

BEREC Report

Regulatory Accounting in Practice 2023



7 December 2023

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List of Abbreviations

A

AD *Access Directive*

C

capex *capital expenditure*

CAP-M *Capital Asset Pricing Model*

CCA *Current Cost Accounting*

D

DEA *Digital Economic Agenda*

E

EECC *European Electronic Communications Code*

ERT *Economic Replicability Test*

EWG *Expert Working Group*

F

FDC *Fully Distributed Costs*

FLLU *Fiber Local loop unbundling*

H

HCA *Historic Cost Accounting*

L

LLU *Local Loop Unbundling*

LR(A)IC *Long Run (Average) Incremental Cost*

LRIC *Long Run Incremental Cost*

M

MDF *Main Distribution Frame*

MST *Margin Squeeze Test*

N

NDCM *Non-discrimination Obligations and Costing Methodologies*

NRA *National Regulation Authorities*

O

ODF *Optical Distribution Frame*

opex *operating expenditure*

R

RA *Regulatory Accounting*

S

SA *Shared Access*

SLU *Sub Loop Unbundling*

SMP *Significant Market Power (regulated operator)*

T

TD *Top Down*

V

VULA *Virtual Unbundled Local Access*

VHCN *Very High Capacity Networks*

W

WACC *Weighted Average Cost of Capital*



1. Executive summary

This is the nineteenth RA annual report which summarises the findings of a detailed survey of regulatory accounting systems in the regulatory context in access markets across Europe. Information has been gathered from National Regulatory Authorities (NRAs) and covers the implementation of regulatory cost accounting methodologies in the national market situations. As 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 focusing on the implementation of the corresponding European Commission WACC Notice on the calculation of the cost of capital for legacy infrastructure.

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 (former Market 3a/2014, now market 1/2020), Wholesale Central Access (Market 3b/2014) and Wholesale high quality access (former Market 4/2014, now market 2/2020).

In line with the last reports it 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, and the cable regulation. A brief analysis of symmetric remedies is included. Outcomes of the survey are simply reported in a descriptive form.

The report also looks at annualization methodologies provided by respondent NRAs. As in last year's report, accounting information for specific products in Market 1, such as copper access (including LLU, SA, SLU), fibre access (FLLU, VULA), dark fibre access and duct access have been further analysed.

An evaluation of the implementation of the Recommendation 2013/466/EU on consistent non-discrimination obligations and costing methodologies is also reported (par. 3.5). In this context some new elements about BU models are 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 (chapter 4).

In Chapter 5 the report delivers an extended survey on WACC parameters, mainly focusing on market 1. 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 main focus this year report is related to the adoption of the Commission Notice on WACC.

Appendix I contains a number of figures/tables providing further details on some of the analyses in the report.

1.1 Key findings

The Regulatory Accounting annual report gives an overview of the main remedies imposed on SMP operators in relevant markets susceptible to ex-ante regulation. Specific focus is given to the

relevant costing methodologies, applied in relation to the corresponding price control schemes, adopted by NRAs for single products.

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 in accordance with the EU Regulatory Framework continues to be high and accommodates the use of elements or parameters that reflect national circumstances.

The RA report 2023 provides an analysis more oriented on single products (increasing the scope of monitoring) with respect to the previous editions. The 2021 report collected information on 23 main products (13 in 2015). Like the 2022 report, the 2023 report collects information on 17 main products, as reported in Figure 2, simplifying the information previously collected mainly due to a reduced set of products on copper network.

The regulation of legacy products in market 1/2020 and 3b/2014 is more frequent: 85% of EU NRAs still maintain SMP remedies on ULL and 67% on market 3b over legacy copper network (reduced from 81% compared to last year's report). In case of the former market 3a/2014, VULA product over FTTC and FTTH the situation has remained unchanged since last year. In relation to market 3b/2014 the number of NRAs that no longer regulate NGA products has increased since last year. The SMP regulatory remedies have been applied by NRAs generally towards a single national SMP operator. In some cases, the SMP regulation has been applied to more than one SMP operator.

The number of NRAs that face different competitive conditions across their national territory thus justifying a geographically differentiated approach (in terms of market definition or remedies application) has increased in comparison to last year for some markets/products. Looking at geographically differentiated regulation, the deregulated areas range from 5% of households up to 70% in market 3b/2014, very often between 20% and 50%, increasing in comparison to last year's report.¹ The percentage of households falling under a geographical regulation in combination with less regulatory obligations in markets 3a and 3b (ES, PL, PT, FR) is in line with a regulatory path where a geographical regulation is applied to avoid non-proportional regulation (the range of countries in Figure 9 follows the one reported in Figure 6). Also, the competitive areas are increasing.

Most NRAs apply the whole set of remedies when SMP regulation is imposed on a specific product/market, where access obligation in combination with non-discrimination are the most frequently applied remedies.

Within the copper network, ULL is still the most regulated product. Focusing on RA in general, accounting separation is often imposed together with the cost accounting obligation. Some NRAs consider it necessary to impose both 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 is useful for vertically integrated undertakings by using cost models to supplement price control measures in order to prevent unfair cross-subsidies (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.

¹ PT apply a differentiated market and remedies approach in ex market 4_2014; as this is a market targeted to companies (small, medium and large) the percentage of households covered (by regulated and/or deregulated areas) is not relevant.

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 refers mainly to VULA and market 3b products (Figure 18).

ERT price control methodology is still mainly used complementarily to cost orientation, albeit a slightly increased use of the ERT at least for NGA/VHCN wholesale products as a price control method can be observed, suggesting it is a substitute with respect to cost orientation, in line with the Commission NDCM Recommendation (2013/466/EU) and the price flexibility tool according to Art. 74 of the Code.

Cost orientation for FTTH is more frequent when a legacy network based on copper is still relevant for NGA products (FTTC), where a stronger relation of substitution with respect to a legacy copper product may occur. In case no intermediate steps like FTTC for VHCN transition are in force, more flexibility is granted when regulating FTTH, also with the application of ERT. The relevance of the legacy copper network for NGA take up (e.g. the case of FTTC) appears to be correlated to the regulatory approach in terms of remedies imposed in access markets as well as on the level of the price flexibility tool according to Art. 74 of the Code, irrespective of the application of non-discrimination rules such as EoI.

Overall, the application of EoI models is increasing over the years. The cumulative percentage of EoO and/or EoI is higher in relative terms in case of VULA (FTTH) as well as for market 3b/2014.

With regard to the cost base CCA is by far the most commonly used methodology for all markets. The situation remains stable in comparison to last year.

The most frequent cost allocation approach is LRIC/LR(A)IC, for almost all products/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 a frequent approach for Market 4 over legacy network. With respect to last year an increase in relative terms of the use of FDC can be detected also for Market 3b for legacy products and NGA products which is due to the fact that NRAs that used LR(A)IC removed regulation (there is no “transition” from LR(A)IC to FDC).

For copper LLU most NRAs apply a cost orientation alone/LRIC-LR(A)IC/CCA approach. Generally there is an increase in the use of the combination of cost orientation/price cap with BU-LRIC approach and a reduction of accounting methodologies based on FDC; TD approach is by far less frequent.

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.

Compared to the BEREC WACC parameters Report 2023 (BoR (23) 90), the present BEREC Regulatory Accounting Report WACC chapter (chapter 5) is of a more descriptive nature, aiming at reporting and analysing NRAs WACC calculations “as is” as well as showing the evolution over time, in line with previous versions.

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)² and hence similar parameters for determining the WACC. However, the value of these parameters naturally differs reflecting different national financial market conditions. The statistical analysis (regression) of the data shows – in line with the previous exercises – that the differences of the final WACC values over time are

² Cf. BoR (13) 110.

mainly explained by parameters in the WACC calculation that are more “country related” such as the RFR, ERP and Tax rate, with a less relevant role for “sector-specific” parameters such as beta, gearing and debt premium. This is consistent with survey results on “used methodologies” that confirm that beta, gearing and debt premium are estimated mainly on a “notional” basis (see also Appendix II of Ch. 5) by NRAs from a long time prior to the WACC Notice.

By taking into account only the most recent estimation over time (last three most recent values for each NRA) in the pooled regression analysis, the results show that the ERP, that was the second most relevant parameter after RFR for explaining differences between WACC values applied by NRAs until recently has become less relevant. Tax, which is a country parameter, not under NRAs control, has become more relevant in explaining differences with respect to ERP since last year. This result confirms the fact that the ERP estimation through a notional approach by most NRAs due to the application of the Commission Notice is reducing its spread. At the same time beta is becoming more relevant for explaining the difference in WACC values between NRAs due to asynchronous update of the parameter and due to the fact that contrary to the past the variation of this parameter is more relevant than before. This also shows that the application of the WACC Notice continues to have a material convergent effect.

Overall the 2023 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 for wholesale access markets needs to bear in mind that wholesale access markets are reflecting different national market situations and structural factors influencing the regulatory strategy.

1.2 Future development

As can be seen from the results above the Report confirms a trend towards a consistent application of regulatory accounting frameworks by NRAs. This also reflects clearly convergence in the application of the 2013 Recommendation on consistent non-discrimination obligations and costing methodologies. In 2024 the report will continue to look at the application of regulatory accounting with respect to key access products (e.g. fibre) and will maintain an in-depth analysis of the methods as well as the national market situations in which they are applied. Further to this, the focus of the report will be further adapted in the light of the EECC provisions given that the EECC were to be transposed by Member States by 21st December 2020. This implies looking in which way NRAs apply the updated provisions to deal adequately with the developments in markets and technology.

Regarding the WACC calculation, the report data will continue to be collected based on the methodology and input parameters actually used by NRAs to estimate the rate of return on capital employed, and the impact of both on the result will be considered. Furthermore, the convergence of WACC calculations through the application of the Commission WACC Notice will be followed on.



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 remedies in charge with more specific attention to the obligation for SMP operators 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 an updated benchmark on regulatory accounting at a single access product level; and ii) to give an overview on how the supply and demand factors affect the choices of the regulatory framework specifically on price control and costing methodology as adopted by NRAs.

This is the nineteenth annual report summarising the results of the 2023 survey.

The report has been updated since 2005 in order to monitor trends in the degree of harmonisation of regulatory accounting systems across Europe.³ Until 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 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 2005.⁴

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, since 2013, also on how NRAs implement the principles of the Commission Recommendation on consistent non-discrimination obligations and costing methodologies (NDCM).⁵

In 2014 the Commission issued a Recommendation that further reduced the number of relevant markets focussing the report on specific products in each market.

³ Previous years (2005-2021):

- 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.
- BoR (19) 240 Regulatory accounting in practice 2019.
- BoR (20) 210 Regulatory accounting in practice 2020.
- BoR (21) 161 Regulatory accounting in practice 2021.
- BoR (22) 164 Regulatory accounting in practice 2022.

⁴ 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.

⁵ "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.

In 2020 the Commission ran a targeted consultation on the review of the 2010 NGA Recommendation as well as on the 2013 NDCM Recommendation. BEREC submitted its response in October 2020 (BoR (20) 169).

A new Recommendation on relevant markets has been issued on 18st Dec. 2020 (C(2020) 875). In this report the taxonomy of the new Recommendation on relevant markets (C(2020) 875) has been updated, providing, when needed, the corresponding old taxonomy thus markets and products refer also to the Commission Recommendation of 2014.

On 23rd February, the European Commission invited BEREC to provide the Commission with its opinion on the draft “Gigabit Recommendation”, and BEREC published its opinion on the 5th May 2023 with decision BoR (23) 83.

Even if the focus of the report is traditionally based on the Regulatory accounting measures, it is a matter of fact that the regulatory milieu, outlined by the European Electronic Communications Code (Directive 1972/18/EU), is evolving and price control and costing methodologies are regulatory tools that are going to become less central with respect to the past if considered as stand-alone remedies with their technical developments. For this reason the report will focus on the application of regulatory accounting measures in the general context in which remedies are applied.

Moreover, Directive 1972/18/EU specifically introduced new objectives for ensuring connectivity and widespread availability of very high capacity networks (VHCN). Thus, the regulatory context has become more complex also in light of the specificity of each country in terms of technology adopted by the SMP operator for upgrading the legacy network and the level of infrastructure competition that may reduce the scope of regulatory intervention.

Those specificities, that are related to structural issues and commitments, have adapted to the regulatory context in some way in terms of applied relevant remedies as well as the scope of the regulatory intervention in each country. In this context the report provides an overview of the regulatory outcomes at single country level giving information also on the technology and competitive environment in which the remedies are imposed.

2.2 Current report

This report provides an update on the status of costing methodologies are in use across Europe and it monitors the evolution over time as a consequence of the adoption by NRAs of decisions regarding market analyses.⁶ A first part of the document reports the remedies framework for each EU country in combination with the state of play of the technology adoptions and level of competition. A second section reports statistical analysis on costing methodology: the most frequent approach should be seen as the most frequent situation at European level, being aware that this doesn't mean that it is the most appropriate solution for each country case. Instead, the statistical analysis on the most frequent approach can provide information on the regulatory paths that are emerging at EU level.

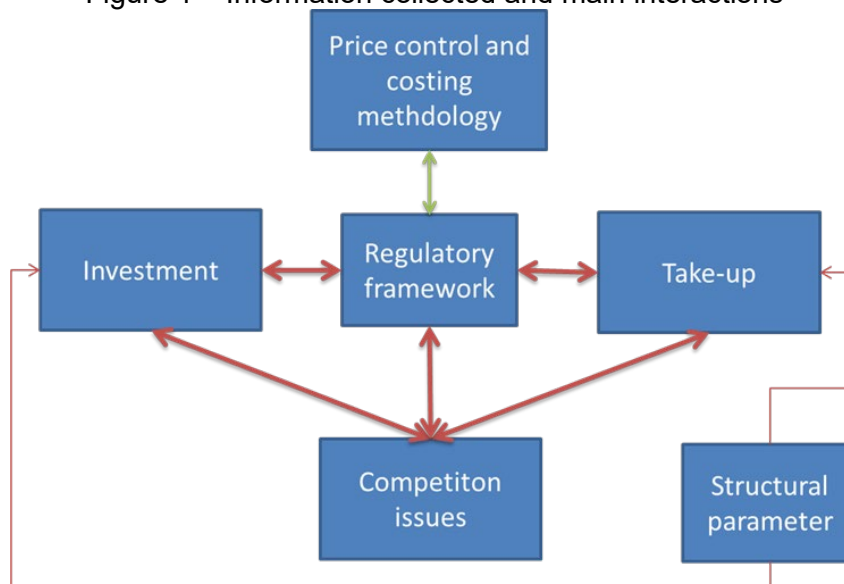
For the 2023 RA report, information on the following main elements , in continuity with the past years, have been collected:

⁶ The monitoring approach is based on a “survey” submitted by NRAs mainly based on predefined categories and sub-categories of replies. In that sense the approach described for each country is standardised for statistical reasons. The chosen and agreed categories and sub categories give just an indication of the main approach in use that is articulated in each NRA's decision reflecting own country specificity.

- i) Regulatory framework (Access regime/geographical regulation);
- ii) Cost assessment (cost orientation implementation; wholesale price; WACC and risk premium);
- iii) Competition indicators (i.e. market share of SMP operators);
- iv) Structural Parameters.

The following picture provides information about the main groups of elements/indicators that have been collected in the survey and the corresponding interaction diagram.⁷

Figure 1 – Information collected and main interactions



The report benefits from information collected from 33 NRAs (listed in Appendix I) with most NRAs responding to the majority of the questions, thus providing a solid base for further analysis and comparisons along the years.

The information provided in this report refers to those markets for which remedies are in force (last update 1st April 2023).

2.3 The data collection process

As highlighted in the introduction, the collected information is targeted at single product level within the relevant market, reflecting the fact that the regulatory framework is mainly influenced by technological drivers, capital costs, business models for investment, demand side factors and national policy, thus addressing national specificities. At the same time it should be considered that in line with the Commission recommendation on relevant markets, along the cyclical review, the number of markets is reduced due to the fact that ex-ante regulation has been removed for most of the previous relevant markets. Going forward, the objective is that NRAs will ultimately be able to find retail markets to be competitive even in the absence of wholesale regulation.

The level of competition in most European countries has reached at least the “local” level of the ladder of investments. In that context investments in VHC network are going to materialise in most

⁷ The boxes connected with bold arrow include indicators that generally guide directly the decisions about the regulatory framework. Structural Parameters are generally external elements that influence the outcome in terms of investment and take-up of services, but they are not under direct control of the regulatory framework and they guide decisions indirectly. Green arrows refer to the focus inside the regulatory framework that is the core of the present report.

EU member states with some countries already having reached the final step of removing the ex-ante regulation even in the last access market.

The transposition of the EECC (Directive 2018/1972/EU) was due on the 21st December 2020 and led to each member state introducing new instruments to address the issue of incentivising investments in VHC networks in a context where competition issues have been well addressed with a different scale for two decades of regulation. The new framework invites NRAs to incentivise infrastructure competition where this is efficient, while relying on other competitive instruments where appropriate. In such context, together with the classical access regulation, the new EECC provides instruments such as i) the civil infrastructure access as independent remedy (Art. 72); ii) symmetric regulation (Art. 61); iii) co-investment agreements (Art. 76); iv) commitment for co-investment agreements (Art. 79);⁸ v) wholesale only operators (Art. 80). All those new instruments provide rules for reducing the classical full ladder model - cost oriented obligation - with the objective to spur investment in VHC networks. At the same time the Commission recommendation on relevant markets suggests to take into account specific geographical situations.

In Art. 61 (3) subparagraph 1 of EECC, NRAs may impose obligations – upon reasonable request and regardless of any findings of SMP – thus granting access to wiring and cables and associated facilities inside buildings or up to the first concentration or distribution point as determined by NRAs. Access obligations may be imposed on electronic communication network (ECN) providers or owners of such network elements, where replication of the concerned network elements would be economically inefficient or physically impracticable. Where access obligations pursuant to Art. 61 (3) subparagraph 1 do not sufficiently address economic or physical barriers to replication, Art. 61 (3) subparagraph 2 of EECC authorises NRAs to extend the imposition of access obligations (including active or virtual access obligations if justified on technical or economical grounds) beyond the first concentration or distribution point up to a point capable of hosting a sufficient number of end-user connections to be commercially viable for efficient access seekers. BEREC has provided guidelines on the criteria for a consistent application of Art. 61(3) EECC in BoR (20) 225.

Alongside the new Code of Communication, it is also relevant to point out specific topics of the new draft Gigabit Recommendation for which BEREC provided its opinion in BoR (23) 83. The new Draft Gigabit Recommendation focalises the scope on the new access market 1/2020 in line with the updated relevant product and service markets susceptible to ex ante regulation and eventually to the markets that are upstream and downstream of this access market (civil infrastructure access and previous market 3b “wholesale central access”). Some elements of the Commission Recommendation of 2013/466/EU are still valid within the new regulatory scope of the Draft Gigabit Recommendation inter alia:

1. The fact that the legacy product should be cost oriented priced through a BU-LRIC+ approach providing an efficient make or buy signal to the market;
2. Flexibility of VHCN network when some conditions are also met on a non-discrimination basis.
3. Relevance of the civil infrastructure access to spur efficient infrastructure competition.

⁸ In such a context commercial agreements should be taken into account when a market analysis is done and NRAs should evaluate how they can affect the regulatory framework in term of SMP assessment and consequently remedies imposed overcoming the price control obligation.

With this in mind this year report provides a more precise picture on the implementation of the Recommendation of 2013/466/EU with respect to previous years' RA reports in light of the relevance of the main guidelines provided in the 2013/466/EU Recommendation that are still valid in the draft new framework as evaluated by BEREC in the opinion BoR (23) 83.

The 2023 report collects information on 17 main products as reported in Figure 2, in line with the one considered for 2022 report.

In every case behind those new addressed specificities, the standard Significant Market Power (SMP) regime remains at the cut-off date the key instrument for *ex ante* regulation and the main focus of the present report.

The report is targeted on SMP *ex ante* framework focalising the monitoring process on the products enumerated in Figure 2, in line with the collected information. At the same time it is relevant to understand if and how the new instruments which are provided in the EECC are applied and considered: i) symmetric regulation (Art. 61 (3)); ii) co-investment (Art. 76); iii) functional and voluntary separation (Art. 77, 78); iv) commitments for co-investment agreement (Art. 79); v) wholesale only operators (Art. 80).

There is evidence that cooperative and commercial agreements are considered by NRAs, affecting the regulatory outcome independently from the application of the legal basis of the Code.

The survey asked about some of the previously given elements.

Figure 2– Market and products monitoring perimeter

Market/products	Definition	
Symmetric regulation	M3a_2014_M4_2007_Terminating segment (in line with definition of Art. 61 (3)) symmetric regulation (please fill if you apply symmetric regulation even if the new code is still not adopted in your country)	Symmetric access to wiring and cables and associated facilities inside buildings or up to the first concentration or distribution point
	M3a_2014_M4_2007_Terminating segment (point beyond the first concentration point Art. 61 (3)) symmetric regulation (please fill if you apply symmetric regulation even if the new code is still not adopted in your country)	Symmetric access to wiring and cable and associated facilities beyond the first concentration point
Market 3a	M3a_2014_M4_2007_ULL	SMP Local loop unbundling service on copper network
	M3a_2014_M4_2007_SLU	SMP Sub loop unbundling on copper network
Market 1 (ex .Market 3a)	M3a_2014_Optical terminating segment SMP regulation (in-house wiring)	SMP Access to wiring and cables and associated facilities inside buildings or up to the first concentration or distribution point
	M3a_2014_M4_2007_fiberLLU	SMP fiber local loop unbundling
	M3a_2014_M4_2007_VULA (FTTC)	SMP VULA on fiber to the cabinet network
	M3a_2014_M4_2007_VULA (FTTH)	SMP VULA on fiber to the home network
	M3a_2014_M4_2007_VULA (cable Docsis <3.0)	SMP VULA on cable docsis <3.0 network
	M3a_2014_M4_2007_DF	SMP Dark fiber
M3a_2014_M4_2007_DA	SMP Duct access	

ex. Market 3b	M3b_2014_legacy	SMP Bitstream access over legacy copper network
	M3b_2014_NGA (including FTTC)	SMP Bitstream access over NGA FTTC network
	M3b_2014_(FTTH)	SMP Bitstream access over FTTH network
	M3b_2014_(Cable docsis >3.0)	SMP Bitstream access over cable docsis >3.0
Market 2 (ex. Market 4)	M4_2014_Active_Legacy	SMP Terminating segment over copper network
	M4_2014_Active_NGA (native Ethernet)	SMP Terminating segment over NGA network

Source: BEREC RA Database 2023

2.4 The symmetric regulation

The symmetric framework has been introduced by art. 12 of the Framework Directive, as modified by Directive 2009/140/CE.

The EECC gives more emphasis to symmetric regulation in art 61 and introduces new powers for NRAs in 61(3)⁹. Symmetric regulation is considered in some way logically upstream to the SMP regulation. This is why it is presented before the SMP approach in the present report.

Up to now there is no direct application of art. 61 of the EECC, but a “legacy” symmetric framework is present in the regulation of several member states. Specifically, different information on subparagraph 1 (access to wiring and cables and associated facilities inside buildings) and subparagraph 2 (access point beyond the first concentration point) has been collected.

Symmetric regulation affecting the terminating segment, in line with the 2021 and 2022 reports, is applied by 8 NRAs (ES, FR, HR, HU, IT, LV, PT and PL which declared to introduced a symmetric framework in the last year) thus granting access to wiring and cables and associated facilities inside buildings or up to the first concentration or distribution point as determined by the national regulatory authority.

Access obligation beyond the first concentration point (which would correspond to art. 61 paragraph 3 subparagraph 2) has been declared by 4 NRAs (FR, HR, HU, PL).

The symmetric obligation has been considered a complement of the SMP regulation on terminating segment for HU and IT as also SMP remedies are applied; in that case all sets of other remedies have been imposed on an SMP basis, also including the obligation to publish a reference offer for accessing the terminating segment.

A symmetric access obligation in line with subparagraph 2 has been considered a complement with respect to Fibre ULL (FULL) and/or VULA FTTH by three NRAs (HR, HU, PL) of the four that

⁹ Art. 61 (3) subparagraph 1 EECC states that: “national regulatory authorities may impose obligations, upon reasonable request, to grant access to wiring and cables and associated facilities inside buildings or up to the first concentration or distribution point as determined by the national regulatory authority, where that point is located outside the building”. The NRA “national regulatory authority... it may extend the imposition of such access obligations, on fair and reasonable terms and conditions, beyond the first concentration or distribution point, to a point that it determines to be the closest to end-users, capable of hosting a sufficient number of end-user connections to be commercially viable for efficient access seekers.”

already apply the symmetric obligation in line with this provision of the sub paragraph 2 of art. 61 (3) of EECC.

In France, the choice of a symmetric regulation with passive access obligation at the shared access point has been applied since 2009 as the main regulatory instrument for NGA networks. The main objective has been to allow fair and effective competition, and to promote investment by the multiplicity of actors wanting to invest in the new FTTH infrastructure. This symmetric regulation works together with a SMP regulation of the access to civil engineering where FR defined a separate market for duct infrastructure access including poles since 2020. It includes provisions that facilitate co-investment between operators. In the case of France, the application of the symmetric obligation has been considered sufficient enough to generally not impose SMP remedies on fibre in market 1 for the mass market.¹⁰

In ES CNMC adopted a decision in 2009 imposing symmetric regulation, on which basis the first operator deploying the fibre local access segment within a building (i.e. the segment of an NGA network that connects end-user premises to the first distribution point) must make it available to third parties at reasonable prices. The decision was adopted on the basis of provisions in Spanish law that were similar (but not identical) to those existing under the existing regulatory framework at that time (i.e. Article 5 of the Access Directive and Article 12 of the Framework Directive), and which enabled the NRA to impose, in exceptional circumstances, symmetric obligations on operators regardless of their SMP status. As a consequence, access to the fibre local access network available within buildings is excluded from the scope of SMP regulation in market 3a, since it is already covered by the symmetric obligations imposed by CNMC in 2009.

In IT AGCOM adopted the symmetric framework for in-building wiring since 2013, in parallel with SMP regulation, using as legal basis the Article 5 of the Access Directive and Article 12 of the Framework Directive. The symmetric framework also covers the civil infrastructure between the first manhole outside the private property and the access point of in-building wiring in fibre.

2.5 The SMP remedies framework

In this section an overview of the SMP finding at single product level is given. The NRAs were asked to provide information on the identifying one or more SMP operator(s) with respect to the corresponding product/market on the legal basis of art. 63 of the EECC. When an SMP position is identified the NRAs may impose obligations on the SMP operator(s) on the basis of the ex-ante (asymmetric) market review process that is provided under EU legislation (art. 68 of EECC).

General remedy application

In Figure 3 the updated situation in terms of remedies applied in the context of the SMP regulation at single product level is shown. The number of NRAs that apply SMP regulation for the corresponding product/market is provided, considering: i) all NRAs (EU and non-EU: 32 NRAs)¹¹ and ii) only EU NRAs (27 NRAs) that have provided information. The regulation of legacy products in market 1 and ex market 3b/2014 is still more frequent (even with a decreasing percentage): 81%

¹⁰ However, concerning FR, even if no SMP regulation has been imposed for fibre LLU, the SMP operator - since the 2017 market analysis decision - is regulated on a part of the fibre local loop, in two specific cases : (i) offers for business customers; (ii) offers with enhanced quality of service.

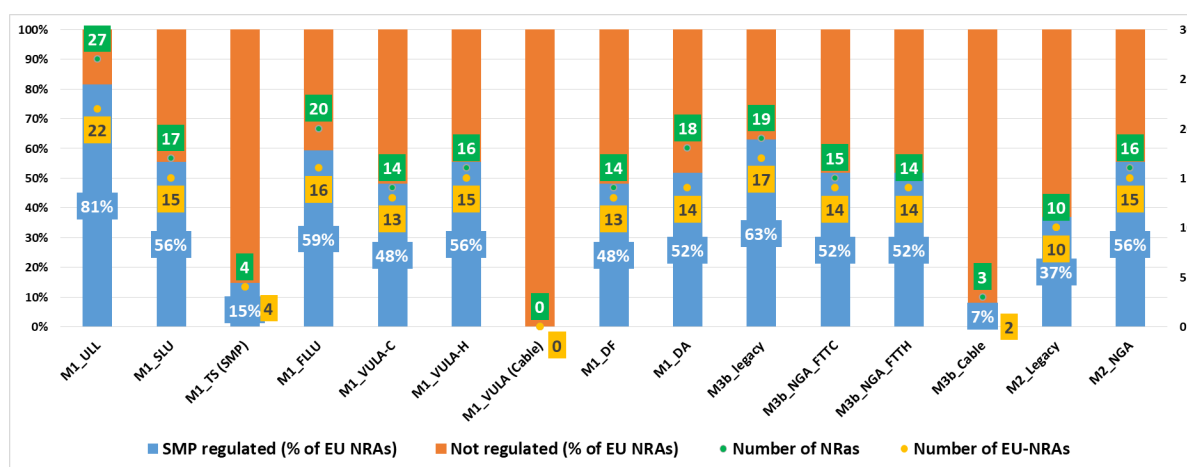
¹¹ IS replied only to the WACC section of the questionnaire.

of EU NRAs still maintain SMP remedies on ULL and 63% of NRAs on market 3b/2014 legacy copper network still regulate the product in the market.

Three NRAs do not apply any SMP or Symmetric regulation (BG, NL and RO) in the analysed products/ markets due to the fact that all markets have been found to be competitive.¹² This year, one more NRA (AT) removed SMP regulation in market 1 and ex. 3b. Due to the availability of commercial offer provided by the (former) SMP operator it was concluded that the three criteria test was no longer fulfilled. Also large geographic parts of the residential market were found to be competitive due to infrastructure-based competition from cable networks and mobile broadband.

From a taxonomy perspective, at the cut-off date of April 2023, no NRA has included ex-market 3b products in the new market 1/2020 of the recommendation on relevant markets.

Figure 3 - SMP-regulatory situation



	M1_ULL	M1_SLU	M1_TS (SMP)	M1_FLLU	M1_VULA-C	M1_VULA-H	M1_VULA (Cable)	M1_DF	M1_DA	M3b_legacy	M3b_NGA_FTTc	M3b_NGA_FTH	M3b_Cable	M2_Legacy	M2_NGA
SMP regulation (Yes)	AL BE CY CZ DE EE EL ES FI FR DE EL ES HR HU IE FR HU IE IT LI LT LU IT LT LU LV ME MTLV ME MT NO PL PT NO PL SE RS SE SISK	CY CZ DE EL ES FR HU IE IT LT LU MTV ME NO PL SE SISK	HU IE IT	AL BE CZ DE DK EE FI HR HU DE EL FI IE LI LT LU HR HU IE LV ME IT LV ME NO PL SE SISK	BE CY CZ DE EL ES FI HR HU DE EL FI IE LI LT LU HR HU IE IT LU LV MT NO SISK			CZ DE EL FR HU IE IT LT LV ME PL PT RS SI	BE DE EE EL ES FR HU IE ME NO PT RS SI SK	BE DE EE EL ES FR HU HU ME NO RS SI SK	BE DE DK EE EL HR HU IE LU LV PL RS SI SK	BE EE ES HR HU IE IT LT LU LV PL RS SI SK	BE HU RS	AL AT BE CY DE EL DE EL ES FR LT HU IE IT PT SI LT LU PT SI	

Source: BEREC RA Database 2023

In Figure 4 the evolution on last three years (2021-2023) for EU NRAs, according to data availability and more homogeneity, is reported. More specifically the percentages of EU-NRAs that applied the SMP regulation in the corresponding product/market is provided.

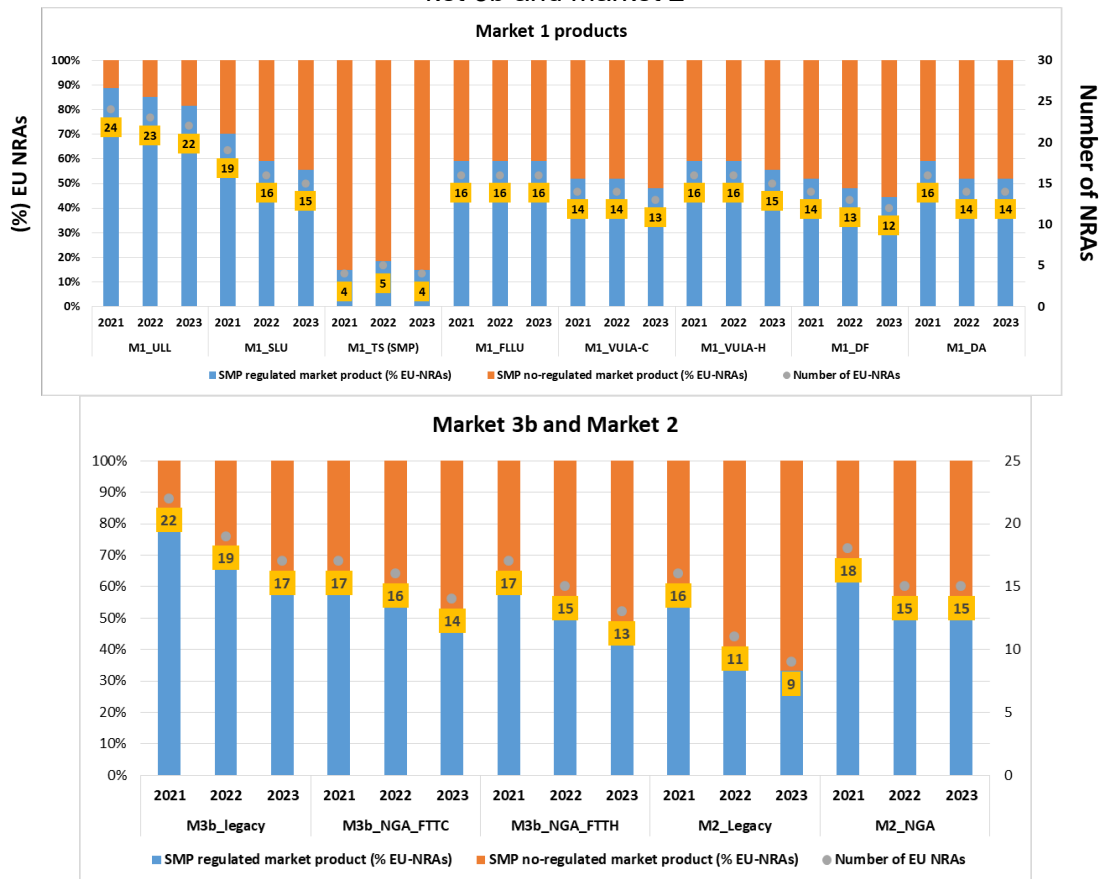
It is possible to observe that there is a substantial stable situation with respect to the SMP regulation for access market, with few NRAs that have removed regulation along this last three years. It can be seen a general trend that shows a partial removal of the SMP regulatory obligations along the years favoured by a constant diffusion of alternative networks as well as cooperative commercial agreement as solution of the market failure.

More specifically, for legacy products providing access to the copper network (ULL, SLU and market 3b over legacy network) the trend reduction is still more evident with respect to what concerns the NGA or VHCN products, where regulatory obligations were less common since the beginning.

¹² NL does not apply any regulation to access markets due to the fact that the Dutch court annulled the national regulator's decision concerning Joint Dominance and thus the obligation for joint dominance network access.

This tendency is also quite evident considering legacy terminating segment products (market 2), due to the advanced decommissioning of the legacy technologies like PDH and SDH.

Figure 4 - (a-b) SMP regulatory situation (2021-2023) (a) product in market 1, (b) product in market 3b and market 2



Source: BEREC RA Database 2023

In table 1 the NRAs that removed regulation since 2021 are reported in comparison with countries where SMP regulation is in force (in parentheses the annual change is given considering the RA database time reference).¹³

Table 1 - NRAs deregulating specific product/market since 2021 (in parentheses the year in which the regulation has been lifted)¹⁴

¹³ Comparison with past year report are in homogeneous terms: that is if mistakes are detected for the past years, findings are appropriately taken into account along the time series available.

¹⁴ In HR the regulation of VULA-C and VULA-H has been taken into account in the last market review, and the product should be given on request at the level of DSLAM at cabinet level or at OLT level. The access product at the local central office is still included in market 3b and not in the new market 1/2020. A new round of market analysis is underway, where the division into the M1 and 3b market will most likely remain.

	M1_ULL	M1_SLU	M1_TS (SMP)	M1_FLLU	M1_VULA -C	M1_VULA -H	M1_DF	M1_DA	M3b_Legacy	M3b_NGAM_FTTC	M3b_NGAM_FTTH	M2_Legacy	M2_NGA
EU_NRAs that removed regulation since last three years	DK (2022), AT(2023)	EE(2022),FI(2022),HR(2022),AT(2023)	PL (2023)	-	AT(2023)	AT(2023)	DK (2022), HR (2022)	PL (2022)	AT (2023), CY(2022), CZ(2023), DK (2022), FI(2022)	AT(2023), CY(2022), CZ(2023), FI(2022)	AT(2023), CZ(2023), DK (2022), FI(2022)	FI(2022),HR(2022),IE(2023),LU(2023),MT(2022),NL(2022)	CZ(2022), CZ(2022),MT(2022)
NRAs that still regulate the market/product (including not EU NRAs)	AL BE CY CZ DE EE CY CZ EL ES FI FR DE EL ES HR HU IE FR HU IE IT LI LT LU IT LT LU LV ME MTLV ME MT NO PL PT NO PL SE RS SE SI SK			AL BE CZ DE DK EE FI HR HR HU IE LI FI HR HU LT LU LV IE IT LV ME NO ME PL SE SI SK	BE CY CZ DE EL FI HR HU IE IT LT LV ME NO ME SI SK	BE CY CZ EL ES FI HR HU IE IT LU LV MT NO SI SK	EL FR HU IE IT LT LV ME PL PT RS SI	BE DE EE EL ES FR HU IE IT LI LT LV ME NO PT RS SI SK	BE DE EE EL ES FR HR HU IE IT LT LU LV PL RS SI SK	BE DE EE EL ES HR HU IE IE IT LT LU LV PL RS SI SK	BE EE AL BE CY DE EL ES ES FR HR LT SI	AL AT BE CY DE EL ES FR HR HU IE IT LT LU PT SI	

Source: BEREC RA Database 2023

Two relevant cases emerged since last year: AT and CZ where the regulatory obligations using SMP framework have been removed for all markets 1 and ex 3b (AT) and in market 3b (CZ); (CZ) has deregulated 95% of market 1¹⁵.

Those decisions have been taken in a situation where availability of access through access obligation on a commercial basis was available and NRAs considered it to be more effective, in term of market efficiency, to lift the traditional SMP obligations.

CZ/2023/2443: “i.e. ČTÚ concluded that the barriers to entry are low also due to (i) the envisaged wholesale regulation in the segment B of the upstream wholesale local access market; (ii) **commercial co-investment initiatives** which are either at implementation phase or are subject to negotiations.

...ČTÚ emphasizes that the central access services are among CETIN’s crucial products provided on the Czech market as the number of users and the volume of sales of such services has an increasing trend while the share of accesses provided to alternative operators, other than O2, is also increasing. Therefore, it is **according to ČTÚ realistic to expect that CETIN could continue to provide and develop the wholesale services on the wholesale central access market**. Infrastructure competition observed by ČTÚ at the retail level market does in ČTÚ’s view not allow CETIN to abuse its position and worsen the conditions of the wholesale service due to potential loss of demand for its main wholesale service.”

AT/2022/2389: i.e. “However, the Commission recognises that TKK, in the evaluation of the susceptibility of the market to continued regulation (the three criteria), assessed the conditions of the **commercial contracts**, taken up by predominant number of access seekers. In this assessment, TKK particularly analysed the conditions as stipulated in Article 79(2) of EEC, namely (i) evidence regarding the fair and reasonable character of the offers; (ii) the openness to all market participants; (iii) the timely availability of access under fair, reasonable and non-discriminatory conditions, including to very high capacity networks, before the launch of related retail services; (iv) and the overall adequacy of the offers to enable sustainable competition on downstream markets and the deployment and take-up of very high capacity networks in the interest of end-users. Indeed, the contracts as offered by A1 and approved by TKK largely reflect the already existing and potentially envisaged ex-ante regulation, and – with respect to the residential market – goes further than the ex-ante regulation as it covers the entire territory of Austria (including also the competitive areas covering approximately 60% of the retail market which represent c.a. 2.15 million of connections, in which A1’s market shares are below 35%). The proposed contracts are open to the current and

¹⁵ In the following, even if market 1 will be deregulated in most parts of the CZ countryside, CZ will be considered in the group of countries that still have an SMP regulatory framework.

future access seekers based on the same conditions. Finally, the contracts address the current and expected demand to A1's network."

This year NRAs were asked to provide information on the relevance of the SMP regulated product/market in term of incidence of the wholesale product available with respect of the competitive outcome.¹⁶ The survey asked for the weight of the regulated products to better figure out the degree by which the regulatory obligations can directly or indirectly affect the competitive outcome. NRAs that considered the regulated product (excluding duct access) to be "very relevant" for the access seekers retail competition are countries where the transition on VHCN is still in progress and/or the copper network of the incumbent is still relevant. Moreover replies indicate that where the VHCN transition is driven also by OAO investment in combination with the investment of the incumbents, it follows a reduction in the scope of ex-ante SMP regulatory obligations on VHCN with respect to what happens on the legacy copper network.

NRA's replies show that the evolution of the regulatory framework takes into consideration not only the need for incentivising investment, but also the necessity to promote take-up over VHCN (this is more relevant in countries where competing technologies are present in the market, e.g. NGA vs VHCN).

Table 2 - Relevance of the SMP market/product regulated

	M1_ULL	M1_SLU	M1_TS (SMP)	M1_FLLU	M1_VULA -C	M1_VULA -H	M1_DA	M3b_lega cy	M3b_NGAM _FTTC	M3b_NGAM _FTTH	M3b_Cabl e
very relevant	1	1	0	1	2	0	3	1	1	1	1
moderate relevant	1	1	0	0	0	0	0	2	2	1	0
no relevant	11	5	2	5	4	5	5	6	4	5	1
Countries replay											
very relevant	DE	DE		LI	DE IT		EE PT RS	BE	BE	BE	BE
moderate relevant	IT	IT						CZ RS	CZ IT	CZ	
no relevant	BE CZ EE HU LI LU LV MT PT RS SE	HU CZ LV SE	HU IT	EE CZ HU LV	BE CZ HU LV	BE CZ HU IT LV	BE DE HU IT LI	EE HU IT LV PL PT	HU EE LV PL	EE HU IT LV PL	HU

Source: BEREC RA Database 2023

In the following the regulatory framework in terms of SMP imposed remedies are reported in line with past years reports.

Considering NGA and VHCN (FTTH), SMP regulation in market 3a and/or 3b has been applied by the most part of NRAs that have provided information; 27 NRAs out of 32 have applied SMP or symmetric regulation to FTTC and/or FTTH (not including duct access, where SMP regulation has

¹⁶ NRA's were asked to provide the following information: "Relevance of the product in the market referred to the current consistency in the market: Please chose between the three option provided. The option should reflect the whole OAO market. Very relevant: means that OAO use consistently the wholesale product in term of retail line sold (i.e. >40% of OAO lines); Moderately relevant: means that OAO use the product in some part of the territory as a complement with respect to the main product (i.e. >10%-<40% of OAO lines); not relevant: means that OAO use the product in a very limited situation (<10% of OAO lines). wholesale products have to be included in the share even when they are sold only by commercial agreements approved by NRAs".

been applied by 18 NRAs): AL, BE, CY, CZ, DE, DK, EE, EL, ES, FI, FR¹⁷, HR, HU, IE, IT, LI¹⁸, LT, LU, LV, ME, MT, NO, PL, RS, SE, SI, SK¹⁹. With respect to NGA products 8 NRAs have applied regulation in markets 1 and 3b on both FTTC and FTTH (BE, HR, HU, IE, IT, LV, SI, SK), reduced from last year; 6 NRAs have applied regulation only to market 1 over VHCN (FLLU and/or VULA FTTH) (AL, FR,²⁰ DK,²¹ MT, NO, SE); in such cases no regulation has been applied to the FTTC network.

Where no FTTC deployment is present, regulation in market 3b is less frequent. Market 3b/2014 is mostly regulated where market 1/2020 products are available, as expected.²² The survey outlines that ex-market 3b product can be still relevant in some countries where virtual or physical access products are imposed, but demand remains low (this situation may occur in countries with limited geographical extension, such as BE, HR). Moreover, all 27 NRAs previously mentioned to have applied SMP regulation including at least one VHCN or FTTC product (market 1/3b) in line with the fact that those technologies are the most widespread in the EU. VHCN regulation has been applied to market 1 VULA FTTH by 16 NRAs (BE, CY, CZ, EL, ES, FI, HR, HU, IE, IT, LU, LV, MT, NO, SI, SK) and FLLU by 10 (AL, DE, DK, EE, FR²³, LI, LT, ME, PL, SE)²⁴. Where VULA-FTTH is present, regulation in market 3b VHCN is generally also frequent even if there is a decrease in regulating market 3b over VHCN since last year: 10 of 16 NRAs (62%) regulate VULA over FTTH and market 3b over FTTH (BE, ES, HR, HU, IE, IT, LU, LV, SI, SK).

A specific case is DK where market 3b/2014 over FTTC is available in three main different geographical markets: one, the most extended (about 80% of households), where the product is available on a commitment base from 4 SMP operators; a second where it is available on an SMP basis provided by a vertically integrated operator (about 10% of households); and a third where it is available from a wholesale only operators (about 5% of households). In every case only non-discrimination and transparency obligations and no access obligations have been imposed on the SMP operators in market 3b/2014 over FTTC.²⁵

In comparison to last year's report the regulation of NGA remained stable all in all even if, in line with the Commission Recommendation on relevant markets, regulation of SMP framework is always more focused on the local access product market.

¹⁷ FR is included in this group due to the fact that it applies obligation of access to the terminating segment of FTTH on a symmetrical basis as reported in the previous paragraph.

¹⁸ LI Regulation of national FTTH/B access (fibre unbundling) is in progress, and will become effective from Jan 2024

¹⁹ PT has applied SMP regulation to the legacy copper network in combination with duct access.

²⁰FR is included in this group due to the fact that it applies obligation of access to the terminating segment of FTTH on a symmetrical basis as reported in the previous paragraph.

²¹ For DK regulation over FTTC is based mainly on a commitment basis, therefore only FTTH falls under ex ante regulation.

²² EE: VULA over FTTC and FTTH it is in principle regulated, but no demand is present for that product contrary to market 3b. DK: market 3b over FTTC is available on a commitment basis without a market 1 product (VULA) available.

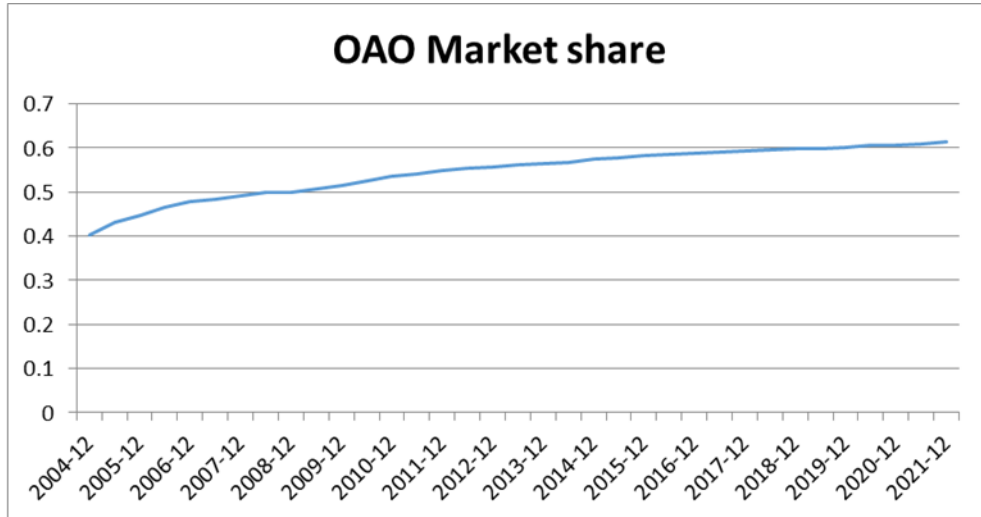
²³ FR is included in this group due to the fact that it applies obligation of access to the terminating segment of FTTH on a symmetrical basis.

²⁴ 11 NRAs apply both FLLU and VULA over FTTH (BE, CZ, FI, HR, HU, IE, LU, LV, NO, SI, SK).

²⁵ A form of price control has been imposed considering benchmarking in line with the commitment price or on fair and reasonable price for the wholesale only.

No regulated products have been added since last year²⁶ showing that the scope of regulation is decreasing in most countries in line with the constant reduction of the number of relevant markets and progress in retail competition (figure 5).²⁷

Figure 5 - OAO average market share



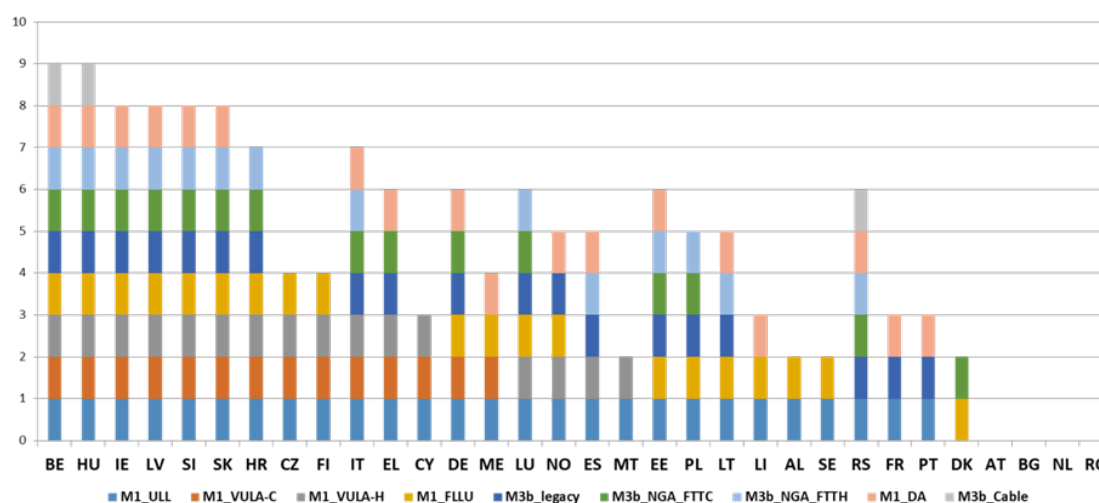
In Figure 6, in line with the last release of the RA reports, the whole set of regulated products by the 32 NRAs that have provided information, ranked by the number of regulatory obligations (at least one) in market 3a and 3b, is shown. NRAs have been ranked taking into account the following scale of product remedies: i) ULL; ii) VULA_FTTC; iii) VULA FTTH; iv) FLLU; v) M3b legacy network; vi) M3b FTTC; vii) M3b FTTH; viii) M1_duct access; ix) M3b cable.

The graph provides a classification of the considered regulatory measures. The following access remedies have been considered for market 1: LLU; VULA FTTC; VULA FTTH; Fibre LLU. For market 3b: legacy, NGA (FTTC) and FTTH have been considered. Duct access and market 3b cable (Docsis >3.0) have also been included.

²⁶ Only LI, (the new regulation of Fibre LLU follows and replaces the regulation of ULL copper. So these regulations are not in force in parallel and will be in charge effectively from 1 January 2024). RS have increased the number of product/market regulated since last year.

²⁷ DESI indicator Market share is based on fixed broadband subscriptions (lines). New entrants mean operators that did not enjoy special and exclusive rights or de facto monopoly for the provision of voice telephony services before the liberalisation.

Figure 6 – SMP-regulatory situation (remedies applied)



Source: BEREC RA Database 2023

It is possible to group the country cases (as for the last 2 Reports), taking into account the regulatory remedies imposed in combination with the main competitive and investment outcomes. Thus countries are ranked on the basis of the regulatory pressure on the SMP operator, considering the proportionality principle related to obligations.

As reported in previous RA reports a first group of countries has applied all access obligations for all products (5 in NGA: VULA FTTC, VULA FTTH, FULL, M3b_NGA, M3b_FTTH; 2 legacy: ULL and M3b_legacy - while information on cable and ducts varies) in market 3a and 3b (BE, HU, HR, IE, LV, SI, SK) apply regulation in FTTH (FULL or VULA), CZ²⁸ and FI regulate both copper and fibre including both FLLU and VULA on copper and fibre only at local level. CZ has been included in the first category despite the fact that the 2023 market review reduced the regulated part of market 1/2020 to about only 5% of households.

In a second group of countries, FTTC is regulated and four out of five main regulatory obligations on NGA are imposed on market 1/2020 and in most case also in 3b/2014 (IT, EL, CY, DE, ME). In this case VULA FTTH or FLLU are applied alternatively as main obligations for VHCN obligation.

A third group of countries (LU, NO, ES, MT, EE, PL, LI, LT, SE, AL, RS, FR²⁹) sees FTTH and not FTTC as the main deployed architecture for NGA and so no specific local access obligations for FTTC have been imposed. In such cases VULA FTTH or FLLU are the SMP product, sometimes in combination or only with remedies in market 3b.

One country (PT³⁰) has included only duct access as an instrument for regulatory purposes to NGA networks. AT, BG, NL and RO³¹ do not impose remedies in market 1/2020 and market 3b/2014.

²⁸ CZ do not regulate access to ducts, but in this case the SMP operator is legally separated.

²⁹ FR is included in this group due to the fact that it applies obligation of access to the terminating segment of FTTH on a symmetrical basis

³⁰ PT applies symmetric obligation to civil infrastructure independently of the BCRD provision.

³¹ In RO, ANCOM has identified strong infrastructure competition at the retail level. The copper-based incumbent strongly competes with an alternative operator who has deployed a widespread national fibre optics network, plus there are cable networks all over the country, in general trebling the infrastructures available. The main technologies used are xDSL - ADSL/VDSL, coaxial cable - DOCSIS 3.0, UTP/FTP cable - FTTx, fibre optics - FTTH and radio/FWA.

For DK, FLLU is still applied, but it covers only 5% of the geographical market and commitment agreements are the main instrument of regulation.

Summing up, the first two groups include NRAs that regulate copper, NGA over FTTC and FTTH, in market 1/3b in general the second group applies lighter FTTH regulation³². The third group includes NRAs that regulate copper and FTTH not only via duct access; the 4th group does not apply SMP regulation or it regulates legacy copper and applies FTTH regulation only based on civil infrastructure access, or only on commercial agreements or commitments in charge.

In the light of the four identified groups of NRAs, six main indicators have been considered in figure 7: i) the weight of DSL over retail BB market share (DESI Report, latest available data),³³ in order to understand the relevance of the legacy copper (including VDSL based on FTTC); ii) the SMP retail market share using the last DESI figure checked also with information collected in the Structural data database 2023; iii) VHCN coverage (%) as reported in last DESI report; iv) FTTP coverage (%) as reported in last DESI report; v) Take-up of cable and FTTP as collected in the Structural data.³⁴

Since last year's report new indicators on coverage and take-up have also been considered with the objective to better represent the evolution of countries' connectivity.

The average values have been calculated including only EU countries.

Results show that the first group combines a high FTTH/cable coverage (FTTC is less relevant) in combination with the intermediate stage of the SMP average market share and take-up not polarised on a specific technology (cable, copper and FTTP). In such group of countries NRAs frequently establish different geographical markets in light of the fact that main suppliers are different in different geographical areas (HU, FI) or cable networks are also regulated (BE). Countries where FTTP coverage and take up are high are also present (LV and LT).

The second group of countries characterised by the fact that NGA over FTTC network is still very relevant and where the competitive situation (SMP market share) is at an intermediate stage. This is the case for a specific group of countries (IT, EL, CY, DE). These countries also have a less wide spread cable coverage and VHCN coverage. Also the take-up rate of cable and FTTP lags behind the first group. In all these countries a single SMP is present and SMP regulatory obligations are mainly focused on the copper network. Where two competing networks (NGA and VHCN) that are closer in the chain of substitution are managed by the SMP operator, regulatory intervention by the NRAs has to balance three main effects: wholesale revenue effects, business migration effects and replacement effects. In such situations copper prices on the legacy network for NGA can still be relevant to incentivise further investment in VHCN and take-up migration of VHCN.

In the third group of countries competition conditions are more favourable, as FTTP is already the main technology, i. e. there is no intermediate step between NGA and VHCN, but rather a direct transition from the legacy copper network to VHCN. Here, the transition to VHCN has been driven by OAO operators including municipal networks (SE³⁵) or via cooperative approaches (ES, FR). SMP obligations are then focused on specific geographical areas and generally are lighter.

³² ex. In DE only a general obligation on FLLU is imposed when available with cost oriented price, and in IT an access obligation on VULA-H is applied in combination with cost orientation with a substantial risk premium applied over WACC for longer period from 2015 since 2022.

³³ <https://digital-strategy.ec.europa.eu/en/policies/desi>.

³⁴ For confidentiality reasons, the averages of SMP market shares and other indicator are given in a range; moreover the scope of the analysis is providing characteristic of the group not to assess specificity of each single country.

³⁵ For SE information at 1st1 of April 2023 relates to the last market analysis, which dates back to 2015. However, the copper access regulation has been lifted and the decision entered into force on 21st April 2023. For existing wholesale agreements (active lines), the obligations to offer access to the copper network shall continue to apply during a transition period of 12 months from the date of the decision.

The fourth group represents specific country cases of deregulated markets. Relevant infrastructure competition by cable is present with a higher penetration of this technology on average, i. e. a more direct competitive constraint (AT, DK, NL). FTTP is at an advanced stage both in term of coverage and take-up in PT, RO, BG. Here, duct access has been considered sufficient for competition (i. e. PT) or full deregulation is currently in force (NL, BG, RO); in other cases, binding commercial agreements are the preferred approach to address any potential market failure when an SMP position is still present ((DK) or to exclude any need of ex ante regulation due to the failure of the three criteria test for imposing an SMP position (AT)).

It should be noted that, on average, there is a reduction in the xDSL share in general in combination with a reduction of the market share of SMP operators. In addition, where there is infrastructure competition and/or a clear commitment to VHCN investment, for example via co-investment agreements or effective commercial agreements, the standard SMP framework is always less relevant (i.e. NL, FR, ES, DK). In that sense only the market share of the SMP operator alone cannot explain the competitive outcome with respect to the corresponding remedy framework applied.

Figure 7– SMP-regulatory approach vs network evolution and SMP market share.³⁶

	DSL(%) (31/12/2021) 1) DESI	MS (%) SMP operator (31/12/2021) DESI	% VHCN coverage (31/12/2021) 1) DESI	% FTTP coverage (31/12/2021) 1) DESI	% cable Take-up Structural data RA report 2023	% FTTP Take-up Structural data RA Report 2023		
Countries where all remedies are applied independently by technologies	BE						Competition condition still at intermediate step, NGA provided by a more technology mix (cable and FTTP, FTTC); copper network still present	
	HU							
	IE							
	LV	[30-35]%	[50-55]%	[70-75]%	[55-60]%	[20-25]%		[35-40]%
	SI							
	SK							
	HR							
	CZ							
	FI							
	IT							
Countries where all remedies are applied not all on FTTP	EL	[70-75]%	[45-50]%	[50-55]%	[40-45]%	[10-15]%	[15-20]%	Copper still the main instrument for access NGA services lower level of FTTP and cable coverage
	CY							
	DE							
	(ME)							
	LU							
Countries where a small set of remedies are present on FTTP network	(NO)							FTTP is wider spread also with respect to cable; competition condition are in more advantage stage; copper network no relevant for NGA deployment
	ES							
	MT							
	EE							
	PL	[20-25]%	[40-45]%	[80-85]%	[75-80]%	[15-20]%	[55-60]%	
	LT							
	(LI)							
	(AL)							
	SE							
	RS							
Deregulated market or only duct access is in charge	FR							Cable competition is more relevant in combination with high level of FTTP coverage and take-up, competitive conditions are in a more advantage stage
	PT							
	DK							
	AT							
	BG	[20-25]%	[35-40]%	[85-90]%	[70-75]%	[25-30]%	[45-50]%	
	NL							
	RO							

Source: BEREC RA Database 2023

The SMP regulatory remedies generally apply to a single SMP operator that is national in scope. In some cases (BE, HU and FI) the SMP regulation has been applied to more than one SMP operator. HU consider 3 SMP operators in market 3a and 3b for all technologies; FI consider >4 SMP operators in market 1; BE consider 3 SMP operators in case of bitstream over cable network.

³⁶ NL does not apply any regulation in access markets due to the fact that the Dutch court annulled the national regulator's decision concerning Joint Dominance and thus the obligation for joint dominance network access.

Where more than one SMP operator is present they mostly operate in the same geographical area, but use their own infrastructure (FI and HU). In HU the network of SMP operators have an overlapping coverage, but there is only one SMP operator per geographically separated area. In BE the cable operators, designated SMP in market 3b, operate in different geographical areas over cable network.

In all the cases where more than one SMP operator has been designated to be SMP in access markets, the motivation for regulation is not based on the legal basis of Joint Dominance in the context of Art. 63 paragraph 2. of EECC.³⁷

The following section includes more detailed information on the geographical scope of the regulation which provides a better description of the regulatory context.

Geographical regulation

A differentiated geographical approach to regulation reflects generally the level of competition reached in each part of the country; it provides insight into the impact of the SMP regulation where a market has been partially deregulated.

In Figure 8 the number of NRAs, and the percentage of EU NRAs, that have applied some form of geographically differentiated approach is provided for each market and product for 2023 and previous years.³⁸ In the same picture the percentage of EU NRAs that apply a geographical approach to regulation is also given with respect to all EU-NRAs that regulate the product market.

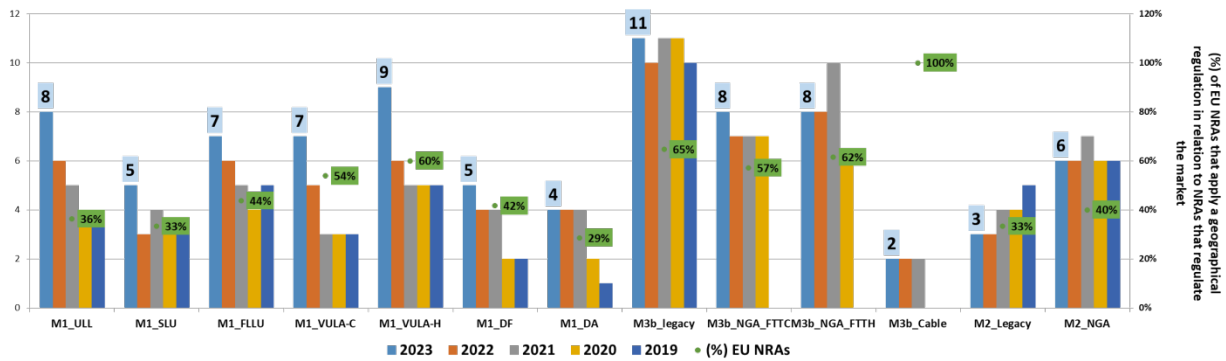
The number of NRAs that have identified different competitive conditions across the national territory justifying a geographically differentiated approach (in terms of market definition or remedies application) has increased in comparison to last year for some markets/products. In line with what has been registered in previous years an increased trend is also seen for products in market 1/2020.³⁹

³⁷ The application of Joint Dominance (JD), as considered in comparable way of provision of art. 63 paragraph 2, has been applied only by ACM, NL in their last market review in September 2018. This analysis has been annulled by the Dutch Trade and Industry Appeals Tribunal, which found that the theory of JD would not be easy to prove, even when using economic models, due to the fact that these models must take into account the specific characteristics of the relevant undertakings and markets concerned as far as possible. Moreover, according to the Tribunal, the modified greenfield approach in the SMP assessment phase, applied by ACM, should have taken into account the incentives and possibilities of commercial agreements between undertakings even in the absence of regulation.

³⁸ In the context of symmetrical regulation only FR apply a geographical differentiation of the symmetrical access remedy: the access to the terminating segment (inside buildings) is available only in less than 20% of households (more competitive areas) and in the rest only symmetrical access beyond the first concentration point is available.

³⁹ The replies of the previous years are homogenous with the current report. In market 3b the distinction between FTTC and FTTH was not available in 2019. For the cable product the information is available only for 2022 and 2021.

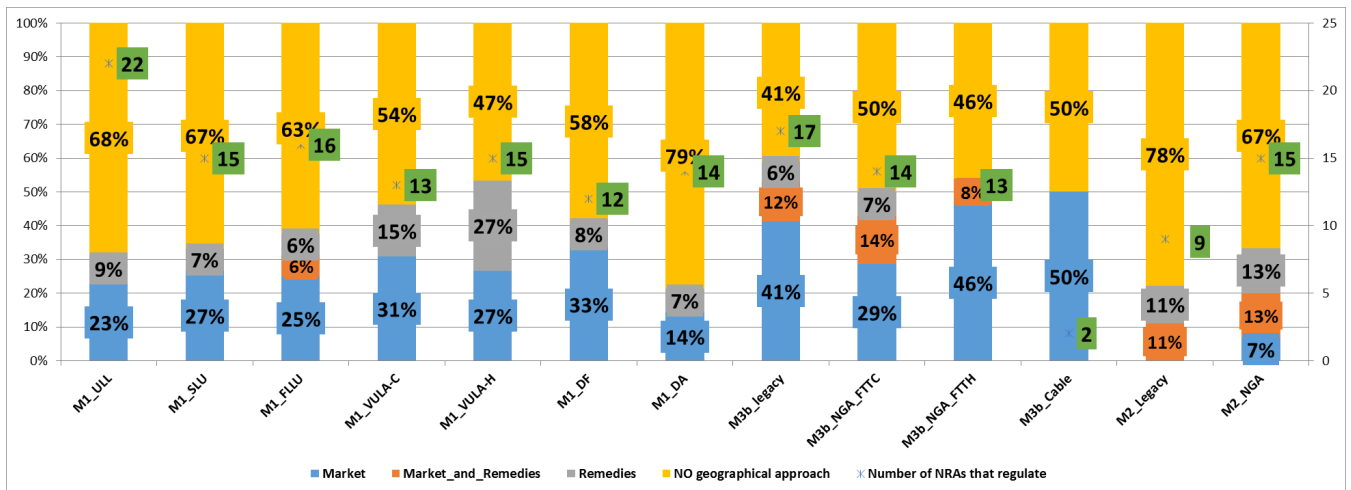
Figure 8– SMP - geographically differentiated regulatory approach⁴⁰



Source: BEREC RA Database 2023

In Figure 9 the percentage of EU NRAs (27 NRAs) that apply geographical approach to regulation is given for 2023 for those NRAs that regulate the market in question; in the illustration the percentage is provided for: i) market; ii) market and remedies; iii) remedies. “Market” means that NRAs apply a differentiated approach in different geographical markets: in that case there is generally a geographical area where regulation is lifted-up and a second geographical area where remedies are applied due to SMP findings (or alternatively, different geographical markets are identified for different SMP operators); “Market and remedies” means that NRAs apply, in a differentiated geographical market approach, differentiated remedies; “Remedies” means that there is one national geographical market, but remedies are differentiated.

Figure 9 – SMP - geographically differentiated regulatory approach



Source: BEREC RA Database 2023

NRAs that apply a differentiated approach to regulation are reported in Figure 10. In the table the percentage of households falling under geographical regulation is shown. For each product/market

⁴⁰ When 100% is given this means that all NRAs that regulate the specific product also apply a geographical regulatory approach.

the percentage of deregulated areas (market regulation) and the competitive areas (remedies differentiation) is provided. The reported percentage of competitive areas have to be considered in addition to the deregulated areas.⁴¹

The same picture shows that deregulated areas range from 5% of households up to 95% in market 1 and market 3b, more often between 20% and 50%, increasing in comparison to last year's report.⁴² The percentage of households falling under a geographical regulation in combination with less regulatory obligations in markets 1 and 3b (ES, PL, PT, FR, CZ) is in line with a regulatory path where a geographical regulation is applied to avoid non-proportional regulation (the order of countries in Figure 10 follows the one reported in Figure 7). In parentheses is the value reported in 2021 (only if different from 2022), in green the modification reported this year showing that the competitive/deregulated areas are increasing.

⁴¹ A missing value in the table means that there is no regulated product/market. For FR the geographical approach has been reported in the category FLLU even if it refers to the symmetric approach as described in the previous paragraph. For FI the % is an estimation based on public information available on FI/2018/2052-2053. For IT in market 3a, the possibility to apply different remedies in "competitive areas" is conditioned to a specific level of retail take-up over FTTH network at national level in 2021. AGCOM verified that target take up had not been reached so geographical remedies differentiation has been applied only for product market 3b updated in 2022. For IE a precise % of households is not available for every case from the public source IE/2018/2089. The geographical urban WCA market, has been deregulated; it constitutes 145 CO to 1058 (roughly 20% of the whole number of CO). Market 4 (IE/2019/2214) WPZ areas 1 and 3 have been deregulated corresponding to 2773 WZP areas to 7219 WPZ areas (roughly 40% of the total number of WZP areas).

⁴² PT apply a differentiated market and remedies approach in market 2; as this is a market targeted to companies (small, medium and large) the percentage of households covered (by regulated and/or deregulated areas) is not relevant.

Figure 10 – Households in deregulated/competitive areas⁴³

	FLLU		VULA FTTH		Market 3b FTTH		VULA FTTC		Market 3b FTTC		ULL		Market 3b legacy		M2 NGA		Duct access		FTTH	State Aid plan	
	Deregulated areas (Market remedies)	Competitive areas (Market remedies)	Deregulated areas (Market remedies)	Competitive areas (Market remedies)	Deregulated areas (Market remedies)	Competitive areas (Market remedies)	Deregulated areas (Market remedies)	Competitive areas (Market remedies)	Deregulated areas (Market remedies)	Competitive areas (Market remedies)	Deregulated areas (Market remedies)	Competitive areas (Market remedies)	Deregulated areas (Market remedies)	Competitive areas (Market remedies)	Deregulated areas (Market remedies)	Competitive areas (Market remedies)	Deregulated areas (Market remedies)	Competitive areas (Market remedies)	Deregulated areas (Market remedies)	Competitive areas (Market remedies)	
BE	0	<5%	0	<5%	0	<5	0	<5%	0	<5%	0	<5%	0	<5%	0	<5%	0	<5%	0	<5%	
HU	<20%	0	20%	0	<20%	0	<20%	0	<20%	0	<20%	0	<20%	0	<20%	0	<20%	0	<20%	0	<30%
IE	0	0	0	0	<20%	0	0	0	<20%	0	0	0	<20%	0	<50% (0)	60% (<40%)					
SI	0	<5% (0)	0	<5% (0)	<50% (0)	0 (<40)	0	<5% (0)	<50% (0)	0 (<40%)	0	<5% (0)	<50% (0)	(<40%)	0	0	0	0	5% (0)	<10%	
HR																					<20%
CZ	<95% (0)	0	<95% (0)	0			<95% (0)	0			<95% (0)	0									<20%
FI	<5%	0	<5%	0			<5%	0			<5%	0									
IT		<5%	0	<5%	<10% (<5)	<5%	0	<5%	<10% (<5%)	<5%	0	<5%	<10% (<5%)	<5%	<5%	<5%	<5%	0	<50% (<30%)		
EL		0	0 (Criteria are defined but still not applied)			0	0	0	0 (Criteria are defined but still not applied)		0	0	0	0	0 (Criteria are defined but still not applied)		0	0	0	0	
CY		0	0 (Criteria are defined but still not applied)			0	0	0	0 (Criteria are defined but still not applied)		0	0	0	0	0 (Criteria are defined but still not applied)		0	0			<20%
DE	0	0					0	0	0	0	0	0	0	0	0	0	0	0	0	0	<5%
ES		0	<70% (<40%)	<70% (<60%)	0						0	0	<70% (<60%)	0	0	0	0	0	0	0	<5%
PL	<20%	0		<40%	0			<40%	0	<20%	0	<40%	0								<20%
LT	0	0		<5%	0						0	0	<5%	0	0	0					
FR		<20%									0	0	<20%	<70%	0	<30%					<50%
PT											0	0	<60%	0	Not relevant	Not relevant					
DK	<95% (0)	0							<90% (0)												
AT															>50%	0					

Source: BEREC RA Database 2023

Where different geographical markets are identified, two areas have generally been specified: one which is not regulated and another where SMP is identified. The same applies to geographical remedies (one competitive area and one non-competitive area). More than two geographically differentiated areas have been identified by four NRAs as reported in the following figure in line with last year's report.

Figure 11 – More than two geographical areas (market or remedies)

Country	Numbers of markets/Remedy areas	Market/product	Notes
DK	>4_markets	Market 1 and market 3b	The low capacity copper network is a single national market with a single SMP, in such a case binding commitment have been accepted by the NRA without imposing any remedy; for high capacity market (NGA/VHCN) instead >4 SMP operators have been identified in different geographical areas. Four operators active in retail and wholesale markets are regulated in different geographical market through commitment only and are subject only on transparency and non discrimination in the geographical regulated areas;

⁴³ Some countries: have also reported that for FTTH there is a state aid plan: HU (<30% of premises), SI (<10%), CZ (<20% included Docsis), IT (<50%), DE (<5%), FR (<50%), CY (<20%), ES (<5%), HR (<20%), RO (<5%).

			Four operators are wholesale only and are regulated in corresponding geographical areas with only non-discrimination obligation; Two vertical operators are regulated over market 3b (FTTC) and Fiber LLU applying, non-discrimination, transparency, obligation to publish a reference offer as well as price control (based on the commitment proposed by other operators);
FI	>4_markets	For all markets/product with geographical differentiation	Market 3a and 3b contains 150 relevant geographic wholesale markets. Remedies have been differentiated by SMP operator (3 large operator have stricter remedies than 18 small operators), not geographically. Competitive areas have been completely deregulated. SMP operators operate also in same geographical area, but on own different infrastructure
HU	>4_markets	For all markets/product with geographical differentiation	Only geographical market regulation: 3 regulated+3 deregulated markets. No differentiated remedies applied on regulated markets.
AT	3_markets	Market 2	
FR	3_remedy_areas	Market 2	

Source: BEREC RA Database 2023

This year's report also provides more information (for consistency reason and easier finding of updated information) on the implementation on the regulatory framework, on the topic of the geographical market/remedies application, on the criteria used by NRAs to define geographical market and/or remedies, on the frequency of update, independently on future more focused activities that BEREC are planning on monitoring the geographical approach to regulation. The information provided by NRAs are reported in the table below per single country. Criteria for defining different geographical markets are the same for market 1 and 3b, that can be different from the criteria adopted for market 2. The market definition is updated between market review, instead in case of remedies the frequency of update can be shorter than market review process and more frequent "yearly". In case of geographical market definition the criteria adopted include coverage of alternative networks in combination with retail market share or structural parameters that address the issue of the sustainability of the infrastructure competition (FR). In case of remedies differentiation a more straightforward approach based only on the number of alternative network in combination with coverage is often adopted, independently of the level of the retail and wholesale market shares measured.

Table 3 – Geographical approach to regulation



	Geographical market definition		Time of update	Remedies differentiation			Time of update
	Market 1 and 3b	Market 2		Market 1	Market 3b	Market 2	
AT	-	Incumbent market share <40%, at least one alternative operator, at least 2 end-points of active lines in the area	Only between market review				
BE	-	-		<p>The CRC has differentiated the remedies geographically according to the circumstances:</p> <ul style="list-style-type: none"> - in areas where at least three independent NGA operators (i.e. offering speeds of 30 Mbps and above) are present regulation will partly be lifted; If 3rd NGA is present with its own infrastructure or based on commercial passive access, some M3a remedies may be modulated. - regulation will also partly be lifted in the areas that are currently less well covered by high-speed infrastructures (those areas represent approximately 5% of households in Belgium). Operators are thereby stimulated to invest in these areas 	If 3 NGA are present, M3b is deregulated	Differentiation at CO level depending on the volume and spread of connected endpoints. Price control lifted in the most competitive areas.	Yearly for market 2 and Other for other market/product
CY				Number of alternative networks			Other
CZ	Combination of criteria retail market shares and coverage threshold	-	Only between market review				
DK	Coverage, presence of infrastructure, variation in retail products caused by alternative operators, only threshold: 5 pct for significant presence.	-	Only between market review				
EL				Combination: Alternative network and coverage (The existence of alternative FTTH infrastructure with 80% coverage of the active broadband subscribers of the LEX)	Combination: Number of alternative networks and coverage (The existence of at least two network infrastructures to cover all the area of LE)		three years for market 1 and yearly for market 3b
ES	Municipalities there are at least 3 NGA networks with individual coverage greater than 20% and incumbent's share in the retail BB market does not exceed the 50% threshold.	-	Only between market review	Municipalities there are at least 3 NGA networks with individual coverage greater than 20% and incumbent's share in the retail BB market does not exceed the 50% threshold.	Municipalities there are at least 3 NGA networks with individual coverage greater than 20% and incumbent's share in the retail BB market does not exceed the 50% threshold.		Only between market review
FR	Geographical market differentiation depend of the density ("very dense areas" and "outside of very dense areas") List of communes considered to be in very dense areas was drawn up by Arcep on December 10, 2013.	-	Only between market review		In the market "outside of very dense areas", there are 2 zones for remedies. The "less competitive area" (not an Arcep name) is where there is no equivalent offer from a competitor of the SMP	ZC1: competitive area(at least one alternative wholesale provider at the MDF) /ZC3: limited competition (no alternative wholesale provider at the MDF)	yearly
HU	At least two significant alternative operators, with at least 15% market share each and 50% combined. Coverage threshold: 60% for each alternative network.	-	Only between market review				
IE	Exchange areas where: 1) at least three main operators (including the SMP) where present or easily reach the local exchange 2) retail broadband market share less than 50%;3) retail broadband service provided by main OAO not including SMP operator >10% using WLA input from SMP operator or by third party operator always using WLA; 4) coverage of any alternative operator of at least 30% of the exchange area; 5) retail broadband service are provide by generic OAO operator with a market share of 10%						

IT	<p>In the 2019 market review the geographical market analysis considered the following main indicators:</p> <ul style="list-style-type: none"> • Extension of alternative access infrastructure open to the wholesale market in the relevant geographical unit • NGA SMP retail market share • NGA Wholesale SMP market share <p>The deregulated areas have experienced relevant competitive outcomes at retail and wholesale level that are visible on the evolution of the retail and wholesale SMP market shares measured in the relevant geographical unit. No specific threshold has been defined to identify the competitive market.</p>	<p>In the 2019 market review the geographical market analysis considered the following main indicators:</p> <ul style="list-style-type: none"> • Extension of alternative access infrastructure open to the wholesale market in the relevant geographical unit • SMP market share 	Only between market review		<p>In the geographical regulated market a specific set of indicators and thresholds has been considered to distinguish between more competitive areas and less competitive areas. Specifically more competitive areas have been identified if all the following criteria have been met: i) At least two alternative NGA fixed networks (FTTC based on SLU/FTTH) to the one of incumbent are deployed with a coverage threshold of 60% of the real estate each; ii) the full coverage by alternative networks in the relevant unit will be of 75% considering the union of the alternative network coverage; iii) one alternative OAO network has to be a wholesale only; iv) the NGA retail market share of the SMP operator has to be <=40%; v) the wholesale NGA market share has to be less than 80%.</p>	<p>In the geographical regulated market the following indicators and thresholds have been considered to distinguish between more competitive areas and less competitive areas. Specifically more competitive areas have been identified if the following criteria have been met: i) at least one FTTH alternative operator with a wholesale only model will be available in the market with a coverage threshold of 60% of the real estate;</p> <p>No other indicators have been included such as the SMP market share due to the fact that the amount of volume measured on the relevant geographical unit are generally volatile with measures that can be very variable.</p>	yearly
LT	<p>Criteria to delineate geographic markets:</p> <ol style="list-style-type: none"> 1) At least for two of the three relevant retail markets (internet, pay TV, fixed telephone) in a given municipality: <ul style="list-style-type: none"> -At least three (including Telia) retail operators, and; - One alternative operator shall have a retail market share of at least 25 % and; - Telia's retail market share does not exceed 40 %, or if the market share exceeds 40 %, another alternative operator's market share is less than Telia's market share by no more than 15 percentage points or greater than Telia's market share; and 2) Each of at least two alternative operators in that municipality shall have developed its landline network of at least 50 % of the residences of that municipality, and 3) The coverage of the three operators in that municipality shall result in the duplication of at least 70 % of the residences in that given municipality <p>Taking into account the Lithuanian particularity that alternative operators build their networks using ducts (access to ducts together with other market 3a products is regulated in market 3a), there is also an additional need in market 3a to evaluate which part of the networks of alternative operators is built using access to ducts (4th criterion)</p> <ol style="list-style-type: none"> 4) No more than 40 % of the retail users are accessible via another operator's access to physical infrastructure. 						
PL	<ol style="list-style-type: none"> 1. Orange Polska S.A. market share in retail fixed broadband is less than 40% 2. there are 3 active operators 3. At least 65% of households have access to at least three operators (this includes cable networks, even though cable is excluded from the relevant wholesale market) 4. fewer than 10% households with no internet access 		other				
PT	<p>The areas considered competitive were the civil parishes where (i) there were at least 2 alternative operators with NGA coverage above 50 percent or (ii) there was an alternative operator to the SMP operator with NGA coverage above 50 percent and where the SMP operator's retail market share was below 50 percent.</p>	<p>The areas considered competitive were the civil parishes where the following 3 criteria were simultaneously met: (i) there was at least two networks of 2 alternative operators; (ii) there was at least 2 alternative operators with accesses installed/provided;</p>					

Source: BEREC RA Database 2023

Single remedies application.

In this section an overview on the application of the set of remedies imposed for each product (Ex Art. 69-74 of the EEC) is given in non-competitive areas in case remedies differentiation is in charge or a national market is defined. The specific cross reference to the Access Directive has

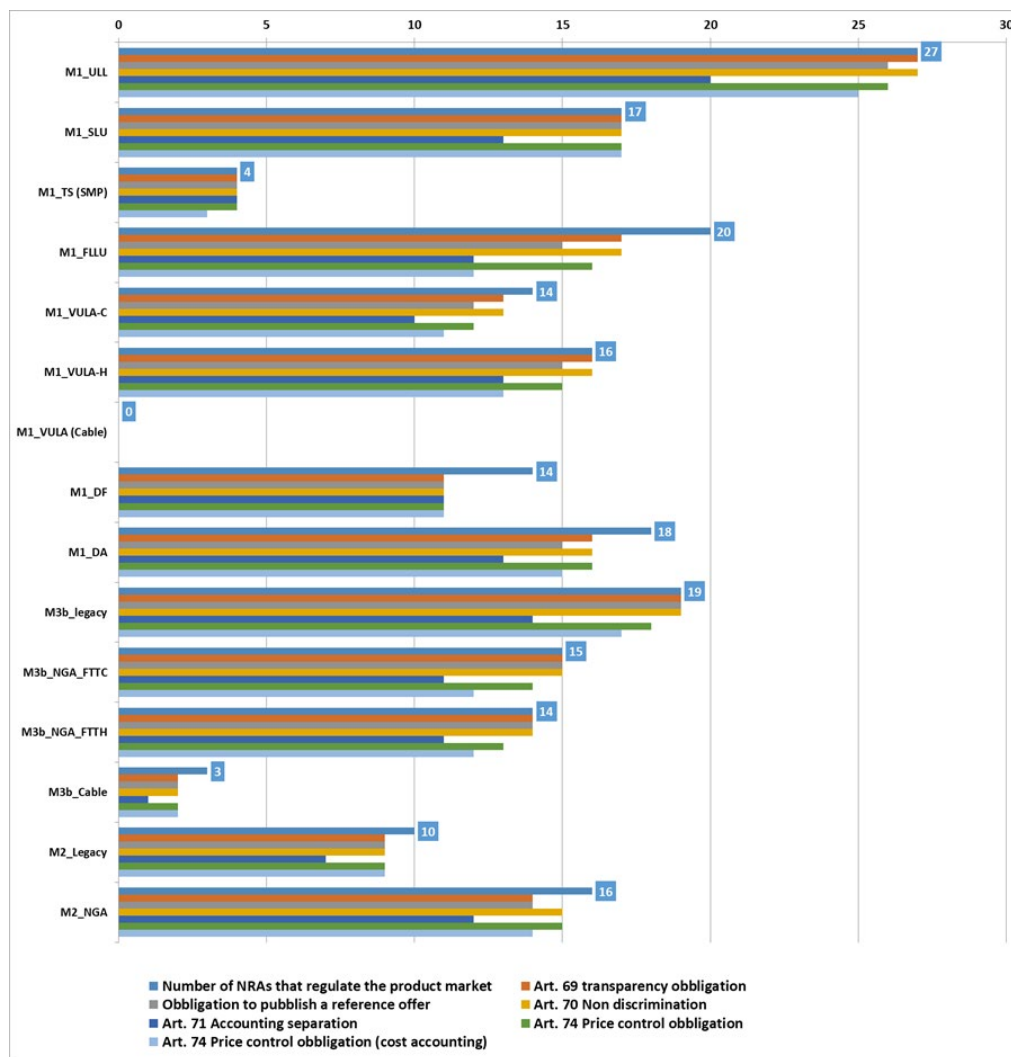
been made in continuity with the previous reports and it has taken into account that the European Electronic Communications Code (EECC) is still in the transposition phase in several EU Member States. In any case, the remedy sets “Transparency”; “Non-discrimination”; “Accounting separation”; “Access”; “Cost accounting” and “Price control” are still available in the EECC.⁴⁴

Figure 12 – EECC art. 69-74

Article	Obligation
Art. 69 (Ex. Art. 9)	Transparency
Art. 70 (Ex. Art. 10)	Non-discrimination
Art. 71 (Ex. Art. 11)	Accounting Separation
Art. 72	Access to civil infrastructure
Art. 73 (Ex. Art. 12)	Access to and use of specific network facilities
Art. 74 (Ex. Art. 13)	Cost accounting
Art. 74 (Ex. Art. 13)	Price control

The absolute number of NRAs (including both EU and non EU member states) that have applied a single obligation is reported.

⁴⁴ In relation to the EECC we refer to: Art. 69 (Obligation of transparency), Art. 70 (Obligation of non-discrimination); Art. 71 (Accounting separation); Art. 72 (access to civil infrastructures) and 3 (Obligation of access to and use of specific network elements and associated facilities); Art. 74 (Price control and cost accounting obligations).

Figure 13 – Application obligations Art. 69 -74 EECC⁴⁵

Source: BEREC RA Database 2023

Figure 13 shows that different sets of remedies have been applied to each product.

Most NRAs apply the whole sets of remedies where SMP regulation is imposed on a specific product/market, where access obligation in combination with non-discrimination and transparency are the most frequently applied remedies.

Focusing on RA in general, accounting separation is the less commonly used remedy and often imposed together with the cost accounting obligation. Some NRAs consider it necessary to impose both 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 is useful for vertically integrated undertakings by using cost models to supplement price control measures in order to prevent unfair cross-subsidies (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

⁴⁵ Labels indicate relevant markets according to the 2014 Rec when needed. For LT cable operators are regulated only in the way of access granting: if an alternative operator has its own wholesale access products, it must provide access to other operators (SMP included) if required. Cable operators are regulated only on the basis of a legal act (Access granting rules).

become less intrusive. In a quite mature and stable environment, such as LLU services in market 3a, 20 NRAs have applied accounting separation in combination with all other sets of remedies.

In line with the past year, considering the “competitive areas” (Figure 14) where geographical remedies differentiation is applied to some markets/products (BE, IE, SI, IT, ES, FR, DK, EL, CY), the set of remedies that are applied in more competitive areas can be distinguished into three groups of NRAs: i) the price control obligation at least for 3b market has been eliminated, holding all other SMP remedies (SI, IT⁴⁶, FR⁴⁷); ii) only access and transparency obligations/publication of a reference offer have been maintained (BE, IE); iii) all set of remedies in the same geographical market have been completely eliminated (ES, DK).

Figure 14 – Remedies in competitive areas

Countries	Kind of obligation in more competitive areas
BE	Only access obligation and transparency obligation
SI	No price control and cost accounting
IT	No price control
ES	No access obligation and cost accounting
DK	No access obligation in competitive areas and lift up of all set of remedies
FR	No price control
EL	No price control
CY	No access obligation and cost accounting

Source: BEREC RA Database 2023

The following figure reports the representation of the average number of NRAs applying remedies (transparency; obligation to publish a reference offer; non-discrimination; accounting separation; price control; cost accounting) to different access technologies for the four groups already considered in figure 7;⁴⁸ for the same four group of countries the extent of competitive areas and deregulated areas in terms of average households is also given in line with what has been considered in past year’s report⁴⁹.

⁴⁶ Only for market 3b.

⁴⁷ On market 3b the obligation to publish a reference offer is also removed on the “competitive areas”

⁴⁸ The average for copper considers the sum of the remedies applied for ULL+market 3b legacy remedies; for FTTC considering the sum SLU+VULA FTTC+FTTC market 3b remedies; for FTTH, the sum VULA FTTH+FLLU+FTTH market 3b over cable, remedies.

⁴⁹ The average has been evaluated considering “0” where regulation is in charge without combining any geographical approach to regulation in market 1 and/or 3b. In case of geographical differentiation the maximum % of households has

As can be seen in figure 15, more regulatory flexibility is granted, also at a geographical level, where the copper network is less relevant for NGA deployment and in case infrastructure competition based on cable network is more relevant. In countries where FTTH still lags behind in terms of coverage and take-up, less regulatory remedies are applied to FTTH as an instrument to incentivise investment in FTTP. Regulation mainly addresses the copper network. Where infrastructure competition is at an intermediate stage and the copper network is still relevant, the obligations over VHCN are widely imposed (first group).

Figure 15 – Combination remedies-geographical scope of regulation⁵⁰

	Average of remedies applied (Transparency; Obligation of reference offer publication; Non discrimination; Accounting separation; Price control obligation; Cost accounting)			Average level of deregulated areas + competitive areas (% Households)			
	copper	FTTC	FTTH	copper	FTTC	FTTH	
Countries where all remedies are applied independently by technologies	BE	[80-85]%	[65-70]%	[75-80]%	[30-35]%	[30-35]%	[30-35]%
	HU						
	IE						
	LV						
	SI						
	SK						
	HR						
Countries where all remedies are applied not all on FTTP	CZ	[80-85]%	[85-90]%	[35-40]%	[10-15]%	[10-15]%	[10-15]%
	FI						
	IT						
	EL						
	CY						
	DE						
	ME						
Countries where a small set of remedies are present on FTTP network	LU	[80-85]%	[40-45]%	[40-45]%	[50-55]%	[40-45]%	[30-35]%
	NO						
	ES						
	MT						
	EE						
	PL						
	LT						
	LI						
	AL						
	SE						
Deregulated market or only duct access is in charge	RS	[0-5]%	[0-5]%	[0-5]%	[60-65]%	100%	[95-100]%
	FR						
	PT						
	DK						
	AT						
	BG						
	NL						
RO							

Source: BEREC RA Database 2023

According to the new regulatory tools in the Code, NRAs were asked to provide information on the following: i) experience with co-investment agreements or cooperative deployment of fixed VHCN networks and if and how the regulatory framework has been affected by this (i.e. art. 76-79 of the EECC); ii) if commercial wholesale agreements offered by SMP for VHCN/NGA with respect to the specific product/market are present and how do they affect the regulatory context (i.e. art. 68); iii) the imposition of functional separation (art. 77 of the EECC); iv) if voluntary separation of SMP has been presented and evaluated (art. 78 of the EECC); v) if are other wholesale only operators present in the market and if and how those operators have affected the regulatory framework (i.e. art. 80 of the EECC).

The replies from NRAs are limited showing that those new issues addressed in the EECC have limited application. In the table below the replies to the survey are reported: 7 countries declared specific cooperative deployment (FR, PT, IT, BE, CZ, ES, RS) where the SMP operator can be

been considered in market 1, 3b as reported in figure 8; "100%" of flexibility where no regulation is present on the corresponding technology both on market 1 and 3b. Only EU countries have been considered when calculating averages.

⁵⁰ In parenthesis the values of the last year have been reported in homogenous terms.

present or not (PT); three other countries have stated that the SMP operator has specific commercial offers (SE, PL, FI). For FR the co-investment agreement is an obligation in non-competitive areas in charge to the infrastructure operator in a symmetric framework obligation of access. In CZ co-investments involve the VULA FTTH product, whereas for all other countries cooperative deployment or commercial agreements are related to passive access such as FLLU. In case of PT and ES SMP access to civil infrastructures as a main instrument for competition, has incentivised the cooperative deployment of the networks and reciprocal access services. In all other cases cooperative deployments are still under consideration or not yet considered to have an impact on the corresponding regulatory framework as reported in the following country cases.

Are co-investment /cooperative deployment or commercial agreements present in the market?	Specific information	Impact on the regulatory framework
BE Cooperative deployments (JVs) but no co-investment in the sense of Art. 76 EEC	Telenet/Orange FTTH commercial agreement	Still not considered
CZ Yes in all relevant areas (es.excluding state aid areas) (VULA) (coinvestment or cooperative deployment)		
ES Yes in less densely areas (cooperative deployment and commercial agreement)		
FI	SMP operators provide wholesale access on commercial basis outside of their SMP areas. There are also new fiber network operators who provide access products on commercial basis	Under consideration
FR In less densely areas (co-investment)	Orange is designated SMP in the M3a 2014 current market analysis decision, and also in the M1 2020 market analysis decision project (which is under public consultation). Orange offers commercial wholesale agreements in the form of co-investments in some areas. Orange offers such agreements to "fiber commercial operators" (retail operators) to comply with its obligations as "infrastructure operator" (opérateur d'infrastructure) that are provided for in the symmetric regulatory framework.	SMP remedies designed and provided for in market analysis decisions taking into account competition circumstances of the market and remains coherent with the symmetric framework.
IT In some principal cities	A joint venture between the SMP operator and one main vertically integrated alternative operator happens between 2018 and 2021. During this first tranche of investments, the scope of intervention involved 29 main cities (about 15%- 20% of national households). In summary the co-investment takes the form of access in unbundled form (passive unbundling) to the secondary fiber optic network from the cabinet currently used to supply the SLU services over copper network up to the end user customer's side.	Competition Authority authorized the Joint venture. No specific impact on the ex ante SMP framework.
PL Yes in all relevant areas (es.excluding state aid areas)		Still not considered

(commerical agreemeent)	
PT	<p>Yes in all relevant areas (es.excluding state aid areas) (co-investment, co-operative deployment)</p> <p>In Portugal, several bilateral sharing agreements have been signed: for example, fixed network sharing between Altice and Vodafone Portugal in 2014, as well as between NOS and Vodafone at the end of 2017, and it is estimated that by 2022 around 3 million Portuguese homes will be connected through sharing agreements between the three main electronic communications operators.</p> <p>The co-investment agreement for the construction of a fiber optic network between Vodafone and NOS aimed to reach around 2.6 million homes. The agreement to develop and share a nationwide infrastructure thus enabled the two operators to make their commercial offers available under the shared network from 2018. With this partnership, NOS intended to exceed 4.4 million homes passed by the end of 2018 and make Gigabit Internet available to its customers. Vodafone, on the other hand, planned to reach 1.3 million more families and businesses, totaling around 4 million homes passed with NGA. In July 2019, the same operators announced the establishment of autonomous agreements with DStelecom - a regional wholesale-only (State-aid) operator - for access to the new fiber optic network to be built by this wholesale supplier, covering 1.2 million homes. The main aim of this agreement was to build a new fiber-optic network in areas of the national territory that were not covered at the time and were not subject to coverage plans under the agreement between Vodafone and NOS.</p>
RS	<p>Yes in all relevant areas (es.excluding state aid areas) (cooperative deployment)</p> <p>-</p>
SE	<p>Yes, in all areas. (commercial agreements)</p> <p>SMP offers VHCN/fibre wholesale products according to regulation, but also 3b-like access to its fibre network (communication operator access)</p>

Functional separation

No NRA has imposed the application of art. 77 of the EEC (functional separation) (former art. 13-bis 2002/19/CE) but two NRAs evaluated a voluntary separation of SMP (IT and CZ) (art. 78 of the EEC former art. 13-ter 2002/19/CE). In IT, during last market review (2019), the incumbent operator proposed a legal separation project that could enhance the Equivalence model in charge. In that case the NRA proposed two different regulatory regimes in case the project would be carried on. The regulatory outcome with respect to the implementation of the enhanced Equivalence model was mainly on the relaxation on the replicability test in the context of the public tender procedure. The NRA has considered that the competitive impact of the legal separation model was not relevant, as the 100% property of the legal separated network entity remained property of the SMP operator; the project didn't materialize. In case of CZ the SMP operator is a legally separated entity. The SMP operator provides only wholesale services on its network and obligations of EOI (part of non-discrimination) have not been imposed because it was implemented by the vertically separated SMP operator during separation - all wholesale partners (incl. former retail arm) are using the same ordering systems and service provision.

Wholesale only

NRAs were asked for information on the need to regulate operator(s) other than vertically integrated SMP operators (not on legal basis of CRD, i.e. Art. 80 Directive 1972/2018). CZ regulates a legally separated SMP and provides on its network only wholesale services, but not fully meeting all the criteria in Art. 80 Directive 1972/2018. In DK 4 Wholesale only operators are notified as SMP with the obligation of non-discrimination only.

On the general role of wholesale only operators (SMP or not) the following has been described by NRAs:

(BE) A pilot project by a utility provider based on FTTH LLU, with a wholesale-only model is ongoing with a very limited footprint, the deployment has ended. Due to its small scale, there was no impact on regulation. This footprint will be transmitted to a new JV with cable SMP operator and is going to not remain a wholesale-only infrastructure.

(HR) A few smaller operators provide wholesale services in a limited area, therefore they don't impact wholesale competition. In Market 2 there are several competitors at wholesale level competing with the SMP which may be very relevant with respect to the competitive outcome. This issue will feature in future market reviews, especially for urban areas with more business customers where the regulatory framework will be affected.

(IT) The presence of a wholesale only operator had a relevant impact on the competitive outcome: for the first time in Italy the city of Milan has been deregulated since 2019. Moreover, the role of the alternative wholesale only FTTH networks played an important role in the application of geographical regulation, in principle updating competitive areas on an annual basis.

(PT) There are 2 regional wholesale-only (State-aid) operators with FTTH networks in areas where the SMP operator had a smaller FTTH footprint, but the presence of those operators had no impact.

3. Outline of the Results for Regulatory Accounting

3.1 Regulatory Accounting methodologies (definitions)

In this section a focus on the regulatory accounting methodologies is given. When useful, the information about the regulatory accounting methodologies has been integrated using information on other elements which are considered to have a relevant impact on pricing and regulatory accounting. In that context we still refer mainly to the instruments which are provided by the NDCM Recommendation⁵¹ such as: i) the availability of an economic replicability test (ERT); ii) the imposition of non-discrimination obligations.

With reference to regulatory accounting methodologies, a set of pre-defined options has been used in order to improve data comparability while providing a more detailed picture over the years. Information is related to non-competitive areas or national geographical market.

⁵¹ From 16 July 2020 until 7 October 2020 the Commission launched a public consultation for the revision on the NGA Recommendation (NGA) and the Non Discrimination and Costing Methodologies Recommendation (NGCM), to which BEREC replied (BoR (20) 169).

Price control

For the price control methodology the following categories and sub categories have been considered (Figure 16).

Figure 16 - 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/Price Flexibility		Retail minus	

Source: BEREC RA Database 2023

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 Commission NDCM Recommendation to promote competition and enhancing the broadband investment environment 2013/466/EU). The traditional ex ante MST currently applied by NRAs serves mainly as a complementary tool to price control. It defines a strict level of parameters within which NRAs can 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 can 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 (Figure 17).

Figure 17 - 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 2023

The LR(A)IC and LRIC categories refer to a modelling approach used for estimating the cost of the services in both cases; FDC refers to the fact that the cost of the services has been determined taking into account the results of the regulatory accounting system of incumbent operators. LR(A)IC and LRIC categories have been differentiated for the inclusion of common and joint costs 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 services⁵².

Differences between FDC and LR(A)IC or LRIC are mainly related to the fact that in the first case the prices are determined as a result of the incumbent operator efficiency, eventually using some adjustments prescribed by the NRAs, while in the other cases a modelling approach is used by the NRAs to address the service calculation using as prevalent methodology an allocation method not fully dependent on the SMP case.

Cost base

For the used cost base, the traditional categories of HCA and CCA have been identified (Figure 18).

Figure 18 - Cost base categories and sub categories

Cost base
HCA
CCA

Source: BEREC RA Database 2023

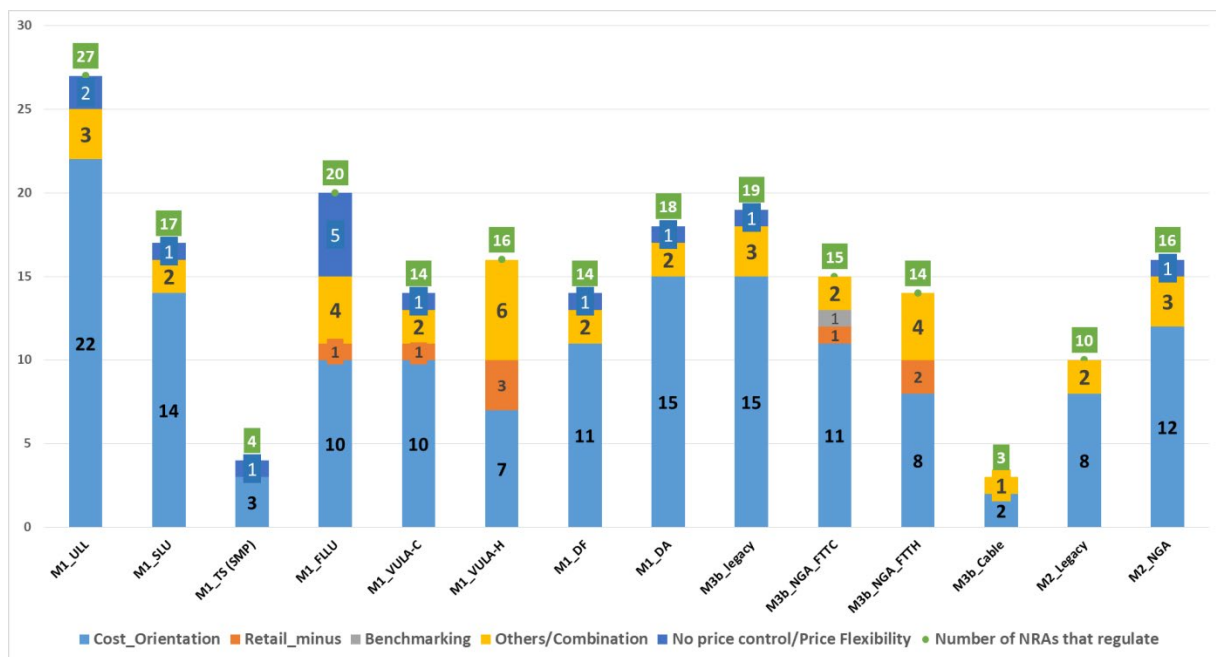
⁵² The replies to the questionnaire refer to the "main" allocation methodology in use for each product market, even if the whole approach for service calculation can be a mix of methodologies that can refer to more than one category or sub category in the final decision.

3.2 Price control methods

This section gives an overview of the price control methods used by NRAs in 2023 to regulate markets and products according to the main categories and sub categories, which have been previously reported. In the same picture the corresponding percentage of the main category of price control in use in relation to the number of NRAs that regulate the market is given for EU countries alone (in appendix detailed information per country are given).

In terms of main categories of price control, cost orientation remains the most frequently used method, and it has been applied mainly to legacy products (Figure 19). Retail minus is sometimes applied to VULA FTTH products or in market 3b. Looking at EU NRAs about 20% (25% last year) of NRAs that regulate VULA FTTH use ERT whereas 47% of the 15 NRAs that regulate the corresponding product use cost orientation (plus one NRA since last year).

Figure 19 - Price control main categories

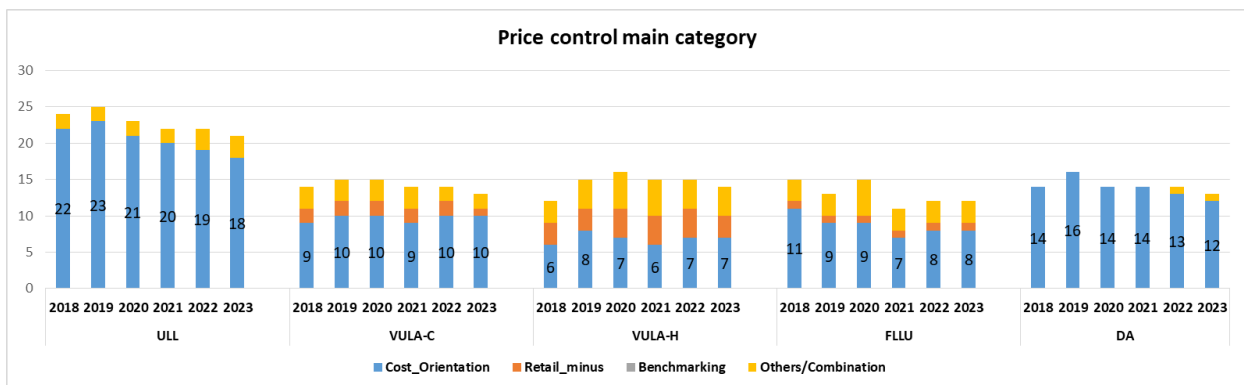




Source: BEREC RA Database 2023

In figure 20 the time series for EU NRAs have been considered along the last five years from 2018 (as reported in previous RA reports).⁵³

Figure 20 - Price control main categories time series



Source: BEREC RA Database 2023

The recorded changes in the last five years are summarised as follows: the change of pricing approach happens in very few cases in market 1 and changes are mainly due to the deregulation of some products (AT, DK, NL, BG, LT, MT, PL, SE) or due to the fact that the regulatory period is no longer relevant and so a price control obligation, as a general remedy, even if imposed, has not been implemented for some products (EE in 2021)⁵⁴. In five cases the obligation of price control has been implemented in the last 5 years (BE, EL, FI, NL, PL) as reported in the following table for each main product in market 1. The situation is quite stable and even if the number of NRAs that

⁵³ Only EU NRAs have been considered .

⁵⁴ Price control obligation is imposed for the corresponding product, as a general remedy, but no specific implementation has been applied due to the fact that it is not relevant for the market.

regulate the market is generally decreasing, cost orientation (strict cost orientation or price cap) is still relevant for NRAs that maintain the regulation of the product/market.

Figure 21 - Price control major changes 2019-2022 (market 1 main categories)

55

Product	2023	2022	2021	2020	2019
ULL	AT ⁵⁶ (removed regulation from Other) MT (removed price control from cost orientation as not anymore relevant)	DK (removed regulation from cost orientation), EE (reintroduced cost orientation), SI (Started to regulate Other/ from cost orientation)	EE (no more cost orientation)	NL-BG (no more regulation)	-
VULA FTTC	AT (removed regulation from Retail minus)	FI (introduced cost orientation from other combination)	LT (No more regulation)	NL (no more regulation)	BE (started to be regulated CO), FI (started to be regulated Other/combination)
VULA FTTH	AT (removed regulation from retail minus)	IE-FI (introduced cost orientation from other combination)	LT (No more regulation)	NL (no more regulation from CO)	BE-FI (started to be regulated Other/combination), NL (started to be regulated CO), HR (started to be regulated CO)
FLLU		DK (removed cost orientation with no price control), EE (introduced cost orientation)	MT (no more regulation from CO)		BE (started to be regulated Other/combination), NL (no more regulation from CO)
DA	HR (no more CO)	EE (introduced cost orientation) SI (Started to regulate Other/ from cost orientation) PL (removed regulation)	EE (no more cost orientation), EL (started to be regulated CO)	PL (started to be regulated CO), SE (no more regulation)	BE (started to be regulated Other/combination), HR (started to be regulated CO), LU (no more regulation from CO)

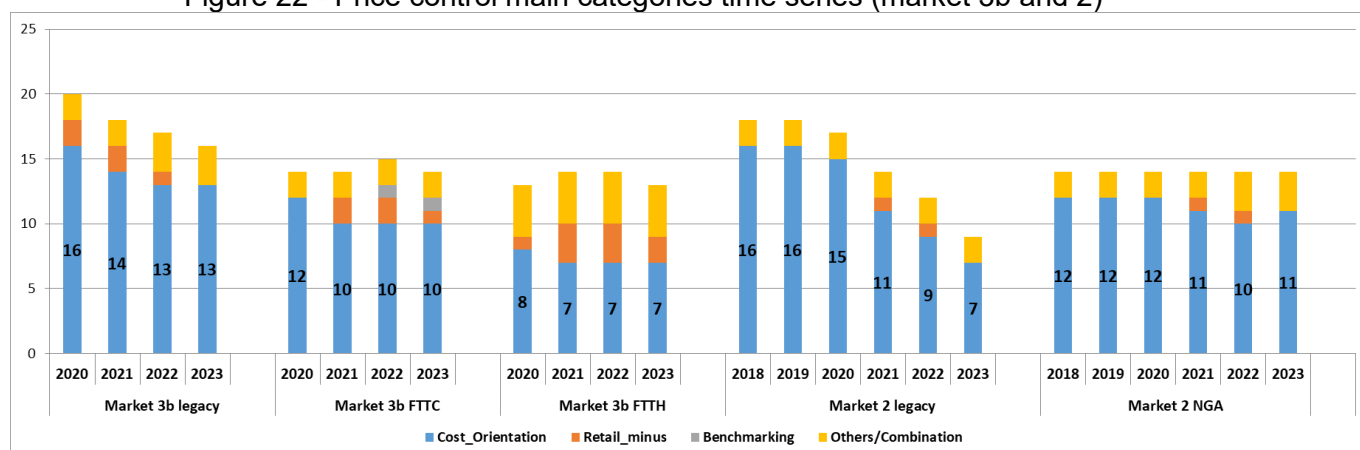
Source: BEREC RA Database 2023

Considering the products in market 3b and 2 in Figure 22 the following trend can be observed for the corresponding countries that have modified the declaration along the years. A reduction of regulatory obligations for market 3b over legacy network and a constant number of NRAs that implement an FTTH price control. Along the years reduction in the application of cost orientation and retail minus can be recorded. An evident decrease of price control obligation is seen in market 2 legacy network.

⁵⁵ The historical series have been adjusted when a miss specification happens along the years that can happen also for material errors when needed. So the last reported values are the best of our knowledge estimation. The year reported refer to the corresponding RA database updated (inclusion/exclusion) that can be different with the year of decision of NRA.

⁵⁶ AT decision had been taken in 2022 and RA report 2023 is the first RA report that report this new situation.

Figure 22 - Price control main categories time series (market 3b and 2)



Product	2023	2022	2021	2020	2019
MK3b legacy	AT (removed regulation from Retail minus)	CY-DK (removed regulation from cost orientation)-SI (from CO to "Others")- ES (CO from retail minus) EE (reintroduced cost orientation)	EE (no more cost orientation)	NA	NA
MK3b FTTC	AT (removed regulation from Retail minus)	CY (removed regulation from CO) DK (introduced "Other" due to the commitment agreements) EE (introduced again CO)	AT-SI (started to be regulated RM); EE (no more cost orientation); LT (no more regulation from CO)	NA	NA
MK3b FTTH	AT (removed regulation from Retail minus)	DK (removed regulation from CO) EE (introduced again CO)	AT-SI (started to be regulated RM); EE (no more cost orientation)	NA	NA
M4 legacy	AT (removed regulation from Retail minus) LU-MT-IE (removed regulation from CO); EL (apply cost orientation from Retail minus)	NL-HR (removed regulation from CO)	AT-HU-IT (no more regulation from CO) EL (Cost orientation RM) FR (from "others" to CO); SI (from CO to "others")	LV (no more regulation from CO)	PL (no more regulation from CO)
M4 NGA	EL (apply cost orientation from Retail minus)		EL (from CO to RM); SI (from CO to "others")	LV (no more regulation from CO)	HU-PT (started to be regulated CO); PL (no more regulation from CO)

Source: BEREC RA Database 2023

Looking at the four groups of NRAs previously described in figure 7 the NRAs have been ranked by the remedy set imposed: from a full range (of all products remedies) in market 1 to complete deregulation. Cost orientation is more frequent where a legacy network based on copper is also relevant for NGA products (e.g. FTTC). This corresponds to a stronger interrelation between prices for old and new technology, since there is a stronger substitution effect with respect to the legacy copper product. As shown before, "cost orientation" is not decreasing for NGA products and might play a role in migration to VHCN.

In that case, the application of cost orientation for FTTH products has the objective to prevent anti-competitive behaviour and discrimination of end-users and competitors as a result of the SMPs pricing strategy; it rather provides a neutral make or buy signal to encourage investment by all

operators in new FTTH networks. In the absence of this intermediate step, the “wait and see” option is less relevant for the SMP operator, because no intermediate steps like FTTC for VHCN transition are present. In such cases it seems to be more popular to apply a more flexible approach to FTTH regulation, also through the use of ERT, but more in general not to apply cost orientation.

In case the intermediated technology (FTTC) is present and plays a competitive constraint, the cost orientation on VHCN is an option to incentivise take-up and migration also on VHCN.

This can be seen when analysing the replies on main categories of price control of the four groups of NRAs for copper ULL, VULA –FTTC and FLLU /VULA over FTTH.⁵⁷ The illustration shows that cost orientation (also for FTTH) is more frequent (and increasing) in countries in the first two groups, specifically where FTTC (or the full copper network) is still relevant for NGA deployment. This situation should also be considered in light of investment commitment to VHCN investments.

This result is not in contrast with the one reported in figure 15 where the amount of obligations imposed on the respective technologies are calculated with respect to the maximum number of obligations applied to all markets/products.

⁵⁷ The averages exclude non-EU countries.

Figure 23 – relation of price control main categories and general group of NRAs⁵⁸

	ULL			VULA FTTC			FLLU/VULA FTTH			
	Cost_Or entation	Retail_m nus	Others/C ombinati on	Cost_Or entation	Retail_m nus	Others/C ombinati on	Cost_Or entation	Retail_m nus	Others/C ombinati on	
Countries where all remedies are applied independently by technologies	BE									
	HU									
	IE									
	LV									
	SI	67% (67%)	0% (0%)	33% (33%)	67% (67%)	11% (11%)	22% (22%)	44.44% (44%)	11.11% (11%)	44.44% (44%)
	SK									
Countries where all remedies are applied not all on FTTP	HR									
	CZ									
	FI									
	IT									
	EL									
	CY	100% (80%)	0.00%	0.00%	100% (80%)	0.00%	0.00%	100% (80%)	0.00%	0.00%
Countries where a small set of remedies are present on FTTP network	DE									
	(ME)									
	LU									
	(NO)									
	ES									
	MT									
Deregulated market or only duct access is in charge	EE									
	PL									
	LT									
	(LI)	90% (90%)	0.00%	0.00%	0.00%	0.00%	0.00%	40% (40%)	25% (25%)	12% (12%)
	(AL)									
	SE									
	(RS)									
	FR									
	PT									
	DK									
	AT	16.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
	BG									
NL										
RO										

Competition condition still at intermediate step, NGA provided by a more technology mix (cable and FTTP, FTTC); copper network still present

Copper still the main instrument for access NGA services lower level of FTTP and cable coverage

FTTP is wider spread also with respect to cable; competition condition are in more advantage stage; copper network no relevant for NGA deployment

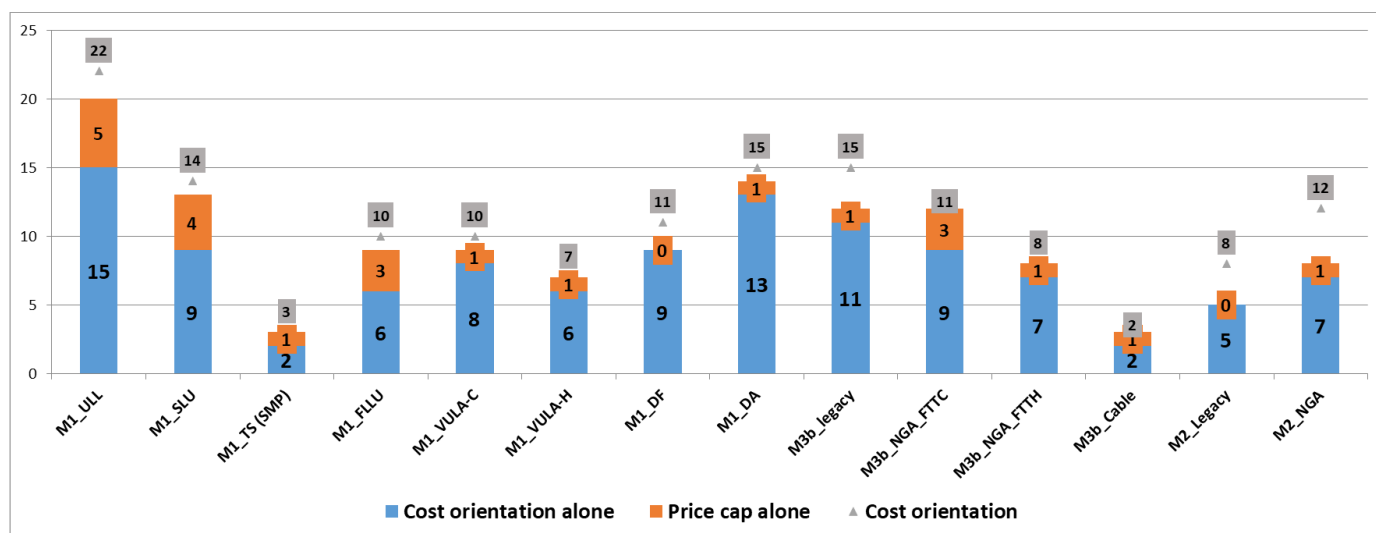
Cable competition is more relevant in combination with high level of FTTP coverage and take-up, competitive conditions are in a more advantage stage

Source: BEREC RA Database 2023

⁵⁸ In parenthesis the values of the last year have been reported in homogenous terms (when needed).

With respect to the sub-categories, Figure 24 highlights that cost orientation alone is still the most frequent price control method used by NRAs, especially in case of DA or DF and the corresponding legacy network including market 3b.

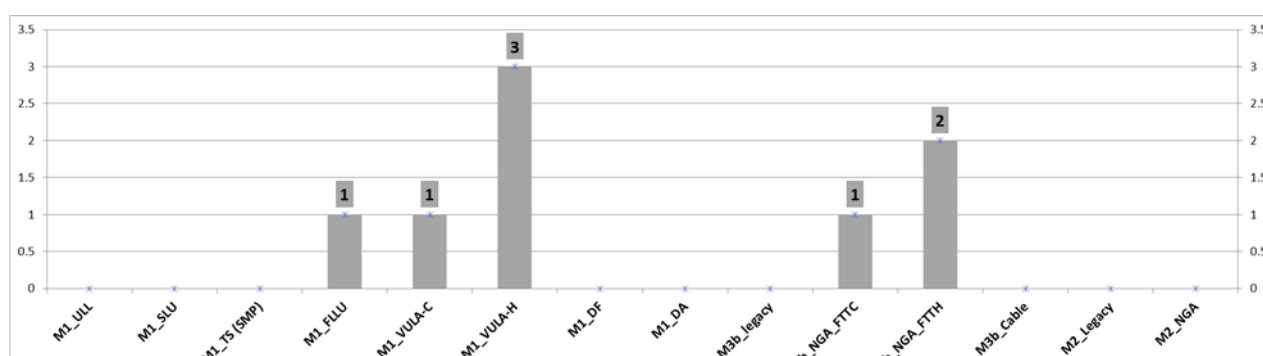
Figure 24 - Price control sub category Cost Orientation



Source: BEREC RA Database 2023

The ERT price control methodology has been mainly applied to VULA and NGA products in line with the Commission Recommendation on Costing Methodologies.

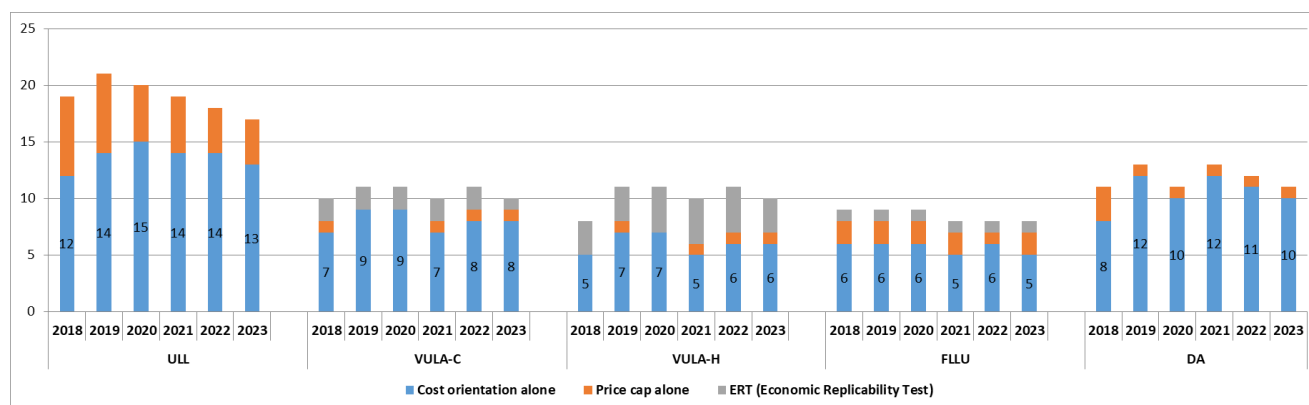
Figure 25 - Price control via ERT sub categories market 1



Source: BEREC RA Database 2023

In figure 26 the evolution over time for EU countries for the sub category price control for products in access markets within the last five years is given, providing information also on what NRA has changed sub category. It seems that also the choice of price cap instead of cost orientation alone is more frequent when legacy network is less relevant for NGA services (i.e. FTTC).

Figure 26 - Price control sub categories market 1



Source: BEREC RA Database 2023

Figure 27 - Price control major changes 2019-2023 (market 1 sub categories)

Product	2023	2022	2021	2020	2019
ULL	MT (removed CO alone)	DK (removed the regulation from price cap alone); EE (introduced again CO); SI (removed CO alone)	EE (no more cost orientation)	NL-BG (no more regulation from Price cap)	LV (implemented cost orientation alone), PL (implemented cost orientation alone)
VULA FTTC	AT (No more regulation through ERT)	FI (Introduced CO alone)	LT (No more regulation from cost orientation alone), HR (From cost orientation alone to Price cap)		BE (started to be regulated Cost orientation alone), LV (implemented cost orientation alone), NL (no more regulation from price cap)
VULA FTTH	AT (No more regulation through ERT)	FI (introduced CO alone)	HR (From cost orientation alone to Price cap), LT (No more regulation from cost orientation alone)	NL (no more regulation from Price cap)	BE-FI (started to be regulated Other/combination), NL (started to be regulated Price cap), LV (implemented cost orientation alone), HR started to be regulated (Cost orientation alone)
FLLU	PL (from CO to price cap alone)	DK (removed price cap alone) EE (introduced CO alone)	MT (no more regulation), FI (from Price cap to cost orientation alone); HR (From cost orientation alone to Price cap)		NL (no more regulation from Price Cap), LV (implemented cost orientation alone)
DA	HR (No more CO alone)	EE (introduced CO alone); SI (Started to regulate Other/ from cost orientation alone) PL (removed regulation)	EL (start to regulate with cost orientation alone)	PL (start to regulate with cost orientation), SE (removed regulation from cost orientation alone), BG (removed regulation from cost orientation alone)	LV (implemented cost orientation alone) LU (removed access obligation from Price cap), HR (start to regulate through Cost orientation alone),

Source: BEREC RA Database 2023

Looking at market 3b and 2 the following evolution is observed: an increased implementation of price control regulation related to NGA/FTTH in market 3b, where a reduction of price control regulation of the legacy product in market 2 is observed.

Figure 28 - Price control sub categories market 3b and 2

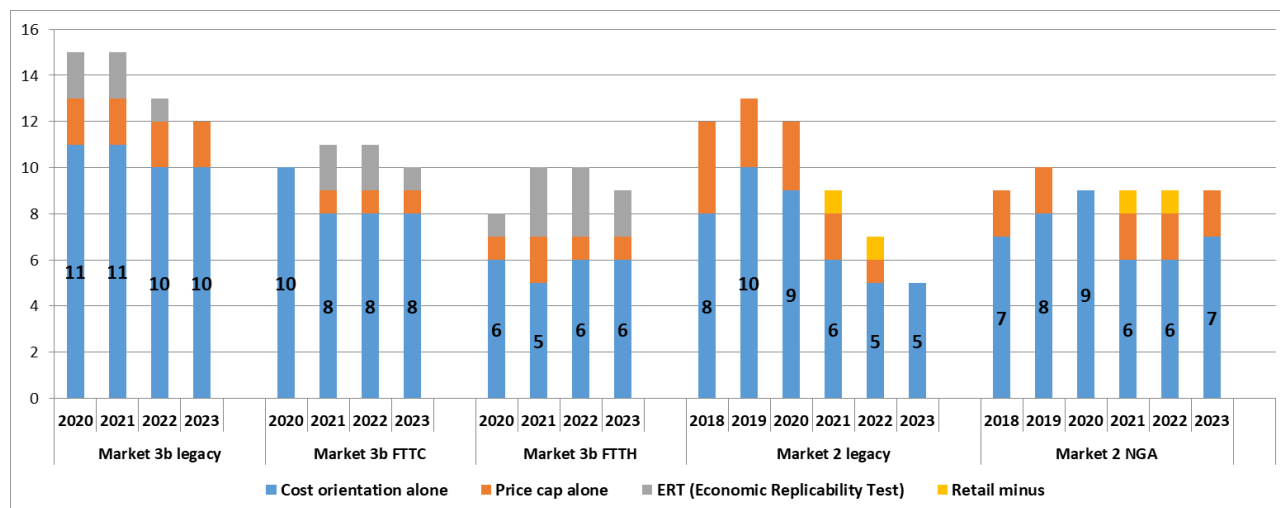


Figure 29 - Price control major changes 2019-2023 (former market 3b and market 2 and 4 sub categories)

Product	2023	2022	2021	2020
MK3b FTTC	AT (removed regulation from ERT)	CY (removed regulation from CO) –HR (removed regulation from Price cap) EE (introduced again CO);	AT-SI (start to apply ERT),HR (moved from Cost orientation alone to Price cap),LT (No more regulation from cost orientation alone)	
MK3b FTTH	AT (removed regulation from ERT)	DK-HR (removed regulation from price cap) EE (introduced CO);	AT-ES-SI (start to apply ERT),HR (moved from Cost orientation alone to Price cap)	
M2legacy	EL (from retail minus to CO) LU (removed regulation from price cap)	NL (removed regulation from price cap) HR (removed regulation from CO)	AT(from Price cap to No regulation), EL (from cost orientation to retail minus), HU-IT-SI (from cost orientation to no regulation)	LV-RO (removed regulation from cost orientation)
M2 NGA	EL (from retail minus to CO)		EL from cost orientation alone to retail minus); SI (removed regulation from cost orientation)	LV (removed regulation from cost orientation)

Source: BEREC RA Database 2023

The following part provides information on the implementation of margin squeeze tests and non-discrimination models adopted.

The non-discrimination framework in the context of price control

The ERT (or the traditional margin squeeze test) has a two-folded nature: it can be used as a price control remedy (art. 13 of the AD, now art. 74 of the EECC), or as a non-discrimination remedy (art. 10 of the AD, now art. 70 of the EECC). This is in line with the principle that the ERT must be undertaken by NRAs in light of the regulatory objective to promote sustainable competition and efficient investment - it must be based on the specific competitive concern identified in the market analysis. However, also a different case exists: art. 13 AD 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; otherwise 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. Up to now, the statement of the NDCM Recommendation on the ERT for NGA products as the alternative for ex ante price control has not been fully applied, as highlighted in the previous paragraph.

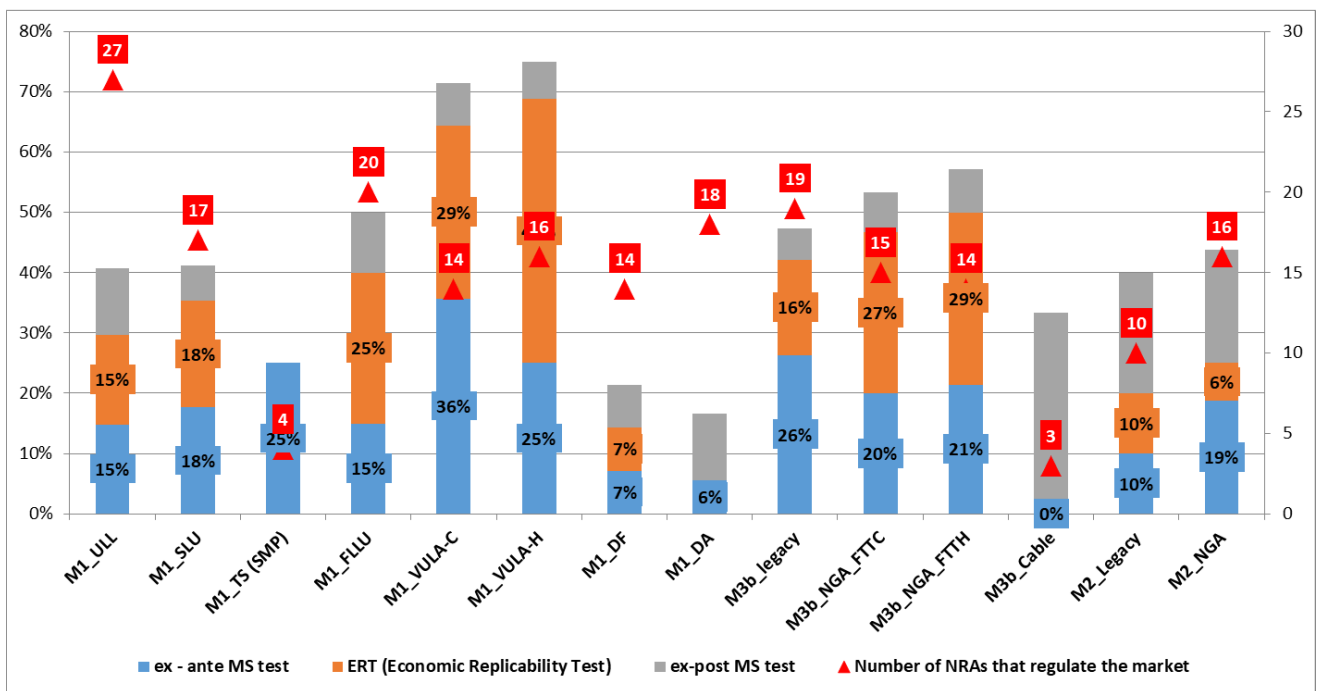
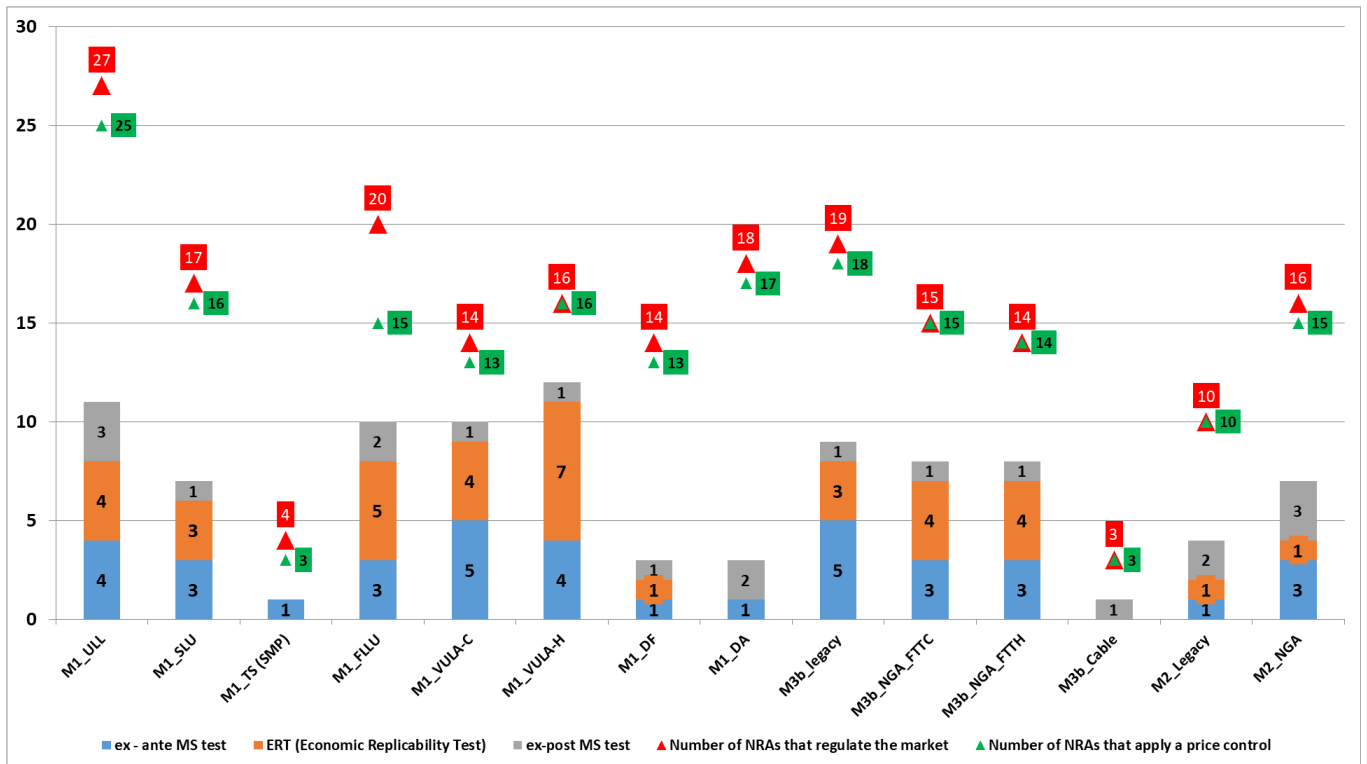
Summing up, margin squeeze tests have been used mainly as a complementary measure for a price control method, within the article 13 AD legal framework. The given options were (see BoR (14) 190): i) ex-ante margin squeeze test; ii) ERT (Economic Replicability Test); iii) ex-post retail margin squeeze test. A combination of price control and a retail margin squeeze test/ERT test has been applied only for specific access products (e. g. the flagship wholesale products on which the retail margin squeeze test has been applied). Almost all NRAs that declared to apply a margin squeeze test (ex ante or ex post) use the test in combination with a price control method applied. Only SE, ES and PT declared for few products to apply an ex ante or ex-post test without a price control method: i) SE applies an ex ante ERT test for FLLU product in combination with EOI; ii) ES for Market 2 NGA product considers to apply a test on ex-post basis (initiative of the NRA or following a dispute issued by an operator), this test (the business replicability test, Business Fiber product) is focused on the taylor-made bundled offers that address business customers and take into account the various wholesale access services that an alternative efficient operator would require to provide such personalized offer (under analysis); iii) PT in case of market 3b legacy network considers an ex-ante margin squeeze test without declaring any specific price control obligation also in light of the irrelevance of the corresponding product.

In all other case where a price squeeze test is in force as a non-discrimination obligation this is in combination with a specific price control obligation. In the figure below the last updated survey on the application of a margin squeeze test is given (figure 30a).

Figure 30b shows that the presence of a margin squeeze test is more common for NGA products when the product is regulated: for regulated VULA FTTH 70% of NRAs apply an ex-ante test, 50% of NRAs apply an ERT test, indicating that the application of the margin squeeze test becomes more relevant for NGA products in market 1, in line with past year’s report.



Figure 30 a-b–Number of NRAs that apply margin squeeze tests and % of NRAs that apply a margin squeeze test



Equivalence model

The options for Equivalence models currently in force for different products are: EoI⁵⁹, EoO⁶⁰ and “Other”⁶¹. In absolute terms there is a small increase in the number of NRAs that impose EoI/EoO models even considering that few NRAs still regulate the market. In figure 32 the evolution over time is provided (only EU NRAs).

Figure 31 – EOO-EoI equivalence model

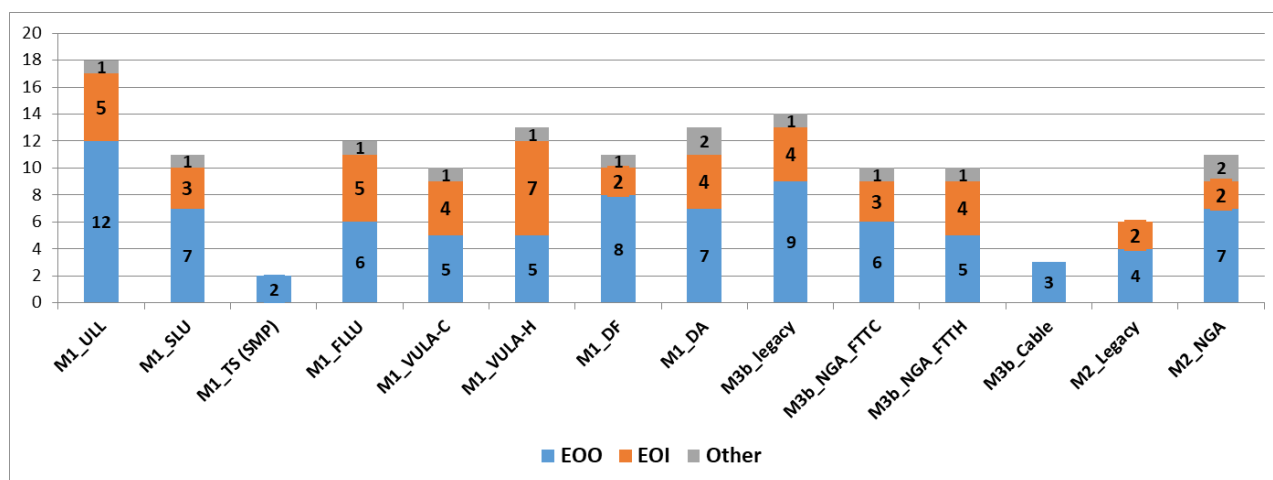
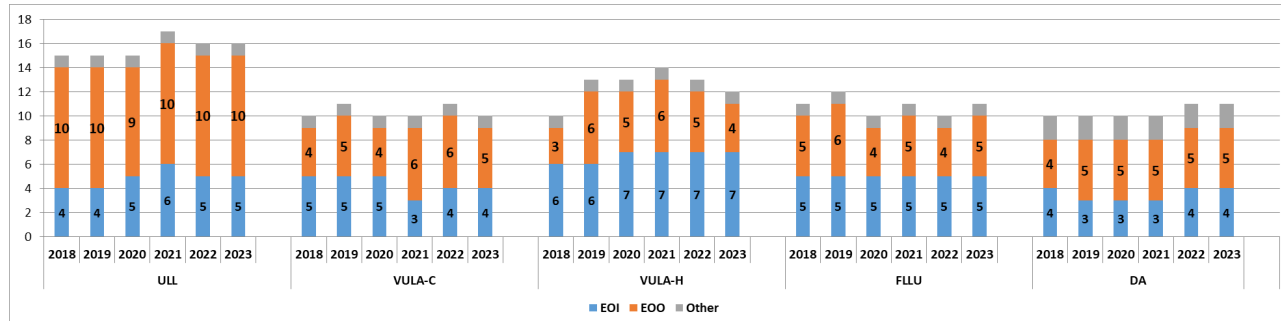


Figure 32 Evolution over time of the Equivalence model applied (EU countries)



Source: BEREC RA Database 2023

One specific element investigated is the relationship of EoI as a prerequisite for not applying cost orientation. In general EoI is not a very common obligation as it is chosen only in case of VULA-H as an equivalence model by the majority of NRAs that implement specific non-discrimination obligation. This year, NRAs have been asked whether EoI has been imposed with the principal motivation for not imposing cost orientation.

The following table provides the replies provided by some NRAs that apply the EoI approach for the corresponding market product, and the corresponding motivations. In general EoI + ERT is a

⁵⁹ ‘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.

⁶⁰ ‘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, even if using potentially different systems and processes.

⁶¹ ‘Other’ is a residual option for enhanced non-discrimination obligation not properly filed under EoI/EoO.

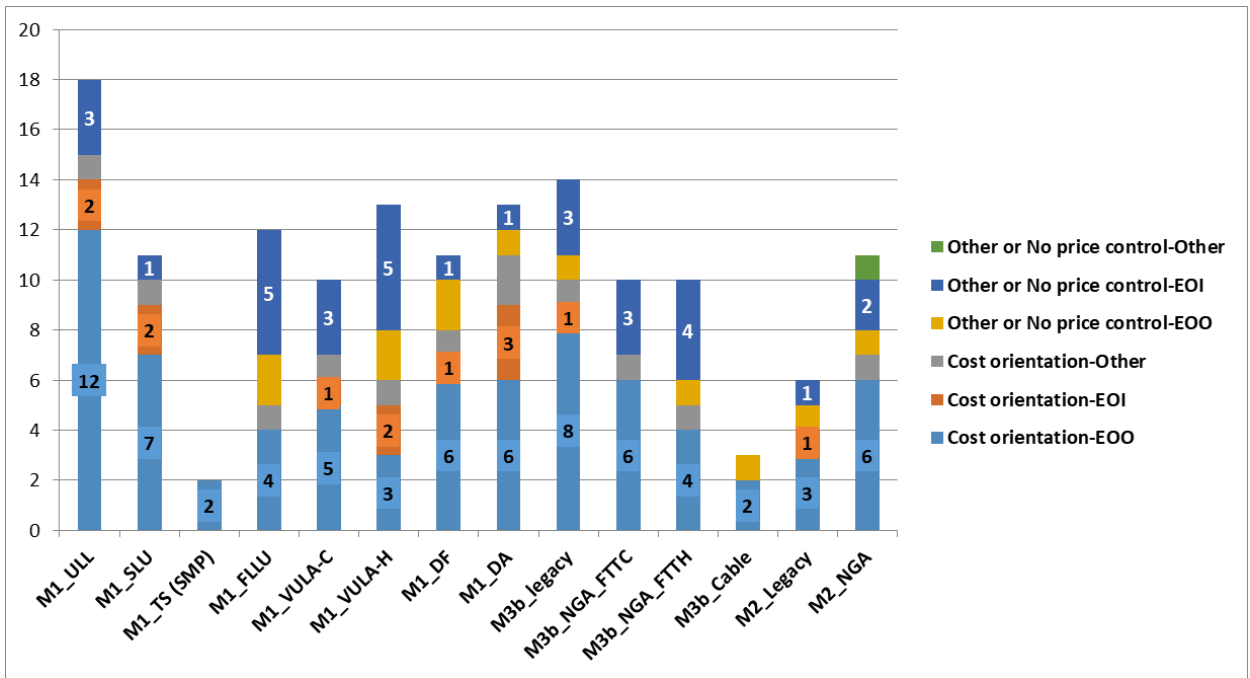
main motivation for not imposing cost orientation for fiber product following the indication of the Commission Recommendation of 2013 (SE,LU); in case of SI the EOI + ERT is relevant also for the legacy network product in combination with a technical replicability safeguard. In countries where ERT is also applied as price control method (ES) the EOI is not a main motivation for excluding the cost orientation specifically for legacy product. In IT, CY and PT the EOI didn't prevent the imposition of cost orientation.

	Have you considered EOI safeguard as principal motivation for not imposing cost orientation?	M1_ULL	M1_SL_U	M1_FLL_U	M1_VUL_A-C	M1_VUL_A-H	M1_D_A	M3b_Le-gacy	M3b_NGA_FT_TC	M3b_NGA_FT_TH	M2_Le-gacy	M2_NG_A
		Yes	2	1	4	2	3	1	2	2	2	1
No	2	2	0	1	2	1	0	0	0	0	0	0
NRAs that apply EOI as equivalence model	Yes	CZ	CZ	LU	CZ	LU	SI	LU	SI	LU	SI	SI
	No	ES	ES	IT	CY	CY	IT	PT				
Motivation expressed	Yes	CZ: SMP operator is legally separated entity which provides only wholesale services to all potential retail providers (providing same inputs). SE-SI-LU :EOI + ERT										
	No	IT: The EOI model has contributed to enhance the level playing field in the provision of wholesale service effectively reducing the incentive to adopt technical discriminatory conducts, with the benefit of the competition also in a forward looking manner providing efficient incentive to the operators to move up the ladder of investment. At the same time the EOI doesn't prevent the incumbent operator to apply excessive prices that can be passed through the end users or to prevent geographical selective price reduction under full efficient costs over the enhanced copper network, with the final end to prevent investment in VHCN network by competitor. ES: EOI included as a general criteria CY: Decision based on market maturity PT: It was considered necessary to impose cost orientation to prevent the SMP operator from setting prices significantly higher than costs in order to lead to a margin squeeze strategy for alternative operators.										

The survey on the motivation behind the choice of the Equivalence model chosen highlights the cases of BE and AT where EOO is in charge in some markets and EOI has not been chosen due to a cost benefit analysis (EOI does not prevent wholesale price increases in combination with high cost of implementation).

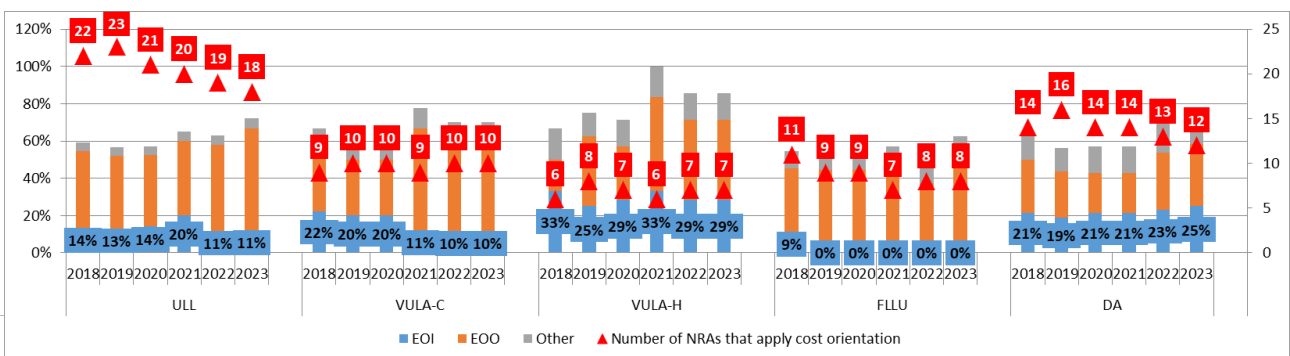
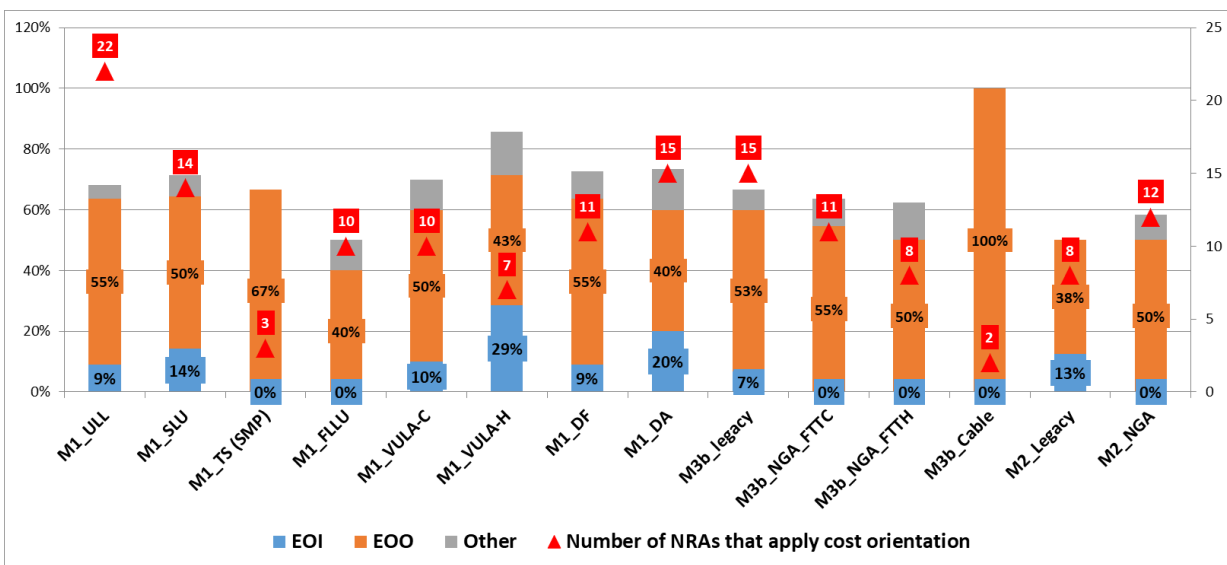
In Figure 33 the % of NRAs that apply cost orientation in combination with the equivalence model EOI/EOO is reported for all NRAs that replied to the questionnaire (and the corresponding time evolution since 2018 only for EU countries). In relative terms EOI is increasing only for the DA product. EOO is in absolute terms seems to be more relevant when cost orientation is applied.

Figure 33 – EOO-EOI equivalence models with respect to the non-discrimination obligation



Source: BEREC RA Database 2023

Figure 34 – EoO-Eol equivalence model with respect to cost orientation obligation



Source: BEREC RA Database 2023

3.3 Cost base, annualisation and cost allocation methodologies

Cost base

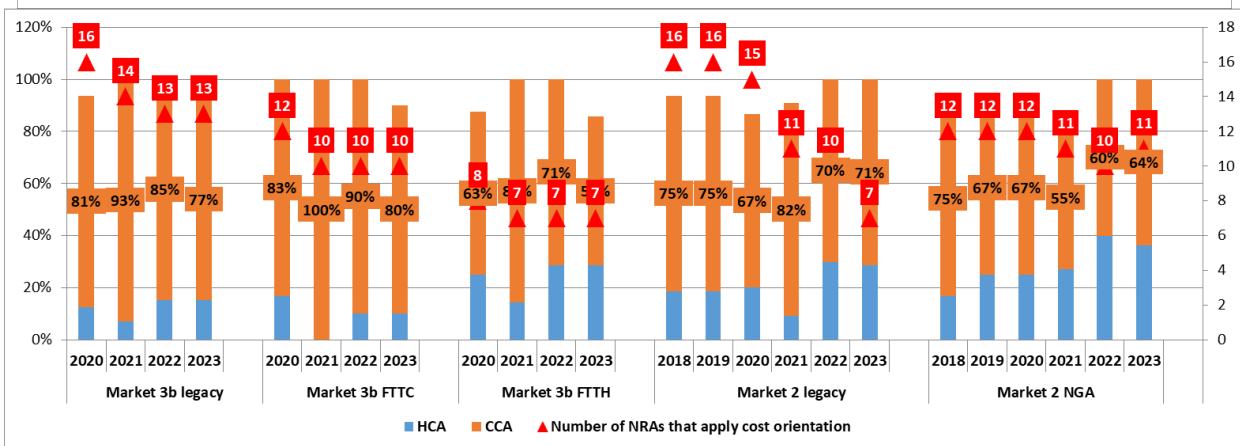
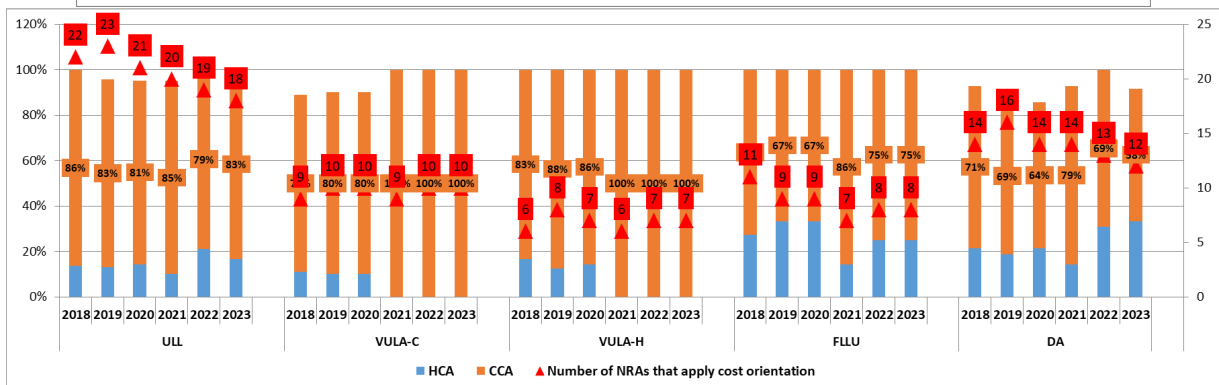
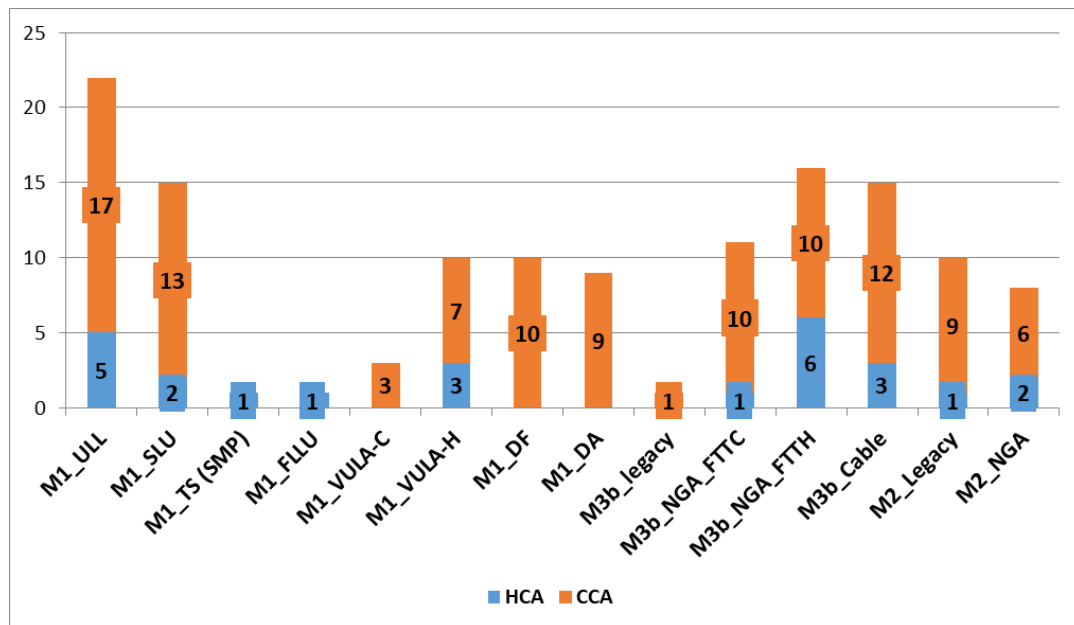
With reference to the cost base, Figure 35 shows that in 2023 CCA is still by far the most commonly used methodology for all markets. The situation remained stable in comparison to last year's survey.

In the following figure the type of cost base in use when price control is in charge is shown. HCA is a relevant cost base only when an FDC approach is applied as accounting method. Even if the actual implementation of the cost oriented price also using an LRAIC approach in every case can take into account an asset base that partially should take into account already depreciated asset when reusable.

In the corresponding figure the evolution over time of the cost base is given (considering only EU-NRAs) for those NRAs that used cost orientation as the main category of the price control. It is clear that the use of CCA-OCM is increasing where cost orientation is applied.⁶² In market 2, HCA is still more frequent in relative terms where cost orientation is applied. The use of HCA is common where NRAs are at the early stage of regulation; they move to CCA before (eventually) deregulating.

⁶² When the percentage reported is less than 100% it means that no information is available for NRAs that applied cost orientation over the years.

Figure 35 - Cost base used



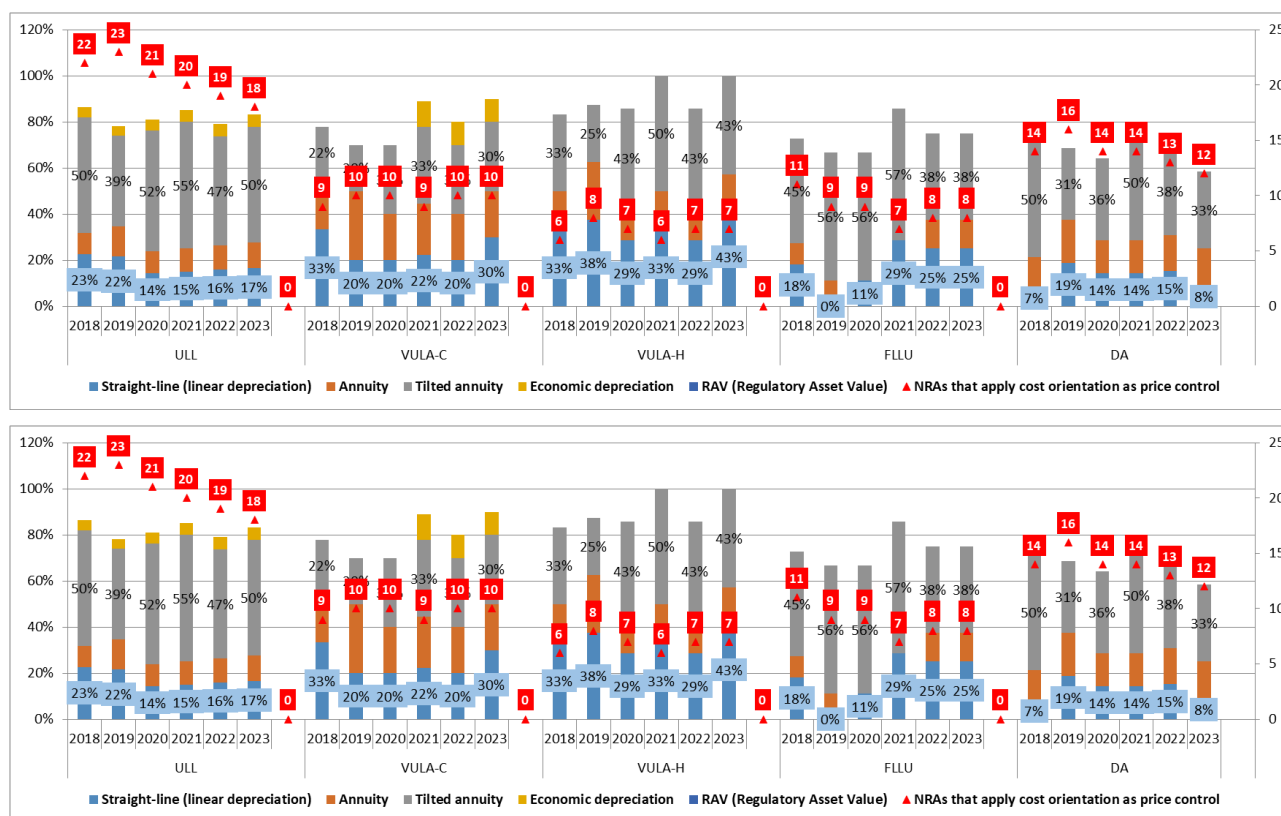
Source: BEREC RA Database 2023

Annualisation

Annualisation methodologies within the CCA category are represented in Figure 36 – Annualisation method

The most frequently used approach is the tilted annuity. Standard annuity and straight line follow. Looking at the trend over time, in this year’s report the tilted annuity is becoming less frequent due to the fact that NRAs that deregulate the market over time generally have declared cost orientation in combination with tilted annuity or economic depreciation. Tilted annuity can be considered a general approach when cost orientation is applied. Only the information of those NRAs that apply cost orientation is reported for EU countries. The number of NRAs refers to the number of NRAs that apply cost orientation as the main category for the corresponding product.

Figure 36 – Annualisation method

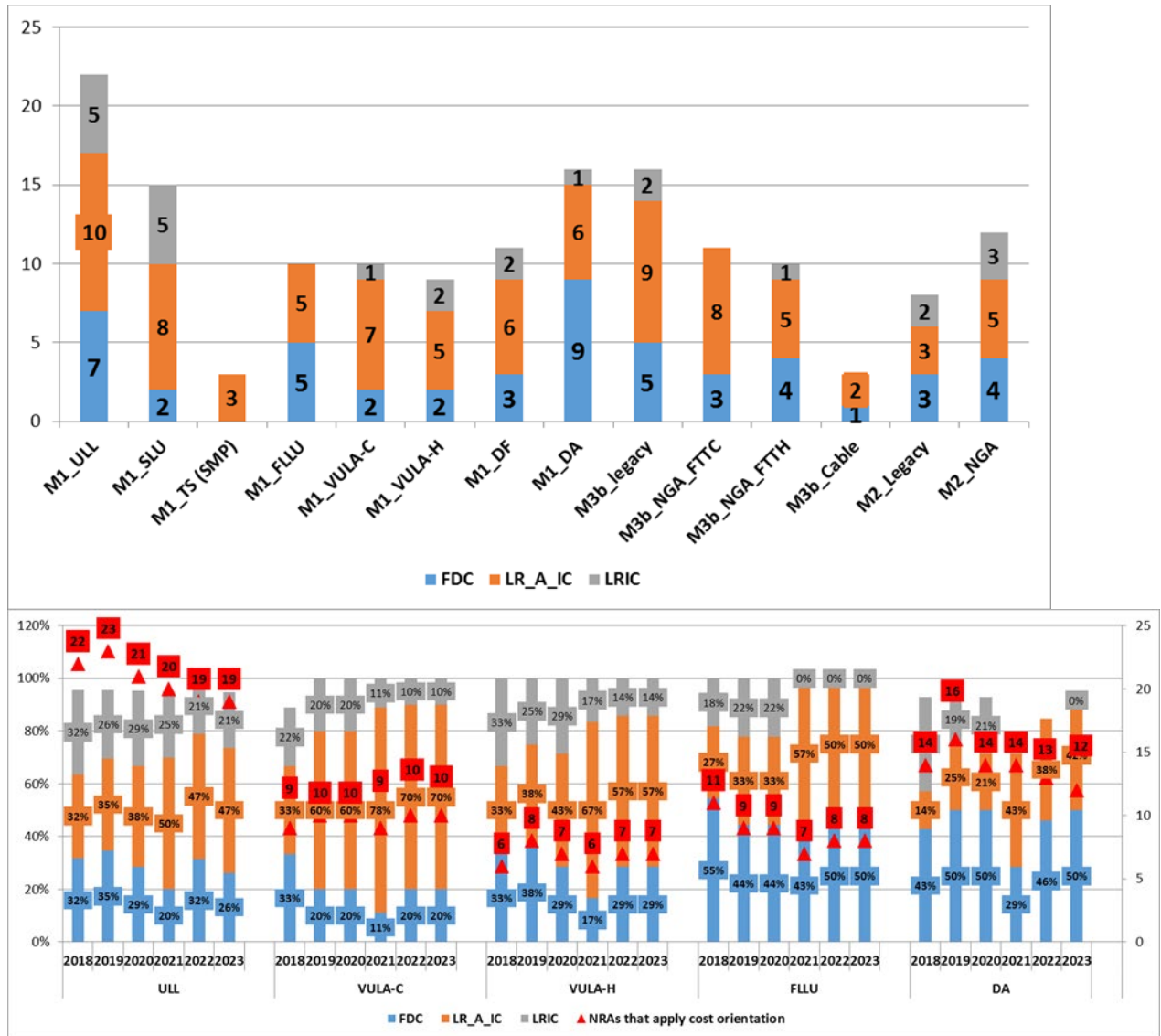


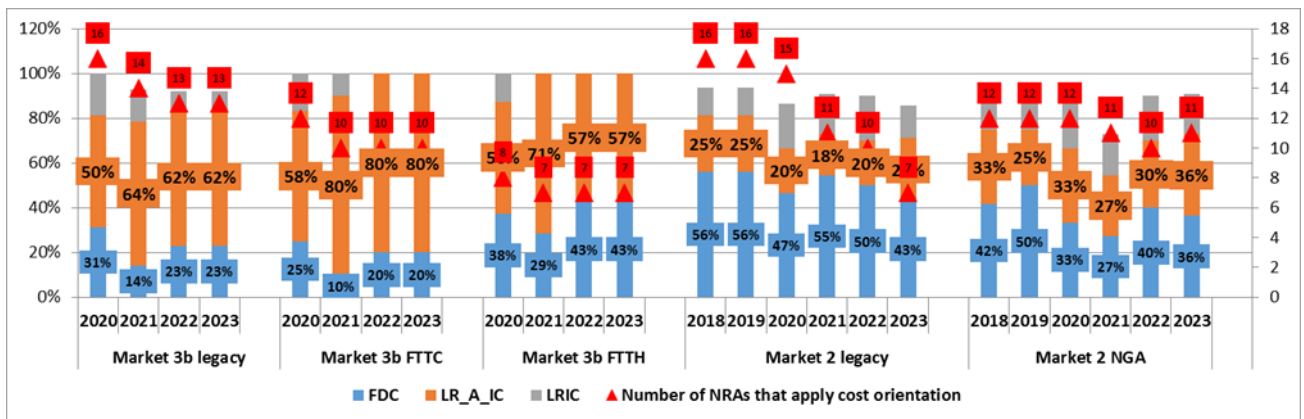
Source: BEREC RA Database 2023

Cost Allocation

Figure 37 shows the main cost allocation methodologies used in each market. Where no sub categories were selected, a hybrid approach is generally in use.

Figure 37 - Cost Allocation methods





Source: BEREC RA Database 2023

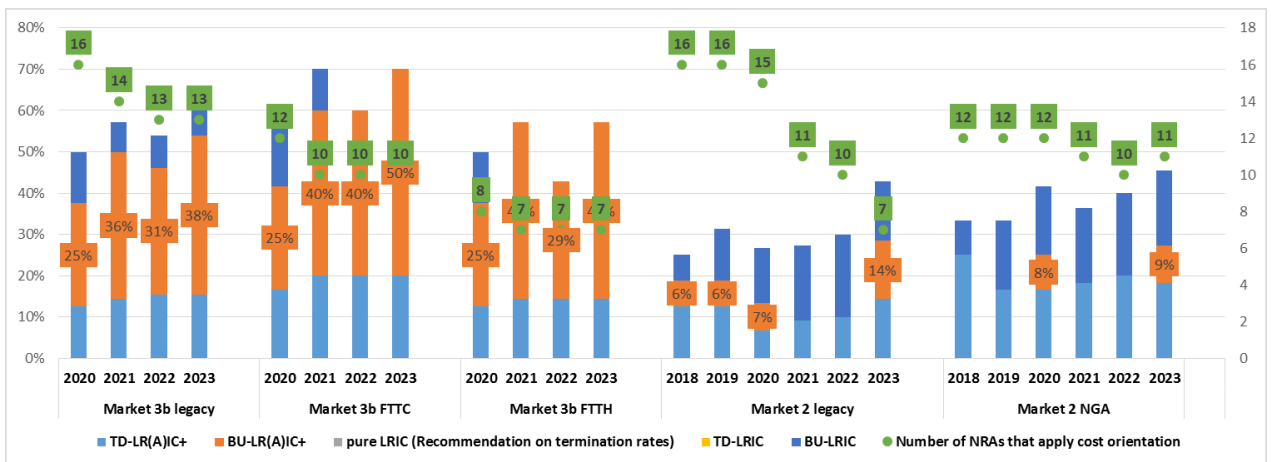
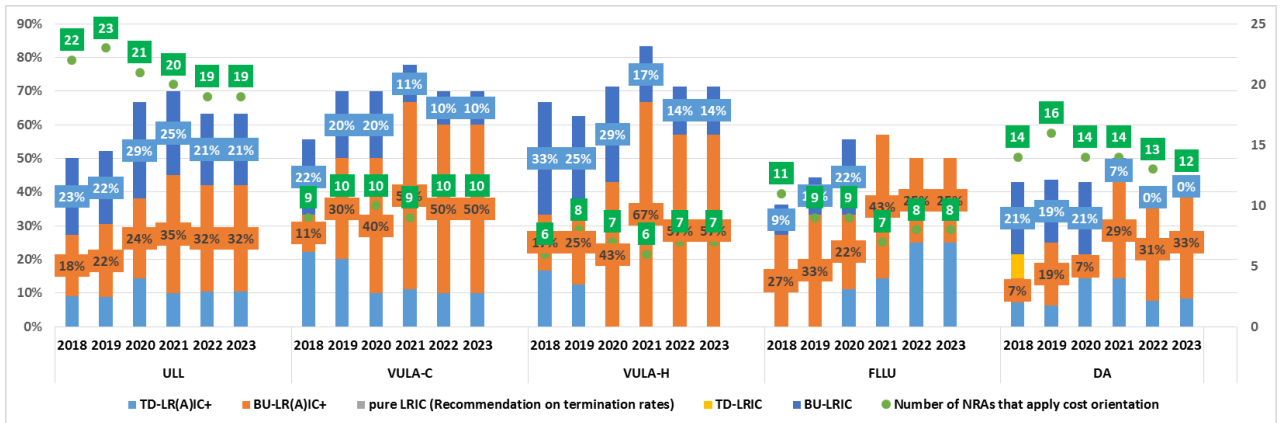
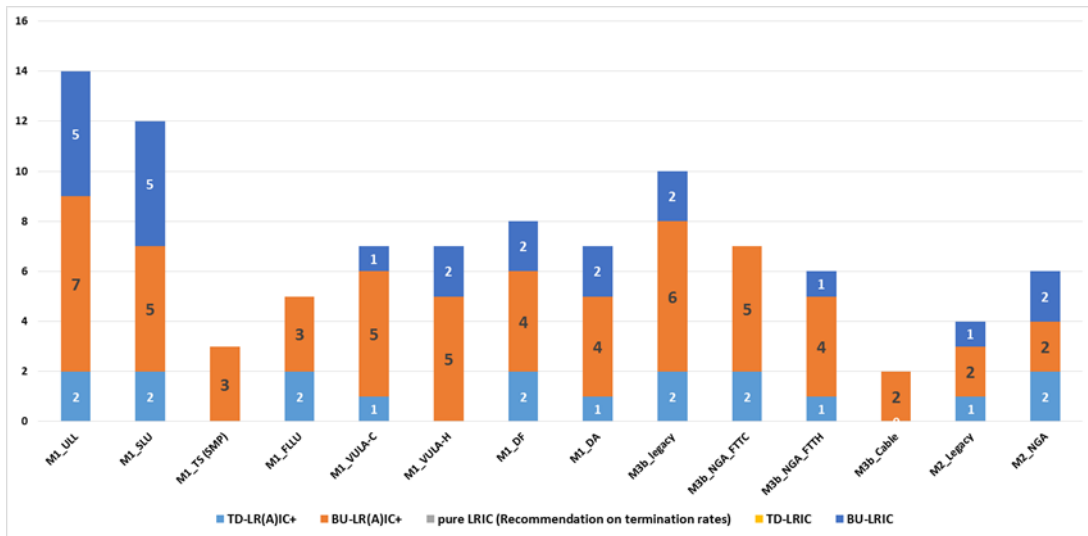
The most frequent cost allocation approach remains LRIC/LR(A)IC for almost all products/markets. FDC is a frequent approach for DA and market 2 legacy network. In comparison to last year it should be noted that NRAs that have removed regulation have applied a LR(A)IC approach more frequently. Insofar, the percentage increase of FDC in all markets can be attributed to the fact that the regulatory path is still at an intermediate stage. For example all NRAs that use FDC for FLLU have a high market share of SMP in the retail market (LT, LV, EE, FI). No changes from LR(A)IC to FDC can be observed over time.

The modelling approach is generally the preferred option where cost orientation is applied as a price control method (the number of NRAs that apply cost orientation is decreasing over time i.e. for LLU 23 NRAs in 2019 to 19 NRAs in 2023 and for legacy market 3b from 16 in 2020 to 13 in 2023) confirming a reduction of the regulatory pressure as competition conditions improve.

In Figure 38 the sub categories of allocation methodologies are represented⁶³. As for the main categories, NRAs that apply a price control method are depicted in terms of percentage of adoption of the corresponding methodology. When LR(A)IC/LRIC has been chosen as the main category, the most common approach is Bottom-up. Where no sub categories are selected, a hybrid approach is generally in use.

⁶³ The sum for sub categories is lower than the record for the main category where NRAs did not provide information on sub categories.

Figure 38 - Allocation methods LR(A)IC-LRIC sub categories



Source: BEREC RA Database 2023

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

To obtain a more accurate picture of the NRAs regulatory accounting approach, we analyse how price control and costing methodologies are applied according to main indicators of the competitive situation. This section provides an overview 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.⁶⁴

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

Figure 39 - 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 2023

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.

Differences between 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.

3.4.2 Products in Market 1/2020 and 2/2020

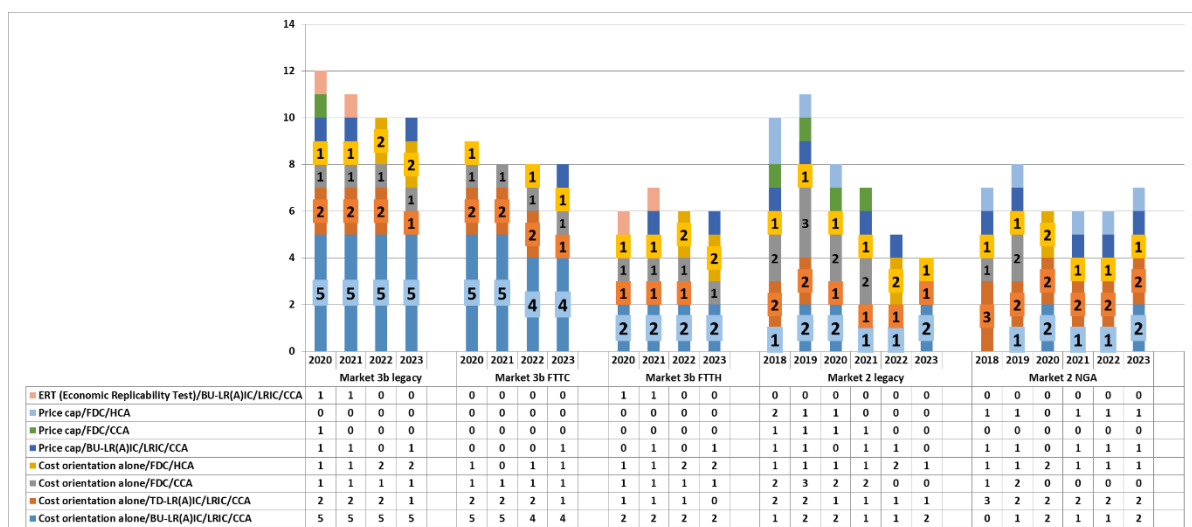
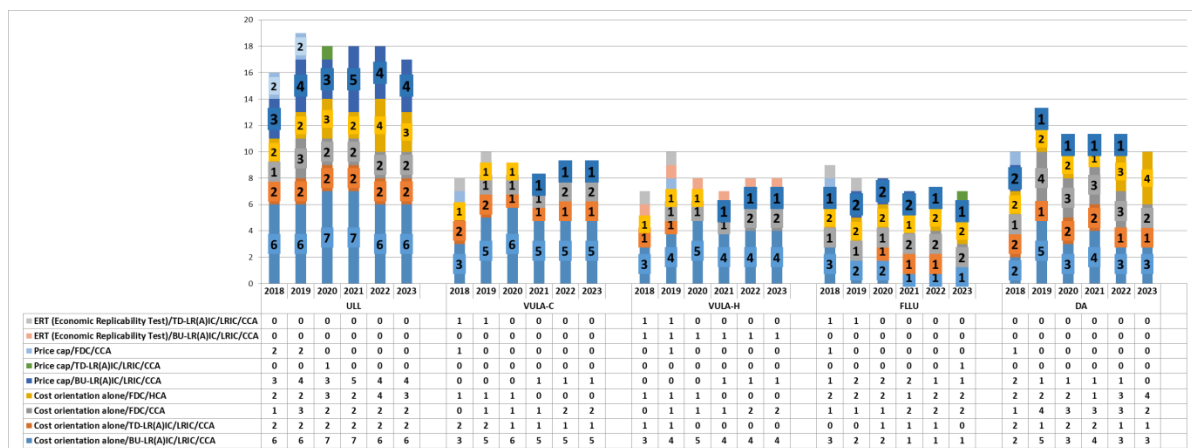
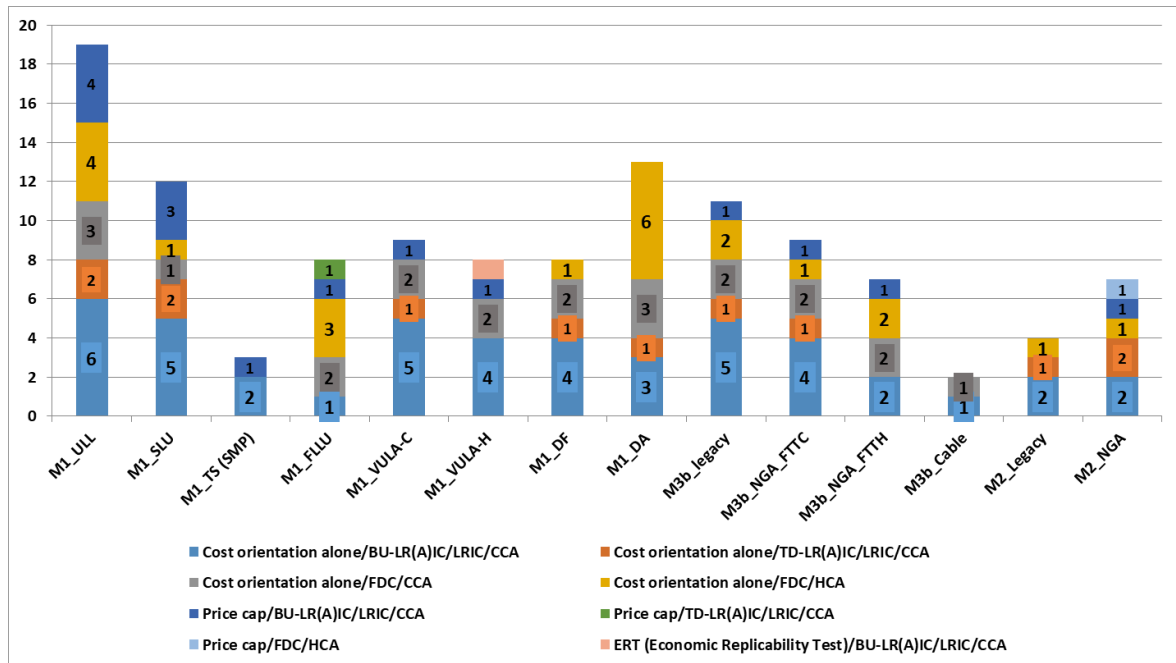
In Figure 40 the combination of costing methodologies and price control is represented for products in market 3a (only combinations with at least two records are shown). There seems to be no clear preference for costing methodologies in relation to the kind of price control in use, apart from the main legacy product (LLU). For this product most NRAs apply a cost orientation alone/LRIC-LR(A)IC/CCA approach; a second group applies Price cap with a BU costing methodology approach. The same holds true for FTTC and FTTH in case those product are regulated. A more differentiated approach seems to emerge for FLLU, where a top down (or accounting) method is also frequent. In the same picture the evolution over time is provided considering only EU NRAs over the last four years. Where some form of price control is applied, the BU-LR(A)IC approach appears to be more

⁶⁴ NRAs that did not provide information on sub categories are not represented. For this reason the number of NRAs may differ from the number reported previously (overall number of NRAs that have provided information).

frequent for all products in relative terms with the only exception: FLLU (it is likely that regulation of this product is at an early stage while competition can be effectively achieved through VULA products).



Figure 40 – Combination price control / costing methodologies (ex Mk 2-M3a)



Source: BEREC RA Database 2023

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. Generally, there is an increase in the use of the combination of cost orientation/price cap with a BU-LRIC approach and a reduction of accounting methodologies based on FDC; A TD approach is the least frequent by far.

In general, NRAs have declared homogeneous costing methodologies for products in each market.

3.5 Implementation of the Non-discrimination and Costing Methodologies Recommendation

This section provides an update of the implementation of the NDCM (2013/466/EU)", with regard to costing methodologies mainly in market 1.

NRAs were asked in continuity with past years how they implement the framework of the Recommendation in Market 3a, by choosing the following options: i) Rec. 30-37 (CCA-BU LRIC+); or ii) Rec. 40; iii) Rec. 42.

Figure 41 - EC Recommendations

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 the costing methodology that they use at the time of entry into force of the Recommendation beyond the 31 st December 2016, if it meets the general objectives of consistency, predictability and price stability over time during the migration from legacy to NGA network (recital 25-28) and <i>inter alia</i> : <ol style="list-style-type: none"> <li data-bbox="576 1249 1465 1317">i. it should reflect a gradual shift from the copper network to an NGA network; <li data-bbox="576 1317 1465 1417">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="576 1417 1465 1518">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="576 1518 1465 1585">iv. it should require only minimal modifications with respect to the costing methodology already in place.
Rec. 42	In those Member States, where at the time of entry into force of the Recommendation, the monthly rental prices for the full unbundled copper local loop fall within the price band, as adjusted according to the Union average (annual) retail price index, NRAs may continue to apply until 31 December 2016 the costing methodology that they use at the time of entry into force of this Recommendation. This is without prejudice to the possibility for NRAs complying with point 40 to continue to apply such methodology beyond this period. NRAs must bear in mind the objectives of regulatory transparency and predictability as well as the need to ensure price stability without significant fluctuations.

The adoption of the 2013 Recommendation on costing methodologies is reported in Figure 42 in relation with the specific Recommendation adopted. NRAs that apply both cost orientation and declared to follow the corresponding methodology for copper LLU prices are considered. It should be pointed out that, when NRAs apply the Commission Recommendation approach, the same is applied for all products/markets where costing methodology is required to implement the corresponding price control; this is in line with the principle that all access services are coherently priced along the network value chain.

Figure 42 - NRA implementation of EC Recommendations

Recommends 30-37 (CCA BU- LRIC+)	Recommend 40	Recommend 42
11	2	2
CY DE EL ES FR HR HU IE IT LU SE	EE LV	LI ⁶⁵ RS

Source: BEREC RA Database 2023

Other countries where regulation on ULL (or other products) does not consider cost orientation as price control or where the Recommendation is not applied, the following can be summarised:

Country	Application of the Recommendation 2013	Comment
AL	NO	definition of maximal price
BE	Yes partially (VULA-H)	Copper prices were set prior to the 2013 Rec. VULA FTTH is still not available, but however rental fees are set with a Fair pricing (reasonable margin above costs) and checked considering a BU-LRIC+ approach in line with the methodology of the Commission Recommendation
CZ	Yes for all product where a price control is imposed (Recommends 30-37 (CCA BU-LRIC+))	CTU follows the Recommendation where applicable, as the SMP operator CETIN has not been imposed a cost orientation obligation on LLU, in light of the structural separation in charge. Recommendations are irrelevant in this respect. Nevertheless, this is only current situation, before lifting cost orientation on LLU in 2018, prices were set in line with the methodology set in Recommendation.
FI	NO (FDC-CCA approach)	Due to supreme court decision (11/2020) price caps are no longer valid and LRIC-model, as it is, can not be implemented for 3 biggest operators. Situation of the update of the model is open.
LT	NO	According the situation of Lithuania, RRT doesn't plan to build LRIC+ model, because of: a) SMP network was build long time ago, so in the light of "build or buy" decision, the SMP's asset indexed by current value, would give enormous incomes, comparing to current ones; b) 50-80% of total costs is costs for long-term assets depreciation; c) current prices in Lithuania are very low, comparing to EU level; d) implementation of LRIC model in Lithuania would increase level of wholesale services prices, so retail prices level aswell. RRT believes that this scenario and possible results of LRIC model would contradict aims mentioned in article 8 of 2002/21/EU directive. e) investments in NGN in Lithuania is very high. f) volume of services (copper access products) is highly decreasing yearly.
PL	NO	Cost orientation, but with a TD model not following the recommendation
PT	NO	FDC-HCA but not relevant product

⁶⁵ This is consistent with the actual regulation in charge for ULL over copper (new model is going to be applied when FLLU will be available)

NO	NO (HCA cost base is in use)	The model calculates asset requirements on a bottom-up basis with a mark-up to recover common cost. The model use a RAB for all copper assets which means that the approach is not a LRIC calculation for the copper network
SI	Partially	Obligation of ERT and technical replicability test without cost orientation, BU-LRIC model is used for some input of the test and co-location
SK	Partially	Obligation of ERT without cost orientation, BU-LRIC model is used for some input of the test and co-location
MT	NO	not relevant anymore

Based on Rec. 30-37 and 40 of the Commission Recommendation, a few relevant questions have been included to address some other elements related to network modelling: i) how take up and demand issues are addressed for cost calculation and which technology is used for estimating the costs, as well as some implementation issues of the cost models; ii) if and how reusable civil infrastructure is taken into account; iii) what is the asset life of underground civil infrastructure considered.

The take-up issue in the model refers to the level of service demand considered for the service increment and the technology used for estimating the cost of services. This means that the cost of services that are based on copper (ULL, SLU), or partially on copper (VULA-C), may be based on the architecture on which the services are effectively sold or, differently, based on the more efficient technology. The Recommendation suggests to define costs based on an efficient NGA network, capable of delivery the DEA target⁶⁶ asking NRAs to address the issue of price stability with respect to the volume reduction due to the transition from the old technology in favour of the new one.

On this aspect some questions have been included in the survey to address take-up and price stability with the following questions: i) "What target coverage and take-up do you consider in your model?"; ii) "Architecture used to model the service costs"; iii) "Coverage NGA (FTTC/FTTH) Target Time"; iv) "Kind of cost calculation (national average/or sub national)".

The survey provided some interesting results. Three technologies, Copper (LLU), FTTC (VULA-C), FTTH (FLLU, VULA-H) are reported separately (they are reported in an aggregated way when the distinction between technologies is not relevant). In general, NRAs that apply the Recommendation address the issue of the target coverage and take-up in defining a national coverage model with a forward-looking perspective. The costs are always estimated at a national level and for copper based services the cost is estimated more frequently using an (efficient) FTTH network instead of a copper based one.

Figure 43 - NRAs information on target coverage

Questions	Options	copper	FTTC	FTTH
What target coverage and take-up do you consider	DEA (2020 digital Agenda For Europe)	3 (FR,HU,HR)	1 (HU)	1 (HU)
	Gigabit connectivity target		-	1 (IT)
	Other	3 (CZ, LU, SE)		

66 The coverage at least of 30 Mbps to 100 % and take-up of the population at 50 % at 100 Mbps. Draft Gigabit Recommendation updates the take-up and coverage statement following the new "Gigabit target" in substitution of the "DEA target", moreover the price stability issue is still relevant specifically in case an "anchor product" based partially or wholly on copper is still present and relevant for the market.

in your model?				
How does service take-up affect your model?	Only volume on third party infrastructures affect the service take-up	1 (IT)	1 (IT)	1 (IT)
	Economic depreciation are applied			1 (BE)
	Sunk cost are shared proportionally between services volume within a single infrastructure	3 (CZ, EL, HU)	2 (EL, HU)	2 (EL,HU)
	Other	3 (FR, LU, SE)		
Architecture considered for cost calculation of the service	FTTH	5 (DE, ES, FR, HR, SE)	0	2 (HR, IT)
	FTTE-FTTC-FTTH	2 (CY,HU)	1 (HU)	1 (HU)
	FTTH-FTTC	2 (EL, LU)	1 (EL)	1 (EL)
	FTTE-FTTC	0	2 (IT,IE)	0
	FTTE	1 (IT)	0	0
	Other	0	0	0
Main coverage	National	10 (CY,DE,EL,ES,FR,HR,HU,IT,LU,SE)		
	Sub national		0	
	Other		0	
Coverage NGA (FTTC/FTTH) Target Time	Forward Looking	9 (CY,DE,EL,ES,FR,HR,HU,IT)		
	As is		1 (LU)	
	Other		1 (SE)	
Coverage (NGA (FTTC/FTTH))	SMP coverage		4 (CY,ES,HR,LU)	
	OAO coverage		0	
	SMP+OAO coverage		2 (DE,EL)	
	National		4 (FR,IT,HU,SE)	
	Sub national		0	
Cost calculation	Other		0	
	National average	11 (CY,DE,EL,ES,FR,HR,HU,IE,IT,LU,SE)		
	Target areas where regulation is in charge		0	
Other comments received	SE (A model of an hypothetically efficient operator with an NGA network is considered)			
	FR (The model is based on FTTH that neutralizes the effects of copper network drainage).			
	IT(The model starts with a dimensioning process based on a full fiber network (FTTH) after that to evaluate the cost for other technologies (FTTE and FTTC) a substitution of the Fiber components has been considered with efficient copper based component).			

Source: BEREC RA Database 2023

The second main issue addressed by the Commission Recommendation, which is also relevant in the new (draft) Gigabit Recommendation, is how reusable civil infrastructure is taken into account in the model. In the following table a resume of the replies provided by the NRAs are reported. Almost all NRAs that apply the Commission Recommendation take into account reusable civil infrastructure for cost calculation when relevant. No differences are detected in the approach between different product market, meaning that already depreciated asset are treated in the same way for estimating costs, where relevant, for copper, NGA and VHCN services. CEI, both underground and poles, can be considered reusable; in some countries only underground civil infrastructure (duct and manhole) is considered reusable (IT, SE). 7 NRAs (IE, FR, HR, HU, LI, NO) considered all CEI to be reusable including poles and underground facilities. Most respondents (6) consider only legacy copper infrastructures reusable (BE, CZ, HU, IE, IT, SE), when others consider both legacy copper infrastructures and new VHCN infrastructures as a reusable asset (FR, LI⁶⁷, LU, NO). Few NRAs also consider copper cables to be a reusable asset. In that case an economic lifetime of the infrastructure is considered longer than the general book value.

A question on duct access, namely pricing differences between old and new infrastructure⁶⁸ reveals that no NRAs applies different prices for old and newly build duct access infrastructure.

Figure 44 - NRA information on civil infrastructure

Question	Options	Replies
Do you take into account reusable civil infrastructure?	Yes	17 (CY,CZ,DE,EE,EL,ES,FR,HR,HU,IE,IT,LU,NO,RS,SE,SI,SK)
	Only legacy copper infrastructures	7 (BE,CZ,HU,IE,IT,LI,SE)
	Both legacy copper infrastructures and new VHCN infrastructures	3 (FR,LU,NO)
Which infrastructure do you consider to be reusable?	Comment received on which elements are taken into account when considering reusable civil infrastructure?	(IT) Reusable infrastructure (underground) are only considered if not specific check and work for de-saturation activity should be done, so only legacy ducted trenches have been considered reusable. In the Italian case the copper network have been build up using a direct buried approach; Ducts and Manholes (SE); (FR,HR,HU,LI,NO) All ducts, manhole, Poles are considered reusable ; (IE) For poles 80% was reusable and 20% (over the course of an NGA deployment) in need of replacement. For ducts the infrastructure is considered reusable depending on the rates of incidence remediation activities per kilometre (e.g. number of blockage clearances per kilometre);

⁶⁷ This is valid only for VHCN services, in other case only legacy infrastructures are considered relevant for copper LLU

⁶⁸ At recommend n.56 of the draft Gigabit Recommendation state that: "NRAs should set individual prices for access to newly built civil-engineering infrastructure of the SMP operator whenever: (i) cost orientation has been imposed for both the legacy and the newly built civil-engineering infrastructure and (ii) where the newly built civil-engineering infrastructure has already become widespread within the concerned area. NRAs should ensure that prices for access to newly built civil-engineering infrastructure reflect current market conditions and are based on the full costs incurred by the SMP operator, as long as strict non-discrimination is ensured for access to these infrastructures."

Which method do you use to consider already-depreciated infrastructures?	The depreciated asset are no longer included in the RAB and estimated at book value using accounting data from the SMP operator (CZ,DE,ES,EE,FR,HR,NO,SE,SK); Indexation method (EL,HU,IE,SI); The amount of already depreciated asset is obtained as the product between the amount of civil infrastructures that can be considered reusable with respect to the BU-LRAIC estimation, with the percentage of asset life already depreciated (IT).	
What percentage of underground civil infrastructure do you consider to be reusable with respect to all underground civil infrastructures included in the RAB model?	<10% (BE,IT);<20% (SE);<50% (HR);<80% (LU); >90% (CZ,FR, EL, EE, HU,LI,RS)	
Average asset life already depreciated of the underground civil infrastructure that you consider reusable	<20 (CZ,SE); <=30 (EE,ES);<=40 (IT,LU);HU (>40)	
Asset life of all other underground civil infrastructure	<30 (EE); <=40 (CZ, EL,IT,LU,SE);>40 (FR,HU,SK)	
Do you consider copper cable reusable?	Yes	6 (CZ,EE,IT,NO,SI,SK)
Asset life of copper cable (number of years)	20 (EE,SI); 36 (CZ); 50 (IT- for distribution network; NO - 12-25 regulatory lifetime)	
Do you differentiate prices for new and old infrastructure (reply for Duct access product)?	No NRA replies «Yes» to this question	

Source: BEREC RA Database 2023

3.6 Cost model technical implementation

In line with past editions of the regulatory accounting report some information on technical cost model implementation by NRAs are reported in the following table. The replies are reported without differentiating between single product market, as is the case for reusable civil infrastructure. No differences are observed when the replies by NRAs are provided for more than one product/market.

Figure 45 summarises the main approaches by NRAs to implement cost models. The replies reported are independent of the specific price control and costing methodology adopted by each NRAs and refer to the implementation of the models that support the price control and costing methodologies.

As a general question NRAs were required to provide information on the asset base of the model used; most replies consider a Bottom-up basis as a main instrument; a scorched node or modified scorched node⁶⁹ approach is generally applied by most of the NRAs; the local central office /ODF area covered is also the main approach to start the design project of the

⁶⁹ 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.

network. For FTTH a GPON solution is the most frequent architecture to calculate the cost of services.

In the survey some other element have also been addressed *inter alia* one question on the treatment of the inflation rate inside the model implementation. Point 61 of the Commission Notice on WACC: “Investors maximise their inflation-adjusted or real returns. There are typically two ways in which NRAs take inflation into account: a) inflation is compensated for through the annual indexation of the company’s assets and only a real WACC return is allowed; or b) inflation expectations are included in the return on capital, by using a nominal WACC, without any adjustment to the company’s asset base.” The replies received are not extensive and both options (a and b) included in the Commission Notice on WACC are considered by NRAs without a specific “more frequent” approach.

Figure 45 – General network modelling approach

Questions	Options	Replies
Asset Base	BU (Bottom up)	13 (BE,CY,CZ,DE,EL,FR,HR,HU,IT,LU,ME,NO,SE)
	TD (Top down)	5 (EE,LI,PL,RS,SI)
	Hybrid	2(ES,IE)
Model main assumption ⁷⁰	Scorched Node	8(BE,CY,CZ,ES,HR,HU,IT,SI)
	Scorched earth	PL
	Modified Scorched node	8(DE,EL,FR,IE,LU,ME,NO,SE)
	Other	1 (EE)
Model geographical unit	MDF/ODF area	13(BE,CY,EE,EL,ES,FR,HU,IE,IT,LU,NO,RS,SE)
	Municipality	0
	Municipality/MDF-ODF area	2(DE,PL)
	Other	2(HR,ME)
Architecture FTTH	GPON/P2P	2(FR,LU)
	GPON	9(CY,CZ,EE,EL,ES,HR,HU,IT,RS)
	P2P	2(DE,SE)
	Other	0
How do you include the asset price development?	Already in the nominal WACC (point 61-b Commission WACC notice)	3(IT,LI,SI)
	Explicitly in the asset base in combination of real WACC (point 61 -a Commission WACC notice)	3 (BE,FR,HU)
	Allowing direct adjustment of inflation on the final price (ex. $Price * (1 + Allowed\ IR)$)	2(LU,ME)
	Other	1 (CZ)
Number of Local central office/point of interconnection considered		600 (BE); 8187 (FR); 348 (HR) 10000 (IT); 35 (LI);100 (LU); 6400 MDF/200 ODF (RS); 3122 (SE)

⁷⁰ The information reported is independent from the main price control method (such as Cost orientation/Price cap/ERT) declared by NRAs in each market.

Cost per meter (digging) new civil infrastructure (average value)	985 CZK/m - 42 Euro/m (CZ); 40-50 Euro/m (FR); 67,85 Euro/m (HR); 37 (VHCN)-42(copper) Euro/m (IT); 10 Euro/m (RS); 595 SEK/m- 54,3 Euro/m (SE)
Cost per meter (pole) new civil infrastructure (average value)	11-13 Euro/m (FR); 1,05 Euro/m (HR);6.3 Euro/m (IT);
What percentage (%) is the poles length trace included in your model with respect to the whole trace length: (length of pole trace)/(total trace length)?	<40% (FR);<40% (HR);<50%(IT)<10%(SE)
Do the SMP plans of copper network switch-off have an impact on the model?	No relevant replies on this item

In the following Figure legacy ULL services and adopted costing methodology is shown. The reported price bands have been evaluated considering a compound inflation rate from 2014 until 2021 (HIPC) for each country.⁷¹ The other tables show replies provided by NRAs for all other products/markets.

⁷¹ <https://ec.europa.eu/eurostat/databrowser/view/tec00118/default/table?lang=en>. The compound inflation rate is considering the time window 2014 -2021. Where not available, the EU (27) compound inflation rate has been considered. The low and high value of the price band have been evaluated as $8-10 \cdot (1 + \text{inflation rate}_{2014}) \cdot (1 + \text{inflation rate}_{2015}) \dots \cdot (1 + \text{inflation rate}_{2021})$.

Figure 46 – LLU monthly fee and costing methodology/ price band

Regulated product	Price control main category	Price control Sub category	Allocation method main category	Allocation method subcategory	Cost base	Annualization method	Equivalence model	Margin squeeze	Price declared	Price band low	Price band high	Compound inflation rate (2014-2022)	
AL	Yes	Cost_Orientation	Price cap alone	0	0	0	0	0	5.71 Euro or 664 ALL;	9.53	11.91	1.19	
BE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ex-post MS test	8.03	9.96	12.45	1.24
CY	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Straight-line (linear depreciation)	EOO	ERT (Economic Replicability Test)	8.7	8.66	10.83	1.08
CZ	Yes	Others/Combina						EOI	ex - ante MS test € 7,36 / 175 CZK	10.64	13.30	1.33	
DE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Annuity		ex - ante MS test	10.65	9.65	12.06	1.21
EE	Yes	Cost_Orientation	Cost orientation alone	FDC		HCA	Straight-line (linear depreciation)	EOO	ex-post MS test	4.94	11.04	13.80	1.38
EL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ERT (Economic Replicability Test)	7.71	8.67	10.84	1.08
ES	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Economic depreciation	EOI		8.6	9.20	11.50	1.15
FI	Yes	Cost_Orientation	Cost orientation alone	FDC		CCA	Straight-line (linear depreciation)				9.19	11.49	1.15
FR	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	10,04/access/month		9.19	11.49	1.15
HR	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ex - ante MS test	5.24	9.37	11.71	1.17
HU	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Tilted annuity	EOO	1610 HUF/month		10.99	13.73	1.37
IE	Yes	Cost_Orientation	0	LR_A_IC		CCA	Tilted annuity		€13.14 per line per month		8.99	11.24	1.12
IT	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Annuity	EOI	ex - ante MS test (Euro/month)	9.91	9.15	11.43	1.14
LI	Yes	Cost_Orientation	Cost orientation alone	FDC		HCA	Straight-line (linear depreciation)			13.3	8.24	10.30	1.03
LT	Yes	Cost_Orientation	Cost orientation alone	FDC		HCA	RAV (Regulatory Asset Value)		ex-post MS test		10.95	13.69	1.37
LU	Yes	Cost_Orientation	Price cap alone	LRIC	BU-LRIC	CCA	Tilted annuity			8.88	9.56	11.94	1.19
LV	Yes	Cost_Orientation	Cost orientation alone	FDC		CCA	Straight-line (linear depreciation)	Other		8,34	10.61	13.26	1.33
ME	Yes								4.075 Euro/monthly		9.66	12.07	1.21
MT	Yes										9.27	11.59	1.16
NO	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	HCA	Economic depreciation	EOO	94 NOK	10.36	12.95	1.29	
PL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Tilted annuity	EOO	ERT (Economic Replicability Test)		10.29	12.86	1.29
PT	Yes	Cost_Orientation	Cost orientation alone	FDC		HCA	0	EOO		8.99	9.07	11.34	1.13
RS	Yes	Cost_Orientation	Cost orientation alone	FDC		CCA	Straight-line (linear depreciation)	EOO		5,35 eur	10.68	13.36	1.34
SE	Yes	Cost_Orientation	Price cap alone	LRIC	BU-LRIC	CCA	Tilted annuity	EOO		84,67 SEK	9.64	12.06	1.21
SI	Yes	Others/Combina		LRIC	BU-LRIC	CCA	Tilted annuity	EOI		5.46	9.31	11.63	1.16
SK	Yes	Others/Combina						EOI	ERT (Economic Replicability Test)	4.2	9.96	12.45	1.24

Figure 47 – SLU monthly fee and costing methodology

Countries	Regulated product	Price control main category	Price control Sub category	Allocation method main category	Allocation method subcategory	Cost base	Annualization method	Equivalence model	Margin squeeze	Price declared
CY	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Straight-line (linear depreciation)	EOO	ERT (Economic Replicability Test)	5.45
CZ	Yes	Others/Combination	0	0	0	0	0	EOI	ex - ante MS test	€ 1,09 / 26 CZK
DE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Annuity	0	ex - ante MS test	7.2
EL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ERT (Economic Replicability Test)	3.91
ES	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Economic depreciation	EOI	0	0
FR	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	0	10,04/access/month
HU	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Tilted annuity	EOO	0	979 HUF/month
IE	Yes	Cost_Orientation	0	LR_A_IC	0	CCA	Tilted annuity	0	0	€10.18 per line per month
IT	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Annuity	EOI	ex - ante MS test	5.89 (Euro/month)
LT	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	RAV (Regulatory Asset Value)	0	ex-post MS test	0
LU	Yes	Cost_Orientation	Price cap alone	LRIC	BU-LRIC	CCA	Tilted annuity	0	0	5.57
LV	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Straight-line (linear depreciation)	Other	0	4,17
ME	Yes	0	0	0	0	0	0	0	0	0,9945 Euro/monthly in 2024; 0.8291 Euro/monthly in 2025 and 0.6636 Euro/monthly in 2026
MT	Yes	0	0	0	0	0	0	0	0	0
NO	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	HCA	Economic depreciation	EOO	0	77 NOK
PL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Tilted annuity	EOO	ERT (Economic Replicability Test)	0
SE	Yes	Cost_Orientation	Price cap alone	LRIC	BU-LRIC	CCA	Tilted annuity	EOO	0	74 SEK

Figure 48 – FLLU monthly fee and costing methodology

Regulated product	Price control main category	Price control Sub category	Allocation method main category	Allocation method subcategory	Cost base	Annualization method	Equivalence model	Margin squeeze	Price declared	
AL	Yes	Cost_Orientation	Price cap alone	0	0	0	0	0	0	
BE	Yes	Others/Combination	0	LR_A_IC	BU-LR(A)IC+	CCA	0	EOO	ex-post MS test	0
CZ	Yes	Others/Combination	0	0	0	0	0	EOI	ex - ante MS test	€ 65,80 / 1 564 CZK
DE	Yes	Cost_Orientation	0	LR_A_IC	TD-LR(A)IC+	CCA	Annuity	0	ex - ante MS test	0
DK	Yes	0	0	0	0	0	0	0	0	0
EE	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	Straight-line (linear depreciation)	EOO	0	60
FI	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Straight-line (linear depreciation)	0	0	Prices consists of 3 biggest operators. DNA 13,50 Euro, Telia 27,50 Euro, Elisa 16,00 Euro
HR	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ex - ante MS test	0
HU	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Tilted annuity	EOO	0	1379 HUF/month from the ODF;
IE	Yes	0	0	0	0	0	0	0	0	0
LI	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	Straight-line (linear depreciation)	0	0	provisional pricing of CHF 18.00 per month
LT	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	RAV (Regulatory Asset Value)	0	ex-post MS test	0
LU	Yes	Others/Combination	0	0	0	0	0	EOI	ERT (Economic Replicability Test)	0
LV	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Straight-line (linear depreciation)	Other	0	2,74
ME	Yes	0	0	0	0	0	0	0	0	0
NO	Yes	No price control/Price Flexibility	0	0	0	0	0	EOO	0	0
PL	Yes	Cost_Orientation	Price cap alone	LR_A_IC	TD-LR(A)IC+	CCA	Tilted annuity	EOO	ERT (Economic Replicability Test)	0
SE	Yes	No price control/Price Flexibility	0	0	0	0	0	EOI	ERT (Economic Replicability Test)	0
SI	Yes	Retail_minus	ERT (Economic Replicability Test)	0	0	0	0	EOI	ERT (Economic Replicability Test)	0
SK	Yes	Others/Combination	0	0	0	0	0	EOI	ERT (Economic Replicability Test)	0

Figure 49 – VULA-C monthly fee and costing methodology

Countries	Regulated product	Price control main category	Price control Sub category	Allocation method main category	Allocation method subcategory	Cost base	Annualization method	Equivalence model	Margin squeeze	Price declared
BE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	0	EOO	ex-post MS test	0
CY	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Straight-line (linear depreciation)	EOI	ERT (Economic Replicability Test)	8.24
CZ	Yes	Others/Combination	0	0	0	0	0	EOI	ex - ante MS test	€ 7,57 / 180 CZK
DE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Annuity	0	ex - ante MS test	7.85
EL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ERT (Economic Replicability Test)	8.10-8.54 depending on profiles
FI	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Straight-line (linear depreciation)	0	0	0
HR	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ex - ante MS test	0
HU	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Tilted annuity	EOO	0	2035 HUF/month w/o TV - 3441 HUF/month w 3 HD TV channel (and 0 SD channel)
IE	Yes	Cost_Orientation	0	LR_A_IC	0	CCA	Economic depreciation	0	ex - ante MS test	€18.54 per line per month
IT	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Annuity	EOO	ex - ante MS test	13.07 (Euro/months)
LV	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Straight-line (linear depreciation)	Other	0	5,50
ME	Yes	0	0	0	0	0	0	0	0	0
SI	Yes	Retail_minus	ERT (Economic Replicability Test)	0	0	0	0	EOI	ERT (Economic Replicability Test)	0
SK	Yes	Others/Combination	0	0	0	0	0	EOI	ERT (Economic Replicability Test)	8.2

Figure 50 – VULA-H monthly fee and costing methodology

Countries	Regulated product	Price control main category	Price control Sub category	Allocation method main category	Allocation method subcategory	Cost base	Annualization method	Equivalence model	Margin squeeze	Price declared
BE	Yes	Others/Combination	0	LR_A_IC	BU-LR(A)IC+	CCA	Economic depreciation	EOO	ex-post MS test	From 19 to 44€ depending on the profile
CY	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Straight-line (linear depreciation)	EOI	ERT (Economic Replicability Test)	8.24
CZ	Yes	Others/Combination	0	0	0	0	0	EOI	ex - ante MS test	€ 7,57 / 180 CZK
EL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ERT (Economic Replicability Test)	11.9-23.94 (depending on profiles)
ES	Yes	Retail_minus	ERT (Economic Replicability Test)	LRIC	BU-LRIC	CCA	Economic depreciation	EOI	ERT (Economic Replicability Test)	16.68
FI	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Straight-line (linear depreciation)	0	0	0
HR	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ex - ante MS test	0
HU	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Tilted annuity	EOO	0	2299 HUF/month w/o TV - 3794 HUF/month w 3 HD TV channel
IE	Yes	Others/Combination	0	0	0	0	0	0	ex - ante MS test	23.50 per line per month
IT	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Annuity	EOI	ex - ante MS test	14.26 Euro/month
LU	Yes	Others/Combination	0	0	0	0	0	EOI	ERT (Economic Replicability Test)	0
LV	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Straight-line (linear depreciation)	Other	0	5,50
MT	Yes	Retail_minus	ERT (Economic Replicability Test)	0	0	0	0	0	0	0
NO	Yes	Others/Combination	0	0	0	0	Straight-line (linear depreciation)	EOO	ERT (Economic Replicability Test)	0
SI	Yes	Retail_minus	ERT (Economic Replicability Test)	0	0	0	0	EOI	ERT (Economic Replicability Test)	0
SK	Yes	Others/Combination	0	0	0	0	0	EOI	ERT (Economic Replicability Test)	8.2

Figure 51 – Duct-access monthly fee and costing methodology

Countries	Regulated product	Price control main category	Price control Sub category	Allocation method main category	Allocation method subcategory	Cost base	Annualization method	Equivalence model	Margin squeeze	Price declared
BE	Yes	Others/Combination	0	LR_A_IC	BU-LR(A)IC+	CCA	0	0	ex-post MS test	Proposed tariffs by SMP operator are in the range of 0,30-2,72 €/meter, these are not approved by the BIPT (duct access is not being used)
DE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Annuity	0	ex - ante MS test	Dependent on number of users
EE	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	Straight-line (linear depreciation)	EOO	0	0,049 € per meter per cable site
EL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	0	0
ES	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	Straight-line (linear depreciation)	EOI	0	0
FR	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Tilted annuity	EOI	0	Non-mutualised deployments: 0,034€/cm2*m/month Mutualised deployments: 0,610/premise to pass/month Duct: 21028 HUF/km/month Pole: 82 HUF/piece/month
HU	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Tilted annuity	EOO	0	0
IE	Yes	Cost_Orientation	0	0	0	CCA	Tilted annuity	0	0	0
IT	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Annuity	EOO	0	underground civil infrastructures: 0.0653 Euro/meter/month; pole civil infrastructure 0.039 Euro/meter/month (available in the form of IRU pricing 15 Years)
LI	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	Straight-line (linear depreciation)	0	0	duct (access): CHF 0.676 per meter per month duct (backhaul): CHF 0.101 per meter per month
LT	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	RAV (Regulatory Asset Value)	0	ex-post MS test	0
LV	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Straight-line (linear depreciation)	Other	0	0
ME	Yes	0	0	0	0	0	0	0	0	40mm per meter 0.0700 Euro/monthly; 20mm per meter will be 0.0265Euro/monthly; less than 20mm 0.0244 Euro/monthly
NO	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	0	EOO	0	0
PT	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	0	EOI	0	Ducts (occupation for main ducts): 6.37€/km/cm2/month - Lisboa and Porto municipalities 4.88€/km/cm2/month - other municipalities Poles (pole occupation, per cable fixation): 1.00 €/month
RS	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Straight-line (linear depreciation)	EOO	0	up to 20mm is 0,081 eur/m/month. up to 40mm is 0,09 eur/m/month.
SI	Yes	Others/Combination	0	LRIC	BU-LRIC	CCA	Tilted annuity	EOI	0	72,09 EUR/km
SK	Yes	Cost_Orientation	Price cap alone	LRIC	BU-LRIC	0	0	Other	0	0

Figure 52 – Dark fiber fee and costing methodology

Countries	Regulated product	Price control main category	Price control Sub category	Allocation method main category	Allocation method subcategory	Cost base	Annualization method	Equivalence model	Margin squeeze	Price declared
CZ	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Tilted annuity	EOI	0	€ 0,064 - 0,13 / 1,53 - 3,09 CZK
DE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Annuity	0	ex - ante MS test	10.16
EL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	0	0
FR	Yes	Others/Combination	0	0	0	0	0	EOO	0	From 0,50/m/year to 1,80/m/year, depending on the location of the fiber and the number of lines
HU	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Tilted annuity	EOO	0	2150 HUF/km/month
IE	Yes	Cost_Orientation	0	0	0	CCA	Tilted annuity	0	0	€0.12 cents per metre/month
IT	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Annuity	EOO	0	0
LT	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	RAV (Regulatory Asset Value)	0	ex-post MS test	0
LV	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Straight-line (linear depreciation)	Other	0	0
ME	Yes	0	0	0	0	0	0	0	0	0
PL	Yes	Cost_Orientation	Price cap alone	LR_A_IC	TD-LR(A)IC+	0	Tilted annuity	EOO	ERT (Economic Replicability Test)	0
PT	Yes	Cost_Orientation	Cost orientation alone	0	0	0	0	EOO	0	0
RS	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Straight-line (linear depreciation)	EOO	0	Monthly rental fee for optical fiber without transmission equipment (dark fiber) in the local network: 1) for a pair of optical fibers 25,60 RSD/m (0,22 eur/m) 2) for one optical fiber 15,36 RSD/m (0,13 eur/m)
SI	Yes	Others/Combination	0	LRIC	BU-LRIC	CCA	Tilted annuity	EOI	0	0

Figure 53 – Market 3b legacy fee and costing methodology

Countries	Regulated product	Price control main category	Price control Sub category	Allocation method main category	Allocation method subcategory	Cost base	Annualization method	Equivalence model	Margin squeeze	Price declared
BE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ex-post MS test	12.96
DE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Annuity	0	ex - ante MS test	0
EE	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	Straight-line (linear depreciation)	EOO	0	7 - 29 € month per connection+ 0,83 € Mbps monthly backhaul
EL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ERT (Economic Replicability Test)	0
ES	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	0	EOI	0	8.6
FR	Yes	Cost_Orientation	Price cap alone	0	0	CCA	Tilted annuity	EOO	0	1 / Access component: fixed price (13,92€/month) 2/ Backhaul component: For Ethernet, component is 2.70 / month + [0.60 - 2.15]/Mbps
HR	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	0	0	0
HU	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Tilted annuity	EOO	0	Shared Lines (1195 HUF/month) Naked (2666 HUF/month)
IE	Yes	Cost_Orientation	0	LR_A_IC	0	CCA	Tilted annuity	0	ex - ante MS test	0
IT	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Annuity	EOO	ex - ante MS test	13.49 (access component) + bandwidth transport (29.56 Mbit/s/year (Co50)-40.92 Mbit/s/year (Co55))
LT	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	RAV (Regulatory Asset Value)	0	ex - ante MS test	0
LU	Yes	Others/Combination	0	0	0	0	0	EOI	ERT (Economic Replicability Test)	0
LV	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Straight-line (linear depreciation)	Other	0	8,12
NO	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	HCA	Tilted annuity	EOO	0	0
PL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	0	Tilted annuity	0	0	0
PT	Yes	0	0	FDC	0	0	0	EOO	ex - ante MS test	9.59
RS	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Straight-line (linear depreciation)	EOO	0	367 RSD (3,13 eur) for the xDSL access and 450 RSD (3,84eur) per Mb/s for traffic delivery
SI	Yes	Others/Combination	0	LRIC	BU-LRIC	CCA	Tilted annuity	EOI	0	0
SK	Yes	Others/Combination	0	0	0	0	0	EOI	ERT (Economic Replicability Test)	0

Figure 54 – Market 3b_fttc fee and costing methodology

Countries	Regulated product	Price control main category	Price control Sub category	Allocation method main category	Allocation method subcategory	Cost base	Annualization method	Equivalence model	Margin squeeze	Price declared
BE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ex-post MS test	14.7
DE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Annuity	0	ex - ante MS test	0
DK	Yes	Benchmarking	0	0	0	0	0	0	0	Bornfiber: BSA POI2 Maximum average price 206 DKK (2023-prices) Nef: POI1 Raw: 163 DKK (2023-prices)
EE	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	Straight-line (linear depreciation)	EOO	0	8 - 29 € month per connection+ 0,83 € Mbps monthly backhaul
EL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ERT (Economic Replicability Test)	0
HR	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	0	0	0
HU	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Tilted annuity	EOO	0	Shared Lines (1848 HUF/month) Naked Lines (2687 HUF/month)
IE	Yes	Cost_Orientation	0	LR_A_IC	0	CCA	Economic depreciation	0	ex - ante MS test	0
IT	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Annuity	EOO	ex - ante MS test	13.07 (Euro/month)+ badwidth transport (7.70 Mbit/s/Year (CoS0)-10.78 Mbit/s/Year (CoS5))
LU	Yes	Others/Combination	0	0	0	0	0	EOI	ERT (Economic Replicability Test)	0
LV	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Straight-line (linear depreciation)	Other	0	5,50
PL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	0	Tilted annuity	0	0	0
RS	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Straight-line (linear depreciation)	EOO	0	0
SI	Yes	Retail_minus	ERT (Economic Replicability Test)	0	0	0	0	EOI	ERT (Economic Replicability Test)	0
SK	Yes	Others/Combination	0	0	0	0	0	EOI	ERT (Economic Replicability Test)	0

Figure 55 – Market 3b_ftth fee and costing methodology

Countries	Regulated product	Price control main category	Price control Sub category	Allocation method main category	Allocation method subcategory	Cost base	Annualization method	Equivalence model	Margin squeeze	Price declared
BE	Yes	Others/Combination	0	LR_A_IC	BU-LR(A)IC+	CCA	Economic depreciation	EOO	ex-post MS test	From 19 to 30€ depending on the profile
EE	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	Straight-line (linear depreciation)	EOO	0	9 - 29 € month per connection+ 0,83 € Mbps monthly backhaul
ES	Yes	Retail_minus	ERT (Economic Replicability Test)	LRIC	BU-LRIC	0	Economic depreciation	EOI	ERT (Economic Replicability Test)	0
HR	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	0	0	0
HU	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Tilted annuity	EOO	0	3171 HUF/month
IE	Yes	Others/Combination	0	0	0	0	0	0	ex - ante MS test	0
IT	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Annuity	EOO	ex - ante MS test	14.26 (Euro/month)+ badwidth transport (7.70 Mbit/s/Year (CoS0)-10.78 Mbit/s/Year (CoS5))
LT	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	RAV (Regulatory Asset Value)	0	ex - ante MS test	0
LU	Yes	Others/Combination	0	0	0	0	0	EOI	ERT (Economic Replicability Test)	0
LV	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Straight-line (linear depreciation)	Other	0	5,50
PL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	0	Tilted annuity	0	0	0
RS	Yes	Cost_Orientation	Cost orientation alone	FDC	0	CCA	Straight-line (linear depreciation)	EOO	0	0
SI	Yes	Retail_minus	ERT (Economic Replicability Test)	0	0	0	0	EOI	ERT (Economic Replicability Test)	0
SK	Yes	Others/Combination	0	0	0	0	0	EOI	ERT (Economic Replicability Test)	0

Figure 56 – Market 2_legacy and costing methodology

Countries	Regulated product	Price control main category	Price control Sub category	Allocation method main category	Allocation method subcategory	Cost base	Annualization method	Equivalence model	Margin squeeze
AL	Yes	Cost_Orientation	Price cap alone	0	0	0	0	0	0
BE	Yes	Others/Combination	0	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ex-post MS test
CY	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Straight-line (linear depreciation)	0	0
DE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Annuity	0	ex - ante MS test
EL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	0
ES	Yes	Cost_Orientation	Cost orientation alone	0	0	CCA	Economic depreciation	EOI	0
FR	Yes	Cost_Orientation	0	FDC	0	CCA	Tilted annuity	EOO	0
LT	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	RAV (Regulatory Asset Value)	0	ex-post MS test
PT	Yes	Cost_Orientation	0	FDC	0	HCA	0	EOO	ERT (Economic Replicability Test)
SI	Yes	Others/Combination	0	LRIC	0	CCA	Tilted annuity	EOI	0

Figure 57 – Market 2_NGA and costing methodology

Countries	Regulated product	Price control main category	Price control Sub category	Allocation method main category	Allocation method subcategory	Cost base	Annualization method	Equivalence model	Margin squeeze
AL	Yes	Cost_Orientation	Price cap alone	0	0	0	0	0	0
AT	Yes	Cost_Orientation	Price cap alone	FDC	0	HCA	Straight-line (linear depreciation)	EOO	ex - ante MS test
BE	Yes	Others/Combination	0	LR_A_IC	BU-LR(A)IC+	CCA	0	EOO	ex-post MS test
CY	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Straight-line (linear depreciation)	0	0
DE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Annuity	0	ex - ante MS test
EL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	0
ES	Yes	0	0	0	0	0	0	EOI	ex-post MS test
FR	Yes	Others/Combination	0	0	0	0	0	Other	ex - ante MS test
HR	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	0	CCA	Tilted annuity	EOO	0
HU	Yes	Cost_Orientation	Cost orientation alone	direct cost + surcharge (markup)	direct cost + surcharge (markup)	HCA	Straight-line (linear depreciation)	EOO	0
IE	Yes	Cost_Orientation	0	FDC	0	CCA	Tilted annuity	0	0
IT	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Annuity	EOO	0
LT	Yes	Cost_Orientation	Cost orientation alone	FDC	0	HCA	RAV (Regulatory Asset Value)	0	ex-post MS test
LU	Yes	Cost_Orientation	Price cap alone	LRIC	BU-LRIC	CCA	Tilted annuity	Other	0
PT	Yes	Cost_Orientation	0	FDC	0	HCA	0	EOO	ERT (Economic Replicability Test)
SI	Yes	Others/Combination	0	LRIC	0	CCA	Tilted annuity	EOI	0

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) 171). 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 32 NRAs⁷² have provided data for this section. If data is confidential and can therefore not be shown in the analysis or if it has country specificities, this will be shown in the footnotes.

The following structural data have been collected (data as at 1st April 2023 unless otherwise indicated in the footnotes):

⁷² Albania (AL), Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), Czechia (CZ), Germany (DE), Denmark (DK), Estonia (EE), Greece (EL), Spain (ES), Finland (FI), France (FR), Croatia (HR), Hungary (HU), Ireland (IE), Italy (IT), Liechtenstein (LI), Lithuania (LT), Luxemburg (LU), Latvia (LV), Montenegro (ME), Malta (MT), Netherlands (NL), Norway (NO), Poland (PL), Portugal (PT), Romania (RO), Republic of Serbia (RS), Sweden (SE), Slovenia (SI), Slovakia (SK). No data has been provided in 2023 by: Iceland (IS), North Macedonia (MK), Kosovo (XK)* and Turkey (TR). *All references to Kosovo in this document should be understood to be in the context of the United Nations Security Council Resolution 1244 (1999).

Table 4 - Structural Data collected

1	Population and population density
1.1	Number of inhabitants
1.1a	Number of private households
1.1b	Households per population (calculated)
1.2	Population density (number of inhabitants per sqkm)
1.2a	Metro population density
1.2b	Non-metro population density
2	Market situation
2.1	Mobile broadband penetration (subscriptions as % of the total population)
2.2	Fixed broadband penetration (subscriptions as a % of the total households)
2.2.1	Technology share: % of DSL
2.2.2	Technology share: % of VDSL (NGA)
2.2.3	Technology share: % of cable (coax, HFC)
2.2.4	Technology share: % of FTTx
2.2.5	Technology share: % of other technologies (i.e. satellite, BWA etc.)
3	Market share SMP operator / competitors
3.1	Share of fixed broadband subscriptions
3.1.1	SMP operator
3.1.2	Competitors
3.1.3	Cable operators
3.2	Share of DSL broadband subscriptions legacy broadband
3.2.1	SMP operator
3.2.2	Competitors
3.3	Share of NGA (FTTB/C) broadband subscriptions
3.3.1	SMP operator
3.3.2	Competitors
3.3.3	Cable operators
3.4	Share of NGA (FTTH) broadband subscriptions
3.4.1	SMP operator
3.4.2	Competitors
3.4.3	Cable operators
3.5	FTTx/cable coverage on own infrastructure
3.5.1	SMP FTTB/C (via SLU) coverage (total coverage if more than one operator is present)
3.5.2	SMP FTTH BB coverage (total coverage if more than one operator is present)
3.5.3	SMP cable coverage (total coverage if more than one operator is present)
3.5.4	Other access operator(s) own infrastructure (including third party civil infrastructure) vertically integrated operator FTTB/C (via SLU) BB coverage (total coverage if more than one operator is present)
3.5.5	Other access operator(s) own infrastructure (including third party civil infrastructure) vertically integrated operator FTTH BB coverage (total coverage if more than one operator is present)
3.5.6	Other access operator(s) own infrastructure (including third party civil infrastructure) cable coverage (total coverage if more than one operator is present)
3.6	Other access operator(s) using third party infrastructure
3.6.1	Wholesale only other access operator(s) FTTH coverage (total coverage if more than one operator is present)

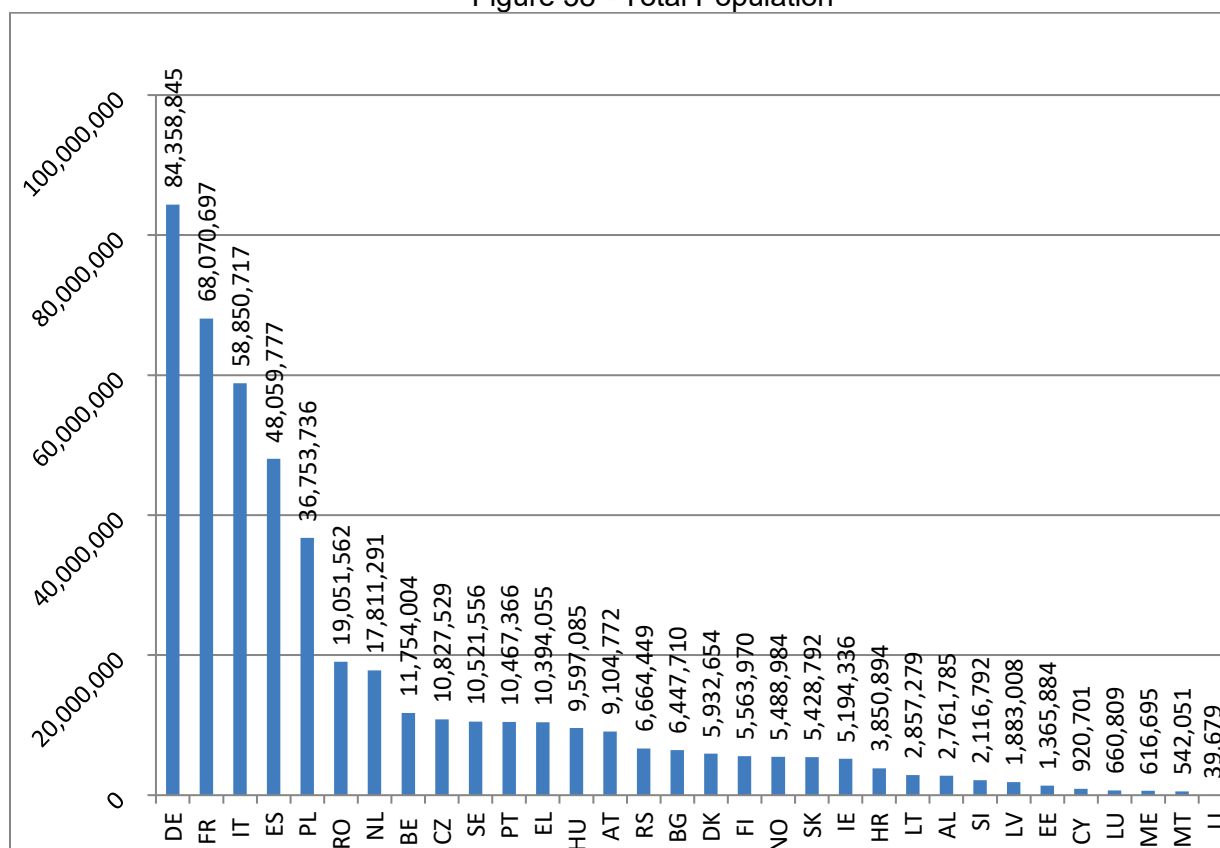
The data for population and population density is sourced from the latest available Eurostat data, the data for Market and Competitive Situation and Market Shares from participating NRAs.

4.1 Population and Population Density

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.

When looking at the **total population**⁷³ (i. e. the total number of inhabitants per country) the top countries remain Germany, France, Italy, Spain and Poland.

Figure 58 - Total Population

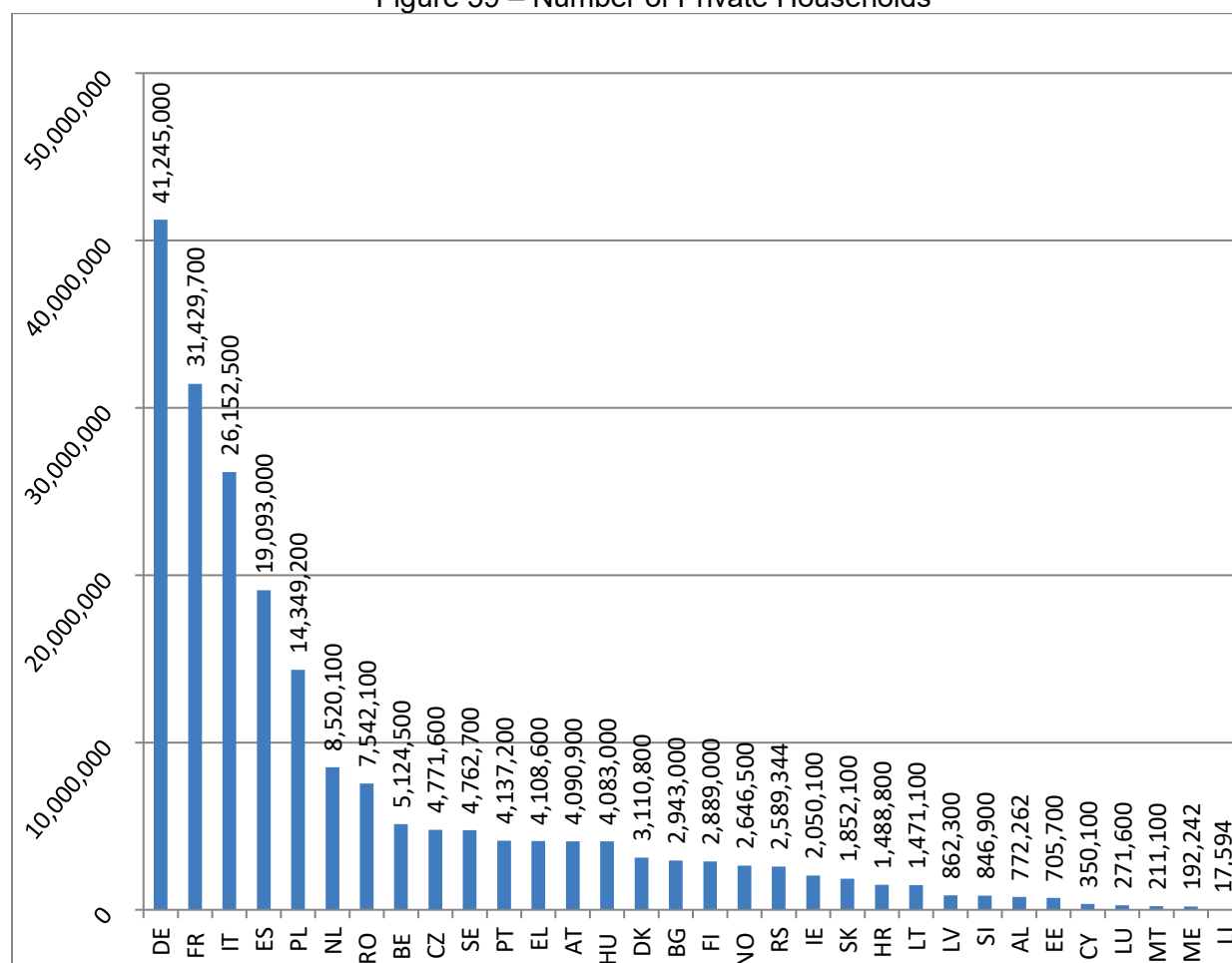


Source: Eurostat 2023

⁷³ Eurostat "Population on 1st January 2023" online data code: TPS00001. Provisional data for BE, ES, FR, IT, CY, RO, LI. Provisional/estimate for EL. RS: Eurostat data. Republic of Serbia 2022 Census: 6.647.003

On average, there are between two and three people per household in most countries, a little over three in Albania and Montenegro⁷⁴. The number of households is used in this report to calculate the fixed broadband penetration, shown per household.

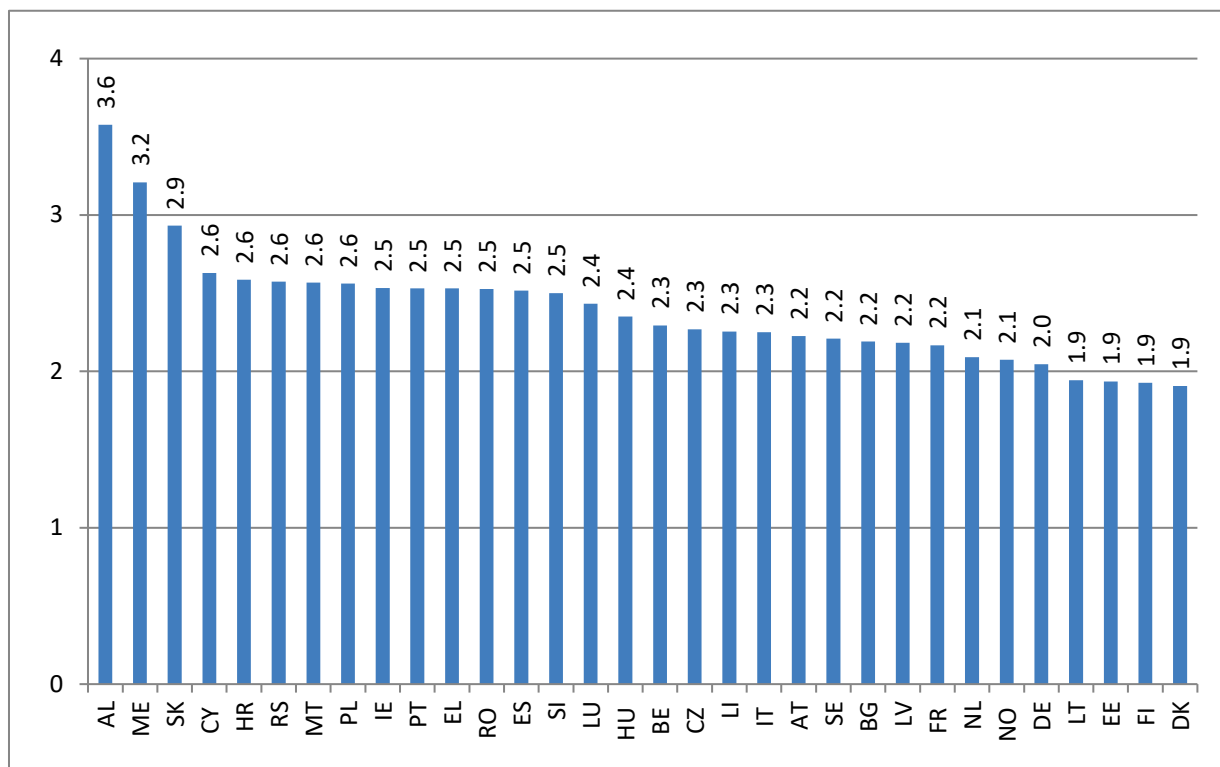
Figure 59 – Number of Private Households



Source: Eurostat 2023

⁷⁴ Eurostat 2023 "number of private households", online data code: LFST_HHNHWHTC. Number of people per household calculated from number of households. Household definition differs (see Eurostat Metadata) in FR, ES. AL: 2011 Census Data, LI: 2020 Public Census (Statistikportal Liechtenstein), ME: 2011 Census (Montenegro Statistical Office), NO: 2020 Data (Helgi Library). RS: 2022 Data (Statistical Office of the Republic of Serbia).

Figure 60 - Number of People per Private Household

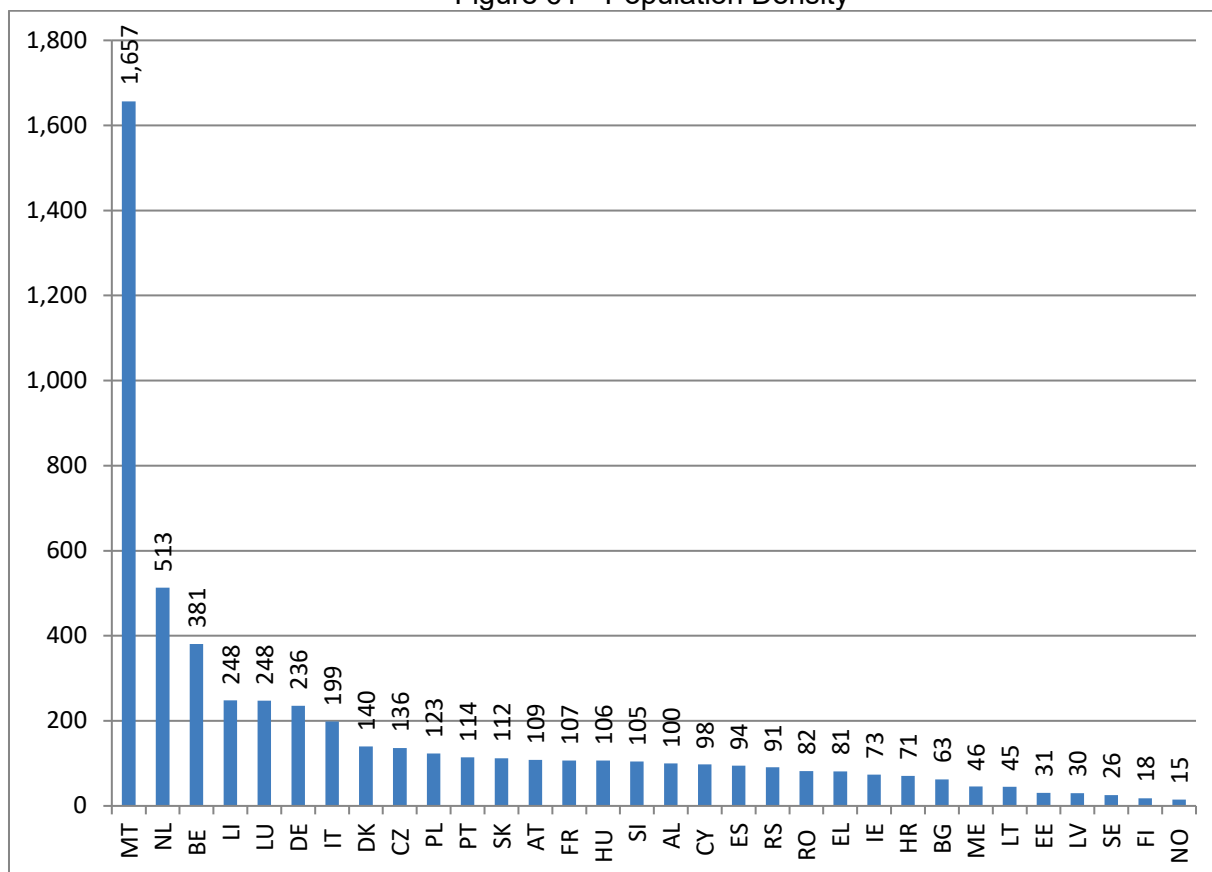


Source: Eurostat 2023

In terms of **population density**⁷⁵ (i. e. the number of inhabitants per square kilometre) the top countries with around/ above 200 people per square km are Malta, the Netherlands, Belgium, Liechtenstein, Luxemburg, Germany and Italy.

⁷⁵ Eurostat 2023 "Population density" online data code: TPS00003. Provisional in FR, MT, PL, PT, estimate in PL, RO, AL. RS: 2019 data (2023 data not available).

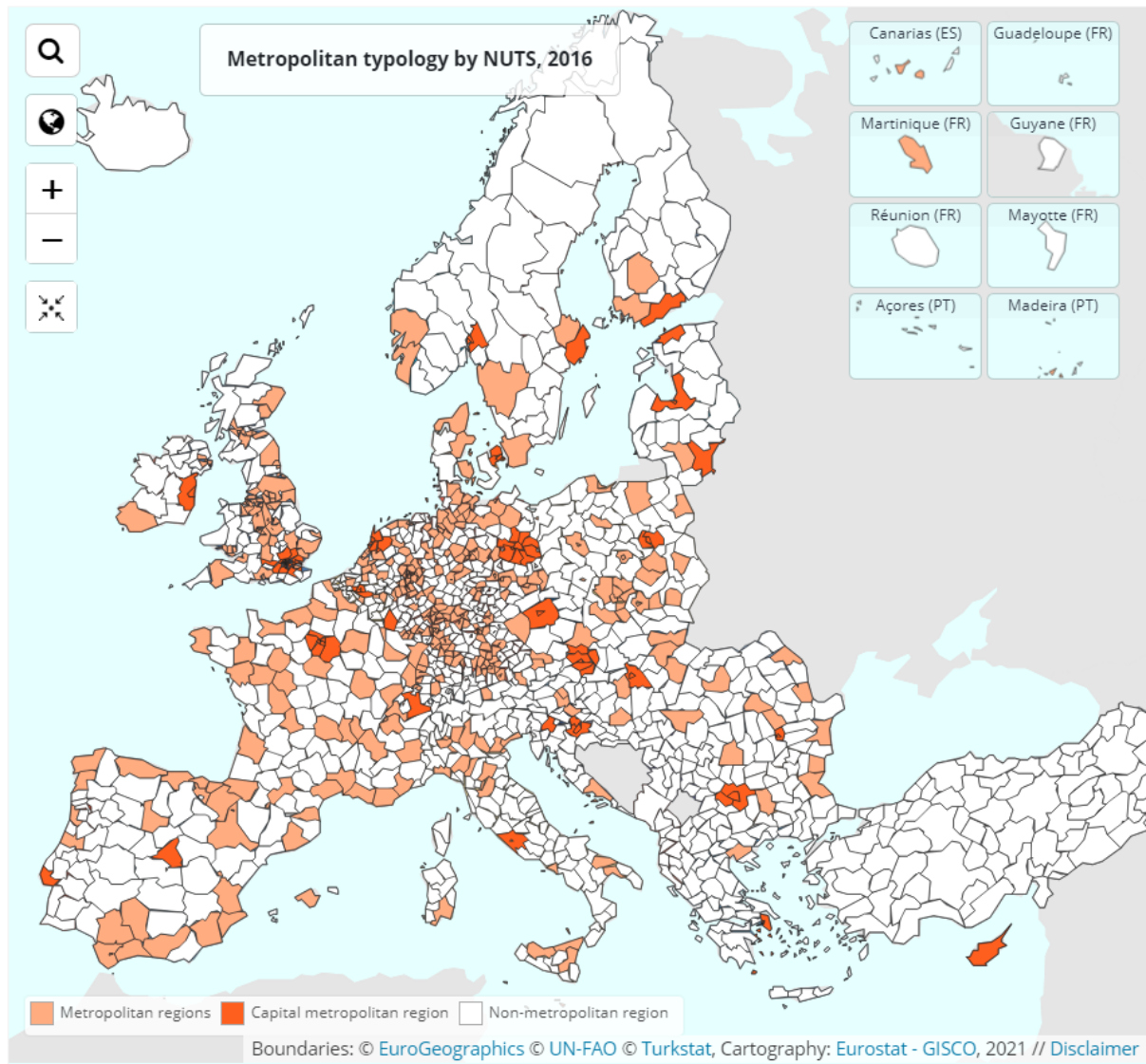
Figure 61 - Population Density



Source: Eurostat 2023

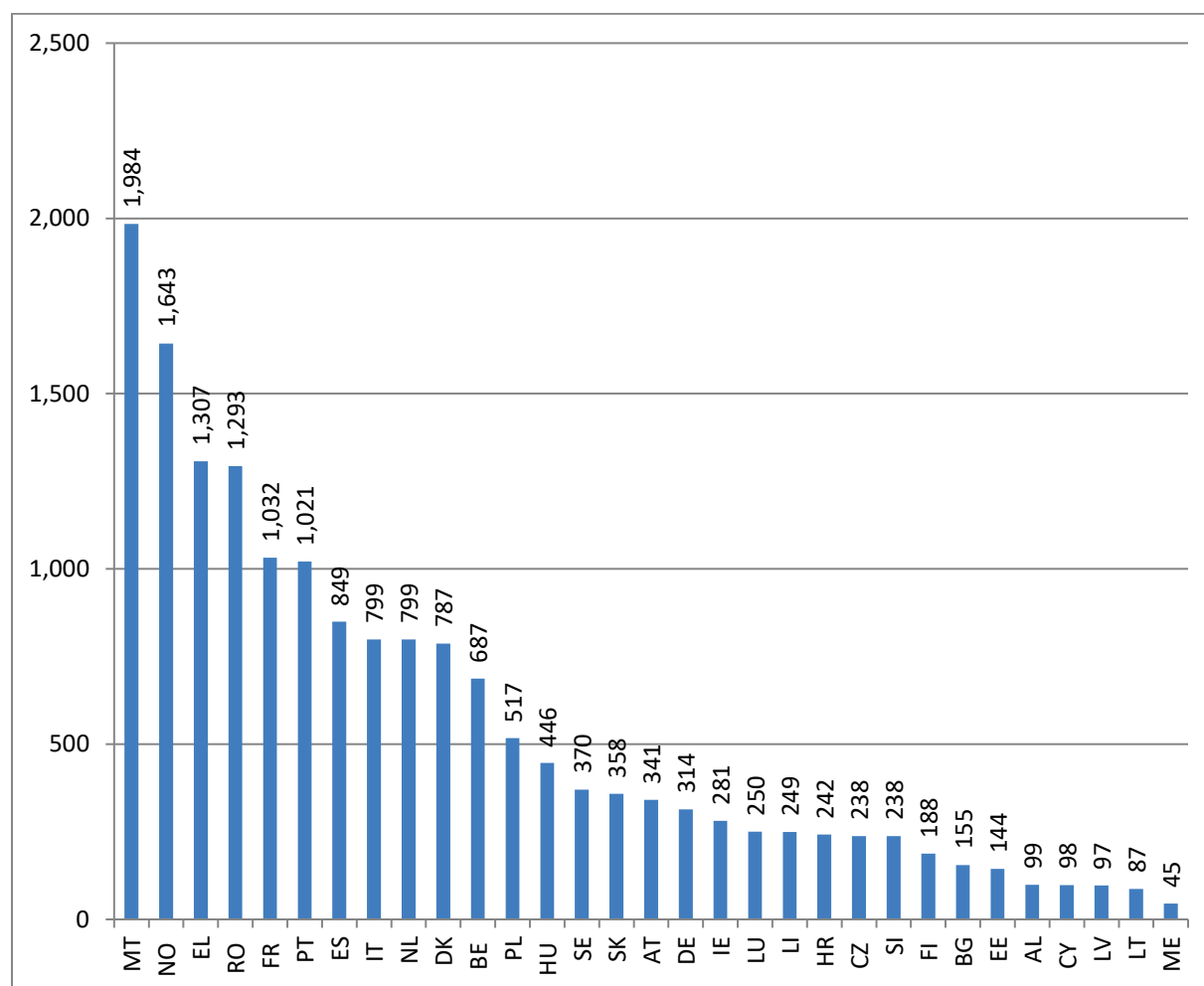
When looking at the **metro and non-metro population density**, an impression is given of the differences in country typology, i.e. a country with highly densely populated urban areas (in many smaller countries one single densely populated urban area) might well have very sparsely populated rural areas. This requires different effort and cost by operators to provide infrastructure access to the population in urban and rural areas and leaves regulators with the challenge of encouraging high capacity broadband roll-out also in less densely populated areas.

Figure 62 - Metro and Non-metro Regions in the EU/EFTA



The **population density in the capital city metro area**⁷⁶ (usually, but not always, the most densely populated area of the country) is highest in Valetta (MT), Oslo (NO), Athens (EL), Bucharest (RO), Paris (FR) and Lisbon (PT)⁷⁷.

Figure 63 - Metro Population Density



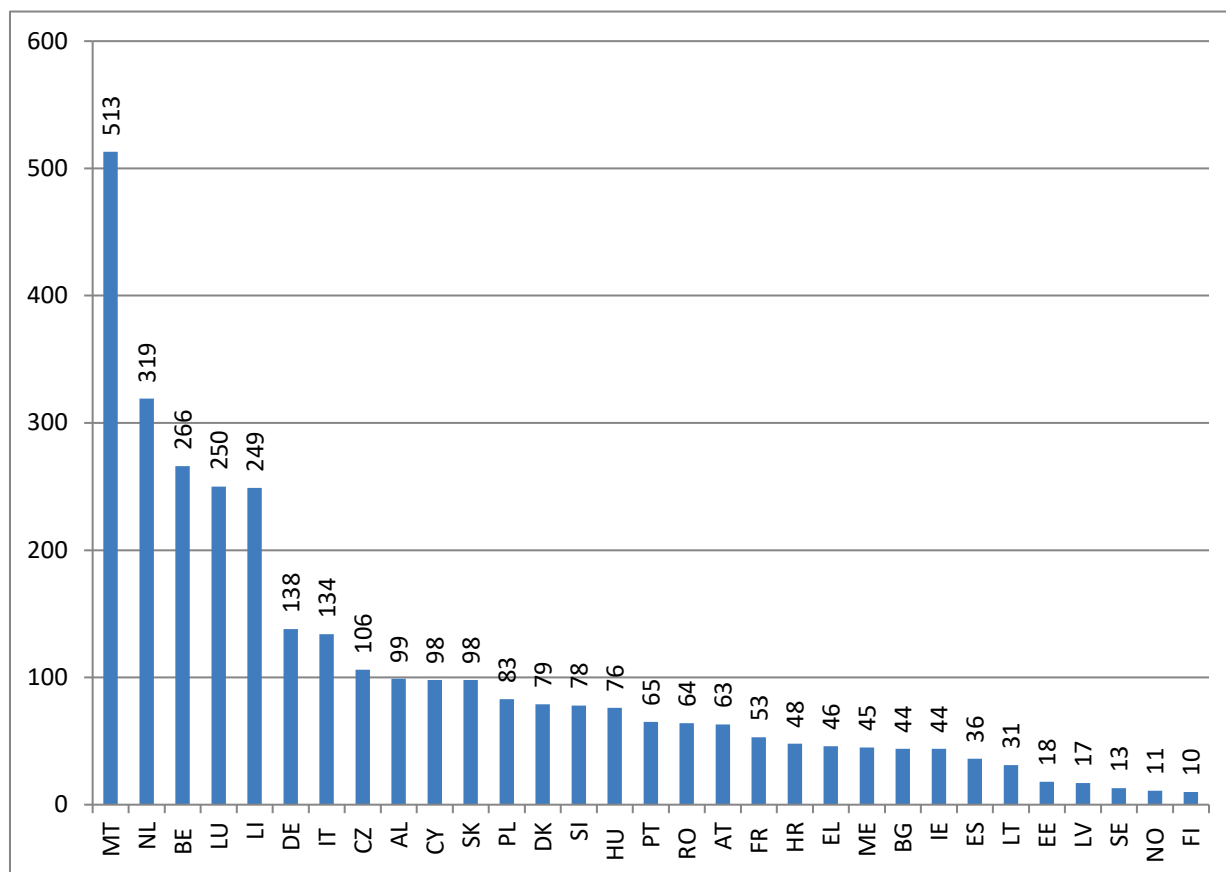
Source: Eurostat 2023

⁷⁶ Eurostat 2023 "Population density by metropolitan regions", online data code: MET_D3DENS. Eurostat metro-regions are based on agglomerations, which include the commuter belt around a city. AT: Vienna, BE: Brussels, BG: Sofia, CY: Nicosia, CZ: Prague, DE: Berlin, DK: Copenhagen, EE: Tallinn, EL: Athens, ES: Madrid, FI: Helsinki, FR: Paris, HR: Zagreb (Source: HAKOM), HU: Budapest, IE: Dublin, IT: Rome, LI: Vaduz (Source: Wikipedia), LV: Riga, MT: Valetta, NL: Amsterdam, NO: Oslo, PL: Warsaw, PT: Lisbon, RO: Bucharest, RS: Belgrade (Source: Statistical Office of the Republic of Serbia), SE: Stockholm, SI: Ljubljana, SK: Bratislava. Provisional for MT, FR, PL, PT. Estimate for AL, PL, RO.

⁷⁷ Discrepancies to last year's data may be due to a break in time series (e.g. NO) or past incorrect data (HR).

The **non-metro population density**⁷⁸ shows Scandinavian and Baltic countries (FI, NO, SE, LV, EE, LT) to have the least densely populated rural areas.

Figure 64 - Non-Metro Population Density



Source: Eurostat 2023

⁷⁸ Eurostat 2023 "Population density by metropolitan regions", online data code: MET_D3DENS. Not available for RS. No differentiation Metro/Non Metro area in AL, CY, IS, LU, ME, MK.

4.3 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. The data in this section has been provided by NRAs⁷⁹. Where data is confidential or not available, it will not be shown in the graphs (see explanations in foot notes).

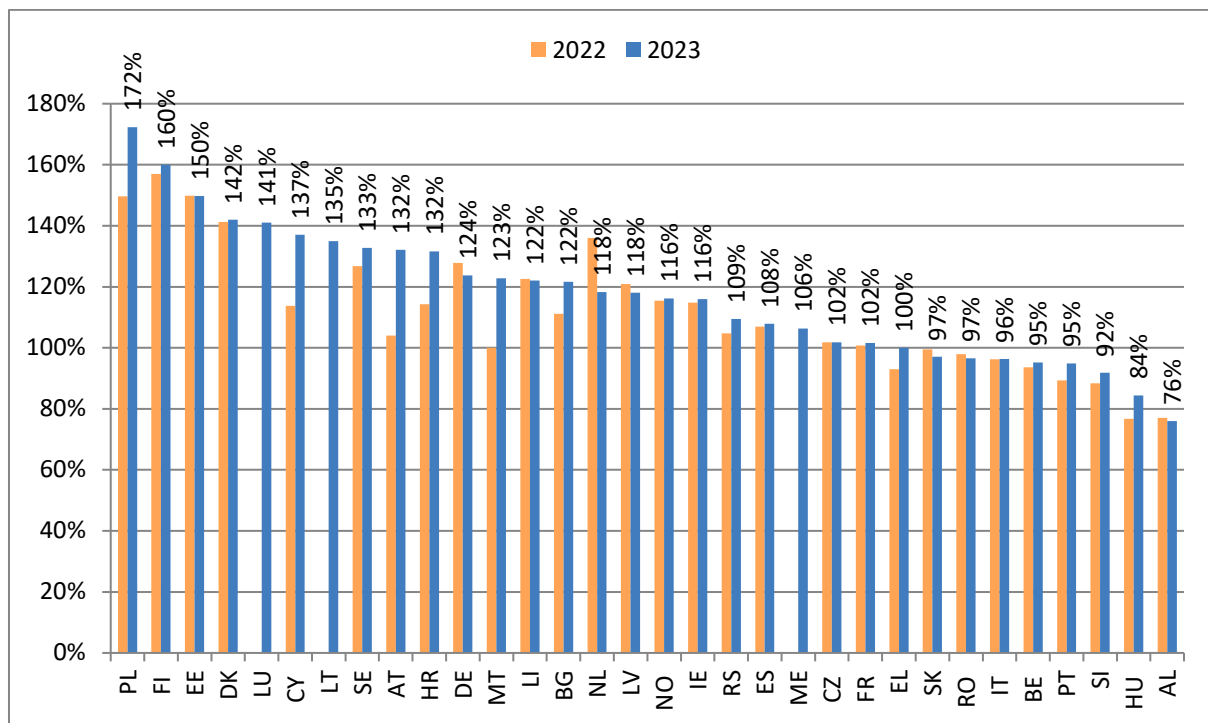
Concurrent with the last reports, this report focusses on the increasingly important broadband usage rather than subscriptions to classical fixed and mobile telephones, which are also depicted in other reports.

The **mobile broadband penetration**, represents mobile broadband end users as a percentage of the total population.⁸⁰ (excluding M2M). Percentages are only shown for 2023; they range between 76 per cent in the Albania to 172 per cent in Poland. In 2023 all but two of the respondents have a mobile broadband penetration rate of more than 90 per cent. Shown in comparison is the penetration rate in 2022.

⁷⁹ CZ: The separation of former incumbent – O2 Czech Republic a.s. (O2), former SMP operator, was performed on June 1, 2015. On the basis of voluntary separation of O2, two companies were created – O2 and Česká telekomunikační infrastruktura a.s. (CETIN). CETIN (as SMP in market 3a and 3b) became infrastructure and wholesale service operator (provider) without any retail activities, and O2 became retail service operator (provider). CETIN is currently SMP operator on Market 1, Market 3b has been deregulated.

⁸⁰ AL: Q2 2023 data. AT: Base not SIM, but mobile BB incl. Smartphone Tariffs. Substantial increase due to the consideration of wholesale lines. DE: Active SIM cards. FR: includes business mobile BB subscriptions. CY: includes users with access to mobile internet without having a contract in place. NL: in 2022 one of the operators mistakenly reported M2M connections as regular mobile connections. This was corrected in 2023, resulting in a downward adjustment of the total number of mobile connections. LU, LT, ME: no data provided in 2022.

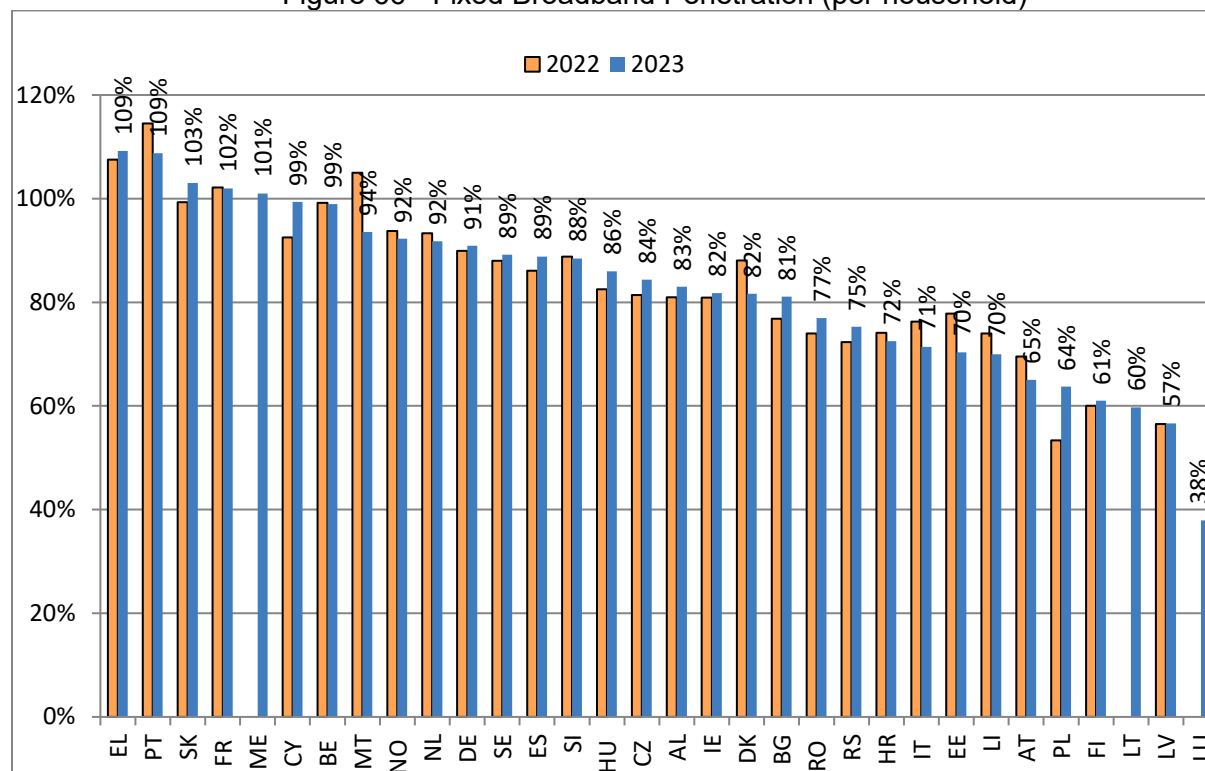
Figure 65 - Mobile Broadband Penetration (per total population)



Source: BEREC RA database 2023

The **fixed broadband penetration**⁸¹ represents fixed broadband subscriptions as a percentage of the total number of households. Percentages are only shown for 2023; they vary between 38 per cent in Luxemburg and 109 per cent in Portugal. Percentages are shown in comparison to the previous year 2022.

Figure 66 - Fixed Broadband Penetration (per household)



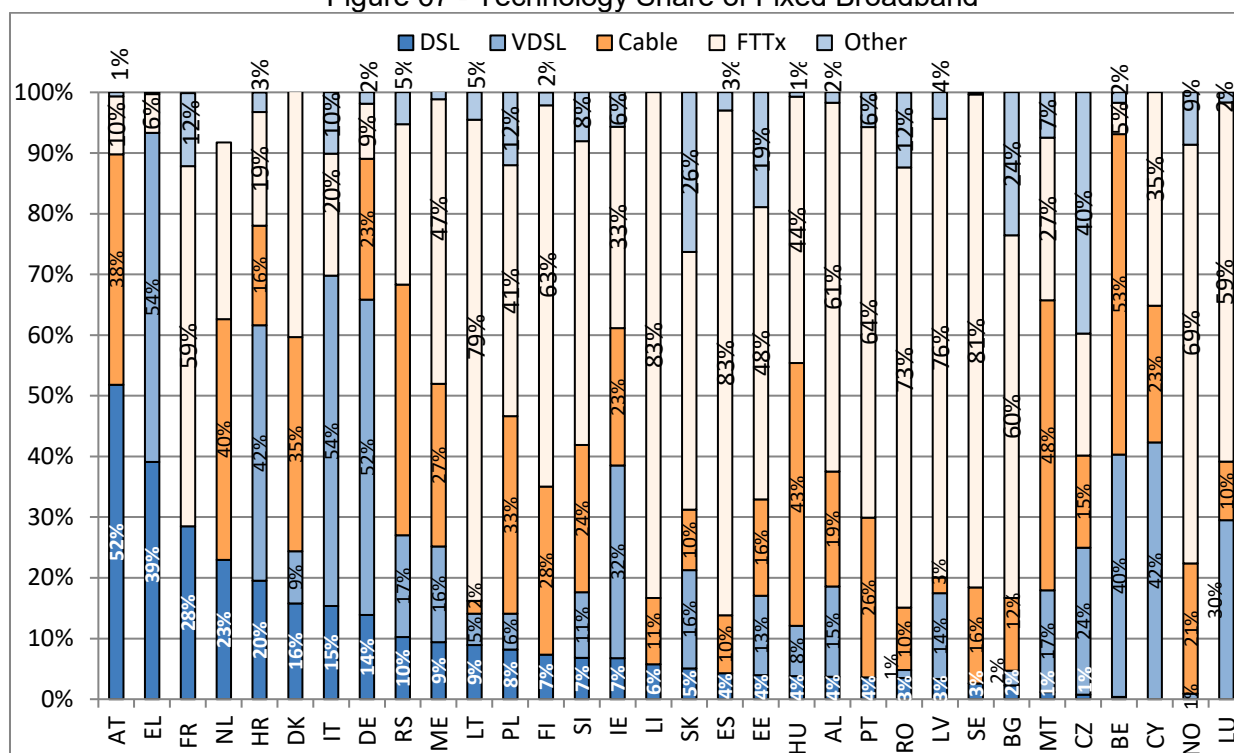
Source: BEREC RA database 2023

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

- DSL lines (including ADSL, naked DSL)
- VDSL lines (NGA)
- Cable (via coax, hybrid fibre coax cable HFC)
- FTTx (via FTTH, FTTB/C)
- Other technologies (broadband wireless access BWA, satellite, fixed LTE etc.)

⁸¹ AL Q2 2023 data. CZ: including fixed LTE/5G access (access provided in fixed location), FI: LTE not included. FR: includes business fixed BB subscriptions. DK: accurate number of LTE subscription is not available, hence the total may be misleading. ME, LT, LU: no data provided in 2022.

Figure 67 - Technology Share of Fixed Broadband



Source: BEREC RA database 2023

DSL lines as a percentage of fixed broadband range (where available) from under 1 per cent in Belgium to over 50 per cent in Austria⁸².

VDSL lines as a percentage of fixed broadband range (where available) from just over 1 per cent in Romania to more than 50 per cent in Italy, Greece and Germany⁸³.

Cable as a percentage of fixed broadband ranges (where available) from just over 2 per cent in Lithuania to over 50 per cent in Belgium⁸⁴.

The use of **FTTx** technology is lowest (under 10%) in Belgium, Greece, Germany and Austria. A share of more than 80 per cent is reported for Sweden, Spain and Liechtenstein⁸⁵.

Other technologies reported by some countries include satellite, fixed wireless access (FWA), fixed LTE, vULL etc. These seem to be on the increase and may receive more focus in future reports. Czechia has the highest share with almost 40 per cent, followed by Slovakia (26 per cent) and Bulgaria (24 per cent)⁸⁶.

⁸² AT: incl. hybrid. NO: included in VDSL. RO: excluding DSL+fibre.

⁸³ AL: includes 3,8% Gfast (fibre over copper). Data not available in AT, FI, NL, SE. RO: includes VDSL+fibre. FR: confidential.

⁸⁴ No cable in EL, IT. FR: confidential.

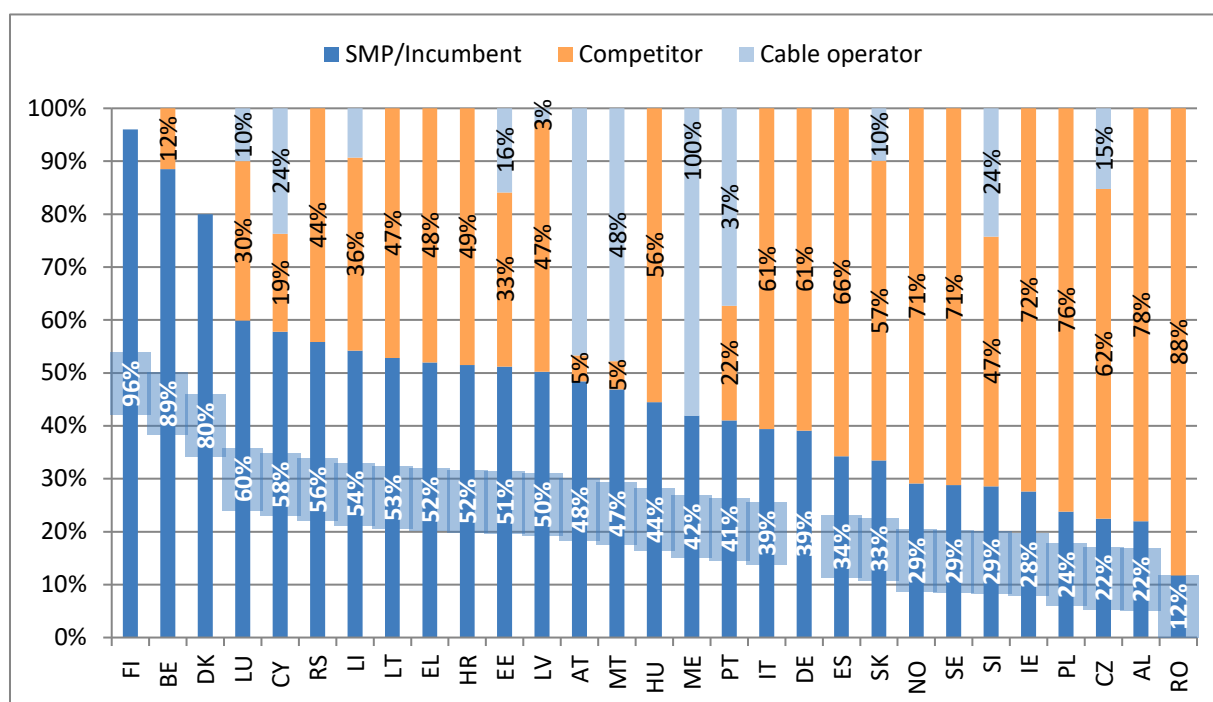
⁸⁵ RO: excluding HFS and DSL+fibre.

⁸⁶ FR: 12% includes VDSL, cable and "Other" (individual shares in these categories are confidential). NL: no data

4.4 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 SMP operator(s)** 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 in this section has been provided by NRAs⁸⁷. The data analysis shows a considerable disparity in market shares. It points to differences in the national competitive situation, thereby affecting regulatory strategy.

Figure 68 - Fixed Broadband Market Share



Source: BEREC RA database 2023

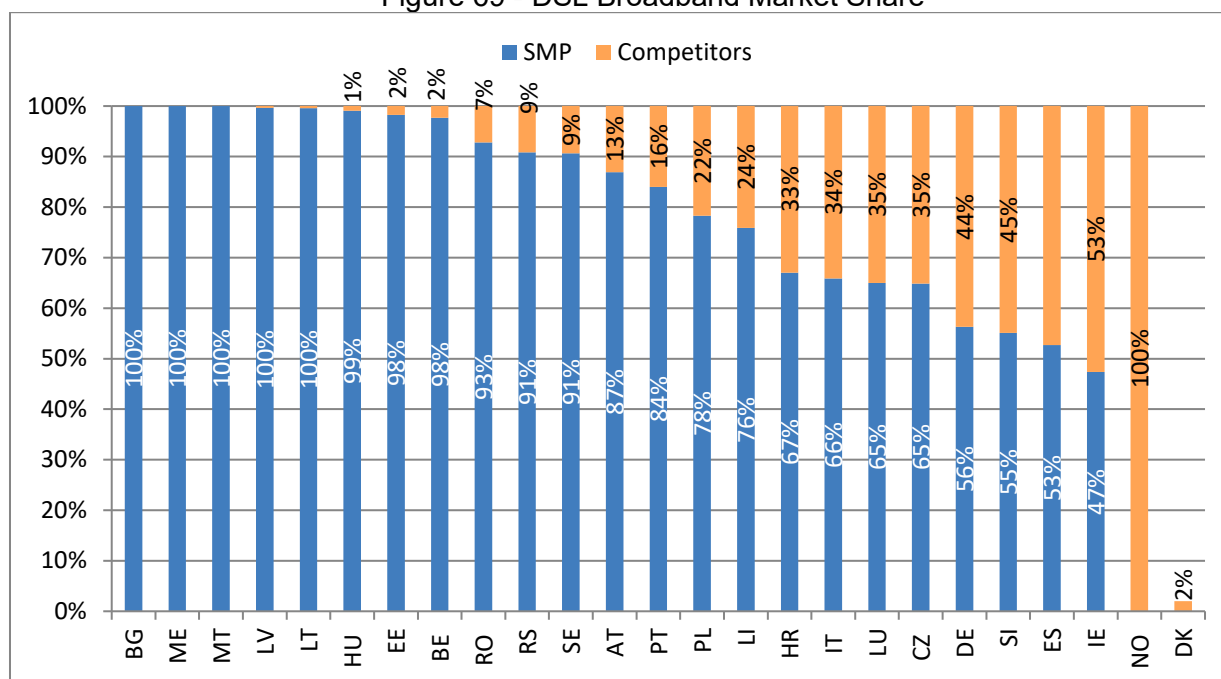
⁸⁷ Confidential in BG, FR, NL. AL: Q2 2023 data for ISP operators on broadband subscriptions using NGA cable 3.0 technology. Some operators use both technologies including cable. BE: SMP/Incumbent share includes cable. CZ: The share of the SMP/Incumbent is represented by the share of O2 Czech Republic (not SMP in Markets 1/3b). Former incumbent CETIN (SMP in Market 1) is wholesale only operator. DE: cable share not recorded (not regulated). ES: No operator can be strictly considered a cable operator since all operators have also FTTH. HU: Cable share (11%) included in competitor share. IE: Cable share (23%) included in competitors. EL/IT: no cable coverage. HR, RO: Cable share included in competitor share. NO: cable share included in SMP/competitor shares. LI, RO: Incumbent is not SMP. RS: Incumbent also owns cable network; this is included in SMP/Incumbent share. Cable share (33%) is included in competitor share. SE: Change of calculation, previous year included mobile subscriptions. PL: Cable share (46%) included in competitor share.

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

- Share of the SMP(s)/Incumbent operator(s): in some countries, they also operate cable, thus total SMP shares may not be portrayed correctly for these countries. The share ranges from a minimum of 12 per cent in Romania to 96 per cent in Finland.
- Share of competitors: market shares range from 5 per cent in Austria to almost 90 per cent in Romania. In some countries, competitor data includes cable.
- Share of cable operators: not all NRAs record data/record data separately from competitor data. Where it is available/recorded separately shares range from around 2,6 per cent in Latvia to 100 per cent in Montenegro.

The **DSL broadband** share⁸⁸ is the traditional domain of SMP/incumbent operators. Their market share ranges from 0 per cent in Norway to 100 (or close to) per cent in Bulgaria, Montenegro, Malta, Latvia and Lithuania. Shown in the same figure are competitor market shares.

Figure 69 - DSL Broadband Market Share



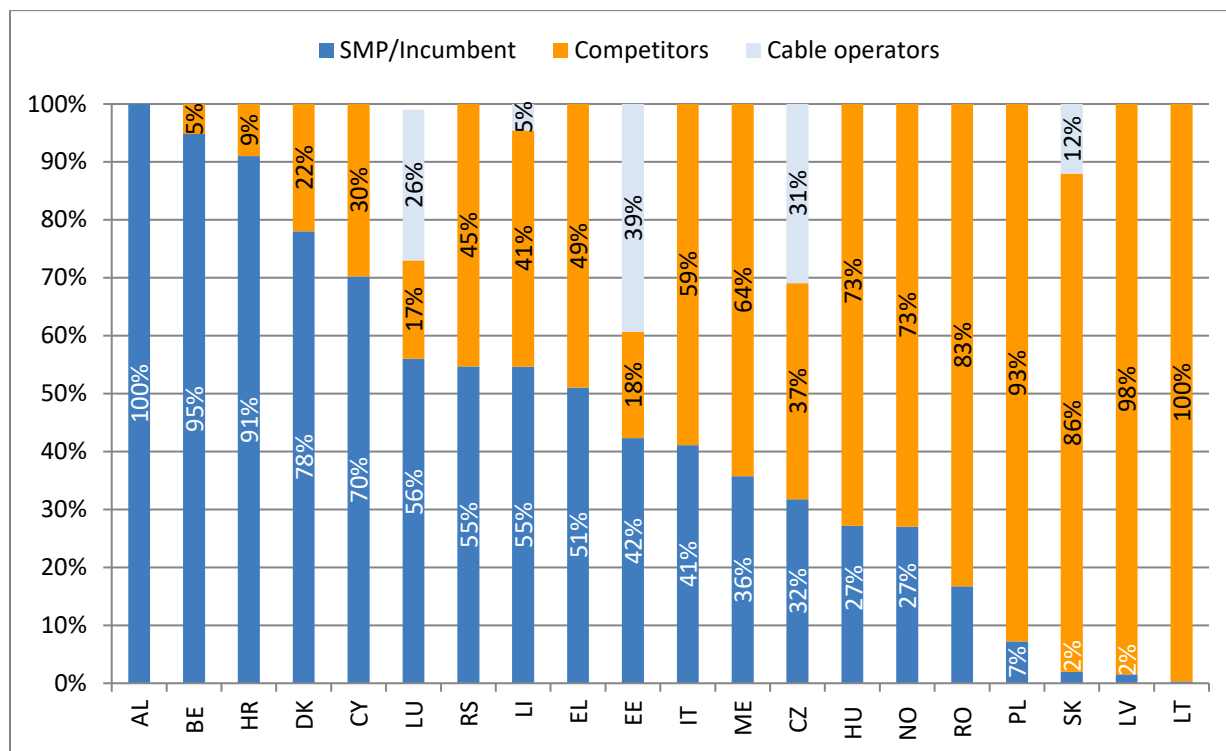
Source: BEREC RA database 2023

⁸⁸ Data is confidential in EL, FR, NL, SK. No data in CY, FI. AL: Reported market share of incumbent over the total market for relevant technologies: Copper-DSL: 0%, DSL - FTTN/FTTC: 100%, Gfast (fiber over copper): 99%. CZ: The share of the SMP/Incumbent is represented by O2 Czech Republic (not SMP in Markets 1/3b). Former incumbent CETIN (currently SMP on Market 1) is wholesale only operator. LI, RO: Incumbent is not SMP.

Due to the growing relevance of NGA and corresponding with questions concerning “coverage on own network”, question on FTTx have been split into FTTC/B and FTTH.

Looking at **NGA (FTTB/C) broadband** share,⁸⁹ the SMP/Incumbent’s share ranges from under 1 per cent in Lithuania to more than 90 per cent in Albania, Belgium and Croatia. Shown in the same figure are competitor’s and cable operator’s market shares.

Figure 70 – NGA (FTTB/C) Broadband Market Share

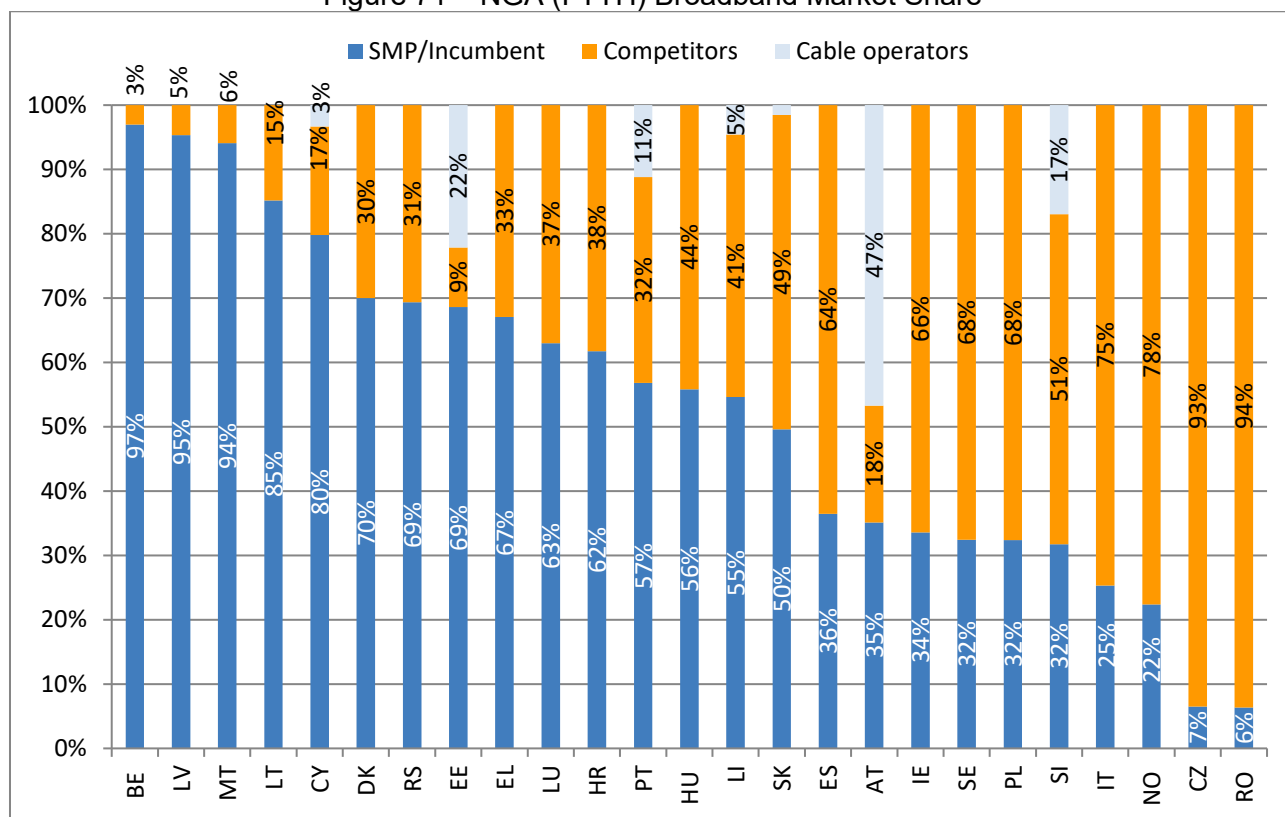


Source: BEREC RA database 2023

⁸⁹ Data is confidential in BG, NL. No data in AT (FTTB not available), DE (FTTB/C and FTTH not recorded separately), ES (no FTTB/C subscriptions), FI, FR, IE (figures are included in other categories), MT, PT, SE, SI. AL: Reported market share of incumbent over the total market for relevant technologies: Copper-DSL: 0%, DSL - FTTN/FTTC: 100%, Gfast (fiber over copper): 99%. BE: includes FTTH. CZ: The share of the SMP/Incumbent is represented by the share of O2 Czech Republic (not SMP in Markets 1/3b). Former incumbent CETIN (SMP in Market 1) is wholesale only operator. LI: Incumbent is not SMP. ME: FTTx data (no separate data available). RO: FTTN included. Incumbent is not SMP. Cable share is included in competitor share in BE, LT (69%), ME (64%), PL (20%), RO, RS (43%). NO: cable share is included in SMP/competitor shares. RS: Incumbent also owns cable network, which is included in SMP/Incumbent share, not in competitor share.

Regarding **NGA (FTTH) broadband** share⁹⁰, the SMP/Incumbent's share ranges from just over 6 per cent in Romania to over 90 per cent in Belgium, Latvia and Malta. Shown in the same figure are competitor's and cable operator's market shares.

Figure 71 – NGA (FTTH) Broadband Market Share



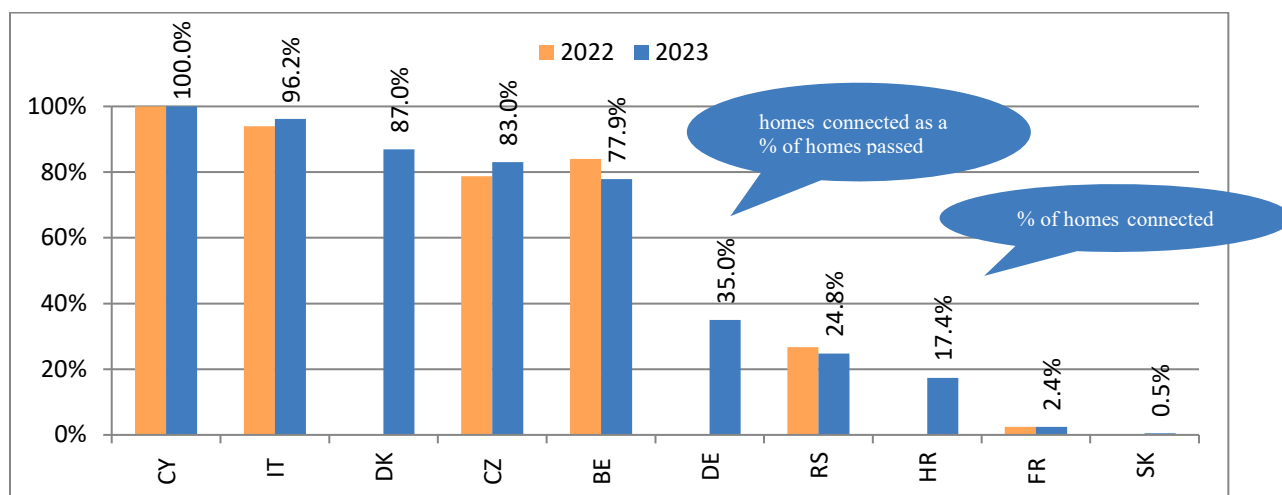
Source: BEREC RA database 2023

⁹⁰ Data is confidential in BG, FR, NL. Data is not available in AL, DE, FI, ME. Cable included in competitor share in LT (8%), RO, RS (13%). NO: cable share is included in SMP/competitor shares. ES: No operator can be strictly considered a cable operator since all operators have also FTTH. LI: Incumbent is not SMP. The network architecture is P2P-FTTH, whereby the complement from FTTB to FTTH is added by the owner of the building. Therefore figures correspond to data in figure 13. RO: Incumbent is not SMP. RS: Incumbent also owns cable network, which is included in SMP/Incumbent share, not in competitor share. SE: Data includes all fibre subscriptions, all FTTH.

The next section covers **FTTx and cable coverage on own infrastructure** split into **SMP** own infrastructure (total coverage if more than one operator is present) and **OAO** own infrastructure (total coverage if more than one operator is present and including third party civil infrastructure). As in the previous part, only percentages for 2023 are shown. Text bubbles indicates a different way of recording coverage, data are therefore not comparable.

SMP's coverage of Fibre to the Building/Curb (FTTB/C) infrastructure as a percentage of total households⁹¹: data is shown for 10 NRAs in 2023⁹² with coverage largely unchanged in comparison to the previous year (where available for 2022).

Figure 72 - SMP FTTB/C Coverage: % of households



Source: BEREC RA database 2023

SMP's coverage of Fibre to the Home (FTTH) infrastructure as a percentage of total households⁹³: data can be shown for a total of 17 NRAs in 2023⁹⁴. Coverage has increased in comparison to the previous year (where available for 2022).

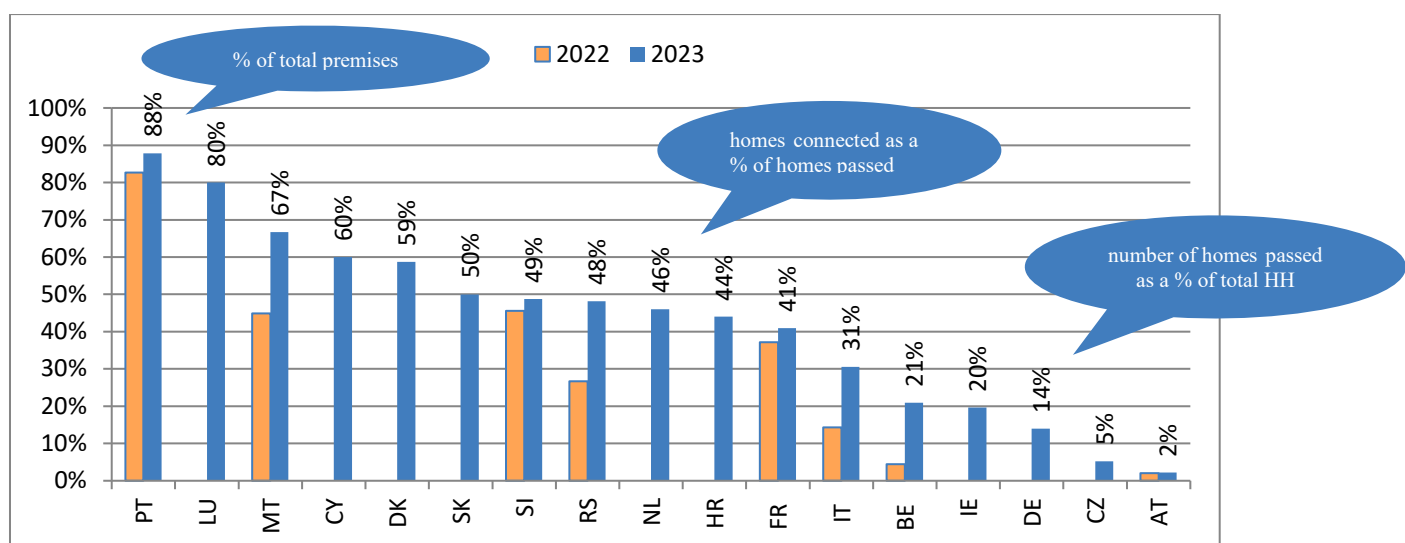
⁹¹ SMP FTTB/C (via SLU) BB coverage: total coverage if more than one operator is present.

⁹² Data is confidential in BG, NL and not available in AL, AT (FTTB not available), EE, EL, ES (no FTTB/C infrastructure), FI, HU, IE (included in other categories), LI (no SMP operator in NGA (FTTB) BB subscriptions (retail) or BB services (wholesale), LT, LU, LV, ME, MT, NO, PL, PT, RO, SE (no public data), SI. CZ: all NGA VDSL lines (coverage) including fixed LTE/5G access (access provided in fixed location). RS: data refers to homes connected. DE: homes connected as a % of homes passed (FTTB/C share).

⁹³ SMP FTTH BB coverage: total coverage if more than one operator is present.

⁹⁴ Data is confidential in BG and not available in AL, EE, EL, ES, FI, HU, LI (no SMP operator), LT, LV, ME, NO, PL, RO, SE (no public data). DE: homes connected as a % of homes passed (FTTH share). LU: FTTP (fibre to the premises = FTTH). NL: the total coverage of all operators as % of total households. Coverage = numbers of homes passed. PT: as a % of total premises (refers to cabled premises of Fastfiber - MEO sold its infrastructure to Fastfiber and Fibroglobel - acquired by Fastfiber).

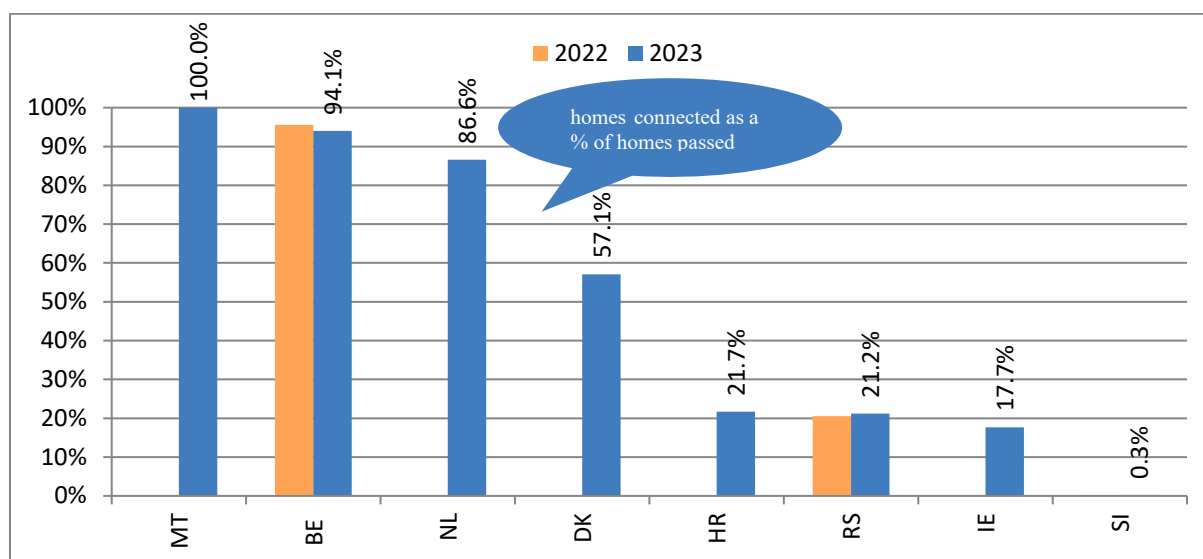
Figure 73 - SMP FTTH Coverage: % of households



Source: BEREC RA database 2023

SMP cable coverage as a percentage of total households:⁹⁵ In 2023 data is shown for 8 NRAs⁹⁶ and – where available in 2022 – does not differ substantially from the previous year.

Figure 74 - SMP Cable Coverage: % of households



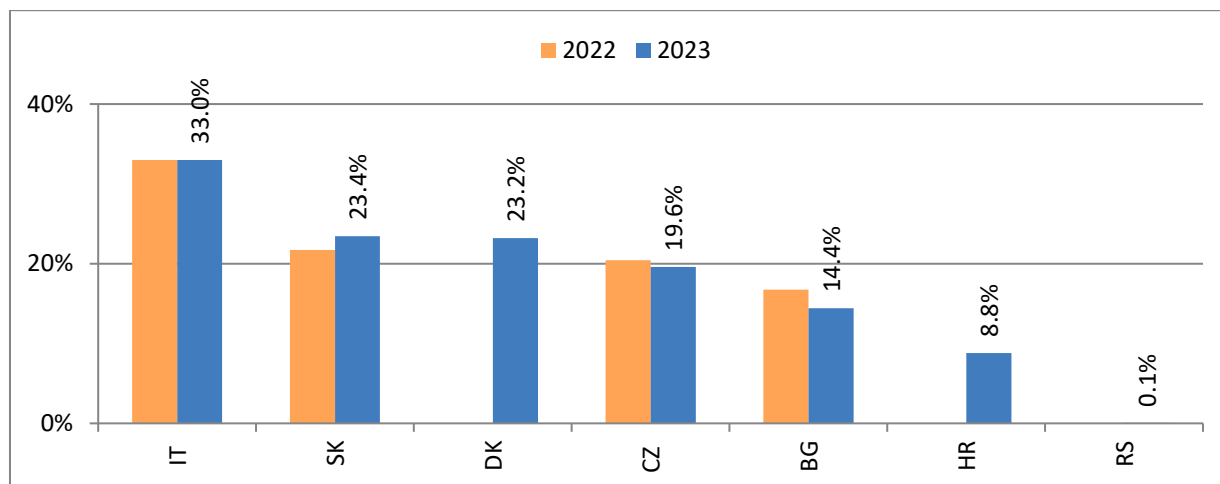
Source: BEREC RA database 2023

⁹⁵ SMP cable coverage: total coverage if more than one operator is present.

⁹⁶ Confidential in BG and not available in AL, EE, EL, FI, HU, IT, LT, LU, LV, ME, NO, PL, RO, SE. 0% in AT, CY, CZ, DE/ES (no SMP cable infrastructure), FR, LI (no SMP operator), PT, SK. NL: the total coverage of all operators as % of total households. Coverage = numbers of homes passed.

The total coverage of the **main OAO Fibre to the Building/Curb (FTTB/C) as a percentage of total households**⁹⁷ data is shown in 2023 for 7 NRAs⁹⁸, which does not substantially differ – where available - from the data provided in 2022.

Figure 75 - Main OAO Coverage on Own Network FTTB/C: % of households



Source: BEREC RA database 2023

Fibre to the Home (FTTH) coverage of the main OAO via their own infrastructure (as a percentage of total households)⁹⁹ resulted in data shown for 13 NRAs in 2023¹⁰⁰. Where recorded, it has increased in comparison to 2022.

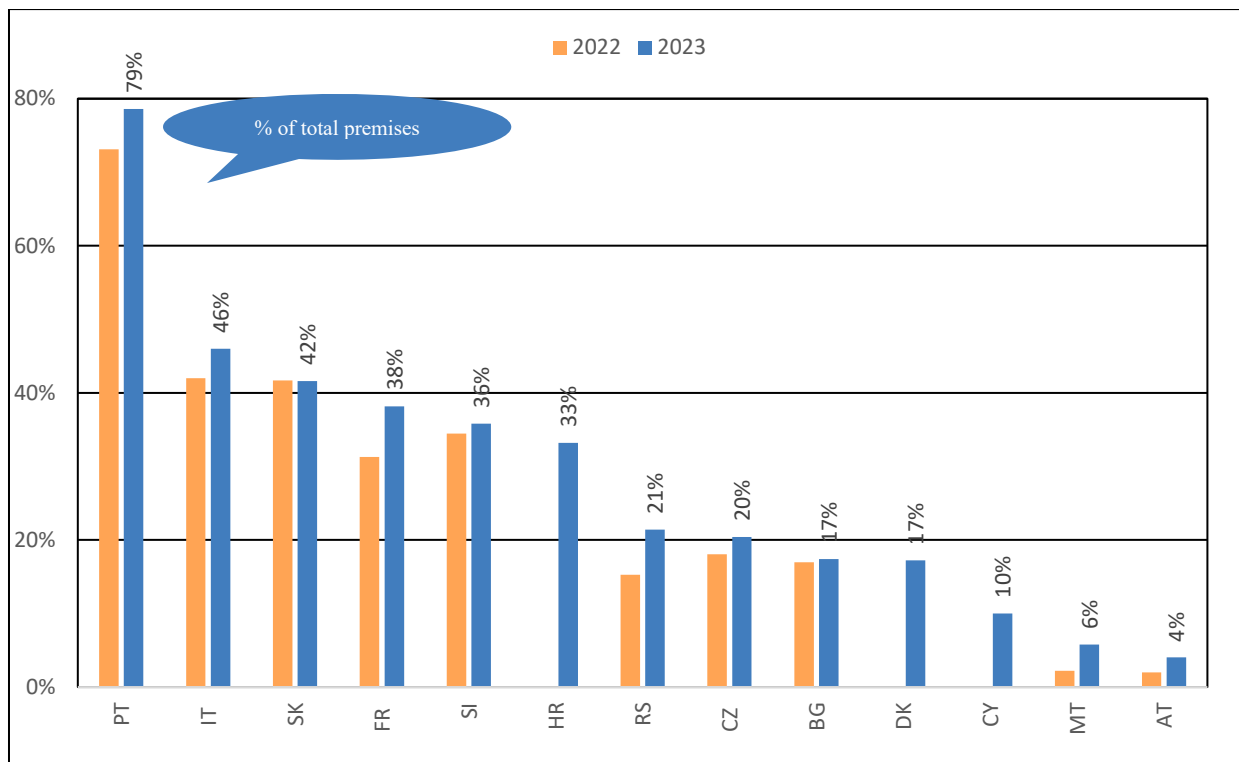
⁹⁷ OAO own infrastructure (including third party civil infrastructure) vertically integrated operator FTTB/C BB coverage: total coverage if more than one operator is present..

⁹⁸ Confidential in NL. Not available in AL, AT (FTTB not available), BE, DE, EE, EL, FI, HU, IE (figures included in other categories), LT, LU, LV, ME, MT, NO, PL, PT, RO, SE (no split on FTTC), SI. 0% in CY, ES (no FTTB/C), FR, LI (the OAO fibre network is built and provided by wholesale only operator. The fibre network of the operator has a 100% coverage of total households). BG: Residential subscriptions as a % of total households. CZ: Coverage of OAOs has decreased due to upgrade of access lines to FTTH by some alternative operators. SK: Data 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. Ultimately, this is the minimum coverage that can be greater. Data includes only FTTB technology.

⁹⁹ OAO own infrastructure (including third party civil infrastructure) vertically integrated operator FTTH BB coverage: total coverage if more than one operator is present.

¹⁰⁰ Confidential in LI, NL. Not available in AL, BE, DE, EE, EL, ES, FI, HU, IE (figures included in other categories), LT, LU, LV, ME, NO, PL, RO, SE (ca. 180 municipal networks, mostly not vertically integrated). BG: Residential subscriptions as a % of total households. AT: incl. vULL. PT: As % of total premises. If two or more operators are cabling in the same area, the overall effect is not taken into account (double counting). Excludes Fibreglobal SK: data 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. Ultimately, this is the minimum coverage that can be greater. Data includes only FTTB.

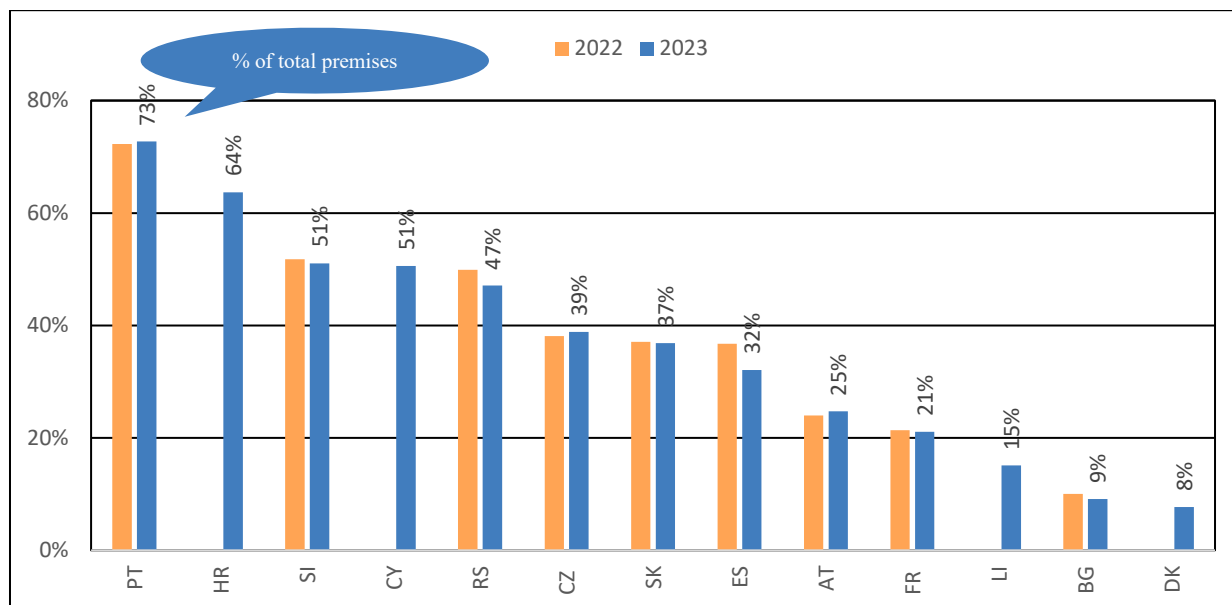
Figure 76 - Main OAO Coverage on Own Network FTTH: % of households



Source: BEREC RA database 2023

The total **cable coverage of OAO on own cable network (as a percentage of total households)**¹⁰¹ resulted in data shown for of a total of 14 NRAs in 2023¹⁰². Coverage has remained largely unchanged in comparison to the previous year (where available)¹⁰³.

Figure 77 - Main OAO Cable Coverage on Own Cable Network: % of households



Source: BEREC RA database 2023

Total **wholesale only OAO FTTH coverage (as a percentage of total households)**¹⁰⁴ resulted in a data shown for 8 NRAs in 2023¹⁰⁵.

¹⁰¹ OAO own infrastructure (including third party civil infrastructure) cable coverage: total coverage if more than one operator is present.

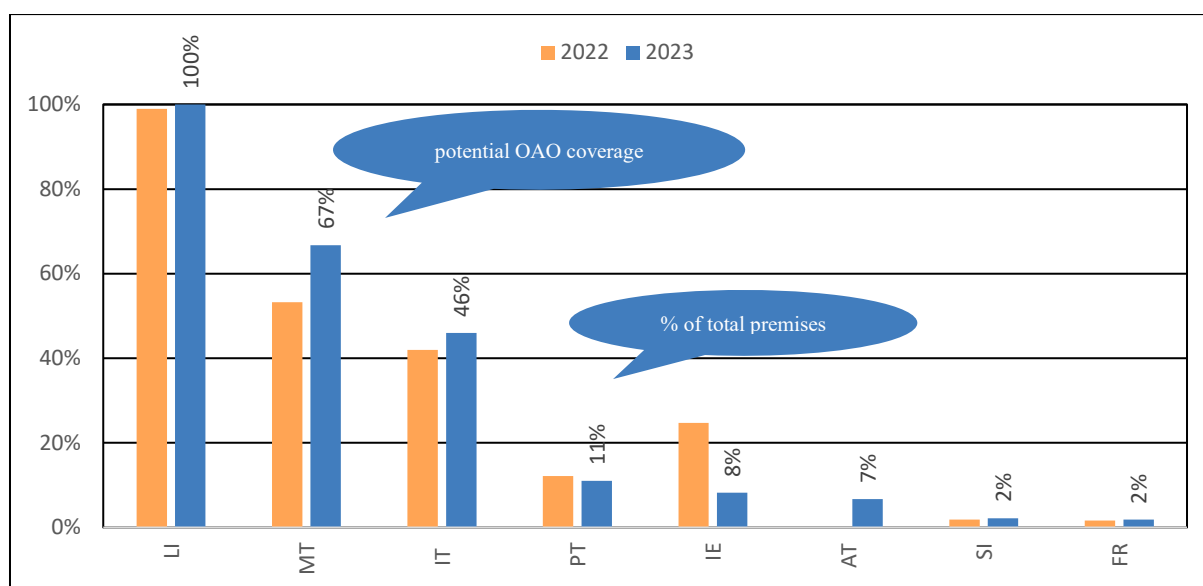
¹⁰² Confidential in NL and not available in AT, BE, DE, EE, EL, FI, HU, IE (figures included in other categories), IT, LT, LV, ME, NO, PL, RO, SE. 0% in MT. BG: Residential subscriptions as a % of total households PT: As % of total premises. If two or more operators are cabling in the same area, the overall effect is not taken into account (double counting). SI: Decline due to few corrections of data by infrastructure owners in the cadastre of public infrastructure. SK: data 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. Ultimately, this is the minimum coverage that can be greater. Data includes only FTTH.

¹⁰³ RS: The acquisition of the 3rd largest operator (and 2nd largest cable operator) at the time by the SMP operator in 2021 resulted in lower values compared to the previous year. IE: 2021 data not comparable.

¹⁰⁴ Wholesale only OAO FTTH coverage (total coverage if more than one operator is present). Not available in BE, BG, CZ, DE, DK, EE, EL, ES, FI, HR, LV, NL, NO, PL, RO, SE, SK. IE: NBI/Siro premises passed / no. of households. 2021 data not comparable. LI: Coverage of national infrastructure owner LKW; national coverage will be complete (100%) by the end of 2022. MT: OAO has own infrastructure and VULA agreement with the SMP. PT: As % of total premises, does not include Fastfiber. MT: The percentage provided - same as last year - reflects the OAO's potential to connect clients to fibre via VULA, the OAOs own infrastructure fibre network is 2,16%.

¹⁰⁵ Confidential in NL. Not available in AT, BE, BG, CZ, DE, DK, EE, EL, ES, FI, HU, LT, LU, LV, ME, NO, PL, RO, SE (ca. 180 municipal networks, mostly not vertically integrated). SK: 0% in CY, HR, RS. AL: incl. vULL. LI: The OAO fibre network is built and provided by wholesale only operator. The fibre network of the operator has a 100% coverage of total households.. MT: OAO has own infrastructure and a VULA agreement with the SMP hence the SMP coverage is the potential OAO coverage. PT: As % of total premises, does not include Fastfiber. Excludes Fibroglobal.

Figure 78 - Wholesale Only Main OAO FTTH Coverage: % of households



Source: BEREC RA database 2023

Appendix I

List of Participating Countries/NRAs

The following countries / NRA's have provided data for the 2023 RA Report:

AL	Albania (AKEP)
AT	Austria (RTR)
BE	Belgium (BIPT)
BG	Bulgaria (CRC)
CY	Cyprus (OCECPR)
CZ	Czechia (CTU)
DE	Germany (BNETZA)
DK	Denmark (DBA)
EE	Estonia (ETRA)
EL	Greece (EETT)
ES	Spain (CNMC)
FI	Finland (TRAFICOM)
FR	France (ARCEP)
HR	Croatia (HAKOM)
HU	Hungary (NMHH)
IE	Ireland (COMREG)
IT	Italy (AGCOM)
LI	Liechtenstein (AK LLV)
LT	Lithuania (RRT)
LU	Luxemburg (ILR)
LV	Latvia (SPRK)
ME	Montenegro (EKIP)
MT	Malta (MCA)
NL	Netherlands (ACM)
NO	Norway (NKOM)
PL	Poland (UKE)
PT	Portugal (ANACOM)
RO	Romania (ANCOM)
RS	Republic of Serbia (RATEL)
SE	Sweden (PTS)
SI	Slovenia (AKOS)
SK	Slovakia (RU)

