/CCA	60.30%	60.30%		60.30%		60.30%												
Cost orientation alone/FDC/CCA												26.75%	46.49%					
Cost orientation alone/FDC/HCA												41.50%						
Price cap/BU-LR(A)IC/LRIC/CCA	58.50%	65.00%	52.00%			65.00%	46.91%					35.85%						
Price cap/FDC/CCA	43.00%		43.00%	43.00%		40.00%	35.90%					35.90%	26.75%	26.75%				
ERT (Economic Replicability Test)/BU-LR(A)IC/LRIC/CCA																		41.50%

From this analysis it is possible to observe that the push demand priority is mainly chosen when the broadband market is still less competitive.

3.3.3 Market 3b and 4

In Figure 25 the combination between costing methodologies and price control approach is presented for products in market 3b. As for market 3a no clear preference of costing methodologies applied with respect to a price control in use can be detected.

Figure 25- Combination price control / costing methods (M3b and 4)



Source: BEREC 2018

With respect to the cost base, there is not a clear preference to use an accounting asset base instead of a bottom-up approach.

	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	7	2	4	2	6	1	6	2	3
Price cap	1	1	0	0	1	4	1	2	0	0
ERT	1	0	0	0	0	0	0	0	0	0

3.4 Implementation of the Non-discrimination and Costing Methodologies Recommendation

This section gives an overview - as in the previous release of 2017 report - 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)” of 11 September 2013, with regard to costing methodologies.

Data assume a more significant weight since almost three years have passed since the adoption of the Recommendation and considering that the 31 December of 2016 was the deadline for the implementation.

NRAs were asked how they implement the framework of the Recommendation for non-discrimination obligations and costing methodologies in Market 3a, by choosing between the following options: i) Recommends 30-37 (CCA-BU LRIC+); ii) Recommend 40; iii) Recommend 42.

Figure 26 - EC Recommends

EC Recommends	Content
Recommends 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.
Recommend 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> : <ul style="list-style-type: none"> • i) it should reflect a gradual shift from copper network to an NGA network; • 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; • iii) it should guarantee that copper network prices do not fluctuate significantly and therefore will remain stable over a long time period; • 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 declaring to be in line with one of three options previously described. The result is shown in the table below.

Figure 27 - NRA implementation of EC Recommends

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

Descending from Recommends 30-37 and 40 of the Commission Recommendation, few relevant questions have been included on some element addressed by the Commission in the Recommendation. Specifically in the recommend 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”. At recommend 40 the recommendation stated: “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 target and reusable infrastructure have been added.

A summary of positive replies by NRAs to this part of the questionnaire are summarised in the following table.

Figure 28 - NRAs information on Recommends 37 and 40

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

From this analysis, we understand that DEA targets¹³ are explicitly implemented in the BU-LRIC model by six NRAs.

The majority of NRAs that implement Recommends 30-37 or Recommend 40 have taken into account reusable civil infrastructures in the modelling process; cables are considered to be reusable infrastructure by 7 NRAs. Furthermore, the analysis shows that the level of the depreciated infrastructure is derived mainly from the accounting data of the SMP operator.

The following table summarises the replies provided about the level of asset life of civil infrastructures, the percentage of civil infrastructures considered reusable and the percentage of asset life already depreciated.¹⁴ Only few NRAs provided information on this aspect.

Figure 29 - NRA information on civil infrastructure

	Recommend 30-37 (CCA-BU LRIC+) (minimum-maximum)	Recommend 40 (minimum-maximum)
Civil infrastructure asset life (number of year) (minimum - maximum)	30-47 9NRAs (39 average)	30-40 3NRAs
Percentage of civil infrastructures considered reusable (minimum - maximum)	35%-100% 7NRAs (73% average)	90%-100% 3 NRAs

¹³ The coverage at least of 30 Mbps to 100% and take-up of the population at 50% at 100 Mbps.

¹⁴ In the table only maximum and minimum are given as only few NRAs have provided information.

Percentage of asset life already depreciated of reusable civil infrastructures (minimum - maximum)	20%-66% 3NRAs	53% (1 NRA)

3.5 Model analysis

The 2018 report also provides information about technical model implementation by NRAs¹⁵.

Specifically the questionnaire asked NRAs to provide information about: 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; v) adjustments adopted for capex/opex efficiency in case top down models are implemented.

The following tables summarises the information provided by NRAs for market 3a and 3b products.

Asset base

The information about the asset base used when a model is implemented is summarised in the next table. The options provided in the questionnaire were: Bottom-up, Top down, or Hybrid (mix of top down and bottom up).

Asset base	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
BU	12	5	5	6	5	5	5	5	6
TD	6	3	4	3	1	1	1	4	3
Hybrid	4	1	0	0	0	0	0	2	0

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

Network modelling approach

The following table summarises the information about the main approaches used by NRAs to implement 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

¹⁵ The information reported is independent from the main price control method (such as Cost orientation/Price cap/ERT) declared by NRAs in each market .

placing any constraints on its network configuration. A modified scorched node is something in-between the two previous approaches.

	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
Scorched Node	12	7	6	5	5	5	5	5	6
Scorched earth	2	0	0	1	0	0	0	0	1
Modified Scorched node	4	2	1	2	0	1	1	2	1
Other	1	0	0	0	0	0	0	0	0

It is shown that a scorched node approach is the most frequent approach used, also for NGA services.

Network topology and architecture

The next table summarises the replies about the topology configuration used by NRAs for modelling purposes in markets 3a and 3b. 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 fiber network of the incumbent operator. The second option (municipality) means that the model considers an administrative area like a post code as a footprint for the access network.

The replies provided show that 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 be different from the one used for modelling a copper based product.

	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	15	7	6	6	3	3	3	4	6
Municipality	0	0	0	0	0	0	0	0	0
Municipality/MDF-ODF area	1	0	0	1	0	0	0	0	0
Other	1	1	0	0	1	2	1	3	1

The next table provides information on the technology used for modelling purposes including in the options information if NRAs use a P2P/GPON solution. It is interesting to see that some NRAs use a fiber network for price control also for legacy products (ES,CY,PL,HR).

	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
GPON/P2P	4	4	1	3	2	2	3	2	1
GPON	4	1	1	2	2	2	0	0	2
P2P	3	2	1	1	0	0	0	2	0
Other	0	0	0	0	0	0	0	1	0

Coverage

The next table summarises information about the approach used by NRAs for the time horizon considered for coverage of the services. In the questionnaire the following options were provided: i) forward looking; ii) as is. The first option means that coverage is achieved in a forward looking way taking into account a long/medium term horizon with respect to the actual situation; the second option considers that the coverage for network modelling purpose is taken as at the time of estimation of service cost. Most NRAs use a forward looking estimation, only for Dark fiber and Market 3b this preference is less frequent.

	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
Forward Looking	11	7	4	4	4	4	3	5	3
As is	4	2	2	3	1	2	3	2	3

Information about the approach used for the level of coverage from a geographical point of view (spatial domain) is reported in the following table. Two options have been provided in the questionnaire: National and sub national. It is interesting to see that the most NRAs consider a “national” network coverage for modelling purposes in line with a forward looking estimation.

	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
National	20	9	8	8	4	5	5	8	8
Sub national	0	1	0	2	1	1	1	1	0

The next table includes elements about the main source of coverage information for modelling purposes. In the questionnaire 6 options were included: i) SMP coverage; ii) OAO coverage;

iii) SMP+OAO coverage iv) National v) Sub national¹⁶. Most NRAs use SMP coverage information in a forward looking way, in other cases a National coverage independently from other sources of information is used.

	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
SMP coverage	10	6	4	6	3	4	4	5	5
OAO coverage	0	0	0	0	0	0	0	0	0
SMP+OAO coverage	2	1	0	1	0	0	0	0	0
National	5	3	3	3	2	2	2	3	2
Sub national	0	0	0	0	0	0	0	0	0

Efficiency adjustments in case of top down models

In the next tables information is provided about possible adjustments in case a Top down 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 adjustments such as adjustments on overall final price. Generally when NRAs apply an adjustment this is applied both to the capex and opex component.

		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
Capex efficiency in TD model	Yes	6	2	3	3	1	1	1	3	2
	No	2	1	1	1	0	0	0	0	1
Opex efficiency in TD model	Yes	6	2	3	3	1	1	1	3	2
	No	2	1	1	1	0	0	0	0	1

		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
Other efficiency assumption (in case of TD) i.e. on overall end prices	Yes	0	0	0	0	0	1	1	1	1
	No	3	2	2	2	0	0	0	2	2

¹⁶ Options iv and v are independent of effective coverage by operators (SMP or OAOs).

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 NRAs regulation strategy (such as the national broadband strategy, special competitive challenges and country specific consumer behaviour).

A total of 34 NRAs¹⁷ have provided data for this section. If data is confidential and can therefore not be shown in the analysis, it will be mentioned in the footnotes.

Network infrastructure data collected in previous years (i. e. number of MDF, number of street cabinets, number of local loop and distribution cable, cost of civil engineering and duct/infrastructure sharing) are no longer collected since the data quality and the number of returns have never been sufficient to conduct meaningful analysis. The following structural data have been collected (data as at 1st April 2018):¹⁸

¹⁷ Austria (AT), Belgium (BE), Bulgaria (BG), Switzerland (CH), 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), Iceland (IS), Italy (IT), Liechtenstein (LI), Luxemburg (LU), Latvia (LV), Republic of Macedonia (MK), Malta (MT), Netherlands (NL), Norway (NO), Poland (PL), Romania (RO), Republic of Serbia (RS), Sweden (SE), Slovenia (SI), Slovakia (SK), United Kingdom (UK). No data has been received from the following NRAs: Albania (AL), Montenegro (ME), Turkey (TR)

¹⁸ FR provided data as of 01/01/2018

Figure 30 - Structural Data collected from NRAs

1	Population and surface area per country ¹⁹
1.1	number of inhabitants
1.2	number of inhabitants biggest city
1.3	% of total population (main metropolis population density)
1.4	number of inhabitants three biggest cities
1.5	% of total population (metro population density)
1.6	country area in square km
1.7	number of inhabitants per square km
2	Market situation per country
2.1	mobile broadband penetration (subscription as % of the total population)
2.1	fixed broadband penetration (subscription as a % of the total households)
2.2	fixed broadband subscriptions: % of cable modems (DOCSIS 3.0 included)
2.3	fixed broadband subscriptions: % of DSL lines (VDSL included)
2.4	fixed broadband subscriptions: % FTTH/B
2.5	ITU fixed broadband subscriptions 2016 ²⁰
3	Market shares
3.1	Fixed broadband subscriptions – incumbent (SMP operator)
3.2	Fixed broadband subscriptions – cable operators
3.3	DSL broadband subscriptions – incumbent (SMP operator)
3.4	DSL broadband subscriptions - competitors
3.5	NGA (FTTx) broadband subscriptions – incumbent (SMP operator)
3.6	NGA (FTTx) broadband subscriptions – competitors
3.7	NGA (FTTx) broadband subscriptions via own cable using SMP infrastructure – competitors
3.8	Other access operator coverage on own network FTTS (via SLU): % of households
3.9	Other access operator coverage on own network FTTH: % of households
3.10	Other access operator coverage on own network cable: % of households

Population and country size

This information stems from publicly available data²¹, therefore all 37 countries usually providing information for the Regulatory Accounting Report²² have been included in the analysis. This data, which is naturally static and is largely unchanged in comparison to last year's data can have a considerable influence on the cost of telecommunications infrastructure. A high population density in urban areas vs. few users in sparsely populated rural areas results in different investment risk for telecommunications companies.

¹⁹ Data source: Fischer Weltalmanach 2018. 1.2 and 1.3 not used in the analysis.

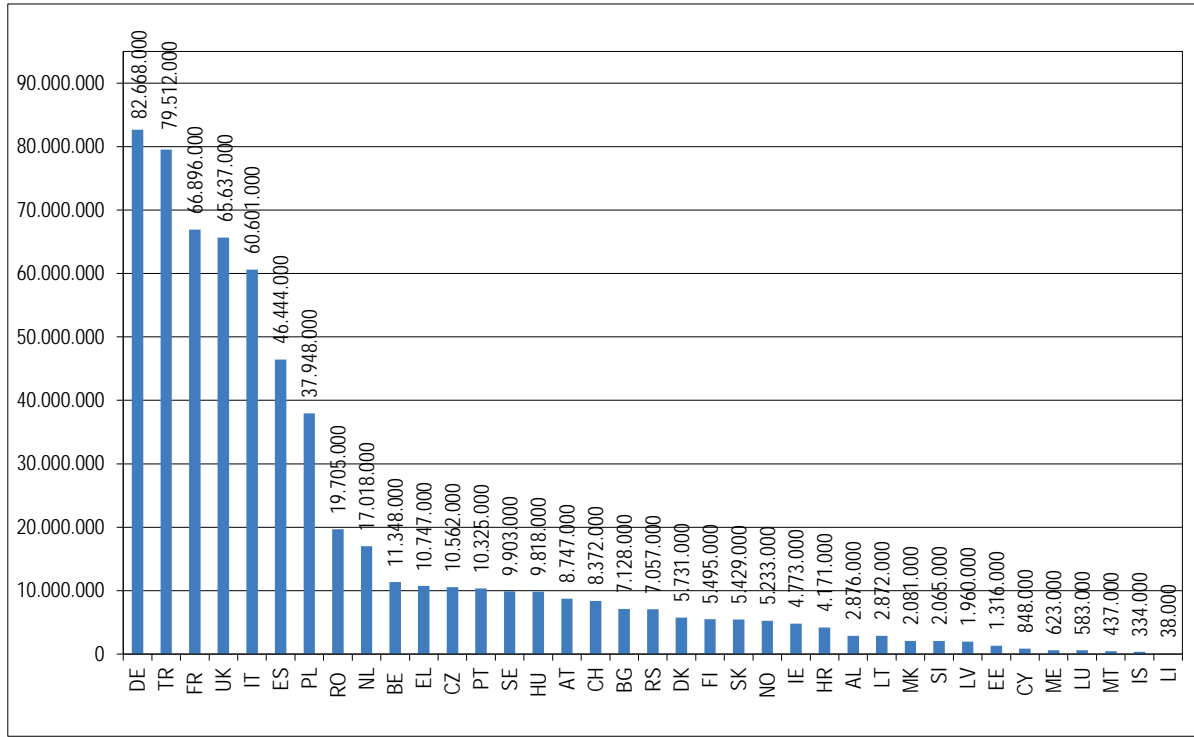
²⁰ Source: International Telecommunication Union (ITU), end of 2016 data used for verification of NRA data.

²¹ Fischer Weltalmanach 2018, editorial deadline 1st July 2017

²² 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 10 countries with a population of above 11 Mio. are: DE, TR, FR, UK, IT, ES, PL, RO, NL, BE.

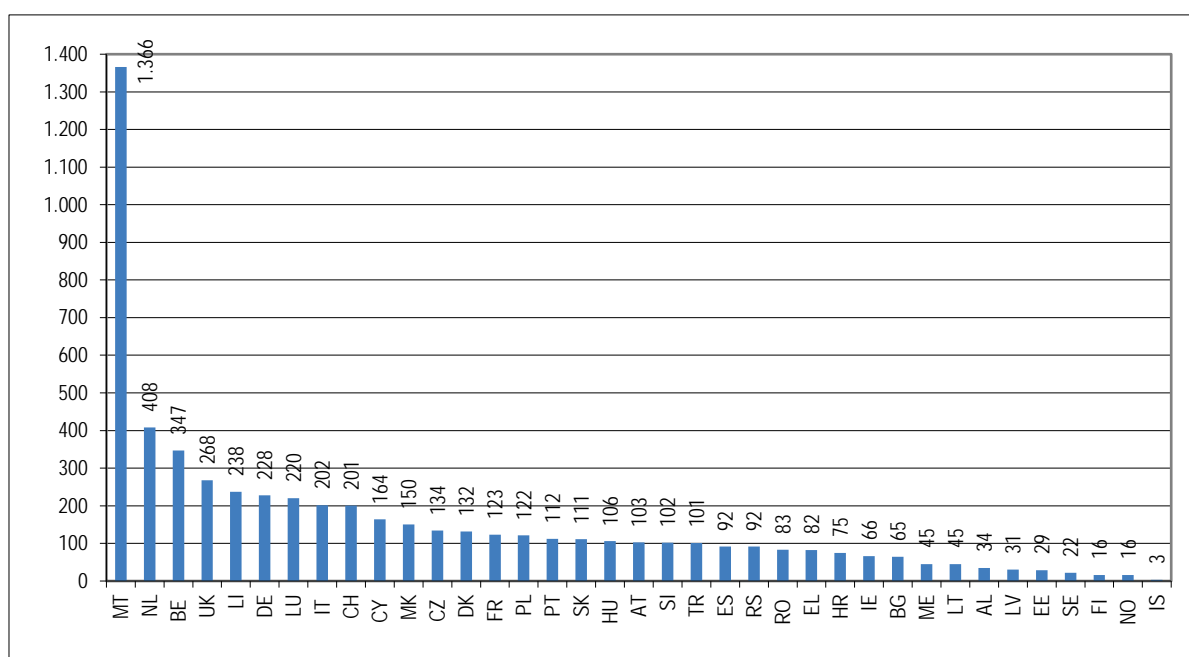
Figure 31 - Total Population



Source: Fischer Weltalmanach 2018

In terms of **population density** (i.e. the number of inhabitants per square kilometre), the picture of the top 10 countries looks different: they are MT, NL, BE, UK, LI, DE, LU, IT, CH, CY, most of them with more than 200 people per square km. Interestingly, 5 of these top 10 countries are amongst the countries with the largest total population (NL, BE, UK, DE, IT) 4 amongst the smallest (MT, LI, LU, CY).

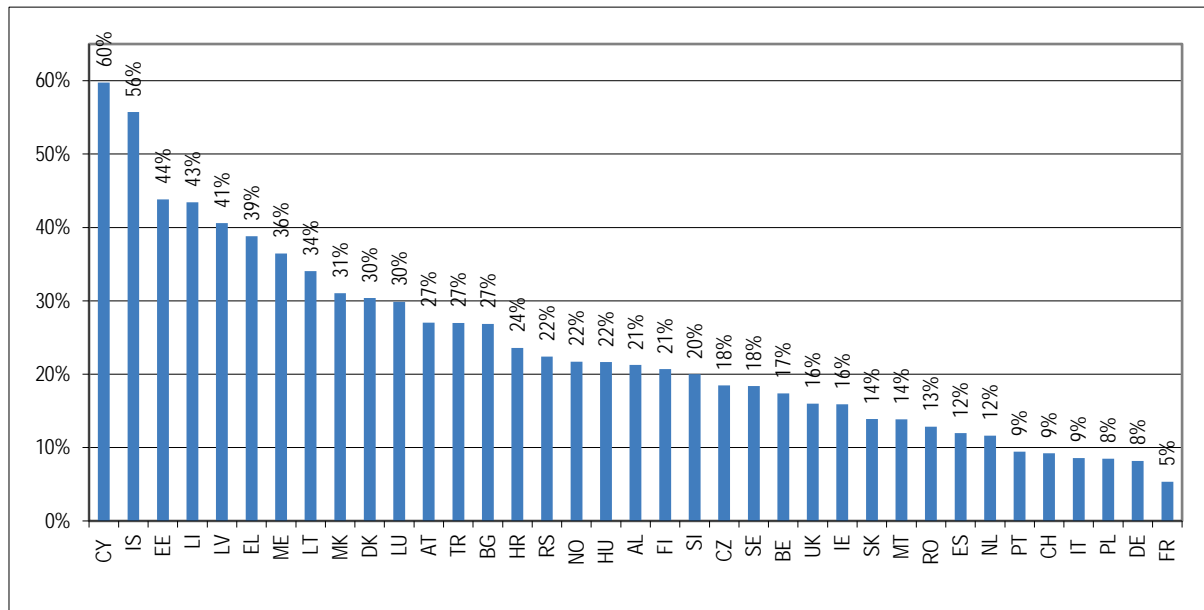
Figure 32 - Population Density



Source: Fischer Weltalmanach 2018

Looking at the **metro population density** (i.e. the number of inhabitants in the three biggest cities as a percentage of the total population) it is interesting to note that mostly smaller countries have a higher metro population density because a sizeable part of the total population live in the major cities. In the larger countries like Germany, France, Poland and Italy this measure is rather low due to a more spread out population. The top 11 countries in this category with a percentage of above 30 are CY, IS, EE, LI, LV, EL, ME, LT, MK, DK, LU.

Figure 33 - Metro Population Density



Source: Fischer Weltalmanach 2018

Market and competitive situation

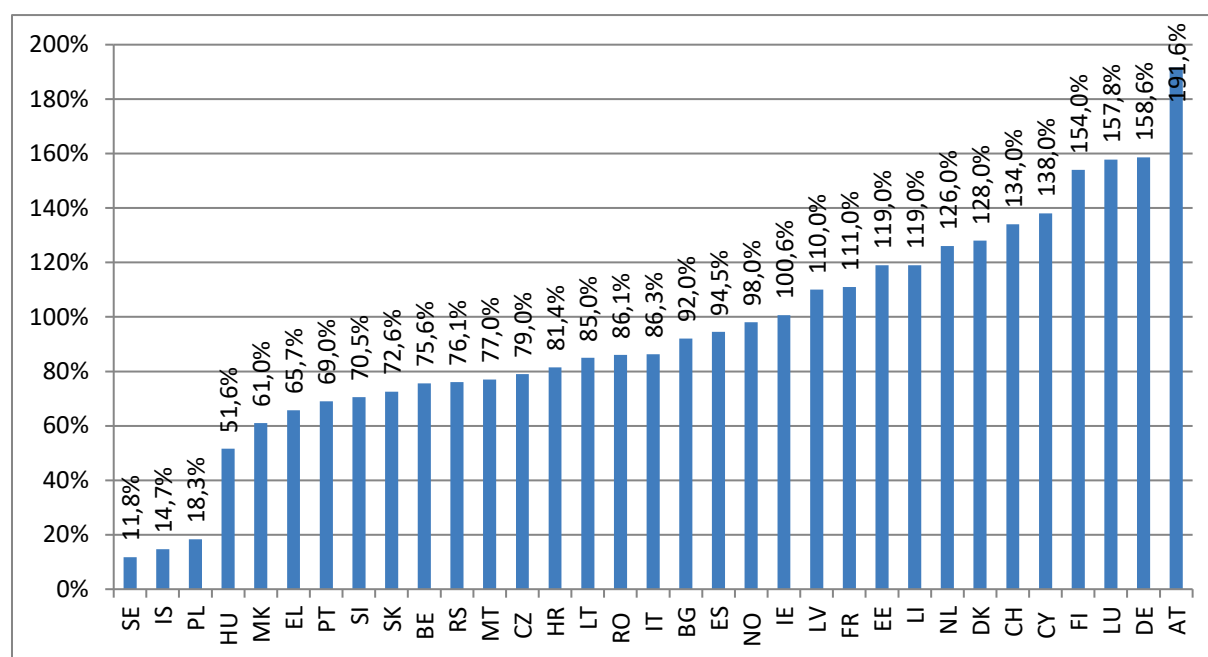
The market and competitive situation within the different countries, which has a direct influence on regulatory direction, shows considerable disparity. Deviating from the previous report, the current report shifts focus from classical telephone lines and mobile subscriptions, which are available in other reports²³, to broadband.

²³ i. e. BEREC Report on European Termination Rates

The **mobile broadband penetration**, representing mobile broadband subscriptions as a percentage of the total population, varies between around 12 per cent in Sweden (only pure mobile data subscriptions) and 191 per cent in Austria²⁴. The countries with a mobile broadband penetration rate of 100 per cent or more are IE, LV, FR, EE, LI, NL, DK, CH, CY, FI, LU, DE, AT.

A word of caution when looking at the following figure: not all countries have specified if they report data only and/or including other kinds of subscriptions or if they report private only and/or business subscriptions; thus data may not always be comparable.

Figure 34 - Mobile Broadband Penetration

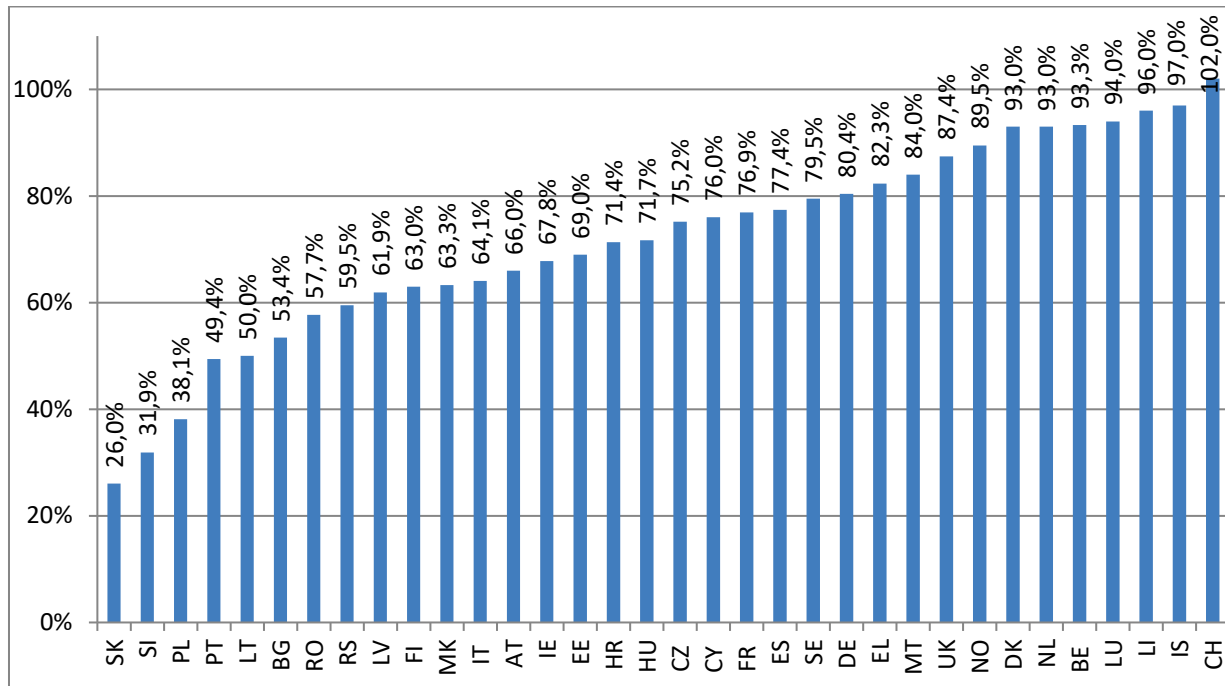


Source: BEREC RA database 2018

²⁴ Confidential data in the UK, AT includes Smartphones, BG includes data cards or modems subscribers, Internet access subscribers of bundled services with mobile Internet access, as well as subscribers of Internet access provided without additional subscription, SE: only pure mobile data subscriptions (not voice subscriptions including data)

The fixed broadband penetration, representing fixed broadband subscriptions as a percentage of the total number of households²⁵, varies between 26 per cent in Slovakia and 102 per cent in Switzerland²⁶. In Sweden, data refers to residential subscriptions only. For Greece and the UK, where data was not available/confidential, ITU data²⁷ has been used.

Figure 35 - Fixed broadband penetration



Source: BEREC RA database 2018

²⁵ In the previous report, this figure has been reported as a percentage of the total population. It is deemed more appropriate to use a percentage of the number of households since there is usually no more than one subscription per household. Therefore it is not possible to include a percentage change from the previous year.

²⁶ Confidential data in the UK, data not available in EL: ITU data have been used

²⁷ Total ITU fixed broadband subscriptions at end of year 2016 divided by number of households

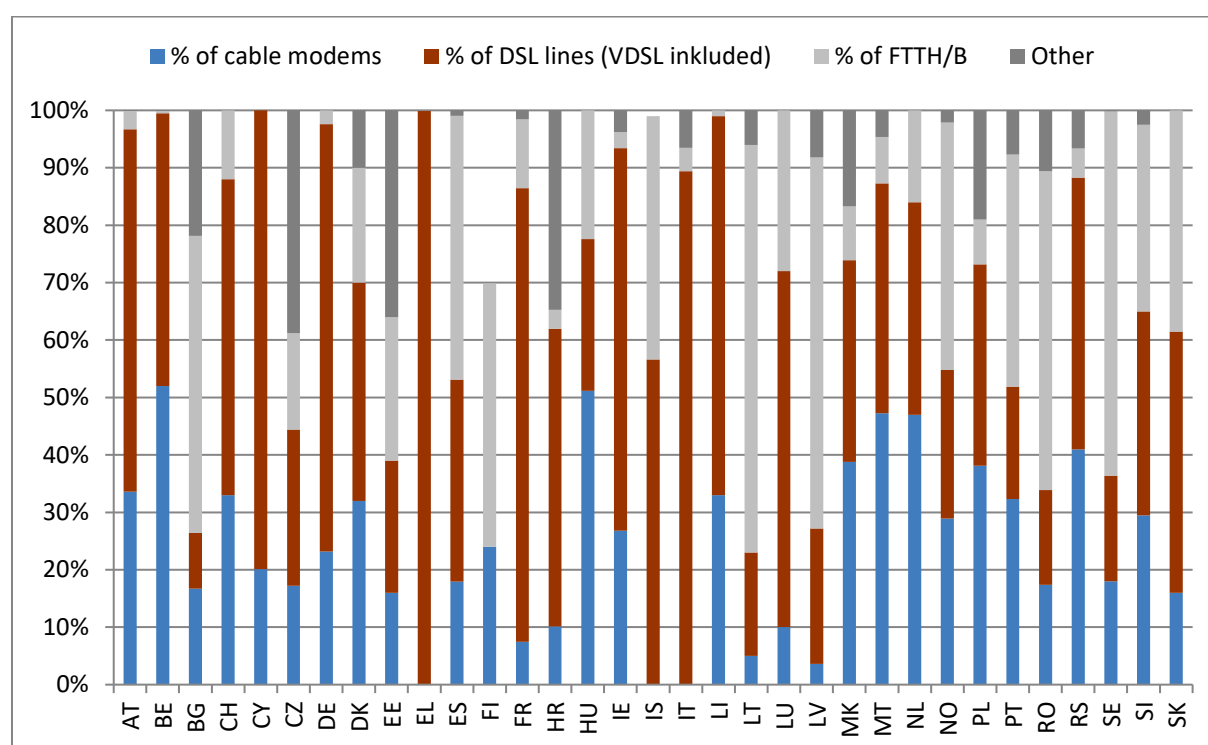
The following table shows the percentage share of technology of fixed broadband:

- cable modems
- DSL lines (VDSL included)
- FTTH/B for broadband application
- Other (e. g. Satellite, FWA etc.)

Cable modems²⁸ as a percentage of fixed broadband range from 3,6 per cent in Latvia to over 50 per cent in Belgium and Hungary; there is no cable coverage in Italy or Greece. The countries with a penetration of above 30 per cent are AT, BE, CH, DK, HU, LI, MK, MT, NL, PL, PT, RS. **DSL lines**²⁹ as a percentage of fixed broadband range from just under 10 percent in Bulgaria to almost 100 percent in Greece. The countries with above 50 per cent are HR, CH, IS, LU, AT, LI, IE, DE, FR, CY, IT, EL. The use of **FTTH/B**³⁰ technology is very diverse and not used in Greece and Cyprus but above 40 per cent in the Scandinavian/Baltic countries Iceland, Norway, Finland, Sweden, Latvia and Lithuania as well as in Spain, Portugal, Bulgaria and Romania.

Other³¹ technology reported by some countries may include Satellite, FWA etc. These technologies seem to be on the increase and may be recorded in more detail in future reports.

Figure 36 – Fixed broadband: share of cable, DSL, FTTH/B technology, Other



Source: BEREC RA database 2018

²⁸ Data is confidential in the UK and not available in IS. No cable coverage in IT and EL.

²⁹ Data is confidential in the UK and not available in FI.

³⁰ Data is confidential in the UK. No coverage in EL and CY.

³¹ CZ: WiFi unlicensed radio bands (33,5 %) and mobile LTE (5,3 %). RO: FTTC/FTTN, FWA, pure UTP/FTP, FR: Satellite, FWA, 4G box etc. (1,54 %)

Market shares (Broadband)

This section looks at the market and competitive situation in the increasingly important broadband market, i. e. the market shares of the incumbent (which is not always the SMP operator) vs. the market shares of alternative operators (competitors) and cable operators. This includes DSL and NGA (FTTx) broadband subscriptions. The particular market situation in each country has an effect on each country's regulatory effort. Since the data analysis shows a considerable disparity in market shares and therefore the competitive situation within each country, different regulatory regimes seem appropriate³².

The market share of the **incumbent's** fixed broadband subscriptions³³ range from a minimum of 21 per cent in Romania to a maximum of 97 per cent in Finland. The **cable operator's** market share of fixed broadband subscriptions³⁴ range from a minimum of 2 per cent in Slovakia to a maximum of 79 per cent in Romania. There are no cable operators in Greece and Italy. Where a share has not been provided, the market share of alternative operators (i. e. non-cable competitors) is calculated.

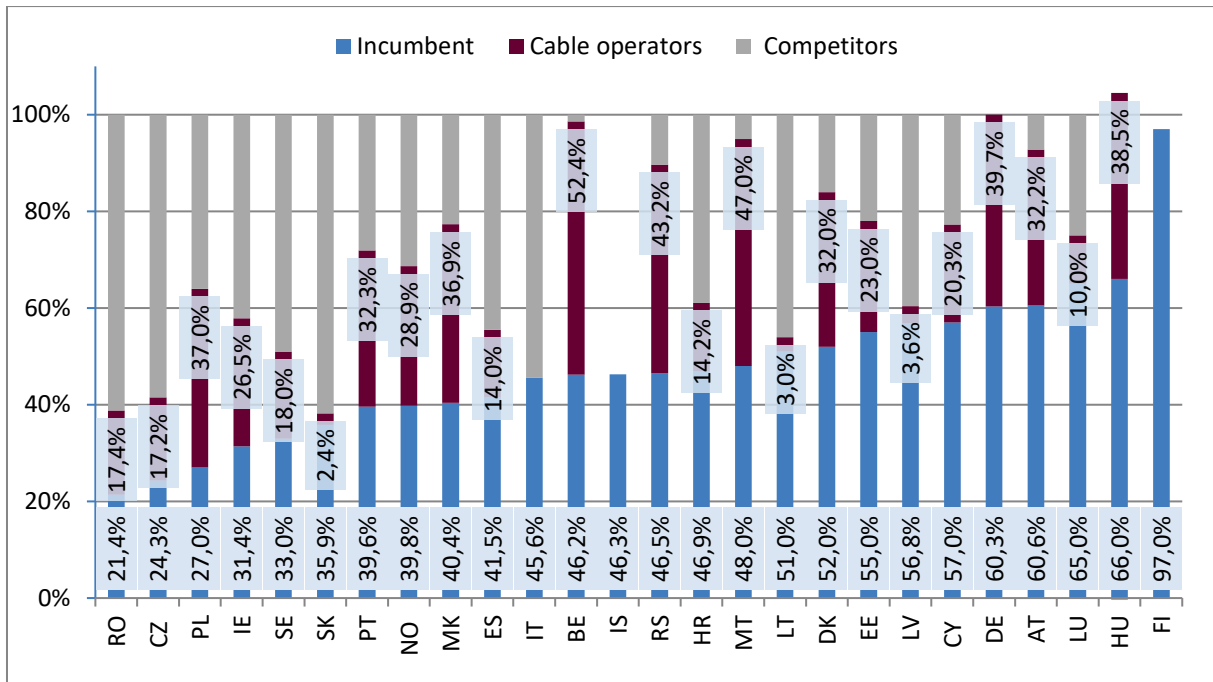
A word of caution when looking at the following figure: in some countries, the incumbent also provides cable services, e. g. in DK the SMP operator is also the biggest cable operator and included in the figure provided and in HU there are three SMP operators, two of which also have cable operations (therefore the share is > 100 %).

³² In CZ, the former SMP operator O2 was separated into two legal entities: infrastructure and wholesale service provider (no retail) and retail service provider. Data provided in this section is for the retail service provider (O2). Data provided for SE is residential data only.

³³ Data is confidential in BG, FR, LI, NL, UK and not available in CH and SI. IE: incumbent retail all platforms

³⁴ Data is confidential in BG, LI, NL, UK and not available in CH, EL, FI, FR, IS. In RO the reported value reflects the share of coax cable. IE: cable retail

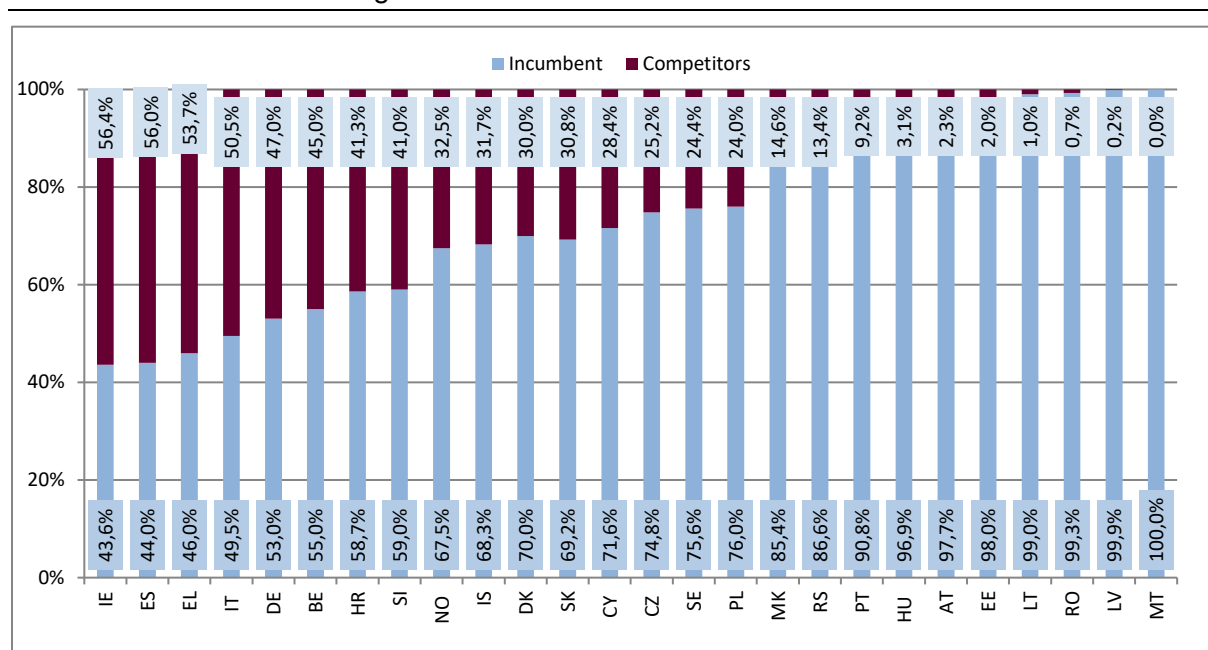
Figure 37 - Fixed broadband market share



Source: BEREC RA database 2018

Looking at **DSL broadband** subscriptions (including docsis prior to 3.0, excluding VDSL)³⁵, the traditional domain of incumbent operators, the incumbent's market share³⁶ ranges from a minimum of 43,6 per cent in Ireland to a maximum of 100 per cent in Malta. Shown in the same figure are the competitor market shares³⁷.

Figure 38 - DSL broadband market share



Source: BEREC RA database 2018

³⁵ It is not possible for some NRAs to report the figures excluding as defined – where this is the case it is specified in the footnote.

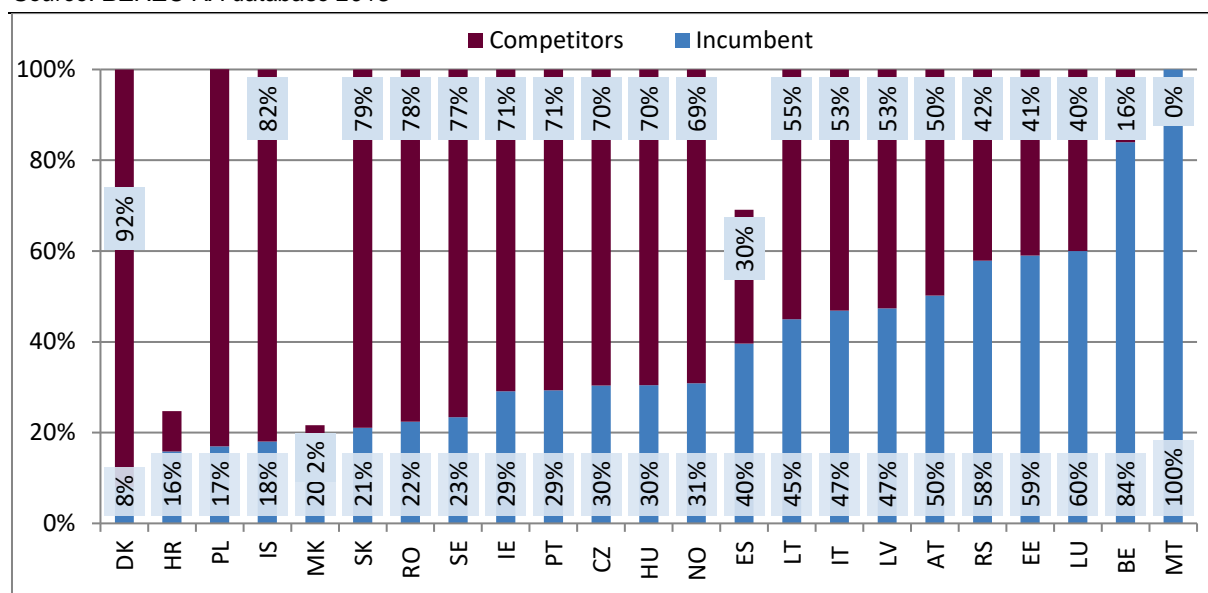
³⁶ Data is confidential in FR, LI, NL, UK and not available in CH, FI, LU. Data includes VDSL in BG, HR, IE: incumbent DSL retail, excludes VDSL

³⁷ Data is confidential in FR, LI, NL, UK and not available in CH, FI, LU. Data includes VDSL in HR, IE: OAO DSL retail

Looking at **NGA (FTTx) broadband** subscriptions (including VDSL, FTTH, FTTB, cable docsis 3.0),³⁸ the incumbent share³⁹ ranges from 8 per cent in Denmark to 100 per cent in Malta. Shown in the same figure are the competitor market shares⁴⁰.

Figure 39 - NGA broadband market shares

Source: BEREC RA database 2018



For the first time other access operator's (OAO) coverage was to be explored, i. e. OAOs using own infrastructure to supply NGA broadband. Only few NRAs were able to report figures and some of them had to make adjustments to the data definitions (see footnotes). It is hoped that responses and the quality of responses will increase over time.

When considering competitors' NGA (FTTx) broadband subscriptions through own cable using SMP infrastructure⁴¹, 13 NRAs⁴² supplied data. Of these, only AT, DK, PT; IE, IT and ES⁴³ reported figures of above 1 per cent, however in Ireland the cable is not used via SMP infrastructure.

³⁸ It is not possible for all NRAs to report data as defined – where data deviates, it is specified in a footnote.

³⁹ Data is confidential in BG, FR, LI, NL, UK and not available in CH, DE, EL, FI, SI. DK data excludes cable. IE data incumbent retail VDSL plus FTTP, CY does not have NGA subscriptions and is therefore not shown.

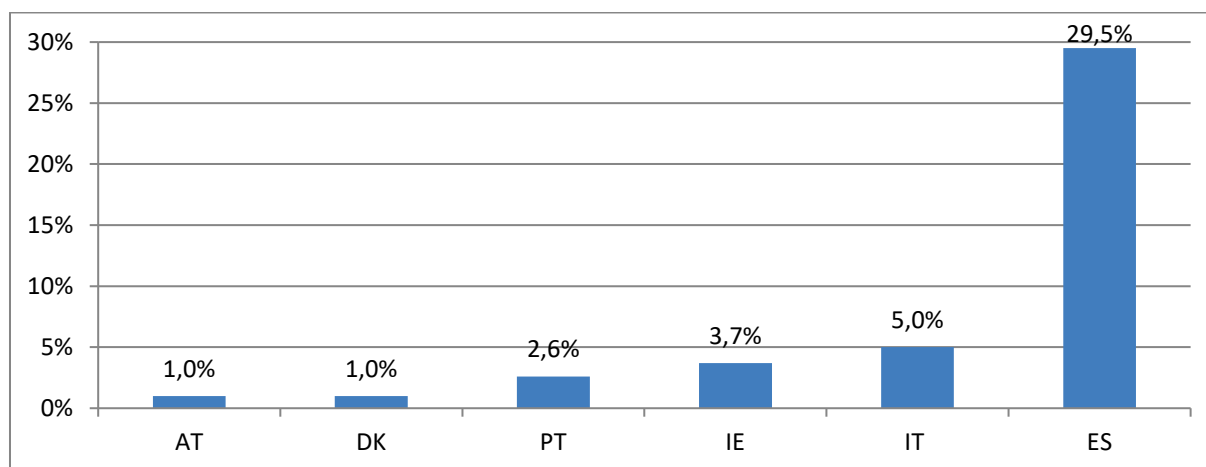
⁴⁰ Data is confidential in BG, FR, LI, NL, UK and not available in CH, DE, EL, FI, SI. BE data includes SMP cable subscriptions, DK data excludes cable, IE data is OAO DSL retail VDSL plus FTTP, CY does not have NGA subscriptions and is therefore not shown.

⁴¹ Data is confidential in FR, NL, UK and not available in BE, BG, CH, DE, EL, FI, HR, HU, IS, LI, LT, LU, LV, MK, NO, PL, RO, RS, SE, SI.

⁴² CY, CZ, MT, UK, EE, SK, IE, AT, DK, IT, PT, ES

⁴³ ES assume that at any point of the network all competitor's FTTH lines use SMP passive infrastructure

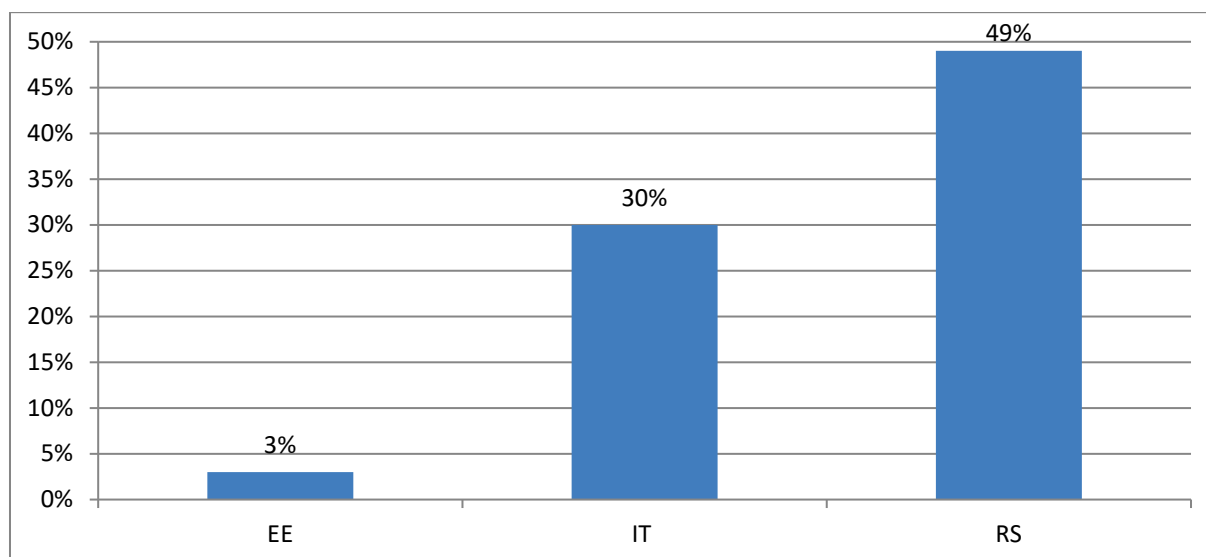
Figure 40 - Competitor NGA broadband subscriptions through own cable
(using incumbent infrastructure)



Source: BEREC RA database 2018

The total coverage of other access operators' (OAO) via their own infrastructure⁴⁴; here on own FTTS resulted in a response of a total of 10 NRAs.⁴⁵ In the following figure, only EE, IT and RS⁴⁶ have reported a percentage share of above 1.

Figure 41 - OAO coverage on own network FTTS (via SLU): % of households



Source: BEREC RA database 2018

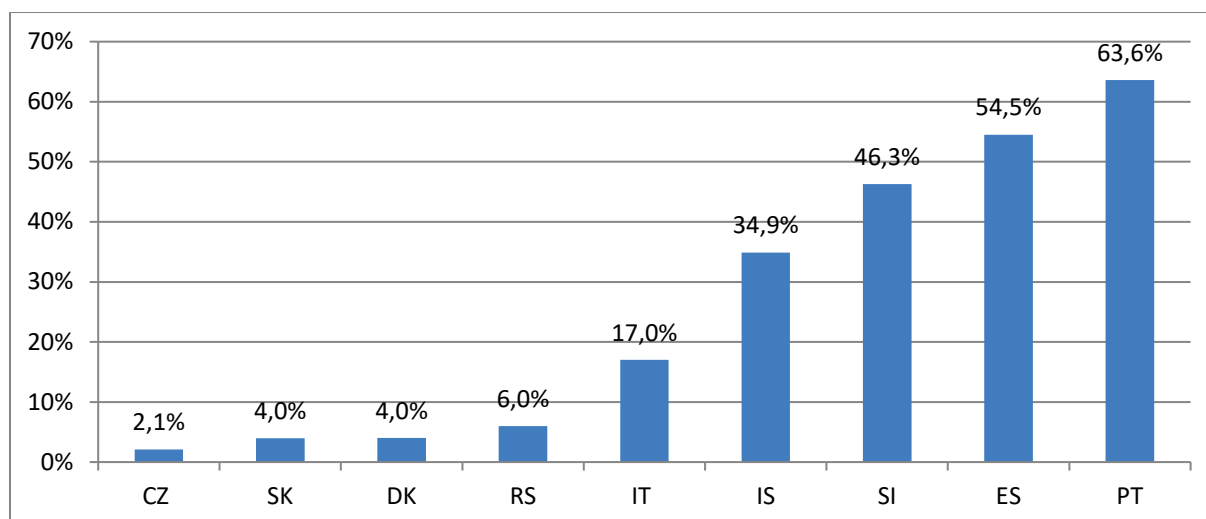
⁴⁴ Confidential data in FR, LI, NL, UK and data not available in AT, BE, BG, CH, DE, EL, FI, HR, HU, IE, LT, LU, LV, NO, PL, RO, RS, SE

⁴⁵ CY, CZ, ES, IE, MT, PT, IS, EE, IT, RS. ES: due to lack of available information "Building Units" were used instead of "households"; this data can be overlapping, i.e. more than one OAO deploy their own network in a building.

⁴⁶ RS data considers the percentage of HFC networks realised in FTTC architecture (without taking into account network overlap).

The total coverage of other access operators' (OAO) via their own infrastructure⁴⁷, in this case OAO coverage on own FTTH via SLU was to be investigated. 16 NRAs⁴⁸ have reported data, of which CZ, SK, DK, RS, PT, IT, IS, SI, ES have provided figures above 1 percent.

Figure 42 - OAO coverage on own network FTTH: % of households



Source: BEREC RA database 2018

The total coverage of other access operators' (OAO) via their own infrastructure⁴⁹ on own cable network resulted in a response of a total of 16 NRAs.⁵⁰ 13 NRAs, i. e. DK, MK, SE, EE, PT, CZ, ES⁵¹, IE⁵², SI, AT, RS, CY, BE provided percentages above 1 percent:

⁴⁷ Confidential data in FR, NL, UK and data not available in BE, BG, CH, DE, EL, FI, HR, HU, IS, LI, LT, LU, LV, MK, NO, PL, RO, RS, SE, SI

⁴⁸ CY, LI, MT, EE, MK, UK, CZ, SK, DK, RS, PT, IT, IE, IS, SI, ES. In IE, all FTTC is supplied by the incumbent.

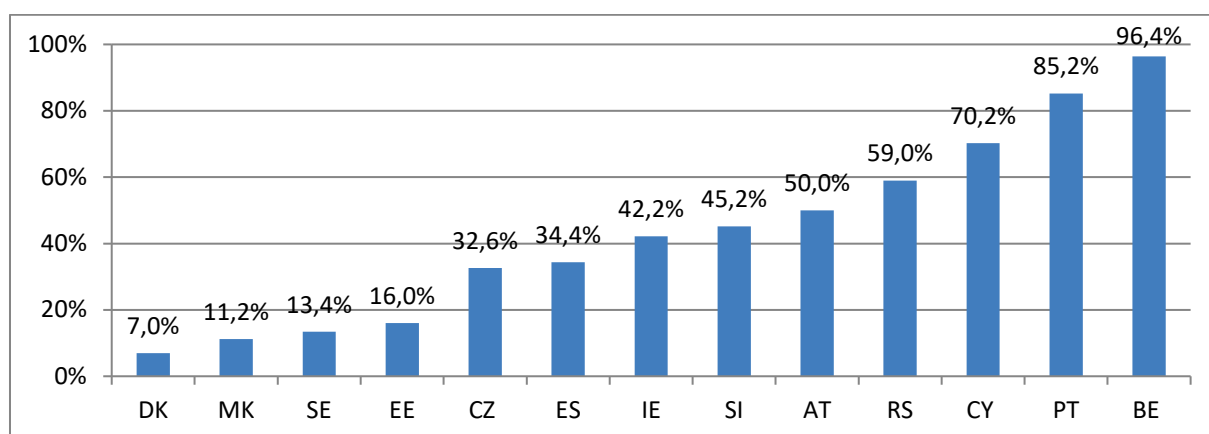
⁴⁹ Confidential data in FR, LI, NL, UK and data not available in BG, CH, DE, EL, FI, HR, HU, IS, LT, LU, LV, NO, PL, RO

⁵⁰ IT, MT, SK, DK, MK, SE, EE, PT, CZ, ES, IE, SI, AT, RS, CY, BE.

⁵¹ Due to lack of information "Building Units" were used instead of "households"; this data can be overlapping in some, i.e. more than one OAO deploy their own network in a building.

⁵² data is for premises passed

Figure 43 - OAO coverage on own cable network: % of households



Source: BEREC RA database 2018