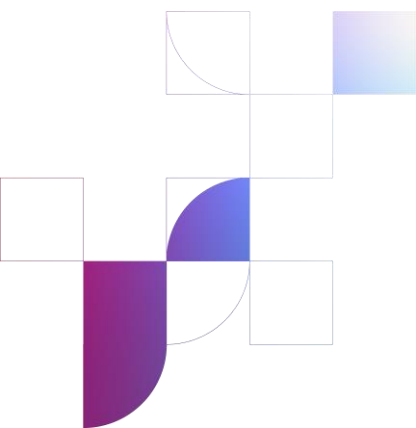


BEREC Report

Regulatory Accounting in Practice 2022



December, 2022

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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 eighteenth 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 is 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 annualisation methodologies provided by respondent NRAs. As in last year's report, accounting information for specific products in Market 3a/2014, 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 presented (par. 3.5).

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 3a/2014. 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.

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 2022 provides an analysis more oriented on single products (increasing the scope of monitoring) with respect to the previous editions. The 2021 report collected in fact information for 23 main products (13 in 2015). The 2022 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 3a and 3b 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 increased since last year. The SMP regulatory remedies have been applied by NRAs generally towards a single SMP operator that is national in scope. 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 with respect to last year for some markets/products. Looking at geographically differentiated regulation, it can be seen that deregulated areas range from 5% of households up to 70% in market 3b, 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 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, generally more flexibility is granted when regulating FTTH, also with the application of ERT. More in general, 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 market as well as on the level of the price flexibility tool according to the Code, other than 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.

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 2022 (BoR (22) 70), 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 mainly

² Cf. BoR (13) 110.

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.

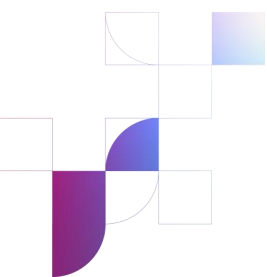
By taking into account only the most recent estimation over time (last three most recent values for each NRA) in the pooled regression analysis, the results show that the ERP, that was the second most relevant parameter after RFR for explaining differences between WACC values applied by NRAs until recently 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 2022 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 2023 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 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 of cost accounting, accounting separation and price control in European countries. The report also provides information on the regulatory context in which the obligation is imposed. The scope of the report is twofold: i) to provide a benchmark on regulatory accounting at a single access product level; and ii) to 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 eighteen annual report summarising the results of the 2022 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.

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, in any case, the corresponding old taxonomy. Thus markets and products refer also to the Commission Recommendation of 2014.

2.2 Current report

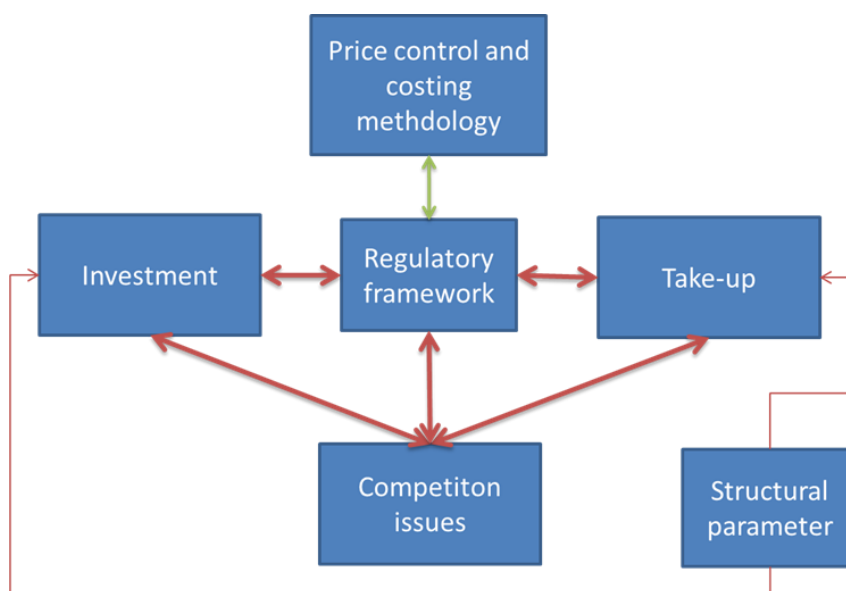
This report provides an update on the status of costing methodologies in use across Europe and it monitors the evolution over time as a consequence of the adoption by NRAs of decisions regarding market analyses.⁶

The 2022 RA report has collected information on the following main elements, in continuity with the past years:

- 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 that have been collected in the survey and the corresponding interaction diagram.⁷

Figure 1 – Information collected and main interactions



⁶ The monitoring approach is based on a “survey” submitted by NRAs mainly based on predefined categories and subcategories 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.

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.

The report benefits from information collected from 30 NRAs (listed in Appendix I)⁸ 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 2022).

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 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); 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

⁸ NRAs that replied to the 2022 questionnaire. Data from ME (Montenegro) are available from 2021 report.

connections to be commercially viable for efficient access seekers. BEREC has provided guidelines on the criteria for a consistent application of Art. 61(3) EEC in BoR (20) 225.

In this context the 2022 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.

In every case behind those new addressed specificities, the standard Significant Market Power (SMP) regime remains at the cut-off date the key instruments for *ex ante* regulation.

In this context 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 EEC code are already applied: 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); vi) wholesale-only lighter rules (Art. 80).

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
ex. Market 3b	M3a_2014_M4_2007_DA	SMP Duct access
	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 2022

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 sub-paragraph 1 (access to wiring and cables and associated facilities inside buildings) and sub paragraph 2 (access point beyond the first concentration point) has been collected.

Symmetric regulation affecting the terminating segment, in line with the 2021 report, is applied by 7 NRAs (ES, FR, HR, HU, IT, LV, PT), 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 sub-paragraph 2) has been declared by 3 NRAs (FR, HR, HU).

The symmetric obligation has been considered a complement of the SMP regulation on terminating segment for HU and IT; 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 sub paragraph 2 has been considered a complement with respect to Fibre ULL (FULL) and/or VULA FTTH by two NRAs (HR, HU) of the three that 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. It includes provisions that facilitate co-investment between operators. In the case of France, the application of the symmetric obligation

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.”



has been considered sufficient enough to generally not impose SMP remedies on fibre in market 3a 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 man-hole 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 absolute number of NRAs that apply SMP regulation for the corresponding product/market is provided, considering: i) all NRAs (EU and non-EU: 31 NRAs) and ii) only EU NRAs (27 NRAs) that have provided information. The regulation of legacy products in market 3a/2014 and 3b/2014 is more frequent: 85% (in comparison to 90% last year, one NRA removed the regulation on copper network, DK) of EU NRAs still maintain SMP remedies on ULL and 67% -(in comparison to 81% last year) on market 3b/2014 legacy copper network still regulate the product in the market (CY, DK, FI, HR have removed regulation since last year's survey). Three countries have removed the obligation on SLU services over copper network since last year (EE, FI, HR).

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 increased since last year. CY removed regulation over FTTC and FI, HR and DK removed the regulation on market 3b/2014 over FTTH.

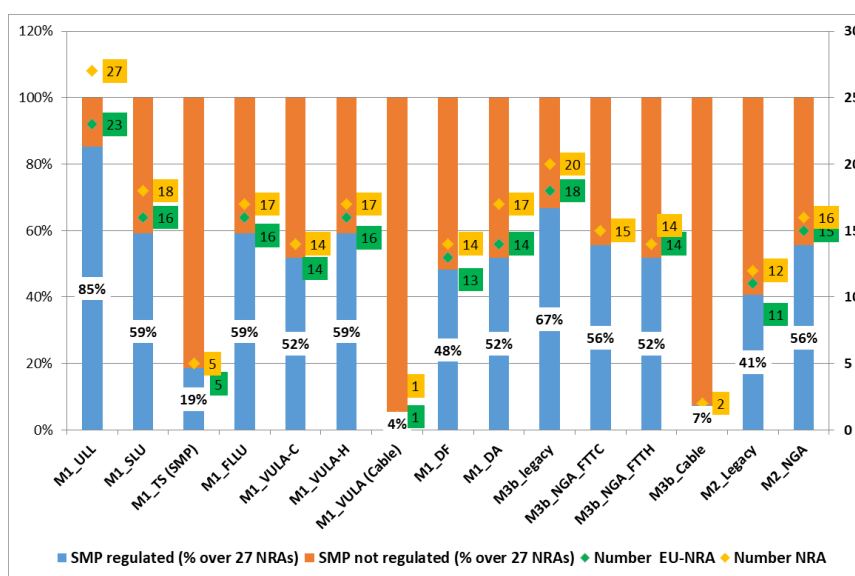
¹⁰ However, concerning FR, even if no SMP regulation has been imposed for fibre LLU, the SMP operator - since the 2017 market analysis decision – is regulated on a part of the fibre local loop, in two specific cases : (i) offers for business customers; (ii) offers with enhanced quality of service.

For DK market 3b/2014 over FTTC technologies 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 3 SMP operators; a second part of the country where it is available on an SMP basis provided by a vertically integrated operator (about 10% of households); and a third part of the country 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.¹¹

Three NRAs do not apply any SMP or Symmetric regulation (BG, NL and RO) in the analysed products and markets at national level due to the fact that all markets have been found to be competitive.¹²

From a taxonomy side, at the cut-off date of April 2022, 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



Source: BEREC RA Database 2022

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; as last year 24 NRAs out of 31 have applied SMP or symmetric regulation to FTTC and/or FTTH (not including duct access, where SMP regulation has been applied by 17 NRAs): AT, BE, CY, CZ, DE, DK, EE, EL, ES, FI, FR¹³, HR, HU, IE, IT, LT, LU, LV, MT, NO, PL, SE, SI, SK^{14 15}. With respect to NGA products 9 NRAs have applied regulation in markets 3a and 3b on both FTTC and FTTH (AT, BE, CZ, HU, IE, IT, LV, SI, SK), reduced

¹¹ 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 operator is planned.

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.

¹³ 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.

¹⁴ PT and RS have applied SMP regulation to the legacy copper network in combination with duct access.

¹⁵ LI Regulation of national FTTH/B access (fibre unbundling) is in progress, and will become effective from Jan 2024.

from last year;¹⁶ 5 NRAs have applied regulation only to market 3a VHCN (FLLU and/or VULA FTTH) (FR,¹⁷ DK,¹⁸ 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 is mostly regulated where market 3a products are available, as expected.¹⁹ Moreover, all 24 NRAs previously mentioned have applied SMP regulation including at least one VCHN-FTTC product (market 3a/3b), in line with the fact that those technologies are the most widespread in the EU. VHCN regulation has been applied to market 3a VULA FTTH by 17 NRAs (AT, BE, CY, CZ, EL, ES, FI, HR, HU, IE, IT, LU, LV, MT, NO, SI, SK) and FLLU by 7 (DE, DK, EE, FR²⁰, LT, PL, SE)²¹ with no difference since last year. Where VULA-FTTH is present, regulation in market 3b VHCN is also more frequent even if there is a decrease in regulating market 3b over VHCN since last year: 11 of 17 NRAs (64% in comparison to 76% last year) regulate VULA over FTTH and market 3b over FTTH (AT, BE, CZ, ES, HU, IE, IT, LU, LV, SI, SK).

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 SMP framework is always more focused on the local access product market.

Since last year's report few NRAs have changed their approach as reported in the following table:

	M1_ULL	M1_SLU	M1_DF	M1_DA	M3b_Legacy	M3b_NGA_FTTC	M3b_NGA_FTTH	M2_Legacy	M2_NGA
NRA that removed regulation since 2021 for the corresponding service/product	DK	EE, FI,HR	DK,HR,	HR,PL	CY,FI,HR,DK	CY,FI,HR	DK,FI,HR	CZ,FI,HR,MT,NL	CZ,FI, MT

No regulated products have been added since last year²² 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 4).²³

¹⁶FI and HR have removed regulation in market 3b over NGA (FTTC and FTTH).

¹⁸ For DK regulation over FTTC is based mainly on a commitment basis, therefore only FTTH falls under ex ante regulation.

¹⁹ 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 3a product (VULA) available

²⁰ 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.

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

²² Only DK added a regulated product in market 3b since last year's report, but this is due to a commitment agreement.

²³ 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.

Source: BEREC RA Database 2022

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, IE, LV, SI, SK, CZ,) apply regulation in FTTH (FULL or VULA)²⁴, HR and FI regulate both copper and fibre including both FLLU and VULA on copper and fibre only at local level.

In a second group of countries, FTTC is regulated and four out of five main regulatory obligations on NGA are in charge in market 3a and 3b (IT, AT, EL, CY, DE). In this case VULA FTTH or FLLU are applied alternatively as main obligations for VHCN obligation in market 3b since the last year survey.

A third group of countries (LU, NO, MT, ES, EE, PL, LT, FR,²⁵ SE) sees FTTH and not FTTC as the main deployed architecture for NGA, but the relevance of copper network has prevented the lift up of the regulation on copper. In such cases VULA FTTH or FLLU are the instruments for SMP regulation, sometimes in combination with remedies in market 3b.

Other countries (PT²⁶, RS, LI) have included only duct access as an instrument for regulatory purposes to NGA networks. BG, NL and RO²⁷ do not impose remedies in market 3a and market 3b. For DK, FLLU is still in charge, but it covers only 5% of the geographical market and commitment agreement is the main instrument of regulation.

Summing up, the first two groups include NRAs that regulate copper, NGA over FTTC and FTTH, in market 3a/3b in general (the second group applies lighter FTTH regulation). 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 copper and applies FTTH regulation only based on civil infrastructure access, or only commercial agreements or commitments are in charge.

In the light of the four identified groups of NRAs, as last year, two main indicators are considered in figure 6: i) the weight of DSL over retail BB market share (DESI Report, latest available data),²⁸ in order to understand the relevance of the legacy copper network for each country (including VDSL based on FTTC); ii) the SMP retail market share, which has been provided in the RA database 2022.

The average values have been calculated including only EU countries (in the picture non-EU countries (NO-LI-ME-RS) have been reported in brackets and not included in the calculation of averages), since the DESI Report figures are only available for these countries. The first group combine a high FTTH/cable coverage (less relevant is the FTTC) in combination with an SMP market share of about 50%, on average.

The second group regulates FTTC, however the copper network is more relevant for NGA deployment and where the competitive situation (SMP market share) is at an intermediate stage. This is the case for a specific group of countries (IT, AT, EL, CY, DE).²⁹ In the third and fourth group the

²⁴ CZ do not regulate access to ducts, but in this case the SMP operator is legally separated.

²⁵ 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

²⁶ PT applies symmetric obligation to civil infrastructure independently of the BCRD provision.

²⁷ 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.

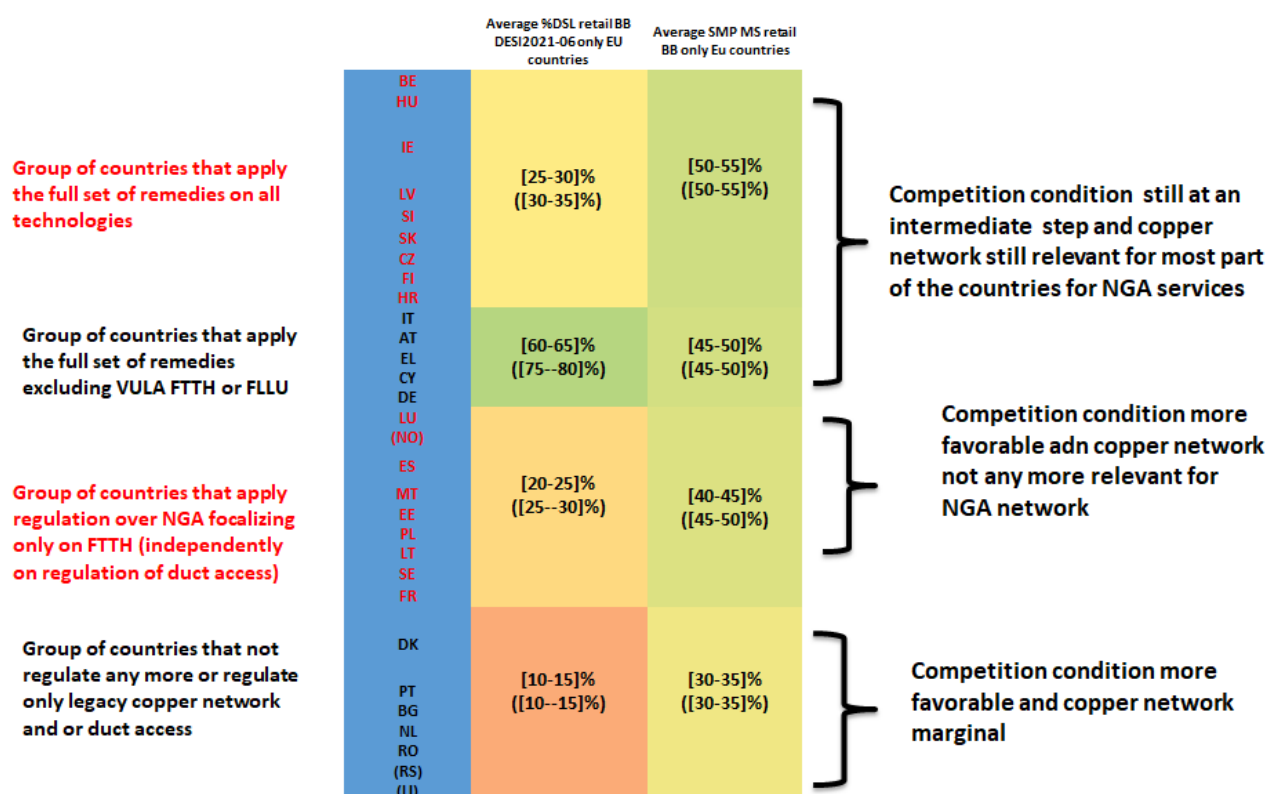
²⁸ <https://digital-strategy.ec.europa.eu/en/policies/desi>.

²⁹ For confidentiality reasons, the averages of SMP market shares and other indicator are given in a range.

copper network is less relevant and the transition to FTTH/VHCN, on average, is – like the competitive situation - at a more advanced stage.

No relevant change has been reported since last year’s report. It should be noted that there is a reduction in the xDSL share in general in combination with a reduction of the market share of SMP operators, on average. In addition, where there is infrastructure competition and/or a clear commitment on VHCN investment, for example via co-investment agreements or effective commercial agreement are available, the standard SMP framework is always less relevant (i.e. NL, FR, ES, DK).³⁰ 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 6 – SMP-regulatory approach vs network evolution and SMP market share (in parentheses previous ranges from BoR (21) 161).³¹



Source: BEREC RA Database 2022

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 3a, 3b and 4; BE consider 3 SMP operators in case of bitstream over cable network.

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

³⁰ AT declared that on October 10, 2022 deregulation in M3a&M3b will be based on commercial agreements.

³¹ 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. For DK the SMP market share used is the one available in the DESI data base with the last value as of July 2021.

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.³²

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

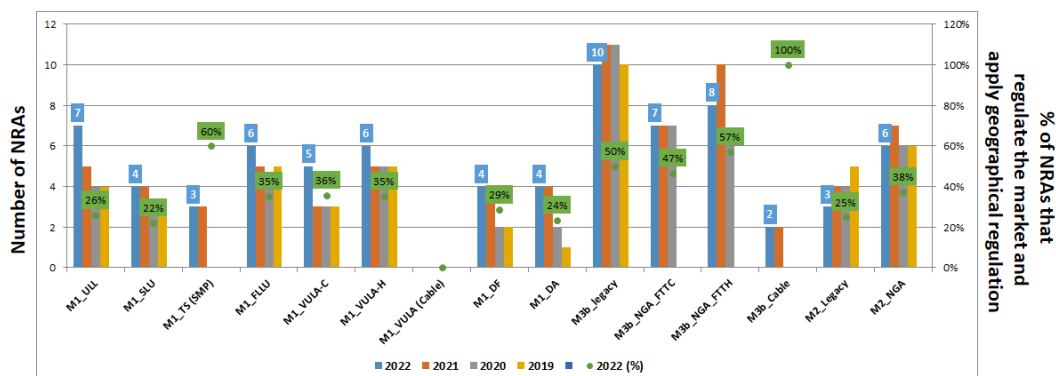
A differentiated geographical approach to regulation reflects generally the level of competition reached in each part of the country; it provides insight into the impact of the SMP regulation where a market has been partially deregulated.

In Figure 7 the number and the corresponding percentage of NRAs that have applied some form of geographically differentiated approach is provided for each market and product for 2022 and previous years.³³ 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. With respect to last year an increased trend is also seen for products in market 3a.³⁴

³² 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.

³³ 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.

³⁴ The replies of the previous years are homogenous with the ones in 2022, considering only replies of the 31 NRAs that have provided information for the 2021 RA 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.

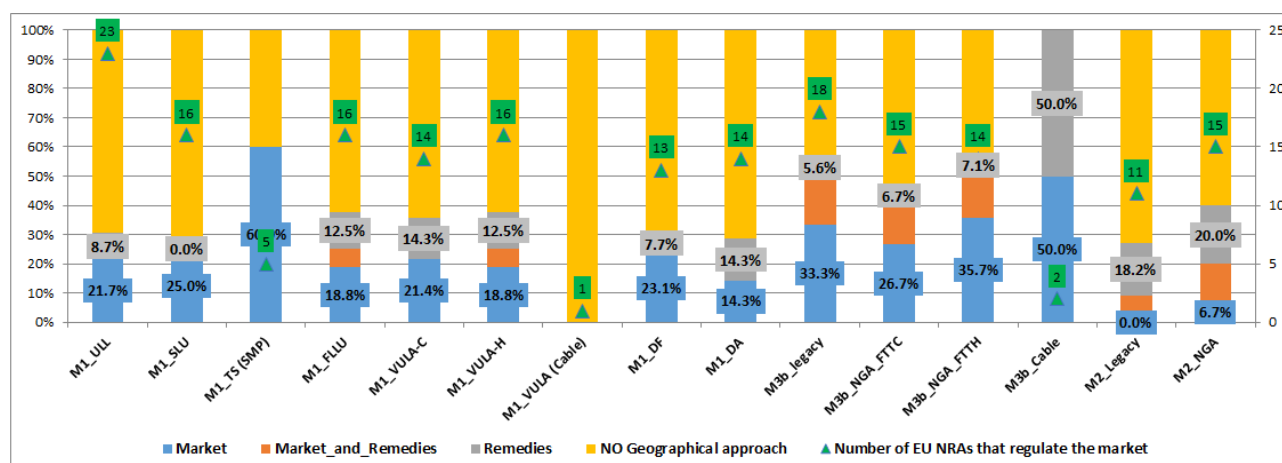
Figure 7 – SMP - geographically differentiated regulatory approach³⁵

Source: BEREC RA Database 2022

In Figure 8 the percentage of EU NRAs (27 NRAs) that apply geographical analysis to regulation is given for 2022 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.

³⁵ When 100% is given this means that all NRA that regulate the specific product also apply a geographical regulatory approach.

Figure 8 – SMP - geographically differentiated regulatory approach



Source: BEREC RA Database 2022

NRAs that apply a differentiated approach to regulation are reported in Figure 8. In the table the percentage of households falling under geographical regulation is shown. For each product/market 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.³⁶

The same picture shows that deregulated areas range from 5% of households up to 70% in market 3b, very often between 20% and 50%, increasing in comparison to last year's report.³⁷ 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). In parentheses is the value reported in 2021 (only if different from 2022) showing that the competitive/deregulated areas are increasing.

³⁶ 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. 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 WZP areas (roughly 40% of the total number of WZP areas).

³⁷ 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.

Figure 9 – Households in deregulated/competitive areas³⁸

	FLLU		VULA FTTH		Market 3b FTTH		VULA FTTC		Market 3b FTTC		ULL		Market 3b legacy		M2 NGA		Duct access		FTH	State Aid plan
	Deregulated areas (Market regulation)	Competitive areas (remedies differentiation)	Deregulated areas (Market regulation)	Competitive areas (remedies differentiation)	Deregulated areas (Market regulation)	Competitive areas (remedies differentiation)	Deregulated areas (Market regulation)	Competitive areas (remedies differentiation)	Deregulated areas (Market regulation)	Competitive areas (remedies differentiation)	Deregulated areas (Market regulation)	Competitive areas (remedies differentiation)	Deregulated areas (Market regulation)	Competitive areas (remedies differentiation)	Deregulated areas (Market regulation)	Competitive areas (remedies differentiation)	Deregulated areas (Market regulation)	Competitive areas (remedies differentiation)		
BE	0	<5%	0	<5%	0	<5	0	<5%	0	<5%	0	<5%	0	<5%	0	NA		<5%		
HU	<20%	0	20%	0	<20%	0	<20%	0	<20%	0	<20%	0	<20%	0	0	0	<20%		<30%	
IE	0	0	0	0	<20%	0	0	0	<20%	0	0	0	<20%	0	<50% (0)	0 (<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	5% (0)	<10%	
CZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0					<20%	
FI	<5%	0	<5%	0	<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%	<50% (<30%)	
AT			0	0	0	0	0	0	0	0	0	0	0	0	>50%	0				
DE	0	0					0	0	0	0	0	0	0	0	0	0	0	0	<5%	
ES			0	<70% (<40%)	<70% (<60%)	0					<70% (0)	0	<70% (<60%)	0	0	0				
PL	<20%	0			<40%	0			<40%	0	<20%	0	<40%	0						
LT	0	0			<5%	0					0	0	<5%	0	0	0				
FR		<20%									0	0	<20%	<80%	0	<30%			<50%	
PT										0	0	<60%	0	Not relevant	Not relevant					
DK	<95% (0)	0																		

Source: BEREC RA Database 2022

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 table in line with last year's report.

Figure 10 – More than two geographical areas (market or remedies)

Country	Numbers of markets/Remedy areas	Market/product	Notes
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	3 regulated and 3 deregulated markets (as country were divided into 3 incumbent operators' areas, therefore 3 times 2 [regulated-non regulated] markets are present)
AT	3_markets	Market 4	
FR	3_remedy_areas	Market 4	

³⁸ Some countries: have also reported that for FTTH there is a state aid plan: HU (<30% of premises), SI (<10%), CZ (<10%), IT (<50%), DE (<5%), FR (<50%), CY (<10%), ES (<5%), HR (20%), RO (5%).

Source: BEREC RA Database 2022

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 EECC) 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.³⁹

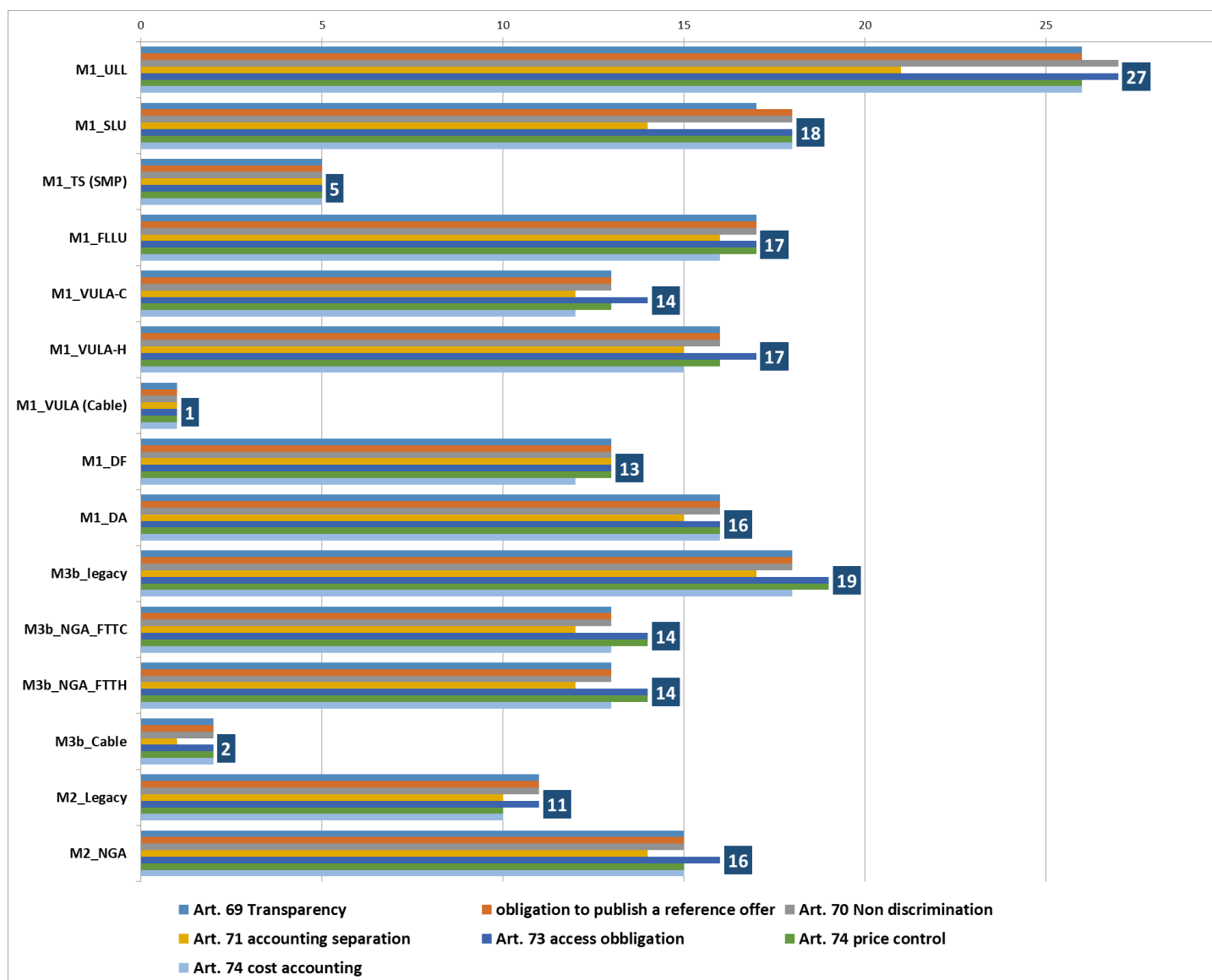
Figure 11 – EECC art. 69-74

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.⁴⁰

³⁹ 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).

⁴⁰ The different numbers in comparison to last year’s report are due to the removal of the regulation in the corresponding product/market by DK, FI, HR, PL, CY, MT, NL as reported in the previous table. One NRA has modified the set of remedies due to the new market outcome: DK for FLLU modified the corresponding set of remedies removing access obligation (Art. 73) and cost accounting obligation (Art. 74).

Figure 12 – Application obligations Art. 69 -74 EECC⁴¹

Source: BEREC RA Database 2022

Figure 12 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 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 become

⁴¹ Labels report the indication of relevant markets according to the 2014 Rec when needed.

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 13) where geographical remedies differentiation is applied to some markets/products (BE, IE, SI, IT, ES, FR, DK), 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, IT⁴², FR⁴³); 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 13 – Remedies in competitive areas

Country	Kind of obligation in more competitive areas
BE	Only access obligation and transparency obligation
IE	Only access obligation and obligation to publish a reference offer
SI	No price control and cost accounting
IT	No price control
ES	No access obligation in competitive areas and lift up of all set of remedies
DK	No access obligation in competitive areas and lift up of all set of remedies
FR	No price control

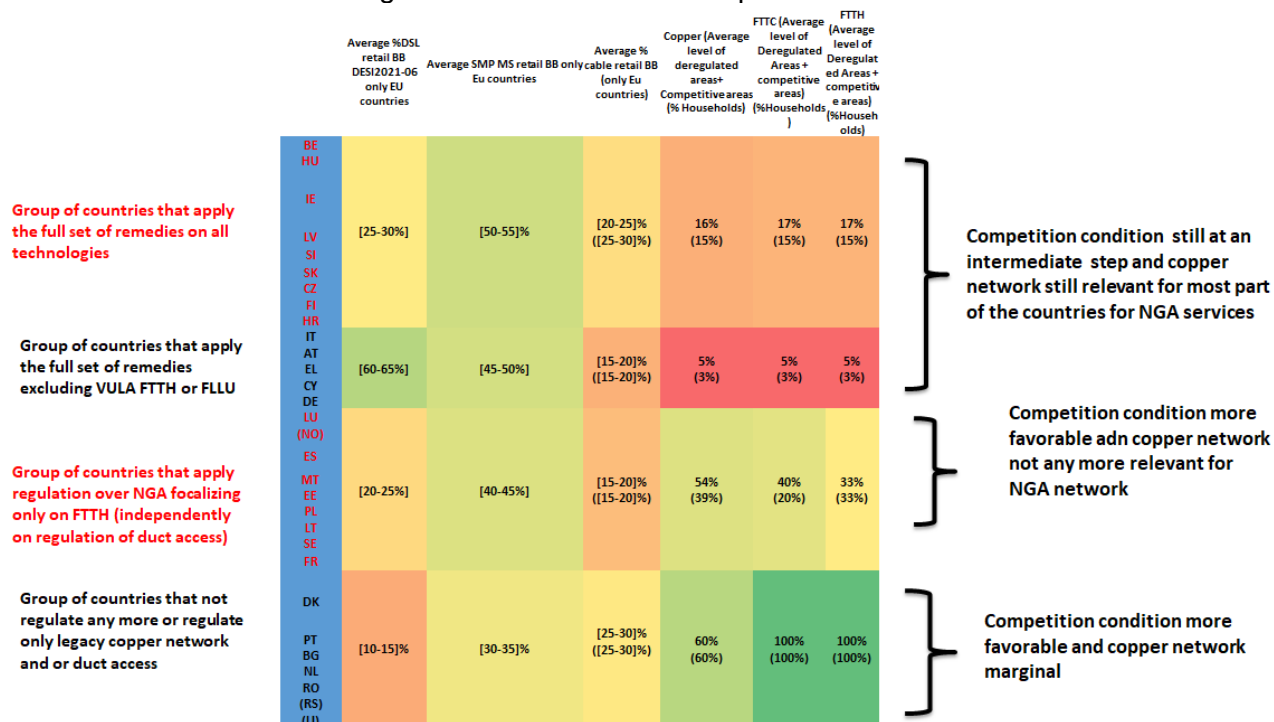
Source: BEREC RA Database 2022

For a general perspective of remedies differentiation, in line with last year’s report, we have added to the four groups of countries highlighted in figure 6 indicators on (i) the percentage of cable retail BB lines, (ii) the average level of deregulated/competitive areas (for copper, FTTC, FTTH),⁴⁴ where relevant. As can be seen in figure 14, 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.

⁴² Only for market 3b.

⁴³ On market 3b the obligation to publish a reference offer is also removed on the “competitive areas”

⁴⁴ The average has been evaluated considering “0” where regulation is in charge without combining any geographical approach to regulation in market 3a and/or 3b. In case of geographical differentiation the maximum % of households has been considered in market 3a, 3b as reported in figure 8; “100%” of flexibility where no regulation is present on the corresponding technology both on market 3a and 3b. Only EU countries have been considered when calculating averages.

Figure 14 – Remedies in competitive areas⁴⁵

Source: BEREC RA Database 2022

3. Outline of the Results

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 Recommendation⁴⁶ such as: i) the availability of an economic replicability test (ERT); ii) the imposition of a 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.

⁴⁵ In parenthesis the values of the last year have been reported in homogenous terms.

⁴⁶ 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 1515).

Figure 15 - Price control categories and sub-categories

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

Source: BEREC RA Database 2022

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 16).

Figure 16 - 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 2022

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 services⁴⁷.

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 17).

Figure 17 - Cost base categories and sub categories

Cost base
HCA
CCA

Source: BEREC RA Database 2022

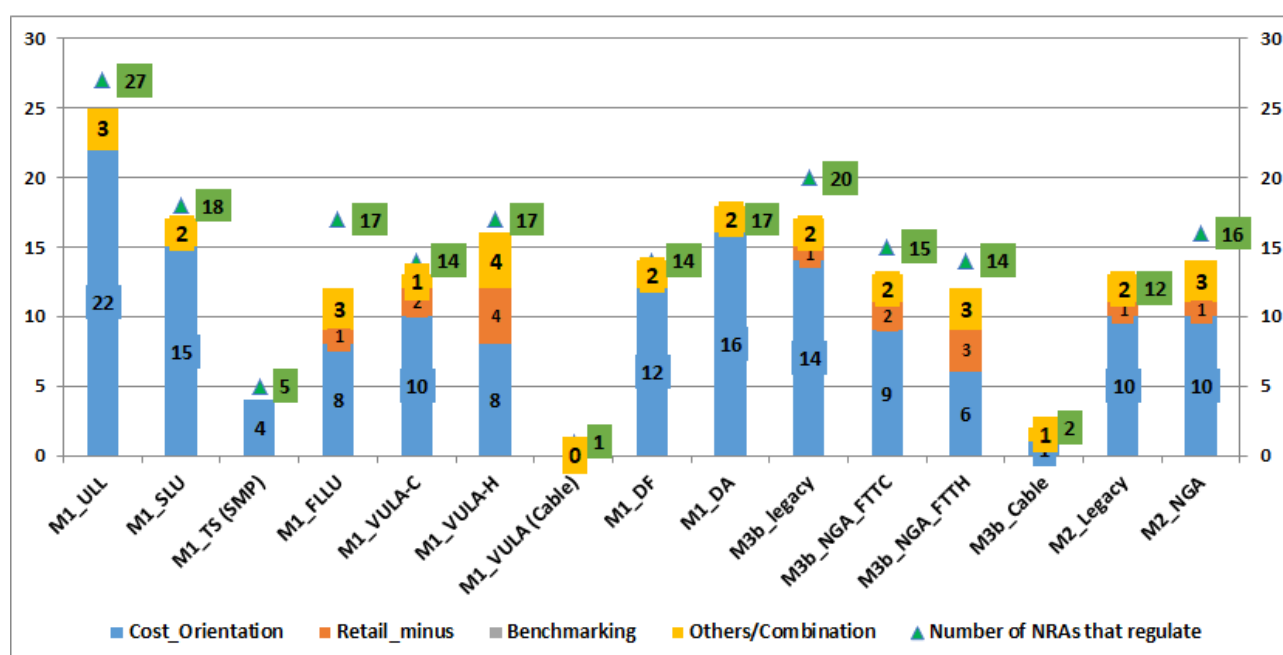
⁴⁷ The replies to the questionnaire refer to the "main" allocation methodology in use for each product market, even if the whole approach for service calculation can be a mix of methodologies that can refer to more than one category or sub category in the final decision.

3.2 Price control methods

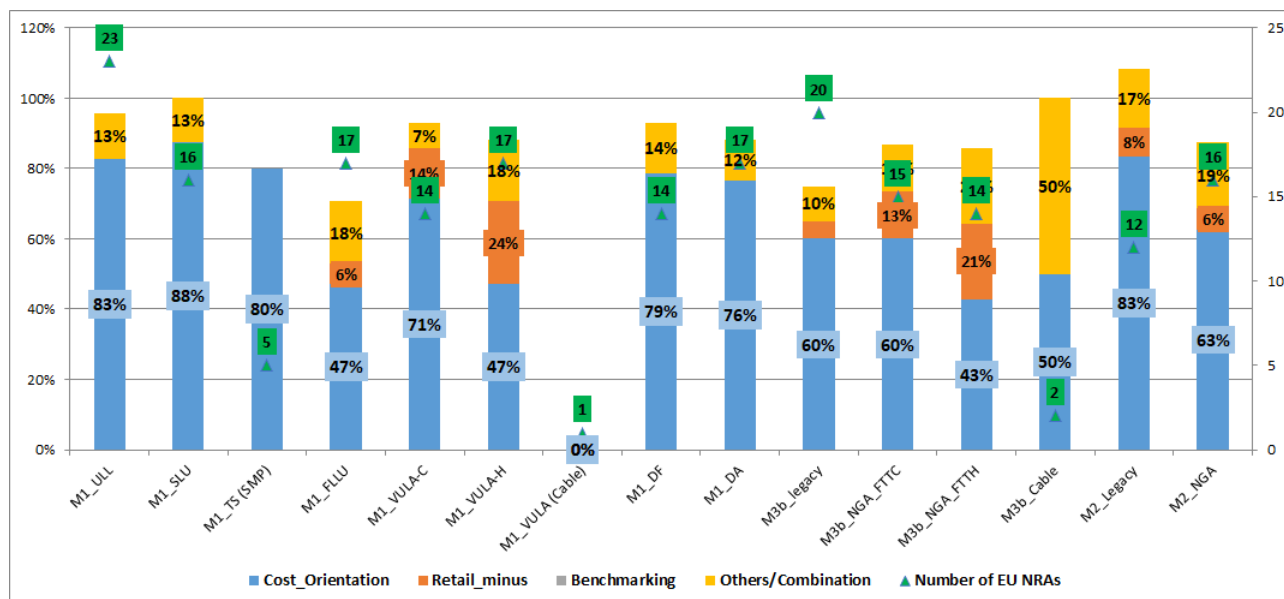
This section gives an overview of the price control methods used by NRAs in 2022 to regulate markets and products according to the main categories and sub categories, which have been previously reported. In the same picture the corresponding percentage of the main category of price control in use in relation to the number of NRAs that regulate the market is given for EU countries alone.⁴⁸

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 18). Retail minus is sometimes applied to VULA FTTH products or in market 3b. Looking at EU NRAs about 25% of NRAs that regulate VULA FTTH use ERT whereas 47% of the 17 NRAs that regulate the corresponding product use cost orientation (plus one NRA since last year).

Figure 18 - Price control main categories



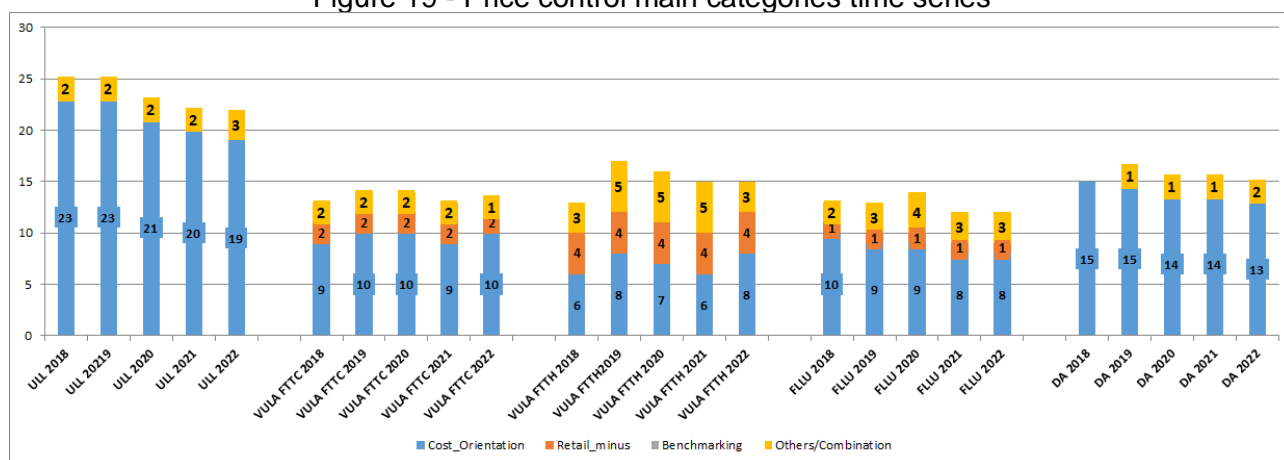
⁴⁸ When the percentage shown is lower than 100% for the corresponding product, this is due to the fact that no information is given on regulation or on price control .



Source: BEREC RA Database 2021

In figure 19 the time series for EU NRAs have been considered along the last four years from 2018 (as reported in previous RA reports).⁴⁹

Figure 19 - Price control main categories time series



Source: BEREC RA Database 2021

The recorded changes in the last five years are summarised as follows: the change of pricing approach happens in very few cases in market 3a and changes are mainly due to the deregulation of some products (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)⁵⁰. In five cases the obligation of price control has been implemented in the last 4 years (BE, EL, FI, NL, PL) as reported in the following table for each main product in market 3a. The situation is quite stable and even if the number of NRAs that regulate the

⁴⁹ Only EU NRAs have been considered .

⁵⁰ 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.

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.

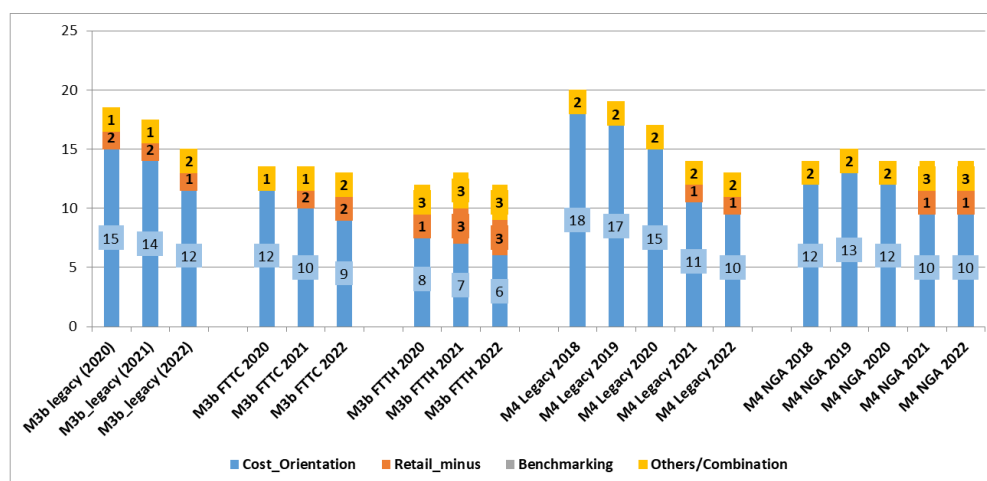
Figure 20 - Price control major changes 2019-2022 (market 3a main categories)

Product	2022	2021	2020	2019
ULL	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	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	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	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 2022

Considering the products in market 3b and 4 in Figure 21 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. A clear decrease of price control obligation is seen in market 4 legacy network.

Figure 21 - Price control main categories time series (market 3b and 4)



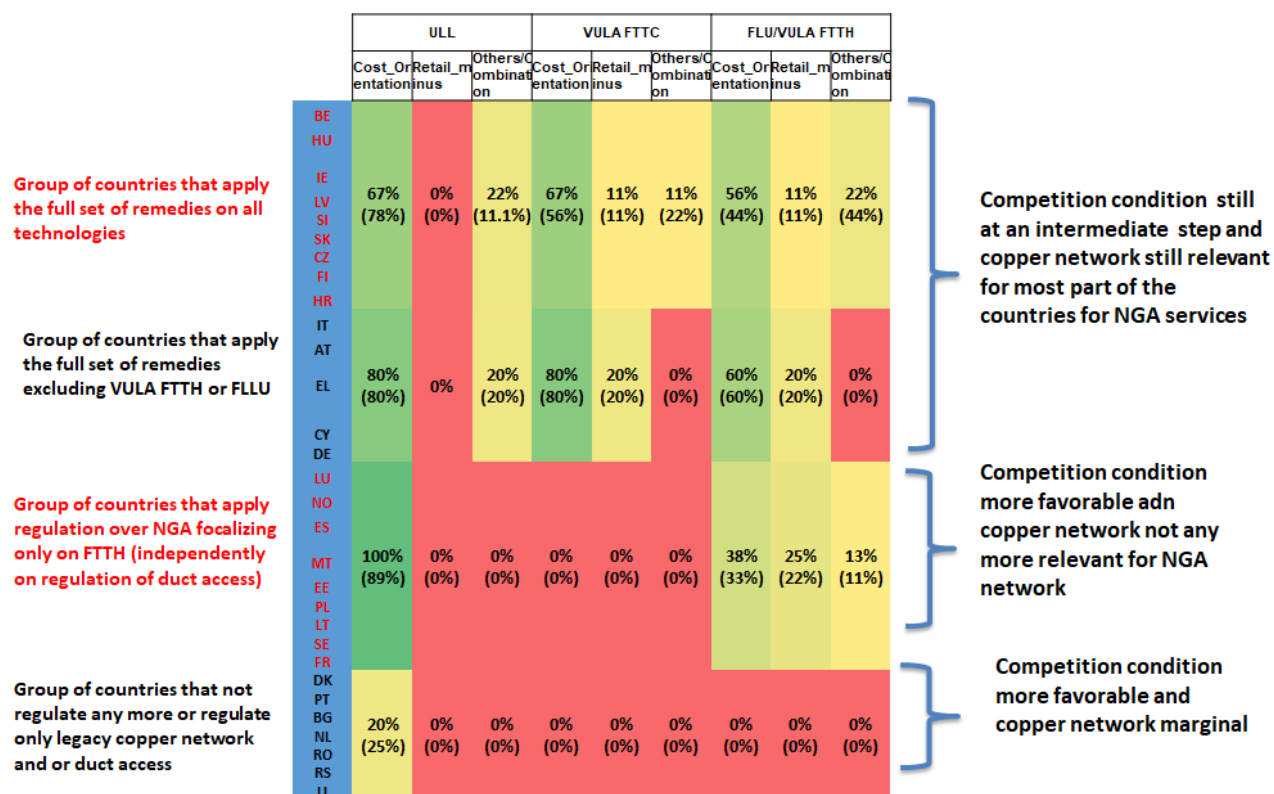
Product	2022	2021	2020	2019
MK3b legacy	CY-DK-HR (removed regulation from cost orientation)-SI (from CO to "Others")- ES (CO from retail minus) EE (re-introduced cost orientation)	EE (no more cost orientation)	NA	NA
MK3b FTTC	CY- HR (removed regulation from CO) DK (introduced "Other" due to the commitment 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	DK-HR (removed regulation from CO) EE (introduced again CO)	AT-SI (started to be regulated RM); EE (no more cost orientation)	NA	NA
M4 legacy	NL (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 (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 2022

Looking at the four groups of NRAs previously described in figure 6 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 (FTTC). This corresponds with 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 generally increasing for NGA products.

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. 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.⁵¹ The illustration shows that cost orientation (also for FTTH) is more frequent in countries in the first two groups, specifically where FTTC (or the copper network) is still relevant for NGA deployment. This situation should also be considered in light of commitment to VHCN investments. In this case cost orientation and, more in general, SMP regulation should also be applied in the light of other possible measures (i.e. AT approved for future years a deregulation in M3a and M3b based on commercial agreements which will include index adjustments of wholesale prices).

⁵¹ The averages exclude non-EU countries.

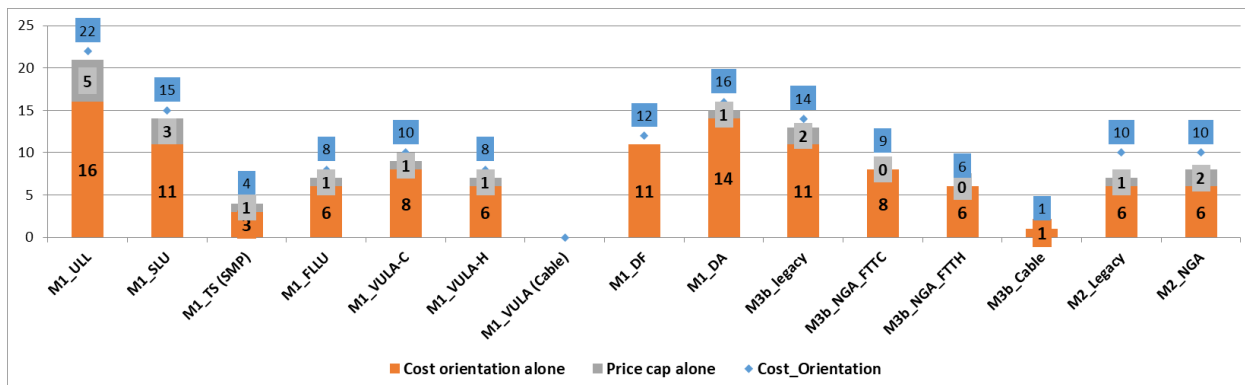
Figure 22 – relation of price control main categories and general group of NRAs⁵²

Source: BEREC RA Database 2022

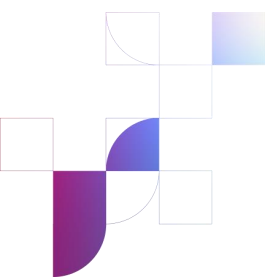
⁵² In parenthesis the values of the last year have been reported in homogenous terms.

With respect to the sub-categories, Figure 23 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 23 - Price control sub category Cost Orientation

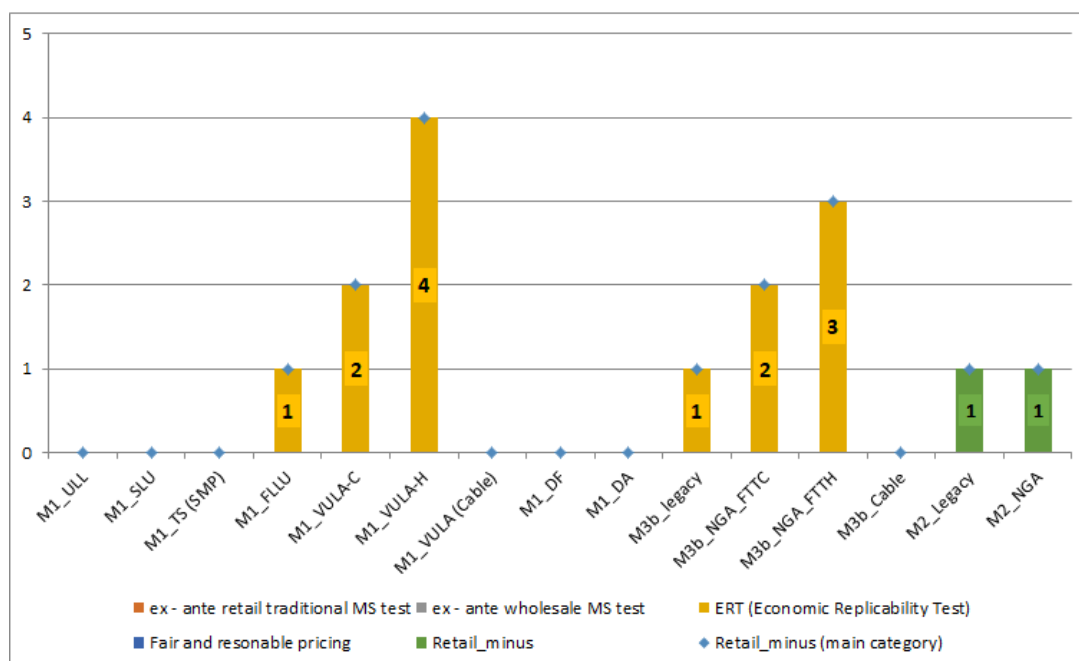


Source: BEREC RA Database 2022



The ERT price control methodology has been mainly applied to VULA and NGA products in line with the Commission Recommendation on Costing Methodologies. Retail minus is currently applied in only one member state in market 4 (Figure 24).

Figure 24 - Price control sub categories market 3a



Source: BEREC RA Database 2022

In figure 25 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 25 - Price control sub categories market 3a

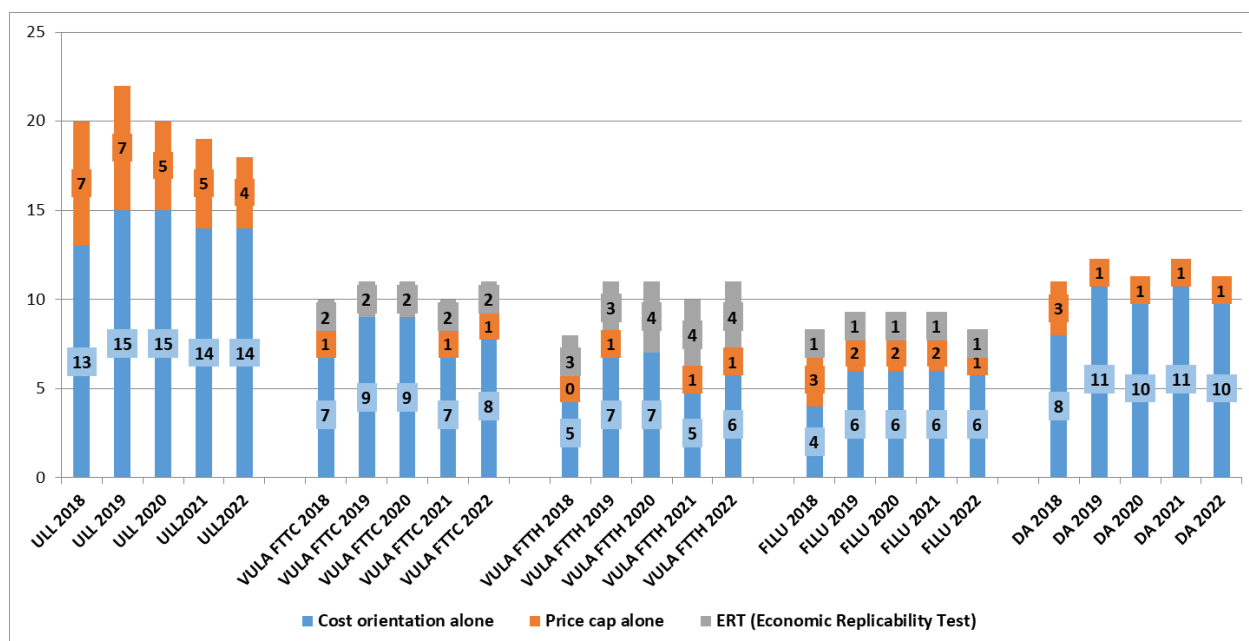


Figure 26 - Price control major changes 2019-2022 (market 1/3a sub categories)

Product	2022	2021	2020	2019
ULL	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	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	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	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	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 2022

Looking at market 3b and 4 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 4 is observed.

Figure 27 - Price control sub categories market 3b and 4

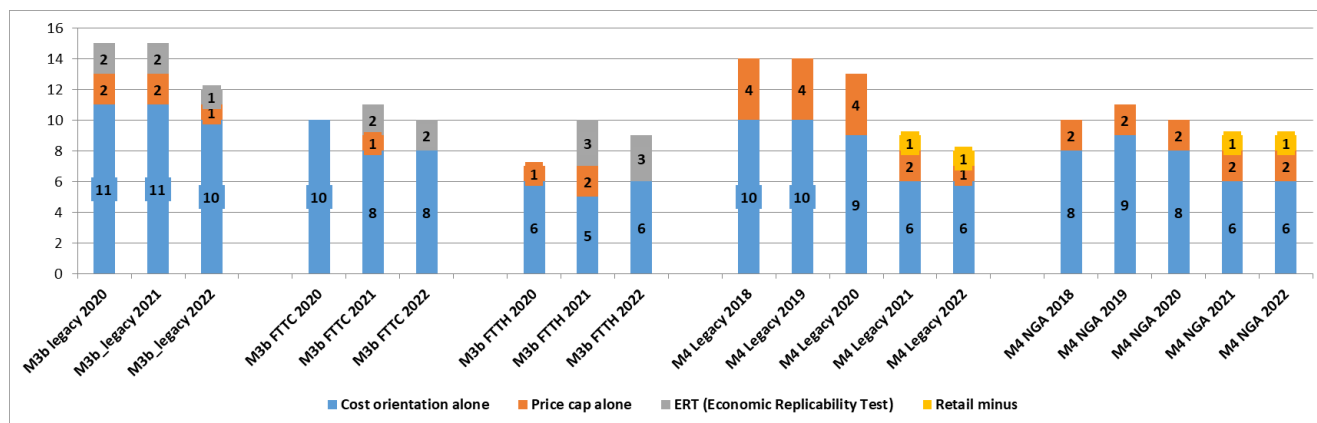


Figure 28 - Price control major changes 2019-2022 (former market 3b and market 4 and 4 main categories)

Product	2022	2021	2020
MK3b FTTC	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	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)	
M4 legacy	NL (removed regulation from price cap)	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)
M4 NGA		EL from cost orientation alone to retail minus); SI (removed regulation from cost orientation)	LV (removed regulation from cost orientation)

Source: BEREC RA Database 2022

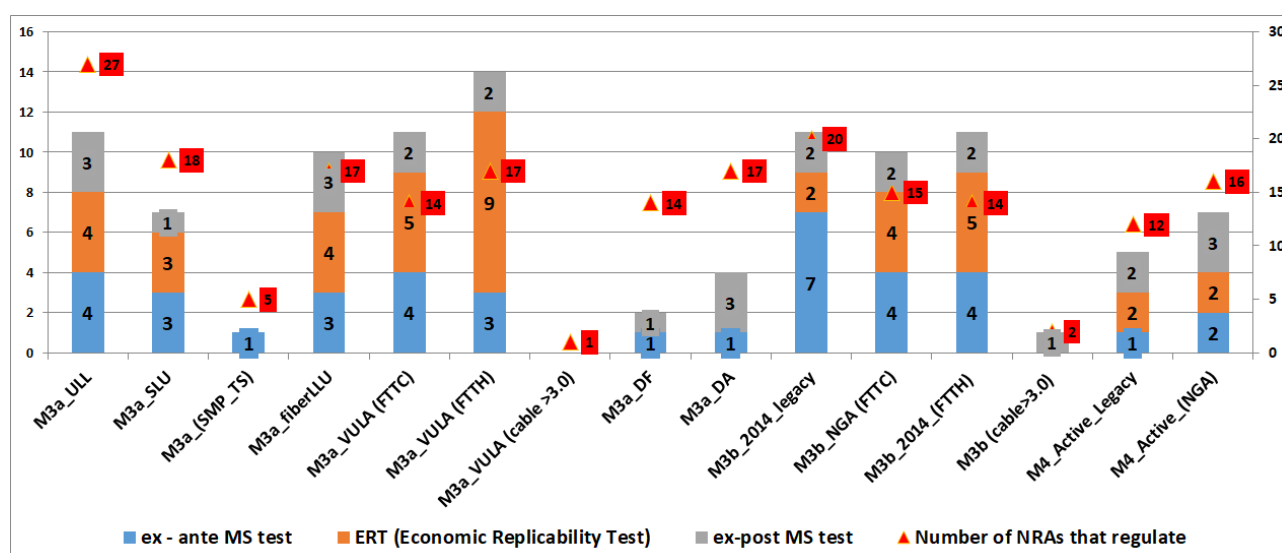
The following part provides information on the implementation of margin squeeze tests and non-discrimination models adopted.

The non-discrimination framework in the context of price control

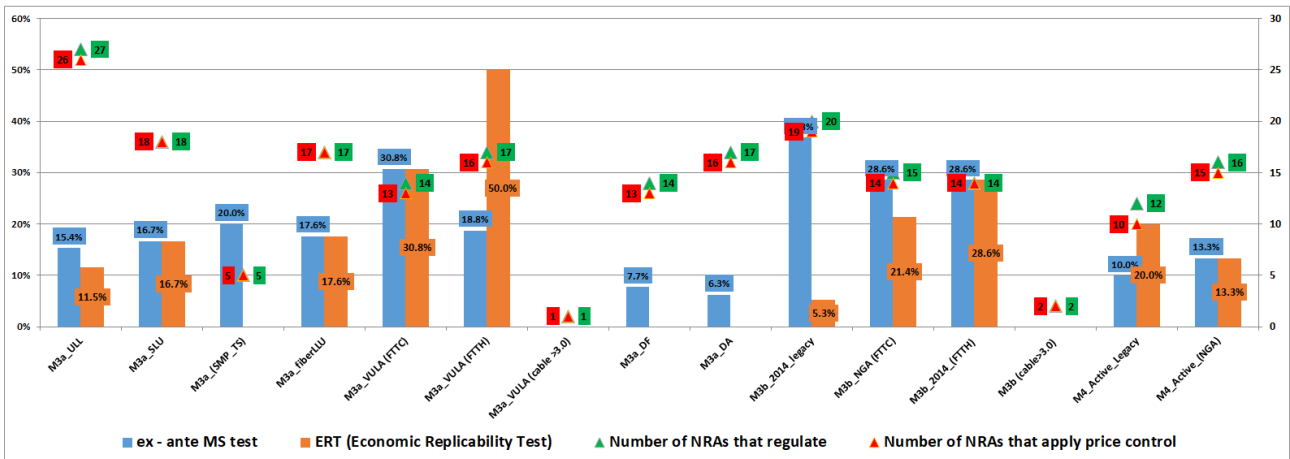
The ERT (or the traditional margin squeeze test) has a two-folded nature: it can be used as a price control remedy (art. 13 of the AD, now art. 74 of the EEC), or as a non-discrimination remedy (art. 10 of the AD, now art. 70 of the EEC). This is in line with the principle that the ERT must be undertaken 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). For example, about 26% of NRAs that apply an LLU price control also apply a form of ex ante replicability test, a decrease in comparison to last year’s report. For VULA FTTH this share can reach 70% (Figure 26 b)⁵³, 50% of NRAs apply an ERT test, indicating that the application of the margin squeeze test becomes more relevant for NGA products in market 3a, on the increase since last year’s report.

Figure 29 – Margin squeeze tests and % of NRAs that apply a margin squeeze test in combination with price control



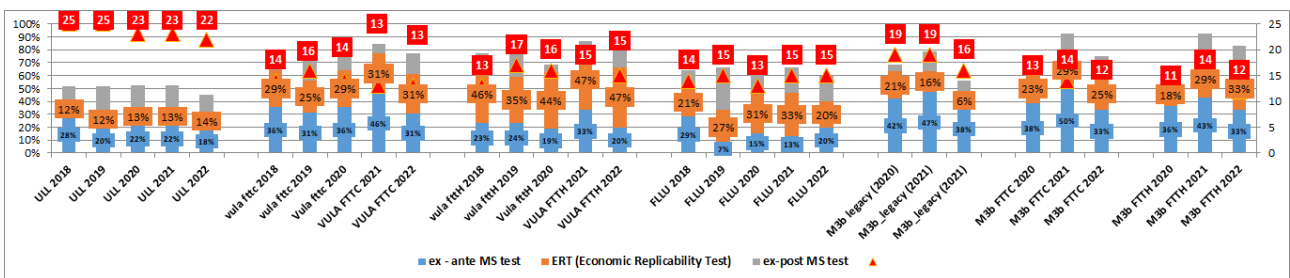
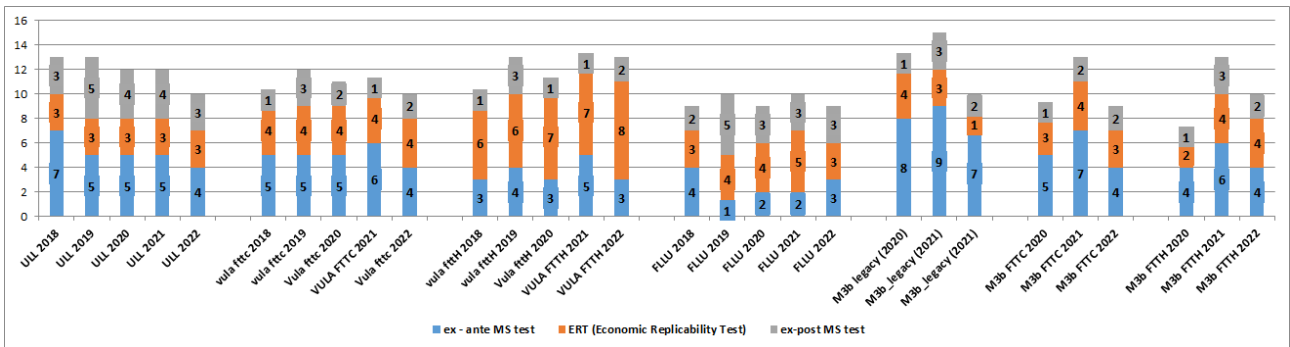
⁵³ In figure 29 EU and non-EU countries have been included. In figure 30 only EU countries have been considered.



Source: BEREC RA Database 2022

In the figure below, the corresponding evolution along the years in terms of numbers and the percentage of NRAs that apply a margin squeeze test in combination with price control is provided for EU countries. The analysis shows that the instrument of margin squeeze test is slightly increasing over time, specifically for FTTH and NGA.

Figure 30 – Margin squeeze tests and % of NRAs that apply a margin squeeze test in combination with price control

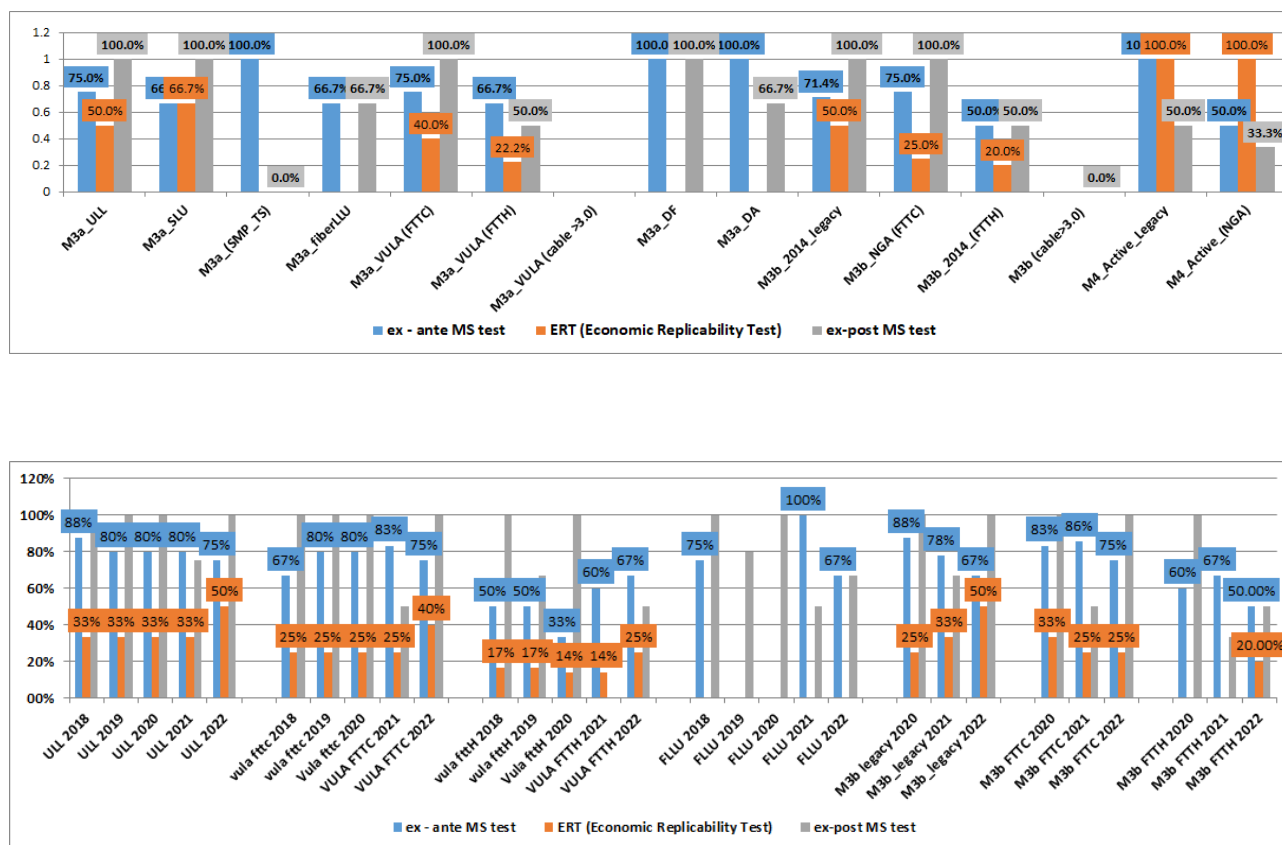


Source: BEREC RA Database 2022



In Figure 31 the percentage of NRAs that apply the ex-ante or ex-post replicability test is shown for NRAs that have chosen cost orientation as the main category⁵⁴. The traditional ex ante margin squeeze test is considered to be more of a complementary tool of cost orientation in market 3a and 3b, whereas the Economic replicability test is applied more frequently as a substitute for the price control method in market 3a for VULA and FLLU. In case of cost oriented price there is an increase in the adoption of the ERT approach instead of traditional ex ante margin squeeze test (according to definitions in the recommendation on costing methodology). The fact that more NRAs have included ERT instead of a standard ex-ante margin squeeze test is due to the NDCM Recommendation's aim to provide SMP operators with more pricing flexibility, while allowing efficient market entry and promoting efficient investment in NGA networks together with non-discrimination.

Figure 31 – Margin squeeze test and % of NRAs that apply a margin squeeze test in combination with cost orientation



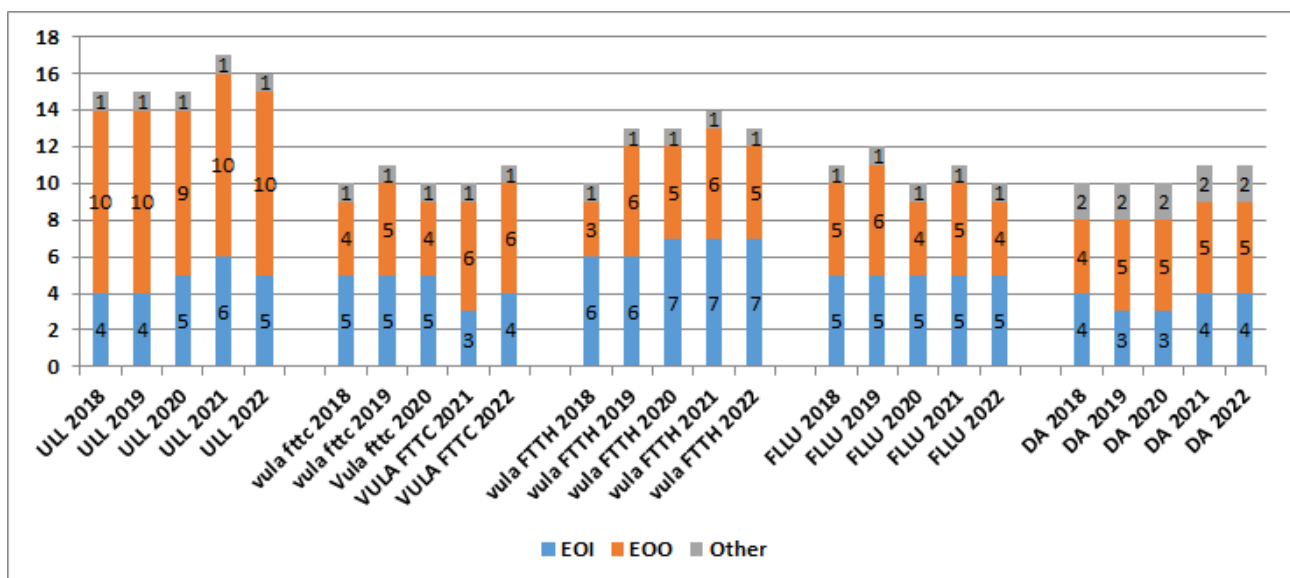
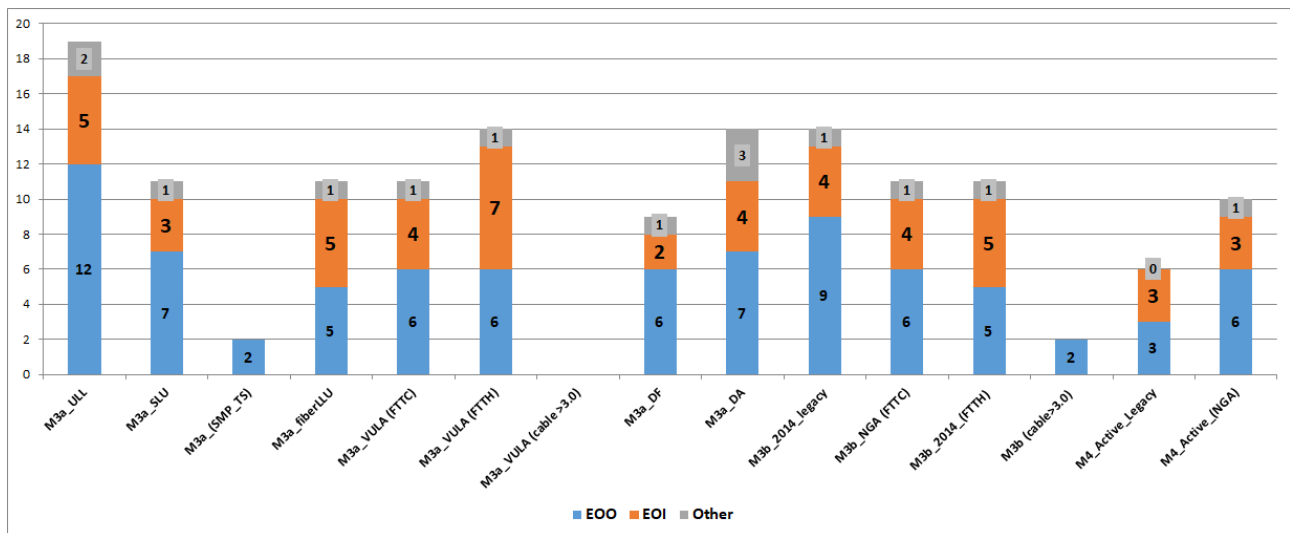
Source: BEREC RA Database 2022

⁵⁴ The ratio between the number of NRAs that apply both cost orientation and some form of ex-ante or ex post margin squeeze test is given with respect to all NRAs that declared an ex-ante or ex-post margin squeeze test

Equivalence model

The options for Equivalence models currently in force for different products are: EoI⁵⁵, EoO⁵⁶ and “Other”⁵⁷. In absolute terms there is a small increase in the number of NRAs that impose EoI/EoO models; this is more evident for products like VULA FTTH and in relation to market 3b. In figure 32 the evolution over time is provided (only EU NRAs).

Figure 32 – EOO-EOI equivalence model



⁵⁵ ‘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.

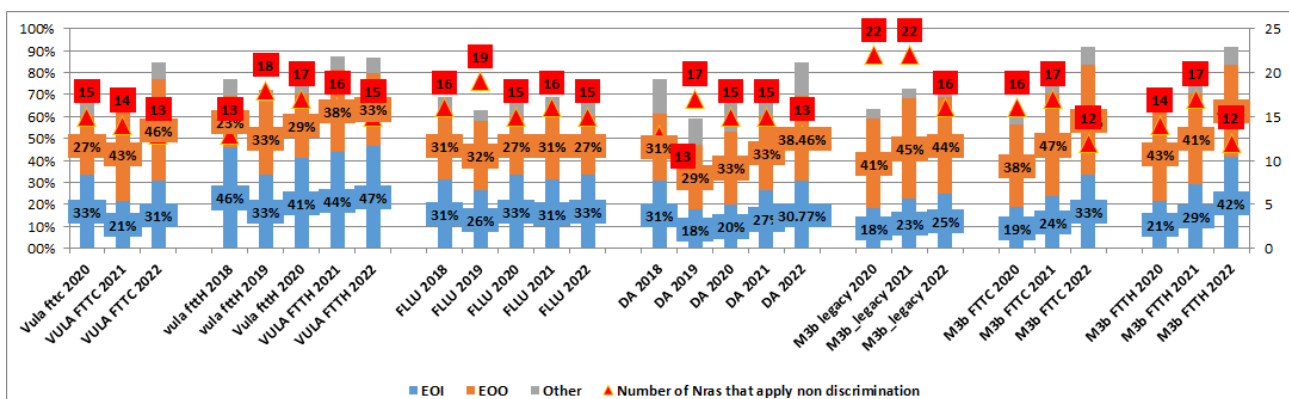
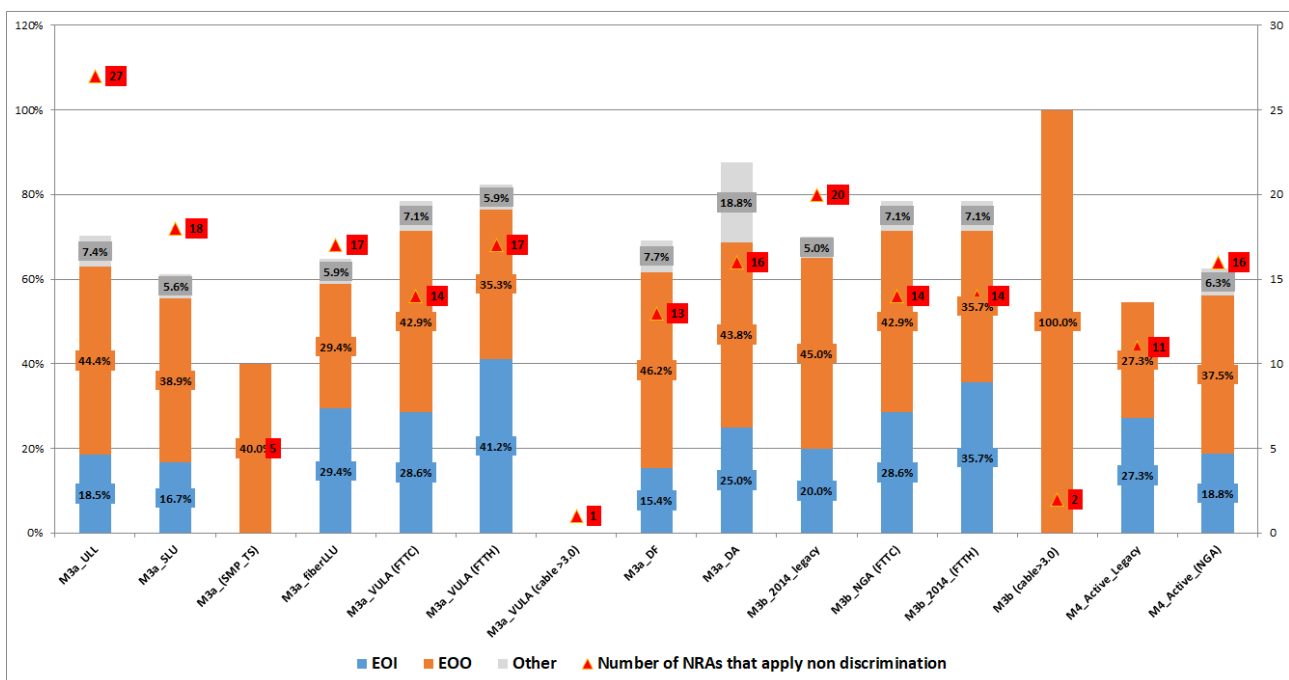
⁵⁶ ‘Equivalence of Output (EoO)’ means the provision to access seekers of wholesale inputs comparable, in terms of functionality and price, to those the SMP operator provides internally to its own downstream businesses, even if using potentially different systems and processes.

⁵⁷ ‘Other’ is a residual option for enhanced non-discrimination obligation not properly filed under EoI/EoO.

Source: BEREC RA Database 2022

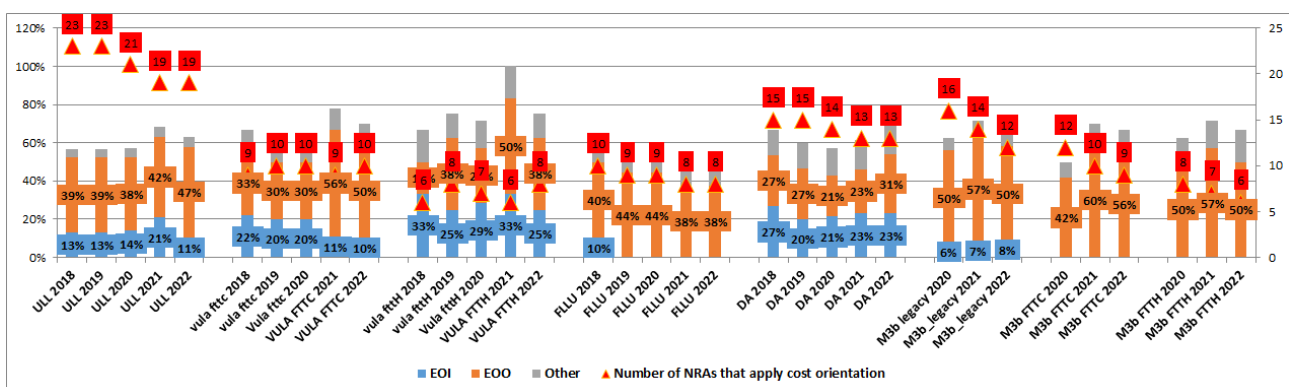
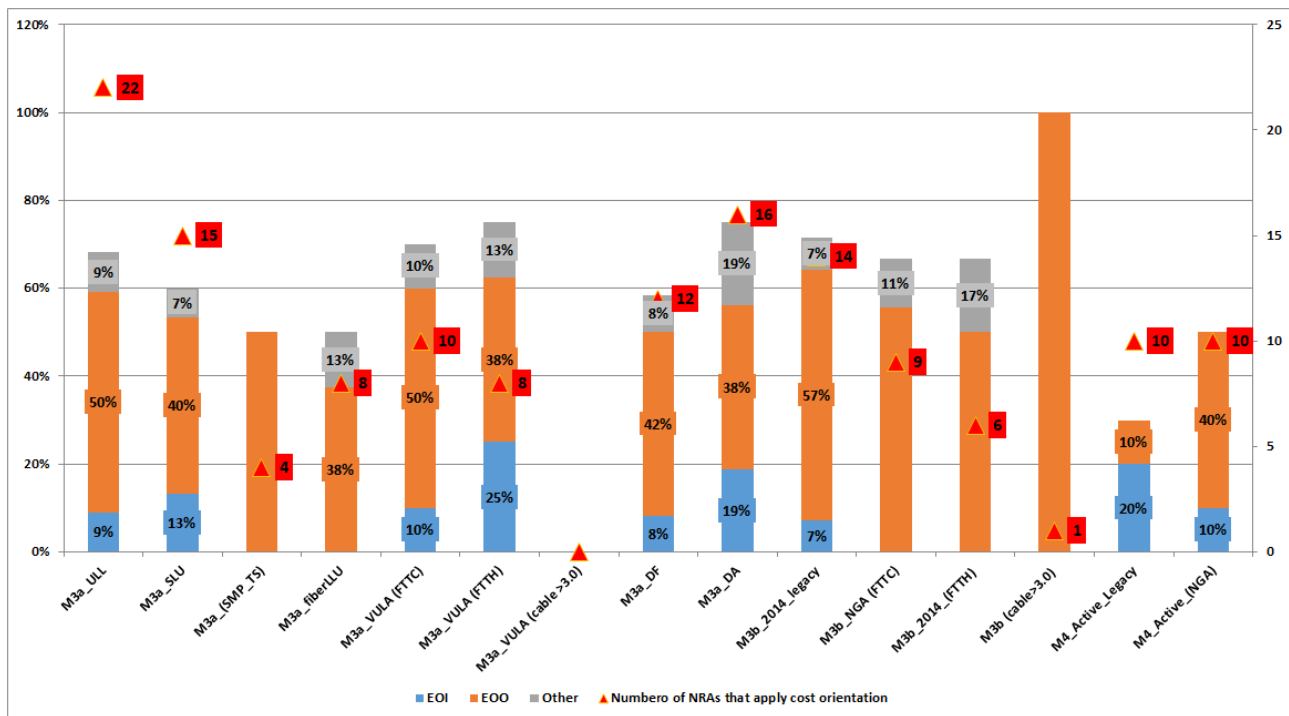
In Figure 33 the percentage of NRAs that apply EoI/EoO in relation to the total number of NRAs that apply a non-discrimination obligation for the corresponding product is provided for each product. Overall, the application of EoI models is increasing over the years. In this year's report this tendency is still prevalent. The cumulative percentage of EoO and/or EoI is higher in relative terms in case of VULA (FTTH) as well as for market 3b. In figure 34 the percentage of NRAs that apply EoI and/or EoO in relation to NRAs that apply it in combination with cost orientation is shown. About 60% of NRAs that apply cost orientation also apply a non-discrimination obligation for access products (EoO or EoI). Nevertheless, where EoI is in charge, cost orientation is increasingly being relaxed, particularly in case of NGA and VHCN products. For market 3b all NRAs that apply EoI do not apply any cost orientation when regulating the corresponding product. 2022 data confirms this tendency.

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



Source: BEREC RA Database 2022

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



Source: BEREC RA Database 2021

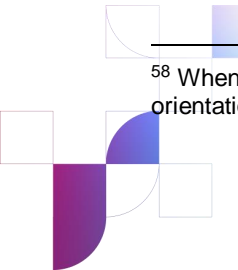
3.3 Cost base, annualisation and cost allocation methodologies

Cost base

With reference to the cost base, Figure 35 shows that in 2022 CCA is by far the most commonly used methodology for all markets. The situation remained stable in comparison to last year’s survey.

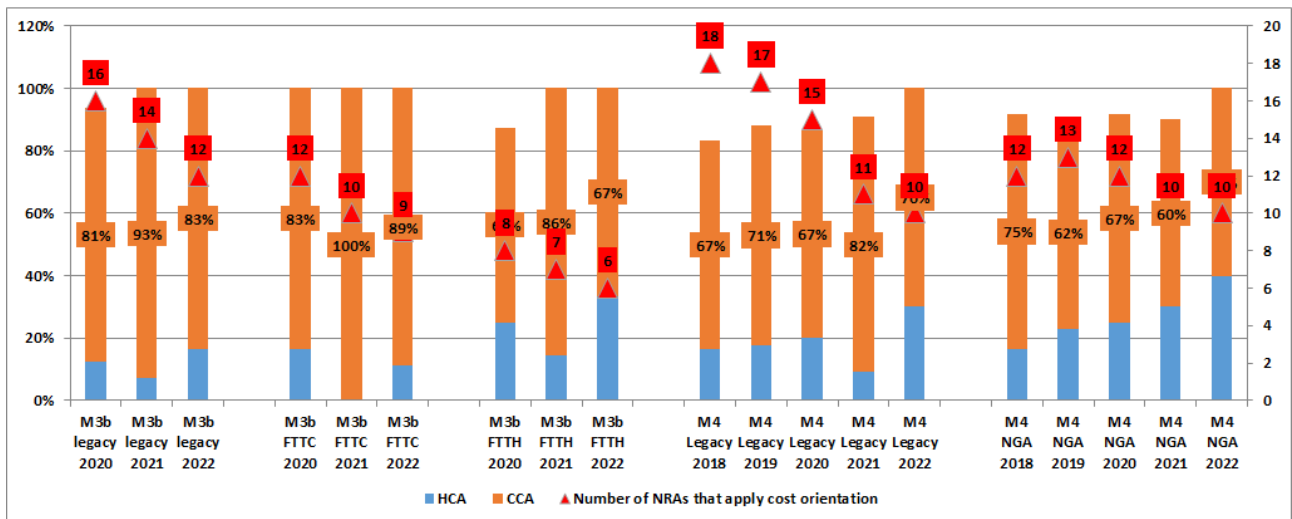
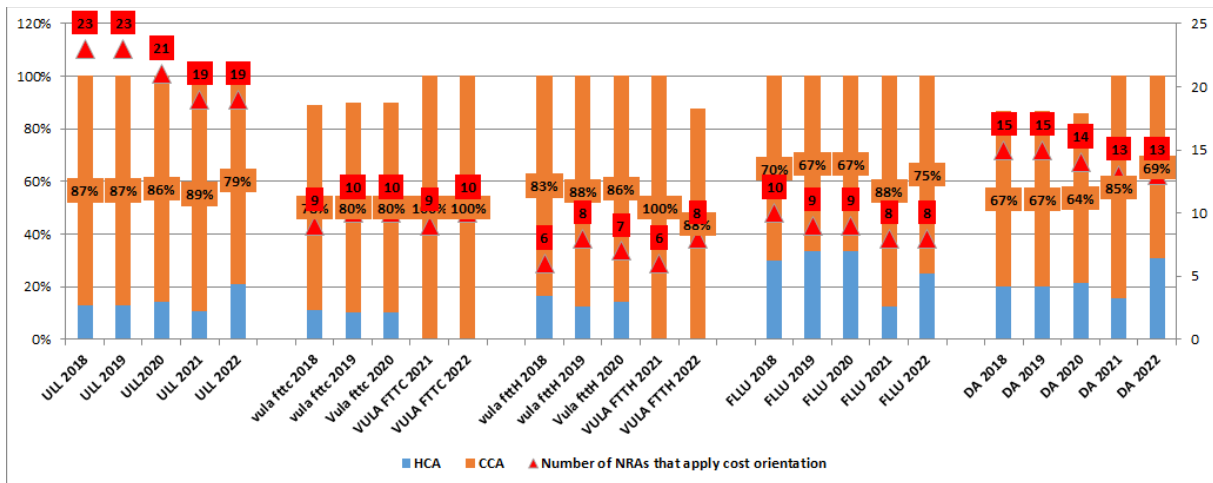
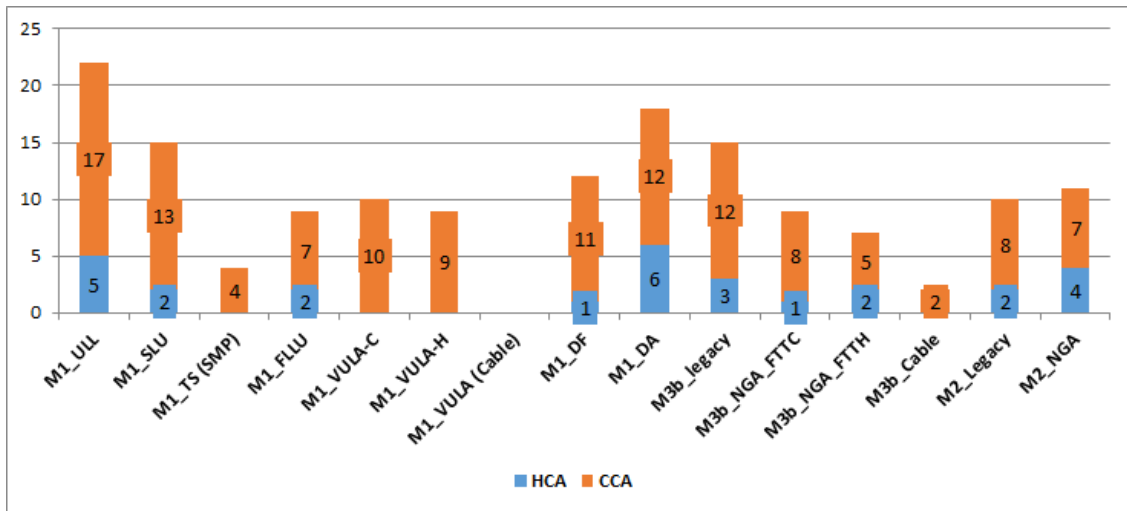
In the following figure the type of cost base in use when price control is in charge is shown. HCA is a relevant cost base only when an FDC approach is applied as accounting method. In the corresponding figure the evolution over time of the cost base is given (considering only EU-NRAs) for those NRAs 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.⁵⁸ In market 4, HCA is still more frequent in relative terms where cost orientation is applied. The use of HCA is common when NRAs are at the early stage of regulation; they move to CCA before (eventually) deregulating.



⁵⁸ 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 2022

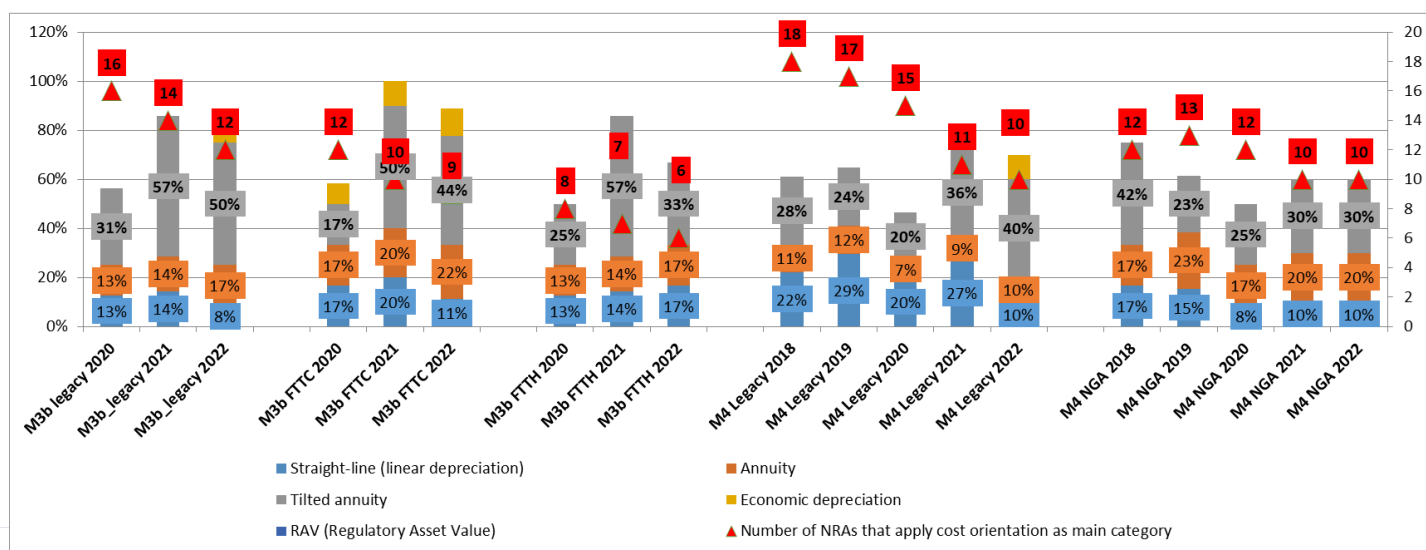
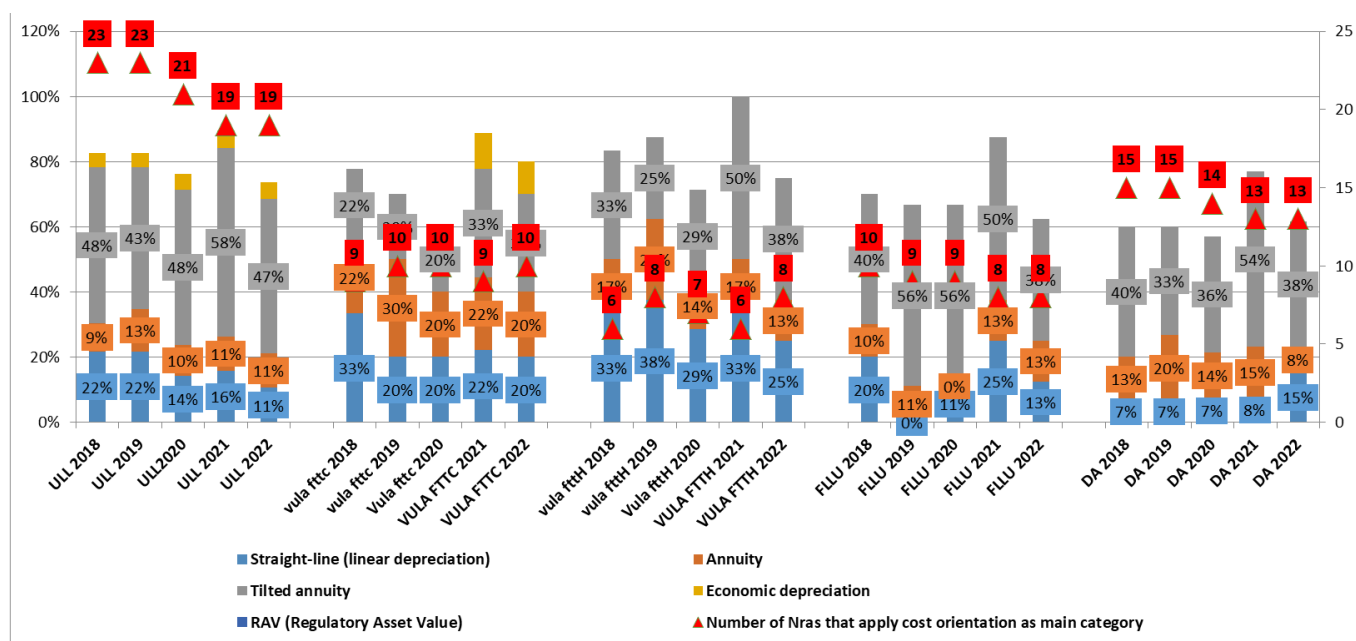


Annualisation

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 less frequent; this is due to the fact that NRAs that last year declared cost orientation in combination with tilted annuity have deregulated the product/market. 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

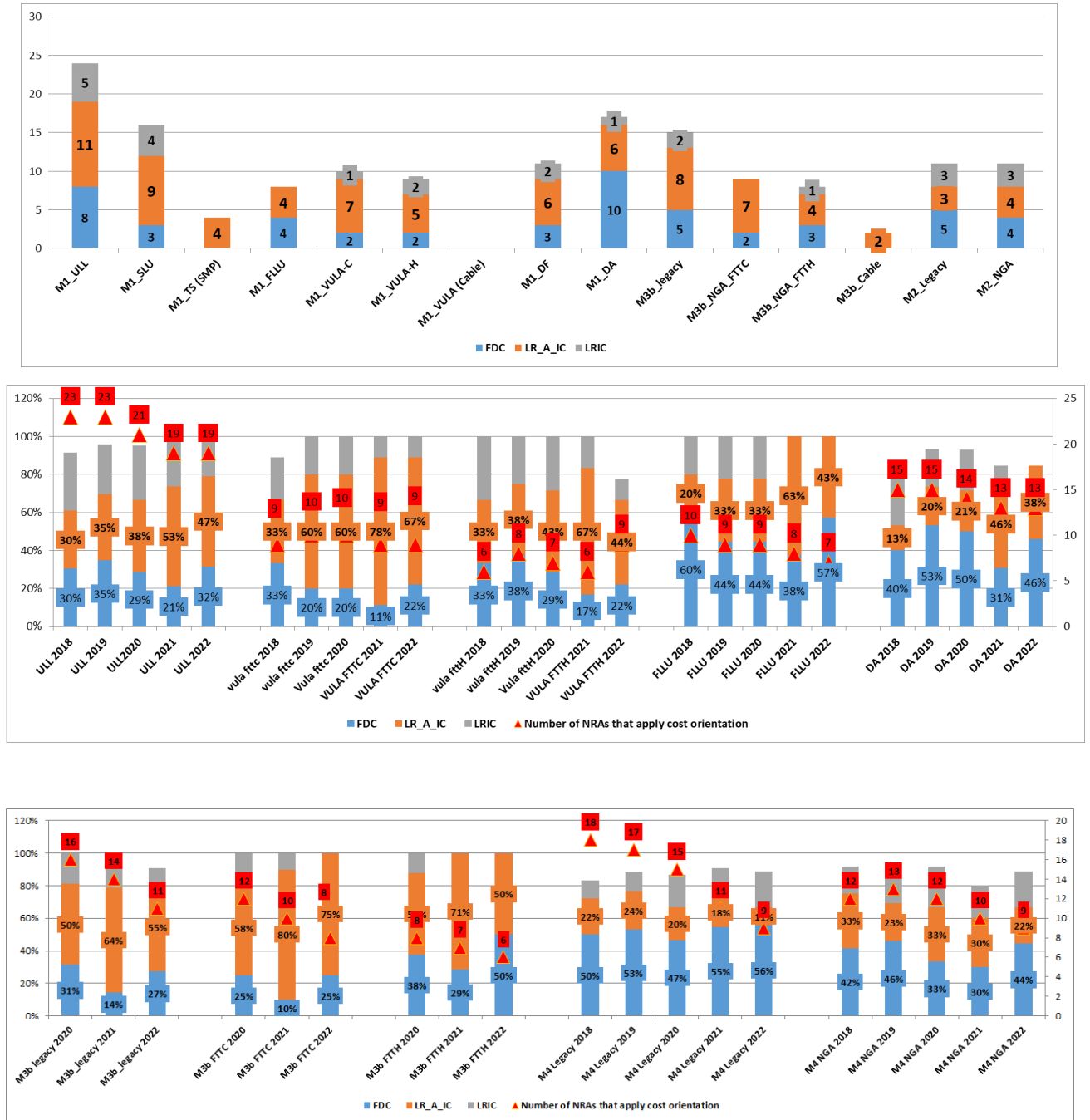


Source: BEREC RA Database 2021

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



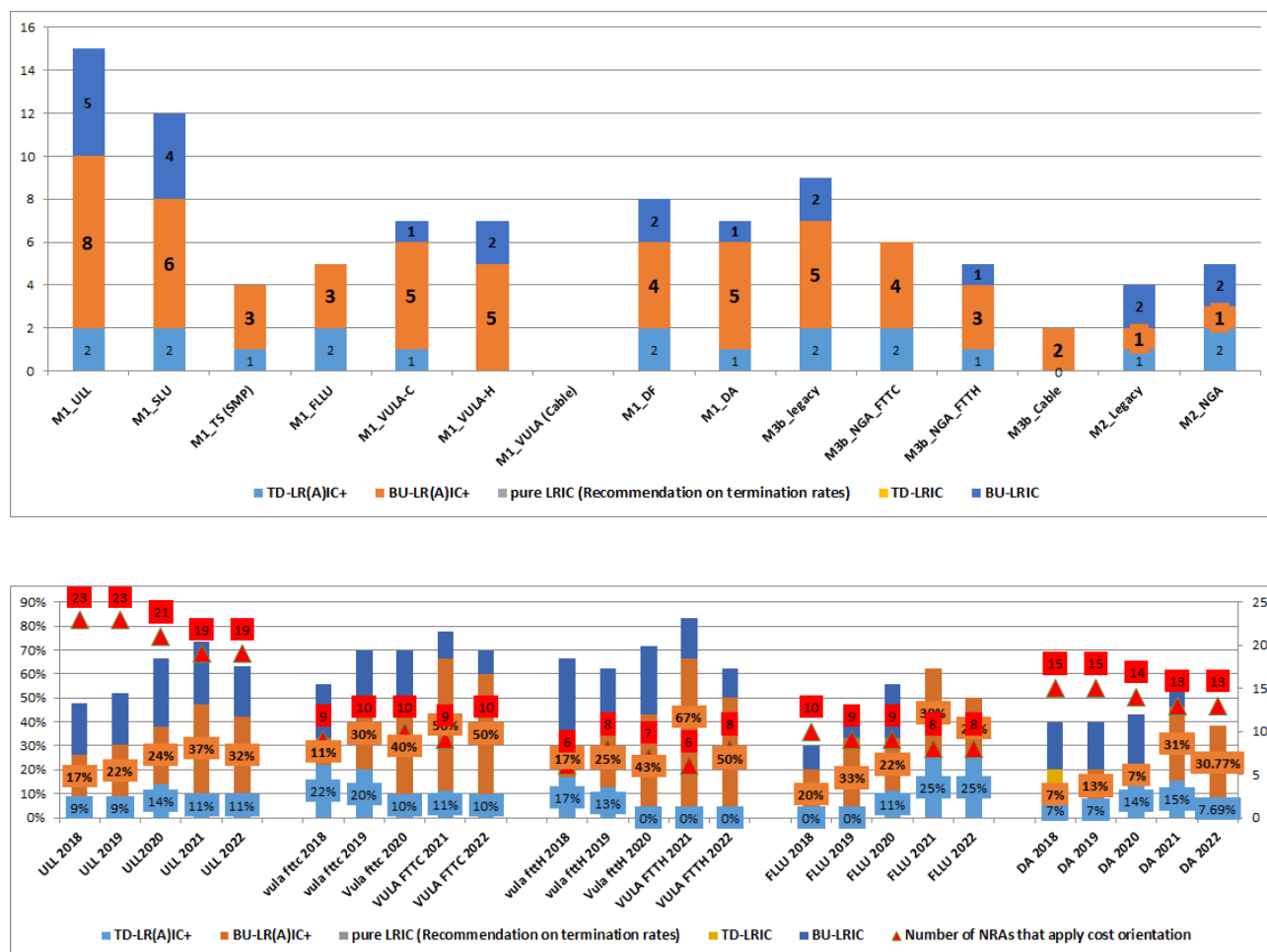
Source: BEREC RA Database 2022



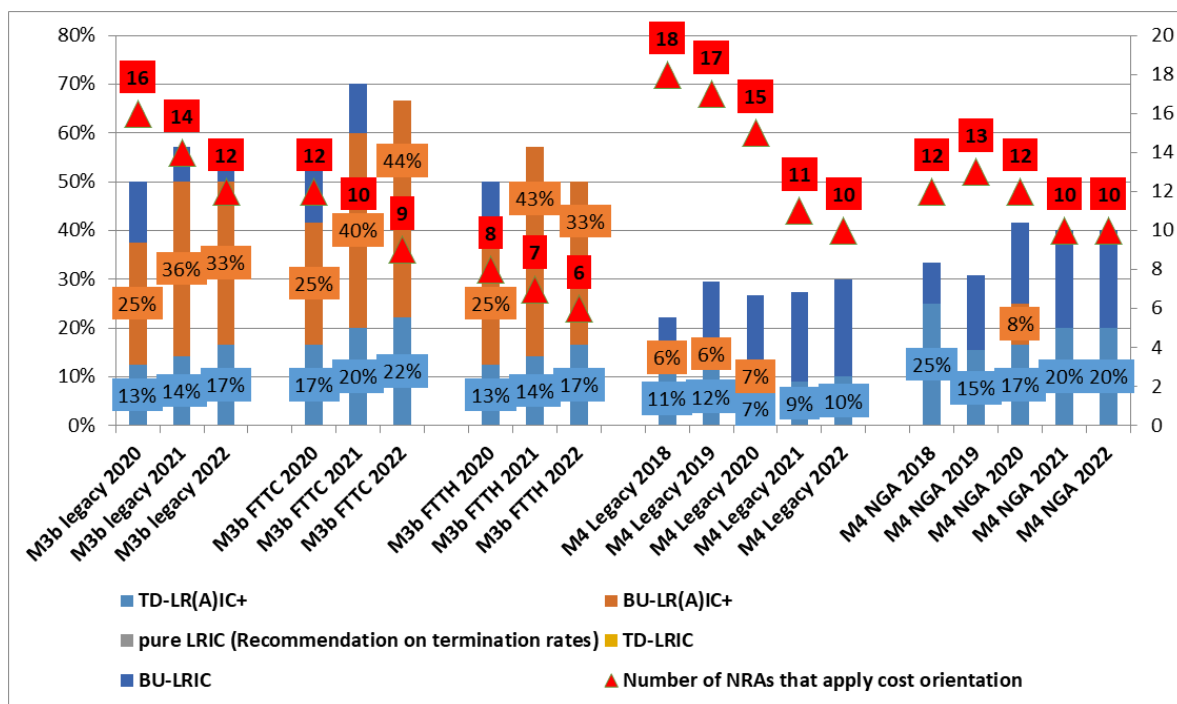
The most frequent cost allocation approach remains LRIC/LR(A)IC for almost all products/markets. FDC is a frequent approach for Market 4 legacy network. In comparison to last year it should be noted that NRAs that have removed regulation have applied a LR(A)IC approach more frequently. Insofar the percentage increase of FDC in all markets can be attributed to the fact that the regulatory path is still at an intermediate stage. No transition from LR(A)IC to FDC again can be observed along the years. The modelling approach is generally the preferred option where cost orientation is applied as a price control method (in any case, the number of NRAs that apply cost orientation is decreasing over time).

In Figure 38 the sub categories of allocation methodologies are represented⁵⁹. 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.

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



⁵⁹ The sum for sub categories is lower than the record for the main category where NRAs did not provide information on sub categories.



Source: BEREC RA Database 2022

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.⁶⁰

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

⁶⁰ 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).

Source: BEREC RA Database 2022

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.

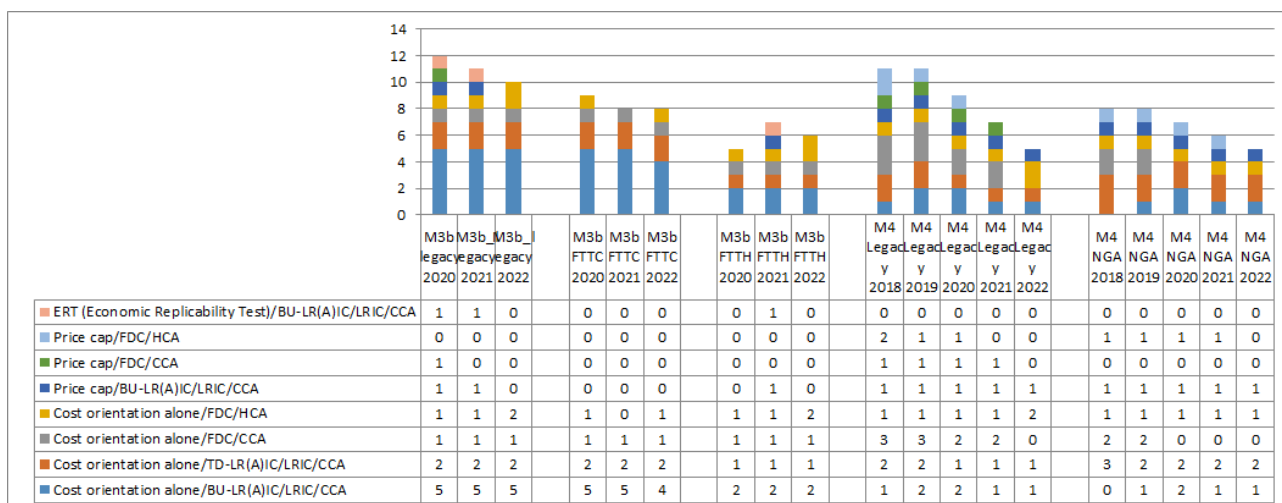
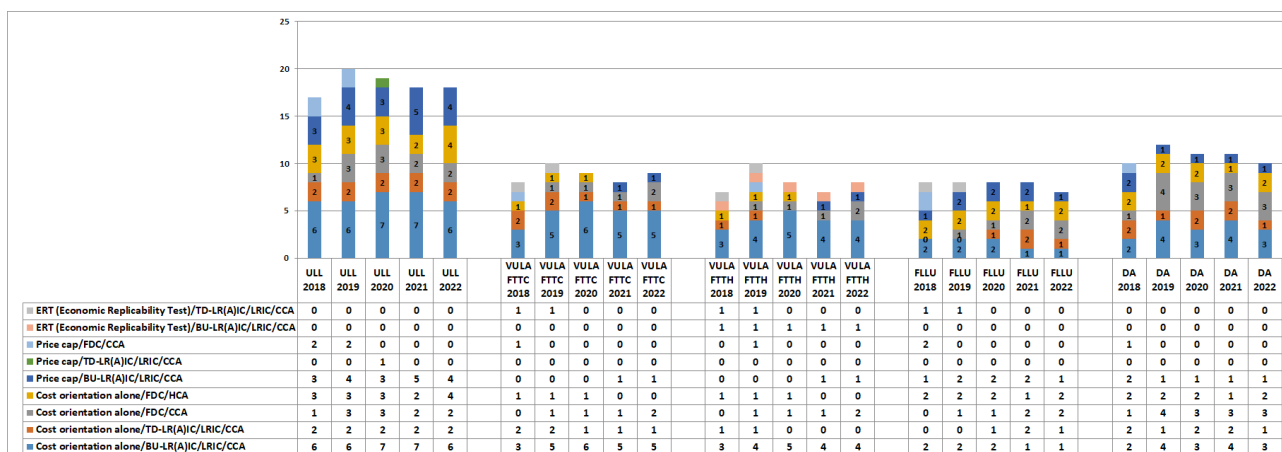
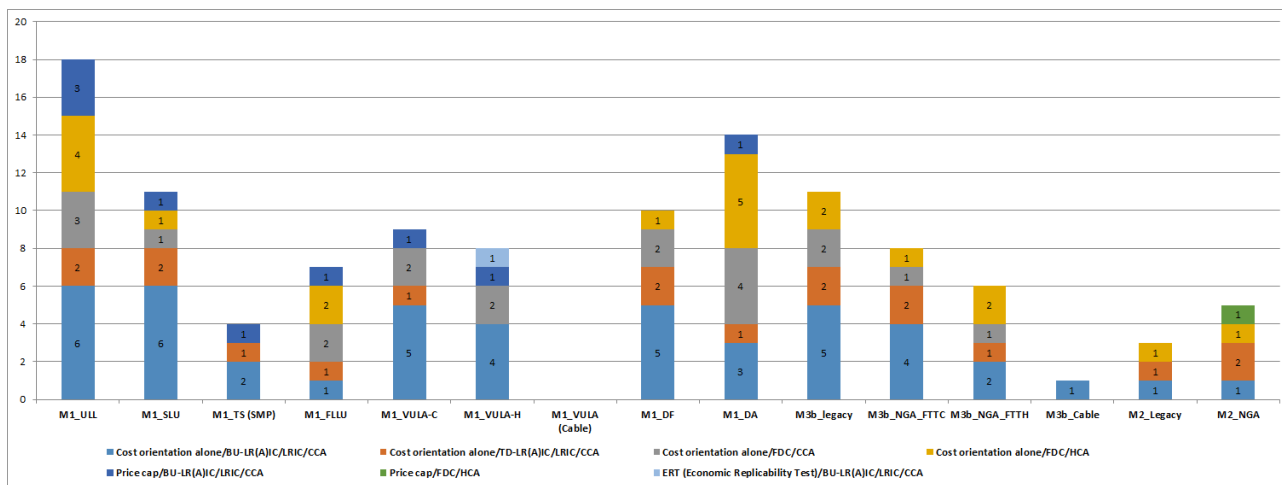
Differences between NRAs may be explained with specific country conditions, e. g. taking into account different competitive conditions in relevant markets. Forms of price regulation and accounting systems currently in force represent the “fine tuning” of regulatory instruments used by NRAs in order to 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 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: BERC RA Database 2022

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.

NRAs were asked 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.

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"> i. it should reflect a gradual shift from the copper network to an NGA network; ii. it should apply an asset valuation method that takes into account that certain civil infrastructure assets would not be replicated in the competitive process; iii. it should guarantee that copper network prices do not fluctuate significantly and therefore will remain stable over a long time period; iv. it should require only minimal modifications with respect to the costing methodology already in place.

This year, 19 NRAs have provided answers to the proposed questions.⁶¹ Results are presented in Figure 42.

⁶¹ Two NRAs (SK-CZ) implement ERT instead of cost orientation also concerning LLU. CZ follows the Recommendation where applicable, but as the SMP operator adopts a functional separation, no cost orientation obligation on LLU has been imposed. BE doesn't follow the recommendation for LLU pricing since the price has been set before the issue of the Recommendation; neither the exception of Rec 40 or 42 are relevant for the implementation of LLU price. BE at the same time declared to use the general statement of recommend 30-37 for VULA-FTTH price calculation even though the product is not available. DK has regulated the access market via commitments so the implementation of the costing methodology recommendation is no longer relevant.

Figure 42 - NRA implementation of EC Recommendations

	2016	2017	2018	2019	2020	2021	2022
Do you implement Recommends 30-37 (CCA BU-LRIC+)	7	9	11	11	14	14	13
Do you implement Recommend 40	6	5	4	4	5	5	4

Source: BEREC RA Database 2022

Based on Rec. 30-37 and 40 of the Commission Recommendation, a few relevant questions have been included for some elements addressed by the Recommendation referred to DEA targets and reusable infrastructures⁶². Replies by NRAs are summarised in Figure 43.

Figure 43 - NRAs information on Recommendations 37 and 40

	2018	2019	2020	2021	2022
Do you consider the DEA target in your model	6	6	7	7	6
Do you take into account reusable civil infrastructure?	12	12	13	13	15
Do you consider copper cable to be reusable infrastructure?	6	6	4	4	5
Is a gradual shift from copper network to NGA network taken into account?	8	8	8	7	9

Source: BEREC RA Database 2022

⁶² Specifically in the Rec. 32 the Commission has considered the following elements: "When modelling an NGA network NRAs should define a hypothetical efficient NGA network, capable of delivering the Digital Agenda for Europe targets set out in terms of bandwidth, coverage and take-up, which consists wholly or partly of optical elements. When modelling an NGA network, NRAs should include any existing civil engineering assets that are generally also capable of hosting an NGA network as well as civil engineering assets that will have to be newly constructed to host an NGA network. Therefore, when building the BU LRIC + model, NRAs should not assume the construction of an entirely new civil infrastructure network for deploying an NGA network". Recommend 40 states: "if not modelling an NGA network, it should reflect a gradual shift from a copper network to an NGA network". On the base of this statement of the Recommendation, some questions about DEA targets and reusable infrastructure have been added.

DEA targets⁶³ have been implemented in the BU-LRIC model by 9 NRAs.

The majority of NRAs that implement Rec. 30-37 or Rec. 40 include reusable civil infrastructures in their modelling process in line with last year; copper cable is considered to be reusable infrastructure by 5 NRAs. Furthermore, the analysis shows that the level of the depreciated infrastructure has been derived mainly from the accounting data of the SMP operator.

Figure 44 summarises the responses provided concerning the asset life of civil infrastructure, the percentage of civil infrastructure considered reusable and the percentage of asset life which has been already depreciated.⁶⁴ Only few NRAs have provided information on this aspect.

Figure 44 - NRA information on civil infrastructure

	Rec. 30-37	Rec. 40
Civil infrastructure asset life (number of years) (minimum - maximum)	30-50 for ducts; (arithmetic av.: 39) 10 NRAs 15-30 years for poles (3 NRAs)	30 1 NRAs
Percentage of civil infrastructures considered reusable (minimum - maximum)	18%-100% (arithmetic av. : 57%) 9 NRAs	100% 1 NRAs
Percentage of asset life already depreciated of reusable civil infrastructures (minimum - maximum)	20%-83% 4NRAs	

Source: BEREC RA Database 2022

3.6 Cost model technical implementation

The 2021 report also provides information on technical cost model implementation by NRAs⁶⁵.

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

Network modelling approach

⁶³ The coverage at least of 30 Mbps to 100 % and take-up of the population at 50 % at 100 Mbps.

⁶⁴ In the figure only maximum and minimum are shown since only few NRAs have provided information.

⁶⁵ The information reported is independent from the main price control method (such as Cost orientation/Price cap/ERT) declared by NRAs in each market.

Figure 45 summarises the main approaches used by NRAs to implement cost models. The scorched node approach assumes that the historical number of locations of the actual network node are fixed and that the operator can choose the best technology to configure the network in between these nodes. The scorched earth approach determines the efficient cost of a network that provides the same services as actual networks without placing any constraints on network configuration. A modified scorched node is in-between the two previous approaches. In case a BU asset base is in use the following situation is in force in 2022. A scorched node is generally the most frequent approach used, also for NGA.

Figure 45 – General network modelling approach

	M3a_ULL	M3a_SLU	M3a_(SM P_TS)	M3a_fiber LLU	M3a_VUL A (FTTC)	M3a_VUL A (FTTH)	M3a_VUL A (cable >3.0)	M3a_DF	M3a_DA	M3b_2014_legacy	M3b_NGA (FTTC)	M3b_2014_(FTTH)
Scorched Node	7	3	1	2	2	3	0	2	1	3	3	3
Scorched earth	0	0	0	0	0	0	0	0	0	0	0	0
Modified Scorched node	7	6	0	0	2	1	0	2	3	3	2	0

Source: BEREC RA Database 2021

Network topology and architecture

Figure 46 summarises the topology configuration used by NRAs for modelling purposes in markets 3a and 3b. The following options were provided: i) MDF/ODF area; ii) Municipality; a mix of the two; iii) other. Choosing the first option means that the model is implemented taking into account the footprint of the copper access network and/or the fibre network of the incumbent operator. The second option (municipality) means that the model considers an administrative area as a footprint for the access network (like postal codes).

The most frequent approach is the MDF/ODF area in line with the replies provided for the node location approach (scorched node/modified). It is relevant to consider that for an NGA network the footprint of the network may differ from the one used for modelling a copper based product. In the same figure, the number of Local central office considered is provided. The architecture taken into account for Local central office for LLU and VULA, where relevant, seems the same.

Figure 46 - Network architecture applied when a BU asset base is in use⁶⁶

	M3a_ULL	M3a_SLU	M3a_(SM P_TS)	M3a_fiber LLU	M3a_VUL A (FTTC)	M3a_VUL A (FTTH)	M3a_VUL A (cable >3.0)	M3a_DF	M3a_DA	M3b_201 4_legacy	M3b_NGA (FTTC)	M3b_201 4_(FTTH)
MDF/ODF area	12	9	2	2	5	5	0	3	3	5	4	2
Municipal ity	0	0	0	0	0	0	0	0	1	0	0	0
Municipal ity/MDF- ODF area	1	1	0	0	0	0	0	1	1	0	0	0
Other	1	0	0	0	0	0	0	0	0	1	1	1

Number of central office for ULL	
AT	1400
BE	600
DE	7542
DK	1182
FR	8187
HR	348
IT	10000
LI	35
LU	106
SE	3122

Source: BEREC RA Database 2022

Figure 47 shows the technology used for modelling purposes. It is interesting to see that some NRAs that model an all FTTH network nevertheless apply price control for legacy products on the base of a fibre product (DE, ES, FR, SE, SI).

⁶⁶ The BU asset base is represented as a TD approach only where a scorched node approach in combination with MDF/ODF approach has been considered.

Figure 47 - Network technology applied

	M3a_ULL	M3a_SLU	M3a_(SM P_TS)	M3a_fiber LLU	M3a_VUL A (FTTC)	M3a_VUL A (FTTH)	M3a_VUL A (cable >3.0)	M3a_DF	M3a_DA	M3b_2014_legacy	M3b_NGA (FTTC)	M3b_2014_(FTTH)
FTTH	5	3	1	1	0	2	0	1	1	0	0	1
FTTE-FTTC-FTTH	3	3	1	1	2	2	0	1	1	1	1	1
FTTH-FTTC	1	1	0	0	1	1	0	2	1	1	1	0
FTTE-FTTC	0	0	0	0	2	0	0	0	0	0	1	0
FTTE	2	0	0	0	0	0	0	0	0	1	0	0
Other	1	1	0	0	0	0	0	0	1	1	1	1

	M3a_ULL	M3a_SLU	M3a_(SM P_TS)	M3a_fiber LLU	M3a_VUL A (FTTC)	M3a_VUL A (FTTH)	M3a_VUL A (cable >3.0)	M3a_DF	M3a_DA	M3b_2014_legacy	M3b_NGA (FTTC)	M3b_2014_(FTTH)
GPON/P2												
P	2	2	1	0	0	1	0	1	0	0	0	0
GPON	6	4	1	2	3	4	0	2	2	3	3	3
P2P	2	2	0	0	0	0	0	1	1	0	0	0

Source: BEREC RA Database 2022

Coverage

Figure 48 summarises the coverage network estimation used for modelling purposes: i) forward looking; ii) as-is. The first option means that coverage is achieved in a forward looking way taking into account a medium term horizon with respect to the current situation; the second option considers that the coverage for network modelling purpose is taken as it is at the time of estimation of service costs. Most NRAs use a forward looking estimation, only for DF and Market 3b this approach is less frequent.

Figure 48 – Estimated network coverage

	M3a_ULL	M3a_SLU	M3a_(SM P_TS)	M3a_fiber LLU	M3a_VUL A (FTTC)	M3a_VUL A (FTTH)	M3a_VUL A (cable >3.0)	M3a_DF	M3a_DA	M3b_2014_legacy	M3b_NGA (FTTC)	M3b_2014_(FTTH)
Forward Looking	10	8	2	2	4	5	0	3	3	5	4	3
As is	1	0	0	0	0	0	0	1	0	0	0	0
Other	1	1	0	0	0	0	0	0	1	0	0	0

Source: BEREC RA Database 2022

The approach used for the level of coverage from a geographical point of view (spatial domain) is reported in figure 49. Two options have been provided in the questionnaire: National and sub national. Most NRAs consider a “national” network coverage for modelling purposes in line with a forward looking estimation.

Figure 49 – Estimated geographical coverage

	M3a_U LL	M3a_SL U	M3a_(S MP_TS)	M3a_fi berLLU	M3a_V ULA (FTTC)	M3a_V ULA (FTTH)	M3a_V ULA (cable >3.0)	M3a_DF	M3a_DA	M3b_2014_lega cy	M3b_NGA (FTTC)	M3b_2014_(FTTH)
Nationa l	11	8	1	2	3	3	0	3	4	5	4	2
Sub nationa l	0	0	0	0	0	1	0	0	0	0	0	1

Source: BEREC RA Database 2022

Figure 50 includes elements of the main source of coverage for NGA modelling purposes for FTTH/FTTC. In the questionnaire 6 options were provided: i) SMP coverage; ii) OAO coverage; iii) SMP and OAO coverage iv) National and v) Sub national⁶⁷. Most NRAs use SMP coverage in a forward looking way. In other cases a National coverage is used independently from other sources of information. When modelling a FTTH network for regulating ULL legacy product, the “national” option is the most frequent case.

Figure 50 – Source used as a base for NGA network coverage in modelling

	M3a_ULL	M3a_SLU	M3a_(SM P_TS)	M3a_fibe rLLU	M3a_VUL A (FTTC)	M3a_VUL A (FTTH)	M3a_VUL A (cable >3.0)	M3a_DF	M3a_DA	M3b_2014_leg acy	M3b_NGA (FTTC)	M3b_2014_(FT H)
SMP coverage	7	3	0	1	1	2	0	1	1	2	1	2
OAO coverage	0	0	0	0	0	0	0	0	0	0	0	0
SMP+OAO coverage	0	0	0	0	1	1	0	1	1	1	1	0
National	4	4	2	1	2	2	0	1	1	2	2	1

Source: BEREC RA Database 2021

Figure 51 shows cost averaging: an average cost for the whole country or for a specific target area where regulation is in charge. The most part of the respondents consider an average price based on a national average, unless this situation is less frequent in case of FTTH product.

⁶⁷ Options iv and v are independent of effective coverage by operators (SMP or OAOs).

Figure 51 - Cost averaging⁶⁸

	M3a_ULL	M3a_SLU	M3a_(SMP _TS)	M3a_fiber LU	M3a_VULA (FTTC)	M3a_VULA (FTTH)	M3a_VULA (cable >3.0)	M3a_DF	M3a_DA	M3b_2014 _legacy	M3b_NGA (FTTC)	M3b_2014 _(FTTH)
National average	13	8	1	3	4	4	0	4	6	7	6	0
Target areas where regulation is in charge	1	1	1	1	0	1	0	1	0	2	1	0
Other	1	1	0	0	0	0	0	0	0	0	0	0

Source: BEREC RA Database 2022

In the following table 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.⁶⁹

⁶⁸ Differently from the previous table in this case all replies have been considered independently if the model has a BU or TD asset base.

⁶⁹ <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 52 – LLU monthly fee and costing methodology/ price band

Country	Regulated product	Price control main category	Price control sub category	allocation method	allocation method sub category	Cost base	Annualization method	Equivalence model	Margin squeeze test	Price monthly fee	Price band low	Price band high	Cumulative inflation rate 2014-2021 (index)
AT	Yes	Others/Combination		LR_A_IC	BU-LR(A)IC+	CCA	Economic depreciation	EOO	ERT (Economic Replicability Test)	7.26	9.13	11.41	1.14
BE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ex-post MS test	8.03	9.03	11.28	1.13
BG											8.51	10.63	1.06
CY	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Straight-line (linear depreciation)	EOO	ERT (Economic Replicability Test)	8.7	8.01	10.01	1.00
CZ	Yes	Others/Combination						EOI	ex-ante MS test	7.13	9.27	11.58	1.16
DE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Annuity		ex-ante MS test	11.19	8.88	11.10	1.11
DK											8.43	10.54	1.05
EE	Yes	Cost_Orientation	Cost orientation alone	FDC		HCA	Straight-line (linear depreciation)	EOO	ex-post MS test	4.94	9.24	11.55	1.16
EL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ERT (Economic Replicability Test)	7.64	7.93	9.92	0.99
ES	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Economic depreciation	EOI		8.6	8.50	10.62	1.06
FI	Yes	Cost_Orientation	Cost orientation alone	FDC		CCA					8.58	10.72	1.07
FR	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO		9.65	8.68	10.85	1.08
HR	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ex-ante MS test	5.34	8.46	10.58	1.06
HU	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO		4.07	9.53	11.91	1.19
IE	Yes	Cost_Orientation		LR_A_IC		CCA	Tilted annuity			12.79	8.32	10.39	1.04
IT	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Annuity	EOI	ex-ante MS test	8.9	8.42	10.52	1.05
LI	Yes	Cost_Orientation	Cost orientation alone	FDC		HCA	Straight-line (linear depreciation)	Other		13.47			
LT	Yes	Cost_Orientation	Cost orientation alone	FDC		HCA	RAV (Regulatory Asset Value)		ex-post MS test		9.21	11.51	1.15
LU	Yes	Cost_Orientation	Price cap alone	LRIC	BU-LRIC		Tilted annuity			2.8	8.83	11.04	1.10
LV	Yes	Cost_Orientation	Cost orientation alone	FDC		CCA	Straight-line (linear depreciation)	Other			9.05	11.31	1.13
MT	Yes	Cost_Orientation	Cost orientation alone	FDC							8.74	10.92	1.09
NL											8.84	11.05	1.11
NO	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	HCA	Economic depreciation	EOO		7.27	9.75	12.19	1.22
PL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Tilted annuity				9.09	11.36	1.14
PT	Yes	Cost_Orientation	Cost orientation alone	FDC		HCA		EOO		8.99	8.39	10.49	1.05
RO													
RS	Yes	Cost_Orientation	Cost orientation alone	FDC		CCA	Straight-line (linear depreciation)	EOO		5.35	9.57	11.96	1.20
SE	Yes	Cost_Orientation	Price cap alone	LRIC	BU-LRIC	CCA	Tilted annuity	EOO		7.75	8.92	11.15	1.12
SI	Yes	Others/Combination		LRIC	BU-LRIC	CCA	Tilted annuity	EOI		5.46	8.51	10.64	1.06
SK	Yes							EOI	ERT (Economic Replicability Test)	4.2	8.88	11.10	1.11



Figure 53 – SLU monthly fee and costing methodology

Country	Regulated product	Price control main category	Price control sub category	allocation method	allocation method sub category	Cost base	Annualization method	Equivalence model	Margin squeeze test	Price monthly fee Euro/month
AT	Yes	Others/Combination		LR_A_IC	BU-LR(A)IC+	CCA	Economic depreciation	E00	ERT (Economic Replicability Test)	5.61
BE										
BG										
CY	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Straight-line (linear depreciation)	E00	ERT (Economic Replicability Test)	5.45
CZ	Yes	Others/Combination						EOI	ex - ante MS test	1.06
DE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Annuity		ex - ante MS test	7.05
DK										
EE										
EL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	E00	ERT (Economic Replicability Test)	4.02
ES	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Economic depreciation	EOI		
FI										
FR	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	E00		9.65
HR										
HU	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	E00		2.4
IE	Yes	Cost_Orientation		LR_A_IC		CCA	Tilted annuity			10.03
IT	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Annuity	EOI	ex - ante MS test	5.5
IS										
LI										
LT	Yes	Cost_Orientation	Cost orientation alone	FDC		HCA	RAV (Regulatory Asset Value)		ex-post MS test	
LU	Yes	Cost_Orientation	Price cap alone	LRIC	BU-LRIC		Tilted annuity			5.47
LV	Yes	Cost_Orientation	Cost orientation alone	FDC		CCA	Straight-line (linear depreciation)	Other		4.17
MT	Yes	Cost_Orientation	Cost orientation alone	FDC						
NL										
NO	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	HCA	Economic depreciation	E00		5.82
PL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Tilted annuity			
PT										
RO										
RS										
SE	Yes	Cost_Orientation	Cost orientation alone	LRIC	BU-LRIC	CCA	Tilted annuity	E00		6.77
SI										
SK										

Figure 54 – FLLU monthly fee and costing methodology

Countries	Regulated product	Price control main category	Price control sub category	allocation method	allocation method sub category	Cost base	Annualization method	Equivalence model	Margin squeeze test	Price monthly fee Euro/month	Price monthly fee Euro/month
AT											
BE	Yes	Others/Combination		LR_A_IC	BU-LR(A)IC+	CCA		EOO	ex-post MS test		
BG											
CY											
CZ	Yes	Others/Combination						EOI	ex - ante MS test	63.78	63.78
DE	Yes	Cost_Orientation		LR_A_IC	TD-LR(A)IC+	CCA	Annuity		ex - ante MS test		
DK	Yes										
EE	Yes	Cost_Orientation	Cost orientation alone	FDC		HCA	Straight-line (linear depreciation)	EOO	ex-post MS test	60	60
EL											
ES											
FI	Yes	Cost_Orientation	Cost orientation alone	FDC		CCA				DNA:13.50;Telia 27.50;Elisa 16 depending on SMP	DNA:13.50;Telia 27.50;Elisa 16 depending on SMP
FR											
HR	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ex - ante MS test		
HU	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO		3.78	3.78
IE	Yes										
IT											
LI											
LT	Yes	Cost_Orientation	Cost orientation alone	FDC		HCA	RAV (Regulatory Asset Value)		ex-post MS test		
LU	Yes	Others/Combination						EOI	ERT (Economic Replicability Test)	19	19
LV	Yes	Cost_Orientation	Cost orientation alone	FDC		CCA	Straight-line (linear depreciation)	Other		2.74	2.74
MT											
NL											
NO	Yes	No price control						EOO			
PL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Tilted annuity				
PT											
RO											
RS											
SE	Yes							EOI	ERT (Economic Replicability Test)		
SI	Yes	Retail_minus	ERT (Economic Replicability Test)					EOI	ERT (Economic Replicability Test)		
SK	Yes							EOI	ERT (Economic Replicability Test)		

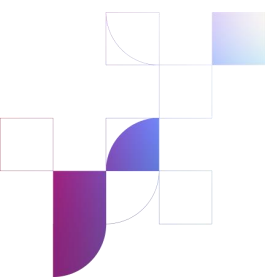


Figure 55 – VULA-C monthly fee and costing methodology

Countries	Regulated product	Price control main category	Price control sub category	allocation method	allocation method sub category	Cost base	Annualization method	Equivalence model	Margin squeeze test	Price monthly fee Euro/month
AT	Yes	Retail_minus	ERT (Economic Replicability Test)					EOO	ERT (Economic Replicability Test)	7.89
BE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA		EOO	ex-post MS test	
BG										
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						EOI	ex - ante MS test	7.34-12.15
DE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Annuity		ex - ante MS test	7.85+yearly fee for the line card (which determines the user profiles) per access point, per customer (€ 920,70 for one user, € 690,55 for two users)
DK										
EE										
EL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ERT (Economic Replicability Test)	8.42-11.91
ES										
FI	Yes	Cost_Orientation	Cost orientation alone	FDC		CCA				
FR										
HR	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ex - ante MS test	
HU	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO		8.44
IE	Yes	Cost_Orientation		LR_A_IC		CCA	Economic depreciation		ex-post MS test	
IT	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Annuity		ex - ante MS test	12.5
LI										
LT										
LU										
LV	Yes	Cost_Orientation	Cost orientation alone	FDC		CCA	Straight-line (linear depreciation)	Other		5.5
MT										
NL										
NO										
PL										
PT										
RO										
RS										
SE										
SI	Yes	Retail_minus	ERT (Economic Replicability Test)					EOI	ERT (Economic Replicability Test)	
SK	Yes							EOI	ERT (Economic Replicability Test)	9.18

Figure 56 – VULA-H monthly fee and costing methodology

Countries	Regulated product	Price control main category	Price control sub category	allocation method	allocation method sub category	Cost base	Annualization method	Equivalence model	Margin squeeze test	Price monthly fee Euro/month
AT	Yes	Retail_minus	ERT (Economic Replicability Test)					EOO	ERT (Economic Replicability Test)	14.98
BE	Yes	Others/Combination		LR_A_IC	BU-LR(A)IC+	CCA	Economic depreciation	EOO	ex-post MS test	From 19 to 30€ depending on the profile
BG										
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						EOI	ex - ante MS test	€ 7,34-12,15 / 180-298 CZK
DE										
DK										
EE										
EL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ERT (Economic Replicability Test)	10.21-26.44 >100Mbit/s depending on the profile
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		CCA				
FR										
HR	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO	ex - ante MS test	
HU	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO		Magyar Telekom L2WAP: FTTH 150 MBit/s 2555 Ft/month w/o TV; 3794 Ft/month w 3 HD TV channel (and 0 SD channel)
IE	Yes	Cost_Orientation							ex-post MS test	entry price €23.50 (150 Mb to 500Mb) https://www.openeir.ie/reference-offers/
IT	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Annuity	EOI	ex - ante MS test	15.2
LI										
LT										
LU	Yes	Others/Combination						EOI	ERT (Economic Replicability Test)	20.10€/month
LV	Yes	Cost_Orientation	Cost orientation alone	FDC		CCA	Straight-line (linear depreciation)	Other		5,50
MT	Yes	Retail_minus	ERT (Economic Replicability Test)						ERT (Economic Replicability Test)	
NL										
NO	Yes	Others/Combination					Straight-line (linear depreciation)	EOO	ERT (Economic Replicability Test)	
PL										
PT										
RO										
RS										
SE										
SI	Yes	Retail_minus	ERT (Economic Replicability Test)					EOI	ERT (Economic Replicability Test)	
SK	Yes							EOI	ERT (Economic Replicability Test)	8.5



Figure 57 – Duct-access monthly fee and costing methodology

	Regulated product	Price control main category	Price control sub category	allocation method	allocation method sub category	Cost base	Annualization method	Equivalence model	Margin squeeze test	Price monthly fee Euro/month
AT										
BE	Yes	Others/Combination		LR_A_IC	BU-LR(A)IC+	CCA			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)
BG										
CY										
CZ										
DE	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	TD-LR(A)IC+	CCA	Annuity		ex - ante MS test	
DK										
EE	Yes	Cost_Orientation	Cost orientation alone	FDC		HCA	Straight-line (linear depreciation)	EOO	ex-post MS test	0,049 € per meter per cable site
EL	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity			
ES	Yes	Cost_Orientation	Cost orientation alone	FDC		HCA	Straight-line (linear depreciation)	EOI		
FI										
FR	Yes	Cost_Orientation	Cost orientation alone	FDC		CCA	Tilted annuity	EOI		Non-mutualised deployments: 0,031€/cm ² /month Mutualised deployments: 0,520/premise to pass/month
HR	until the access point	Cost_Orientation	Cost orientation alone	FDC		CCA	Straight-line (linear depreciation)	EOO		63-110 mm EUR/m/year 1,51 (11,36HRK); 50 mm EUR/m/year 1,28 (9,66HRK); 20-40 mm EUR/m/year 0,43 (3,26HRK); 3-16 mm (micro ducts) EUR/m/year 0,25 (1,85HRK)
HU	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	EOO		21028 HUF/km/month 51,59 Euro/km/mese
IE	Yes	Cost_Orientation				CCA	Tilted annuity			https://www.openeir.ie/reference-offers/
IT	Yes	Cost_Orientation	Cost orientation alone	LR_A_IC	BU-LR(A)IC+	CCA	Annuity	EOO		0,0862 (10-12 mm of diameter/meter/month) only IRU >10 years available (7.11 Euro/m IRU15 Years)
LI	Yes	Cost_Orientation	Cost orientation alone	FDC		HCA	Straight-line (linear depreciation)	Other		duct (access): CHF 0.676 per meter per month duct (backhaul): CHF 0.101 per meter per month fibre, single (backhaul): CHF 0.75 per meter per year fibre, pair (backhaul): CHF 0.95 per meter per year
LT	Yes	Cost_Orientation	Cost orientation alone			HCA	RAV (Regulatory Asset Value)		ex-post MS test	
LU										
LV	Yes	Cost_Orientation	Cost orientation alone	FDC		CCA	Straight-line (linear depreciation)	Other		
MT										
NL										
NO	Yes	Cost_Orientation	Cost orientation alone	FDC		HCA		EOO		
PL										
PT	Yes	Cost_Orientation	Cost orientation alone	FDC		HCA		EOI		Ducts (occupation for main ducts): 6.37€/km/cm ² - Lisboa and Porto municipalities 4.88€/km/cm ² - other municipalities Poles (pole occupation, per cable fixation): 1.00 €
RO										
RS	Yes	Cost_Orientation	Cost orientation alone	FDC		CCA	Straight-line (linear depreciation)	EOO		1) The monthly charge for the lease of the space in cable ducts for laying cables in pipes with the diameter up to 20mm is 0,081 eur/m. 2) The monthly charge for the lease of the space in cable ducts for laying cables in pipes with the diameter up to 40mm is 0,09 eur/m.
SE										
SI	Yes	Others/Combination		LRIC	BU-LRIC	CCA	Tilted annuity	EOI		72,09 EUR/km
SK	Yes	Cost_Orientation	Price cap alone	LR_A_IC	BU-LR(A)IC+	CCA	Tilted annuity	Other		

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 28 NRAs⁷⁰ have provided data for this section. If data is confidential and can therefore not be shown in the analysis or if it has specificities, this will be shown in the footnotes.

The following structural data have been collected (data as at 1st April 2022 – unless otherwise indicated in the footnotes):

⁷⁰ 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), 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 2022 by: Albania (AL), Iceland (IS), Latvia (LV), Luxemburg (LU) Montenegro (ME), North Macedonia (MK), Kosovo (XK)*, 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 1 - Structural Data collected

1	Population and population density
1.1	Number of inhabitants
1.1a	Number of private households
1.1b	Number of people per household
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 (subscription as % of the total population)
2.2	Fixed broadband penetration (subscription 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) vertical 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) vertical 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 is sourced from participating NRAs. In this year's report, the question on technology share (2.2.1 and 2.2.2) has been split into % of DSL and % of VDSL (NGA) in order to explore the increasing importance of high speed broadband technology.

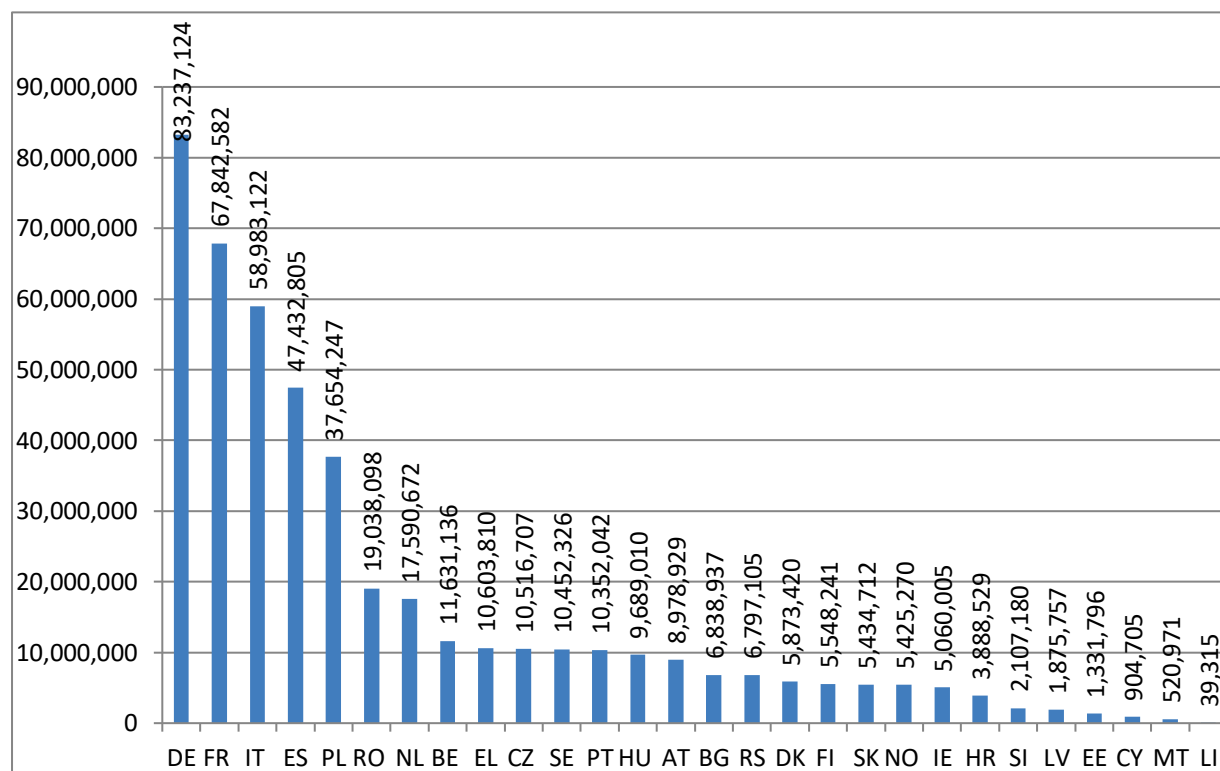


4.1 Population and Population Density

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**⁷¹ (i. e. the total number of inhabitants per country) the top countries are Germany, France, Italy, Spain and Poland.

Figure 58 - Total Population

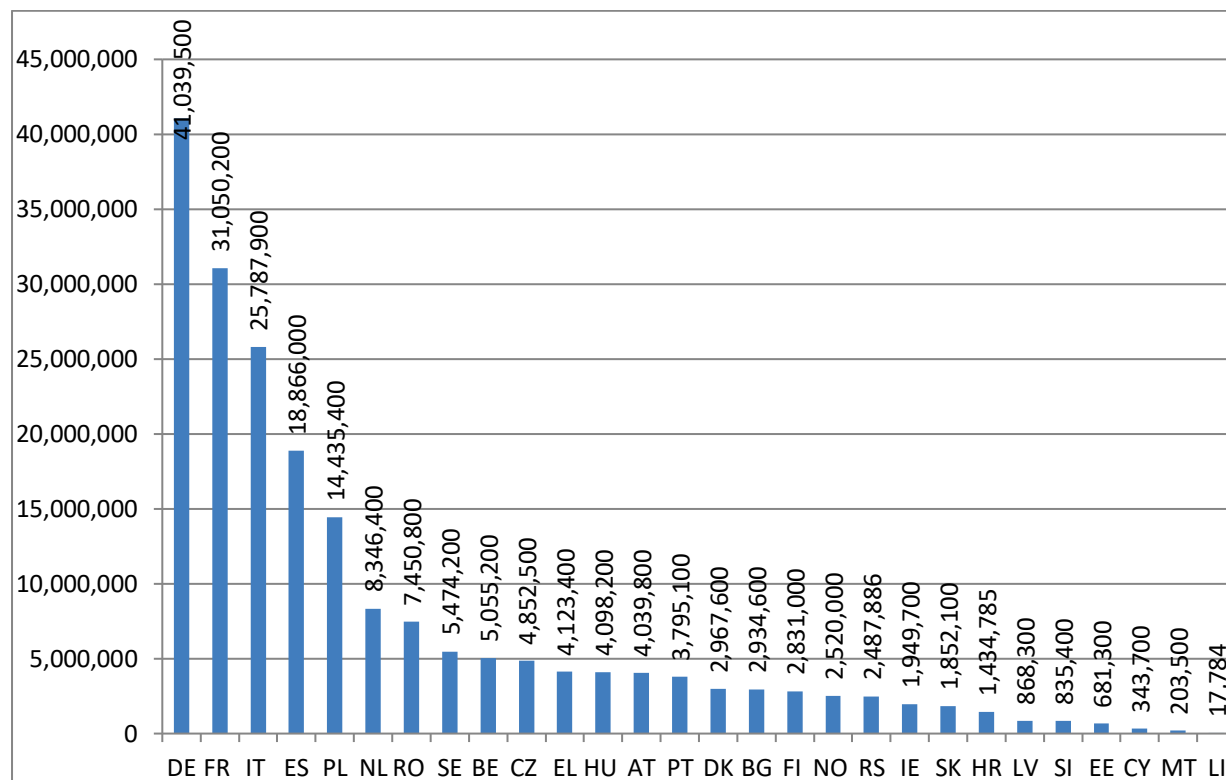


Source: Eurostat 2022

⁷¹ Eurostat "Population on 1st January 2022" online data code: TPS00001. Provisional data for CY, BE, FR, IT, ES, PT, SK. Estimate for EL, RO. HR: Census 2021 data.

There are between two and three people per household in every country⁷². The number of households is used in this report to calculate the fixed broadband penetration, shown per household.

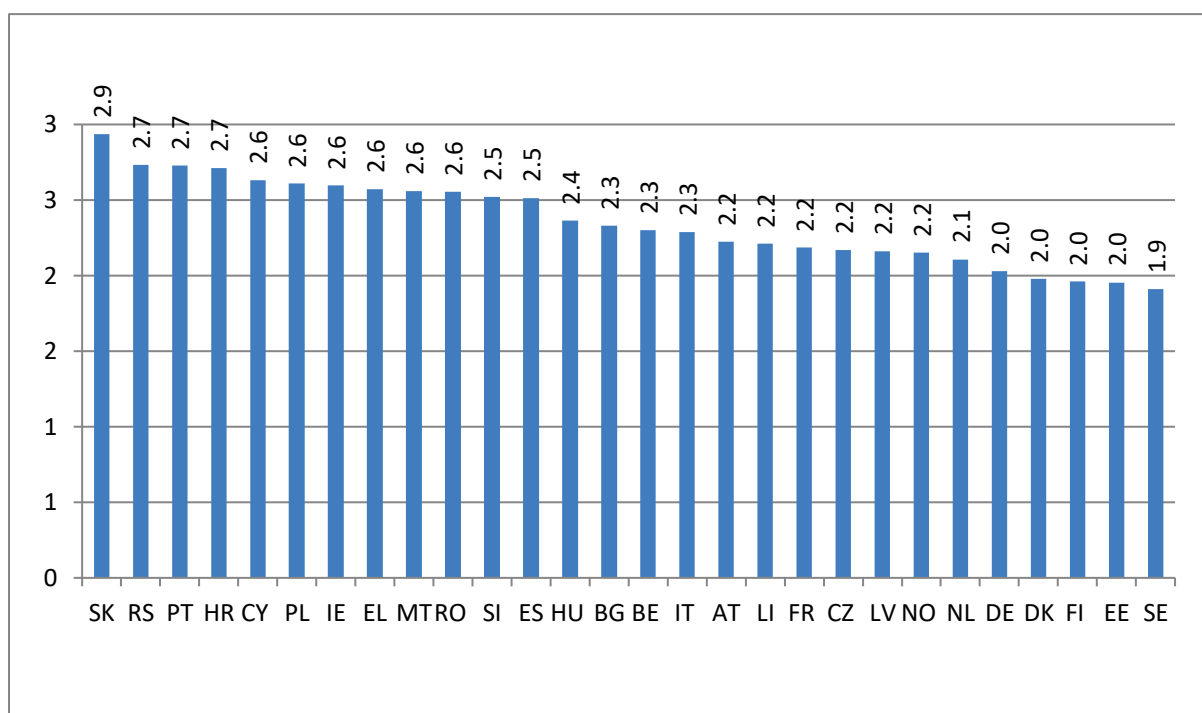
Figure 59 – Number of Private Households



Source: Eurostat 2022

⁷² Eurostat 2022 "number of private households", online data code: LFST_HHNHWHTCH. Number of people per household calculated from number of households. Household definition differs (see Eurostat Metadata) in FR, ES. RS: Census 2011 Data. NO: Helgi Library, 2020 Data. HR: Census 2021 Data.

Figure 60 - Number of People per Private Household

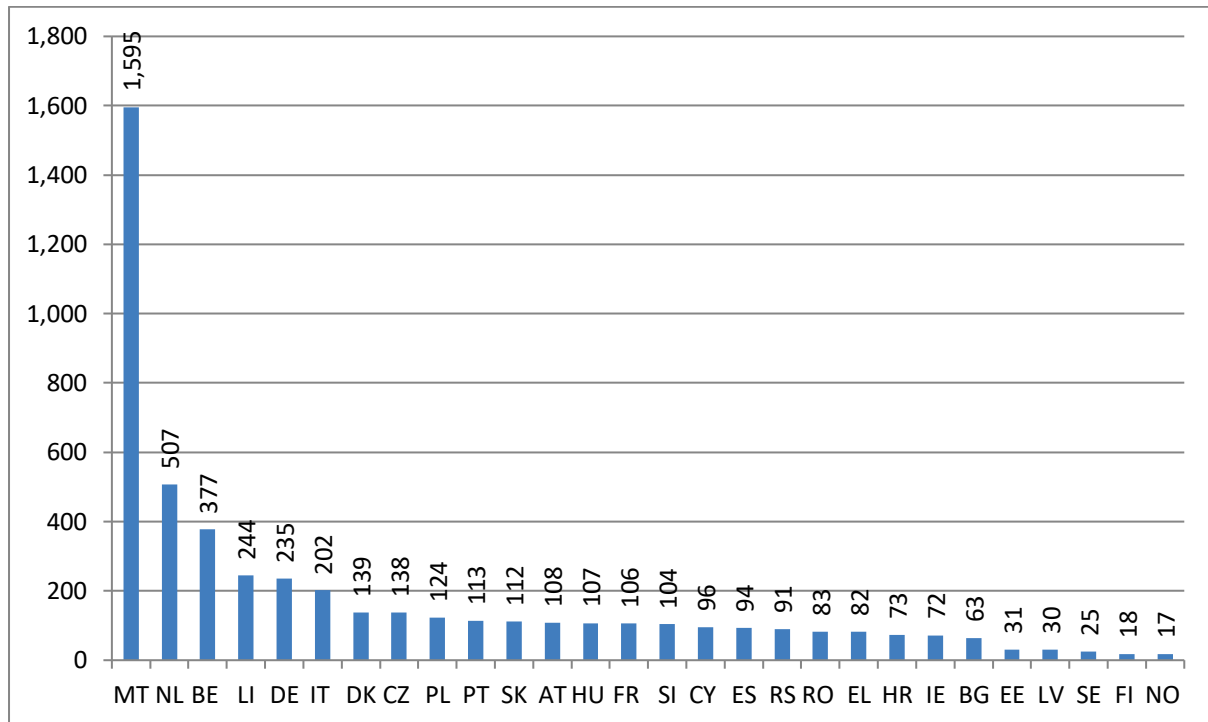


Source: Eurostat 2022



In terms of **population density**⁷³ (i. e. the number of inhabitants per square kilometre) the top countries with above 200 people per square km are Malta, the Netherlands, Belgium, Liechtenstein, Luxemburg, Germany and Italy.

Figure 61 - Population Density

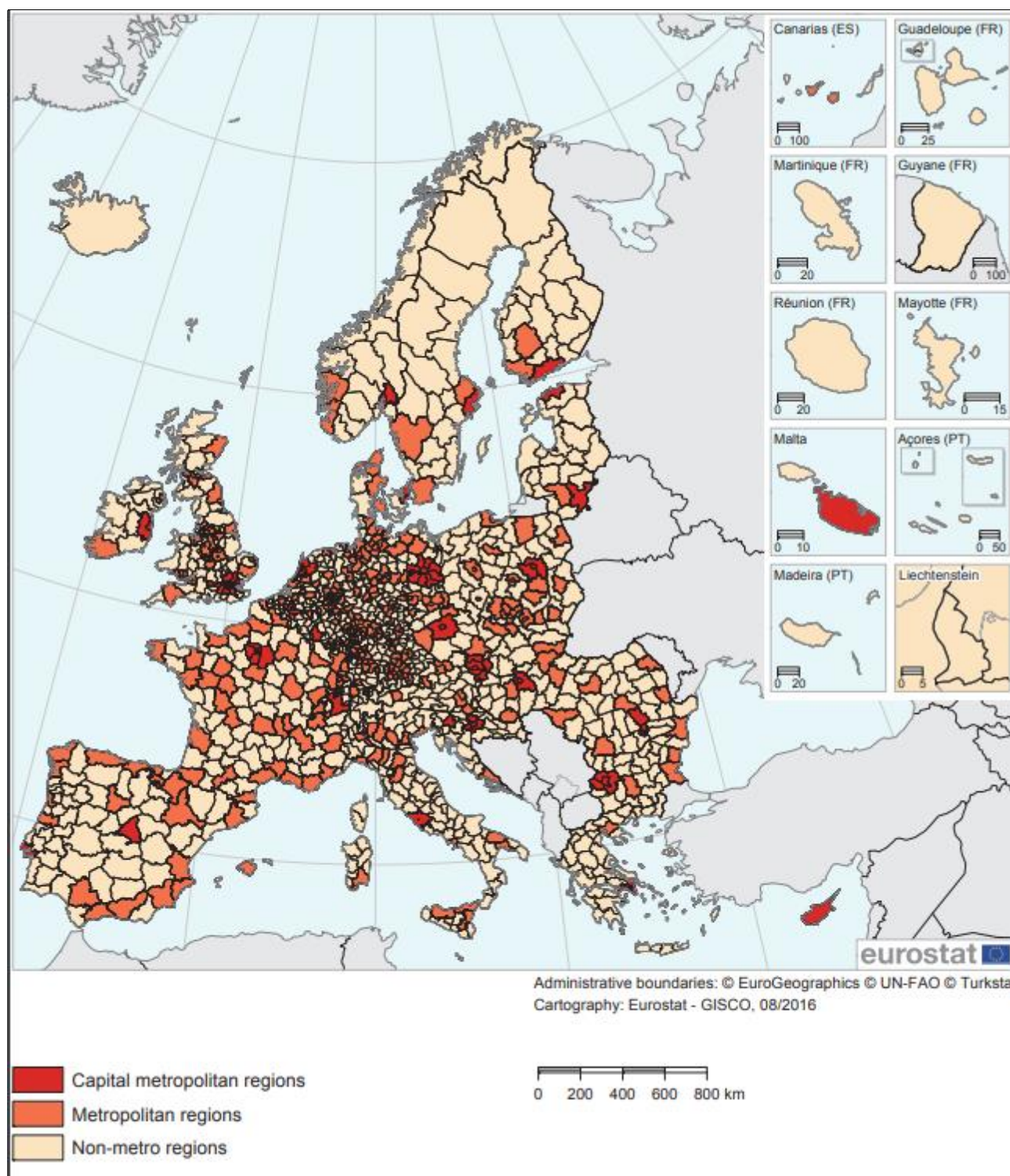


Source: Eurostat 2021

When looking at the **metro and non-metro population density**, an impression is given of the different effort and cost required by operators to provide infrastructure access to the population in metro and country areas.

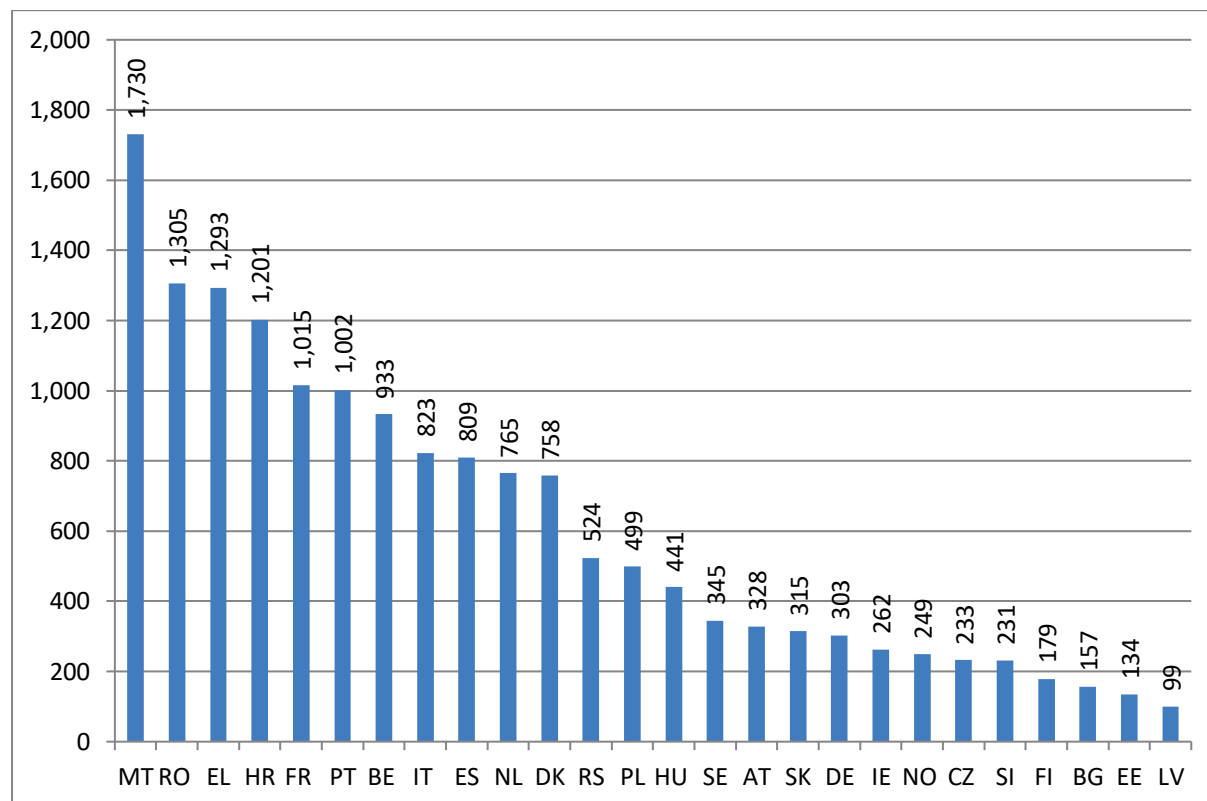
⁷³ Eurostat 2021 "Population density" online data code: TPS00003.

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



The population density in the capital city metro area⁷⁴ (usually, but not always, the most densely populated area of the country) is highest in Valetta (MT), Bucharest (RO), Athens (EL), Zagreb (HR), Paris (FR) and Lisbon (PT).

Figure 63 - Metro Population Density



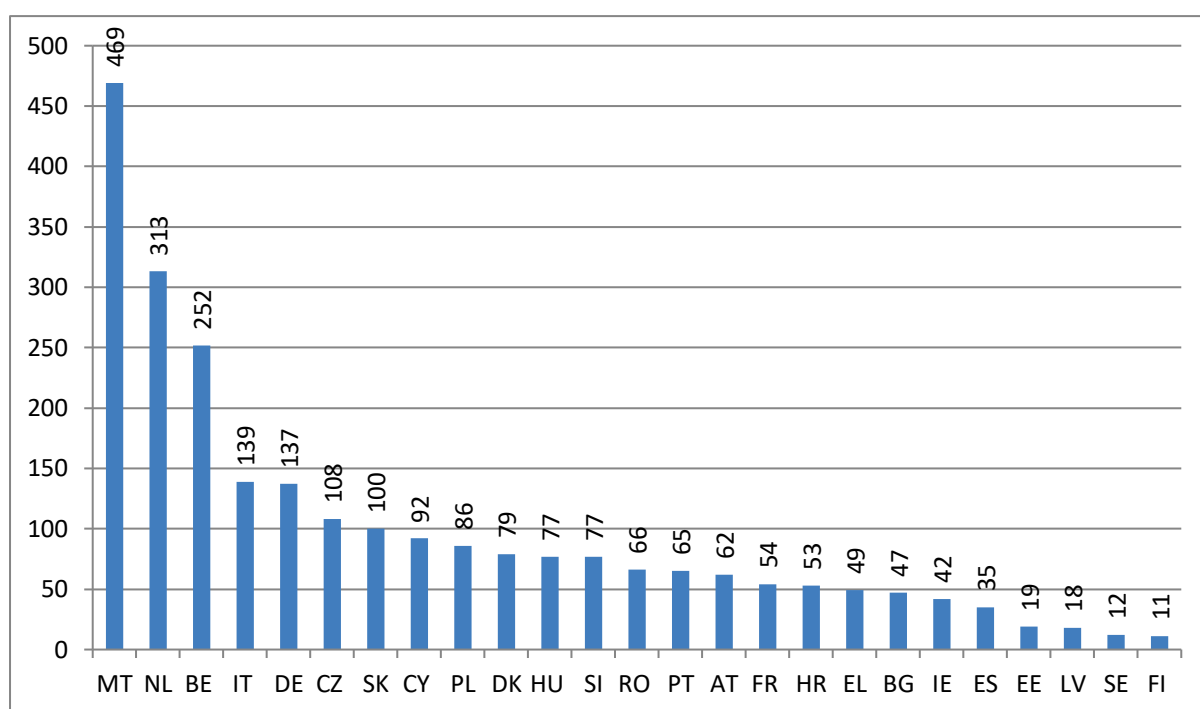
Source: Eurostat 2020

The non-metro population density⁷⁵ shows Scandinavian and Baltic countries (FI, SE, LV, EE) to have the least densely populated country side.

⁷⁴ Eurostat 2020 "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.

⁷⁵ Eurostat 2020 "Population density by metropolitan regions", online data code: MET_D3DENS. Not available for LI, NO, RS.

Figure 64 - Non-Metro Population Density



Source: Eurostat 2020



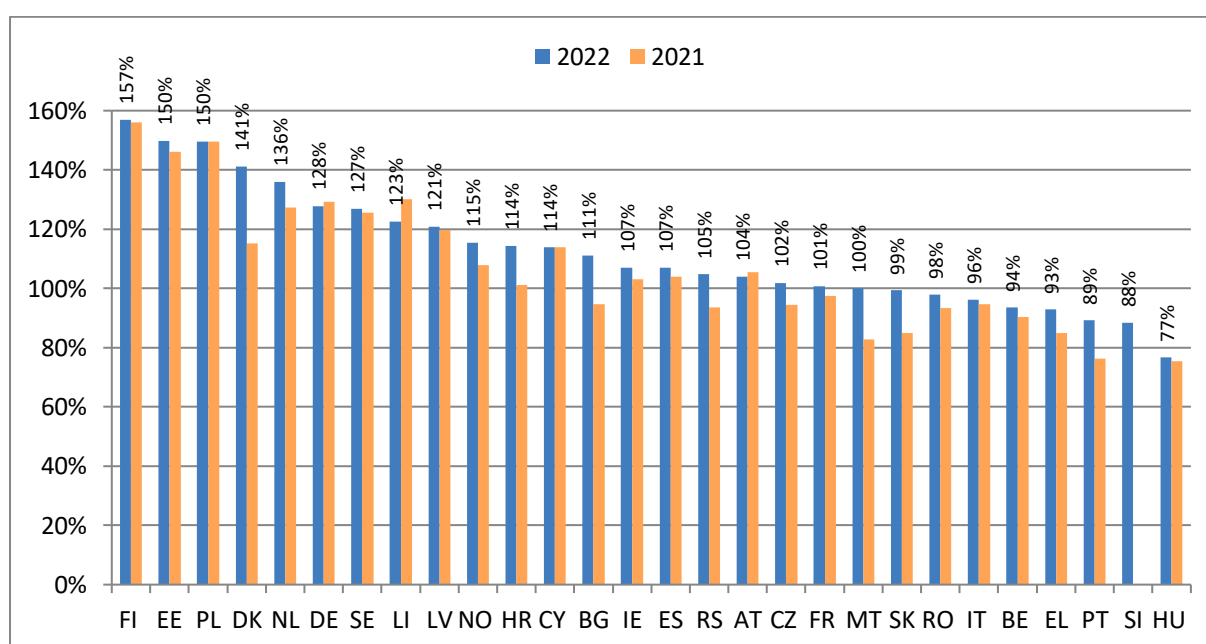
4.3 Market and Competitive Situation

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 NRAs⁷⁶.

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 reports⁷⁷.

The **mobile broadband penetration**, represents mobile broadband end users as a percentage of the total population⁷⁸ (excluding M2M). Percentages are only shown for 2021. They range between 77 per cent in the Hungary and 157 per cent in Finland. In 2022 most countries have a mobile broadband penetration rate of around or more than 100 per cent. Shown in comparison is the penetration rate (as a percentage of the total population) in 2021. Mobile broadband penetration has increased most in countries that have had a relatively low penetration in the previous year (PT, RO, SK, MT).

Figure 65 - Mobile Broadband Penetration (per total population)



Source: BEREC RA database 2022

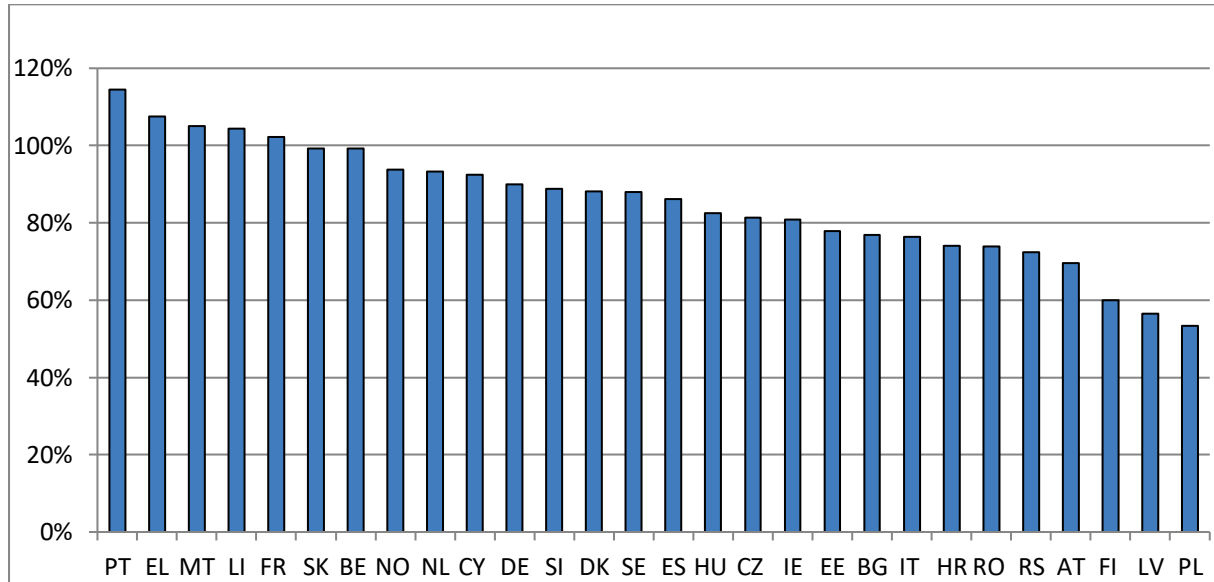
⁷⁶ PL: no updated data available (data is the same as previous year's). CZ: The separation of former incumbent – O2 Czech Republic a.s. (O2), former SMP operator, was performed on June 1, 2015. On the basis of voluntary separation of O2, two companies were created – O2 and Česká telekomunikační infrastruktura 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).

⁷⁷ i. e. BEREC Report on European Termination Rates

⁷⁸ AT: Based on mobile BB incl. Smartphone tariffs. HU: calculated with ITU 2021 data. IE: Users who have made a transaction in the last 90 days via a handset; dongle/USB. i.e. active 3G/4G/5G voice and dongle/USB users.

The *fixed broadband penetration*⁷⁹ represents fixed broadband subscriptions as a percentage of the total number of households. Percentages vary between 53 per cent in Poland and 115 per cent in Portugal (non-residential included).

Figure 66 - Fixed Broadband Penetration (per household)



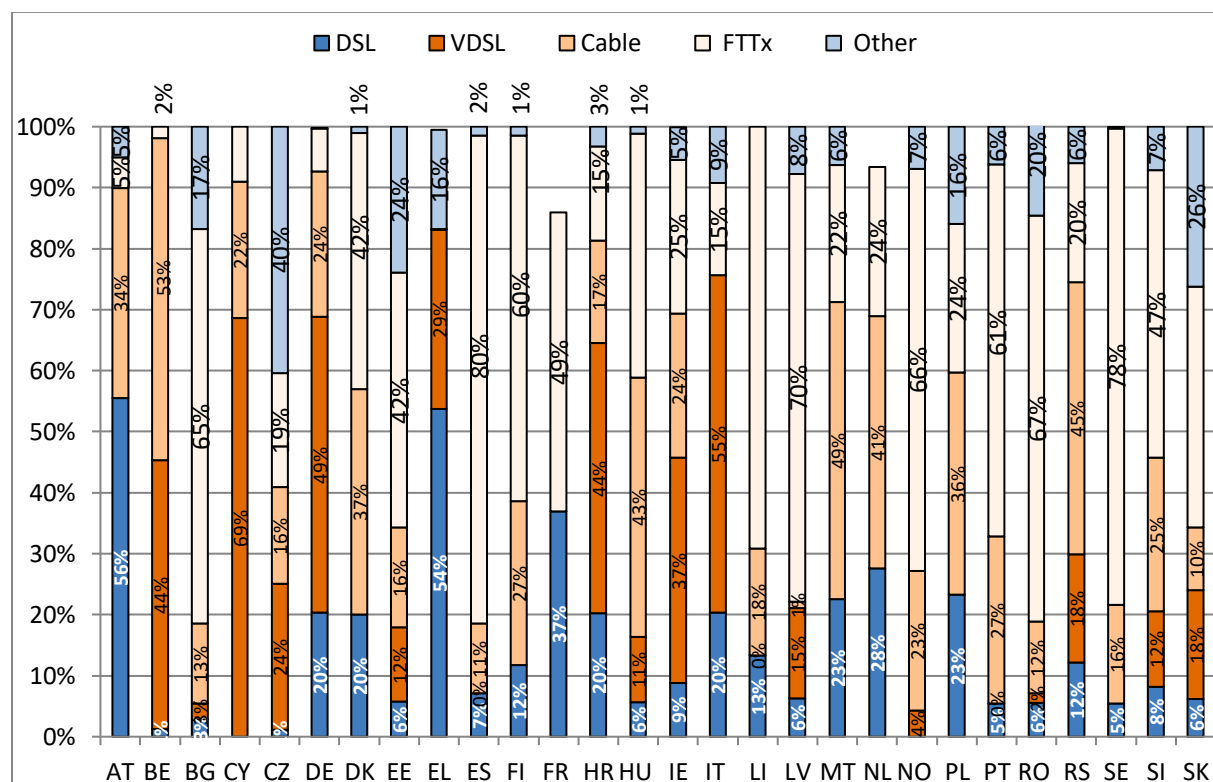
Source: BEREC RA database 2022

⁷⁹ CZ: including fixed LTE/5G access (access provided in fixed location), EE: includes fix-mobile BB, FI: LTE not included. FR: includes business fixed BB subscriptions (therefore > 100%). HU: calculated with ITU 2021 data. LI: subscription data includes households (no separate data) and businesses (therefore > 100%). PT: non-residential included (therefore > 100%). RO: incl. SIM based. SE: private subscriptions.

The following table shows the percentage share of fixed broadband technology⁸⁰:

- DSL lines (including ADSL, naked DSL)
- VDSL lines (NGA)
- Cable (via coax, hybrid fibre coax cable HFC)
- FTTx (via FTTH, FTTB/C)⁸¹
- Other technologies (broadband wireless access BWA, satellite, fixed LTE etc.)

Figure 67 - Technology Share of Fixed Broadband



Source: BEREC RA database 2022

DSL lines as a percentage of fixed broadband range from 1 per cent in Belgium to 54 per cent in Greece⁸².

VDSL lines as a percentage of fixed broadband range from 0 per cent in Spain, Liechtenstein and Portugal to almost 70 per cent in Cyprus.

Cable as a percentage of fixed broadband (no cable coverage in Italy and Greece) ranges from 1 per cent in Latvia to over 50 per cent in Belgium.

The use of **FTTx** technology is very low in Austria, Belgium, Cyprus, Greece and Germany. A share of around or more than 50 per cent is reported for Belgium, France, Portugal, Finland, Romania, Norway, Bulgaria, Latvia, Spain, Sweden and Lithuania.

⁸⁰ FR: confidential (except DSL, FTTx). AT, DK, SE, MT, NO: DSL includes VDSL (no separate data available), Other incl. FWA, vULL. EE: Other incl. fix-mobile BB. FI: no separate information on VDSL. RO: DSL incl. DSL+fi-bre, VDSL incl. VDSL+fi-bre, FTTx excl. HFC and DSL+fi-bre.

⁸¹ FTTx = fibre to "x" connection, i.e. FTTH = fibre to the home, FTTB/C = fibre to the building/curb

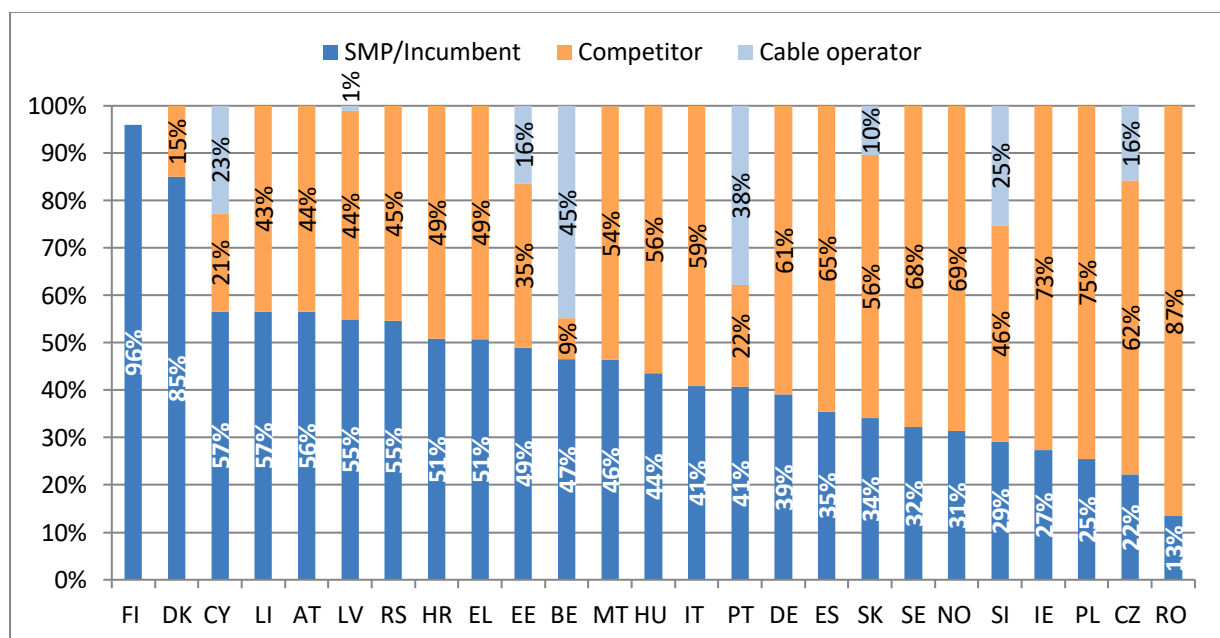
⁸² The 56% in Austria include VDSL.

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 over 40 per cent, followed by Slovakia (26 per cent), Romania (20 per cent) and Estonia (24 per cent).

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(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 NRAs⁸³. The data analysis shows a considerable disparity in market shares and therefore points to differences in the national competitive situation, thereby affecting regulatory strategy.

Figure 68 - Fixed Broadband Market Share



Source: BEREC RA database 2022

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.

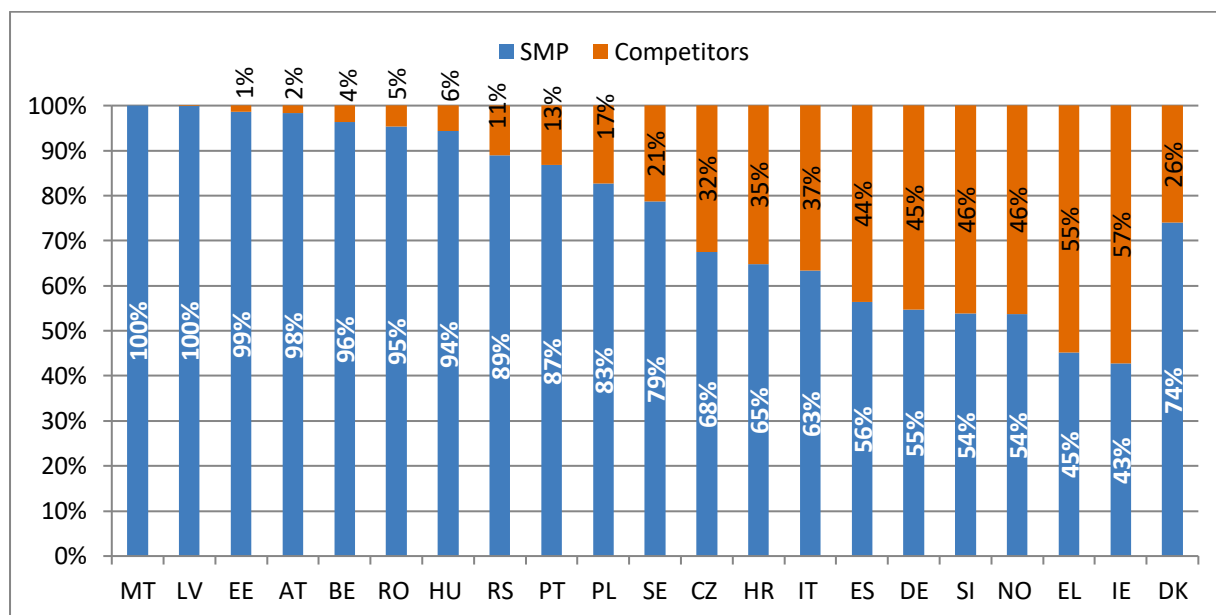
⁸³ Data is confidential in BG, FR, NL. PL: no updated data available (data is the same as previous year's). CY: 2021 figures. CZ: The share of the SMP/Incumbent is represented by the share of O2 Czech Republic (retail service provider company created after voluntary separation of former incumbent) which is not SMP in Markets 1/3b. SMP in Markets 1/3b is CETIN, the operator that provides wholesale services only. CETIN does not provide the retail services. RO: the incumbent is not SMP. DK: SMP figure is inaccurate because DK has two product markets - one for NGA (coaxial and fiber) and one for legacy (copper, FWA); calculation was across product markets. BE: SMP includes cable. NO: SMP and competitors. RS: SMP also owns cable network. Competitors include cable operators in AT (34%), DK (37% incl. in SMP and competitors), IE (24%), HR, MT (49%). NO (SMP and competitors), PL (50%), RO, RS (35%). SE (major cable company ComHem has been acquired by competitor Tele2; shares are therefore recorded under competitors). DE: cable share is not known (not regulated). IT: no cable coverage. ES: no operator can be strictly considered a cable operator since all operators have also FTTH. PT: Cable operators also provide fixed BB access over DSL, FTTH and Other technologies (included in this figure).

The share ranges from a minimum of 14 per cent in Romania to 96 per cent in Finland. The SMP has a market share of close to or greater than 50 per cent in Austria, Belgium, Cyprus, Denmark, Estonia, Finland, Greece, Croatia, Latvia and Rep. Serbia.

- Share of competitors: market shares range from 9 per cent in Belgium to over 80 per cent in Romania. In some countries, competitor data includes cable, which makes shares difficult to compare with countries that record shares separately.
- Share of cable operators: not all NRAs record data/record data separately from competitor data. Where it is recorded separately shares range from around 1 per cent in Lithuania/Latvia to almost 40 per cent in Poland.

The **DSL broadband** share (including DOCSIS prior to 3.0, excluding VDSL)⁸⁴ is the traditional domain of SMP/incumbent operators. Their market share ranges from 20 per cent in Denmark to 100 per cent in Latvia and Malta (only the SMP operator offers DSL). Shown in the same figure are competitor market shares, ranging from around 1 per cent in Estonia to 57 per cent in Ireland.

Figure 69 - DSL Broadband Market Share



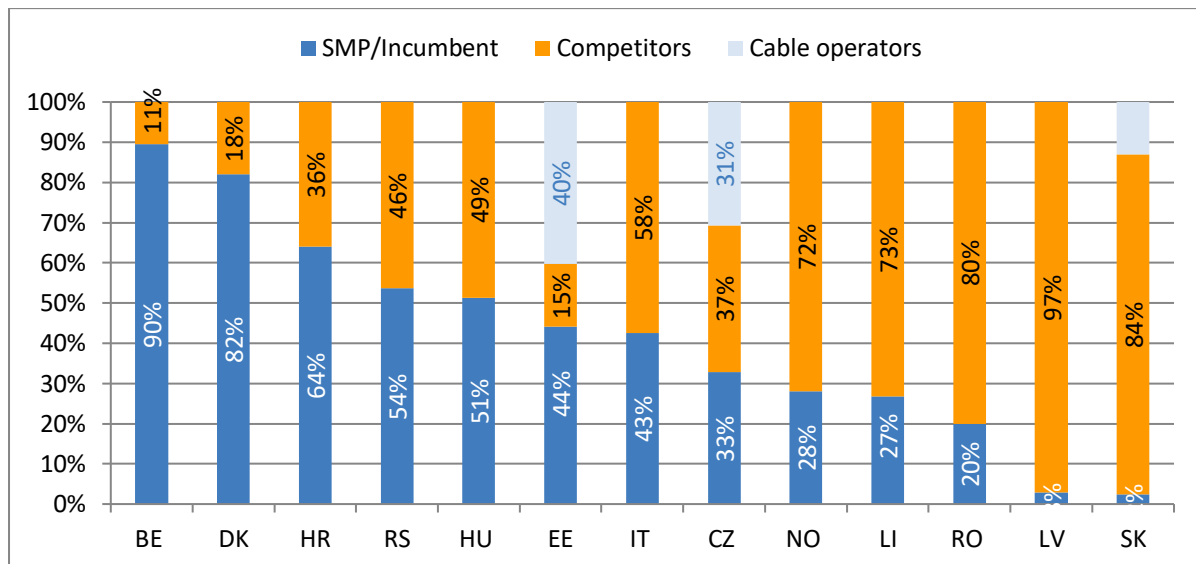
Source: BEREC RA database 2022

⁸⁴ Data is confidential in BG, FR, LI, NL, and SK. No data in CY, FI. CZ: The share of the SMP/Incumbent is represented by the share of O2 Czech Republic (retail service provider company created after voluntary separation of former incumbent) which is not SMP in Markets 1/3b. SMP in Markets 1/3b is CETIN, the operator that provides wholesale services only. CETIN does not provide the retail services. PL: The biggest operator's share (Orange Polska). RO: Market share of the incumbent (incumbent is not SMP). PT: cable operators also provide fixed BB access over DSL.

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,⁸⁵ the SMP/Incumbent’s share ranges from 2 per cent in Slovakia to 90 per cent in the Belgium. Shown in the same figure are competitor’s and cable operator’s market shares.

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

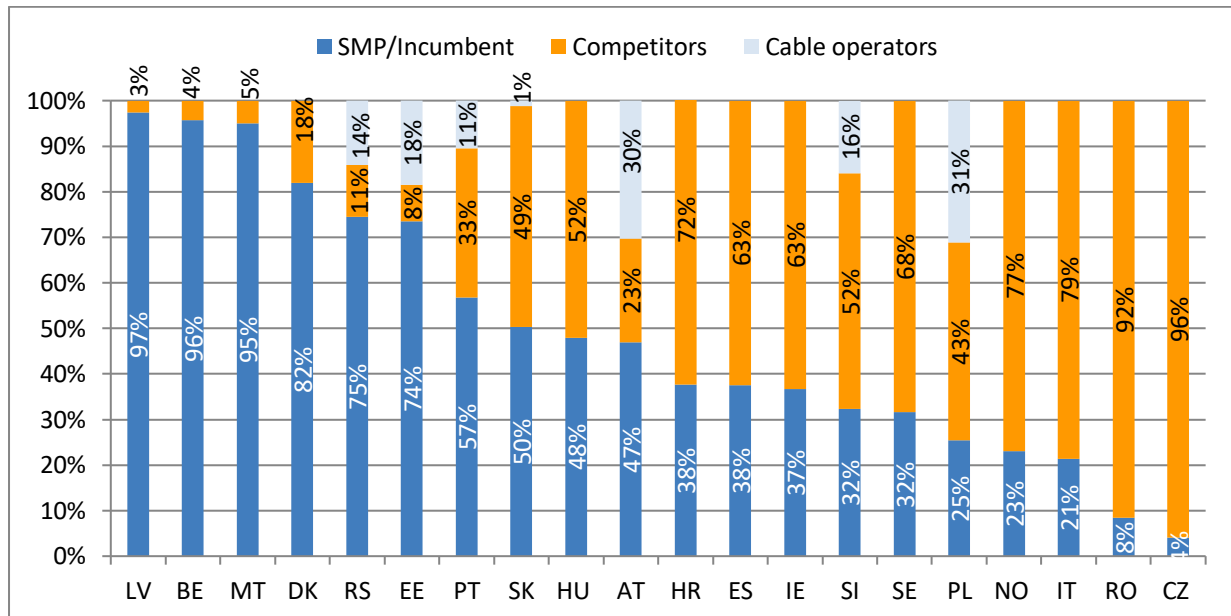


Source: BEREC RA database 2022

⁸⁵ Data is confidential in BG, CY and not available in AT (FTTB not available), DE (FTTB/C and FTTH not recorded separately), EL, ES (0%), FI, FR, MT, NL, PL, PT, SE, SI. Cable operators incl. in competitors in BE, IE, RO, RS (incumbent also owns cable network). LI: The fibre access network is point-to-point FTTB. Vertical cabling in buildings is in the responsibility of the building owner. The vertical cabling complements FTTB to FTTH. FTTC does not exist. CZ: share of the SMP/Incumbent is represented by the share of O2 Czech Republic (retail service provider company created after voluntary separation of former incumbent) which is not SMP in Markets 1/3b. SMP in Markets 1/3b is CETIN, the operator that provides wholesale services only (no retail). NO: cable operators included in SMP and competitors.

Regarding **NGA (FTTH) broadband** share⁸⁶, the SMP/Incumbent's share ranges from 4 per cent in Czechia to 97 per cent in Latvia. Shown in the same figure are competitor's and cable operator's market shares.

Figure 71 – NGA (FTTH) Broadband Market Share



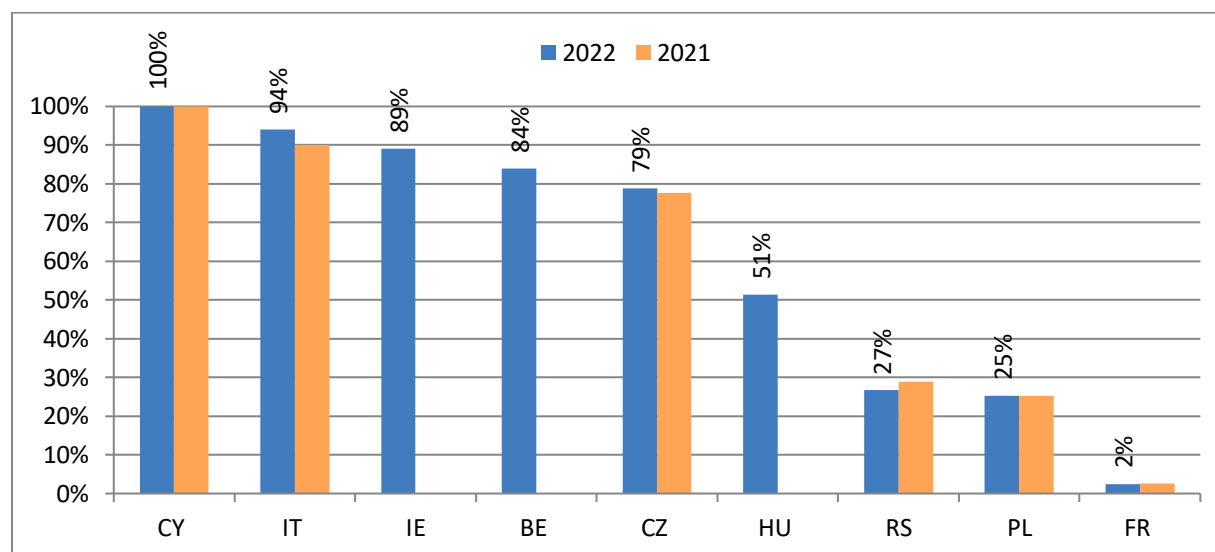
Source: BEREC RA database 2022

⁸⁶ Data is confidential in BG, CY, FR, LI, NL and not available in DE, EL, FI. Cable incl. in competitor in BE, IE, RO, SE. DK: cable is included in SMP/competitors. ES: No operator can be strictly considered a cable operator since all operators have also FTTH. PT: SMP/cable = FTTH/B only. SE: includes all fibre subscriptions. CZ: The share of the SMP/Incumbent is represented by the share of O2 Czech Republic (retail service provider company created after voluntary separation of former incumbent) which is not SMP in Markets 1/3b. SMP in Markets 1/3b is CETIN, the operator that provides wholesale services only. CETIN does not provide the retail services.

The next section covers **FTTx and cable coverage on own infrastructure**⁸⁷ 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 2021 are shown.

SMP's coverage of Fibre to the Building/Curb (FTTB/C) infrastructure as a percentage of total households:⁸⁸ a total of 13 NRAs provided data in 2022 (not shown are ES (no FTTB/C infrastructure) and LI with 0 per cent coverage and BG, SK where data are confidential). Coverage is largely unchanged in comparison to the previous year.

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



Source: BEREC RA database 2022

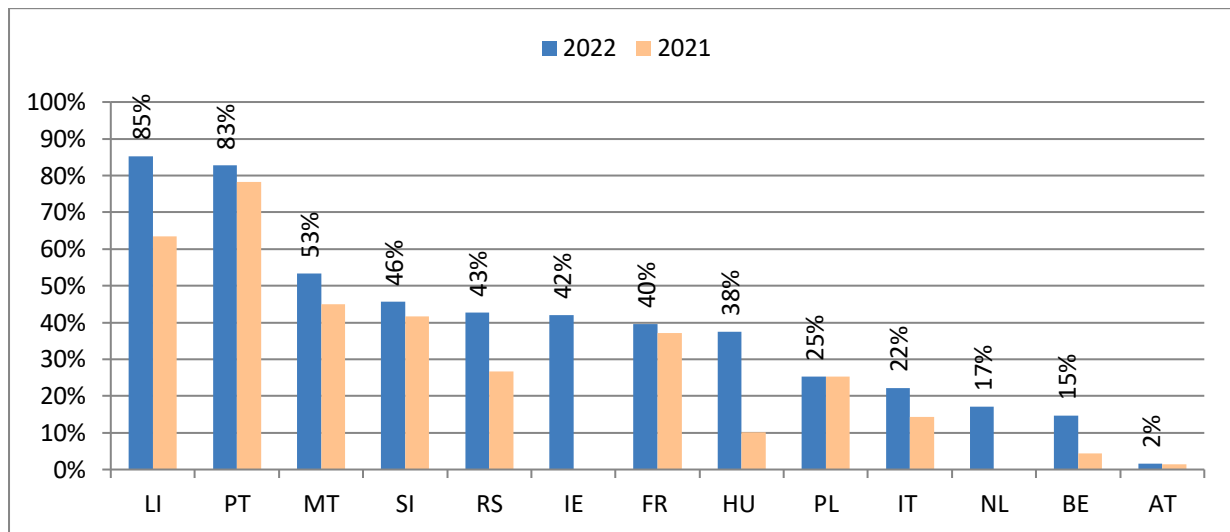
SMP's coverage of Fibre to the Home (FTTH) infrastructure as a percentage of total households:⁸⁹ a total of 17 NRAs supplied data in 2022 (Not shown are confidential data in BG, CY and SK) Coverage is increased in comparison to last year. PT data refers to premises connected/passed and is therefore not comparable. Data not shown for 2021 is either confidential (CZ, NL) or not comparable (IE).

⁸⁷ LI: National access infrastructure (HFC, copper, fibre) is provided by the wholesale-only network provider LKW (=national electric power utility). There are no other infrastructure providers. All service providers, including SMP/Incumbent, rent passive fibre (P2P-FTTH) / copper / HFC from LKW. The available P2P-FTTH network covers 85% of total households.

⁸⁸ SMP FTTB/C (via SLU) BB coverage: total coverage if more than one operator is present. Data is confidential in BG, SK and not available in AT, DE (FTTB/C and FTTH not recorded separately), DK, EE, EL, FI, HR, LV, MT, NL, NO, PT, RO, SE, SI. CZ: figure includes all NGA VDSL lines of CETIN. IE: Eir VDSL passed / no. of households. Not comparable to 2021 data. RS: data refers to homes connected.

⁸⁹ SMP FTTH BB coverage: total coverage if more than one operator is present. Data is confidential in BG, CY, SK and not available in DE (FTTB/C and FTTH not recorded separately), DK, EE, EL, ES, FI, HR, LV, NO, RO, SE. IE: not comparable to 2021 data.

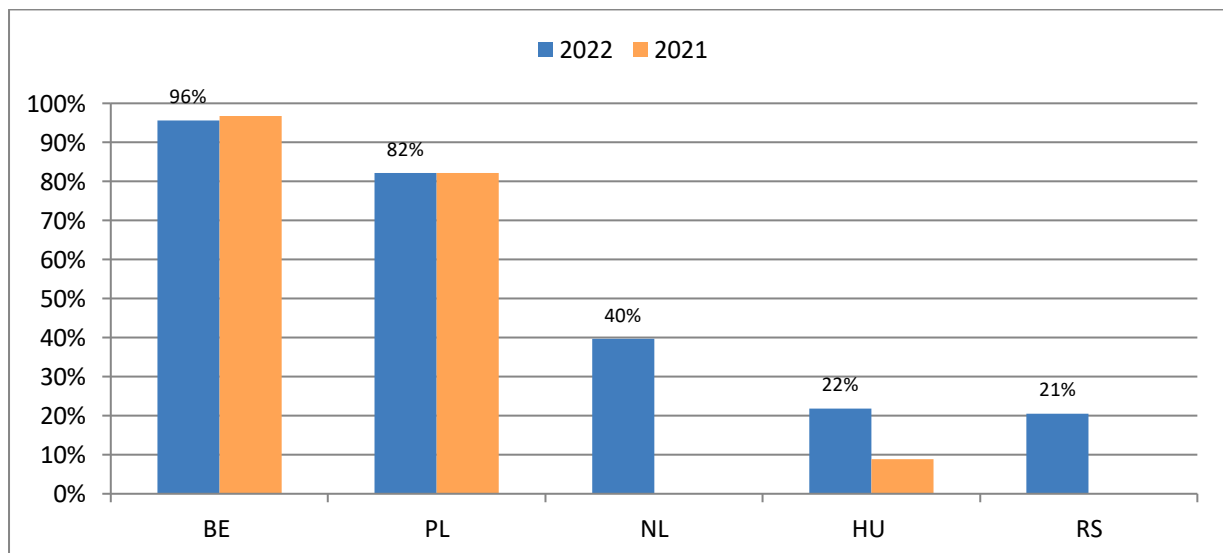
Figure 73 - SMP FTTH Coverage: % of households



Source: BEREC RA database 2022

SMP cable coverage as a percentage of total households⁹⁰ was provided in 2022 by 17 NRAs, of which 12 (not shown) reported 0 or close to 0 per cent (AT, CY, CZ, ES (no SMP cable infrastructure), FR, IT, LI, MT, PT, SI, SK) or have confidential data (BG). 2021 data is confidential in NL and 0% in RS.

Figure 74 - SMP Cable Coverage: % of households

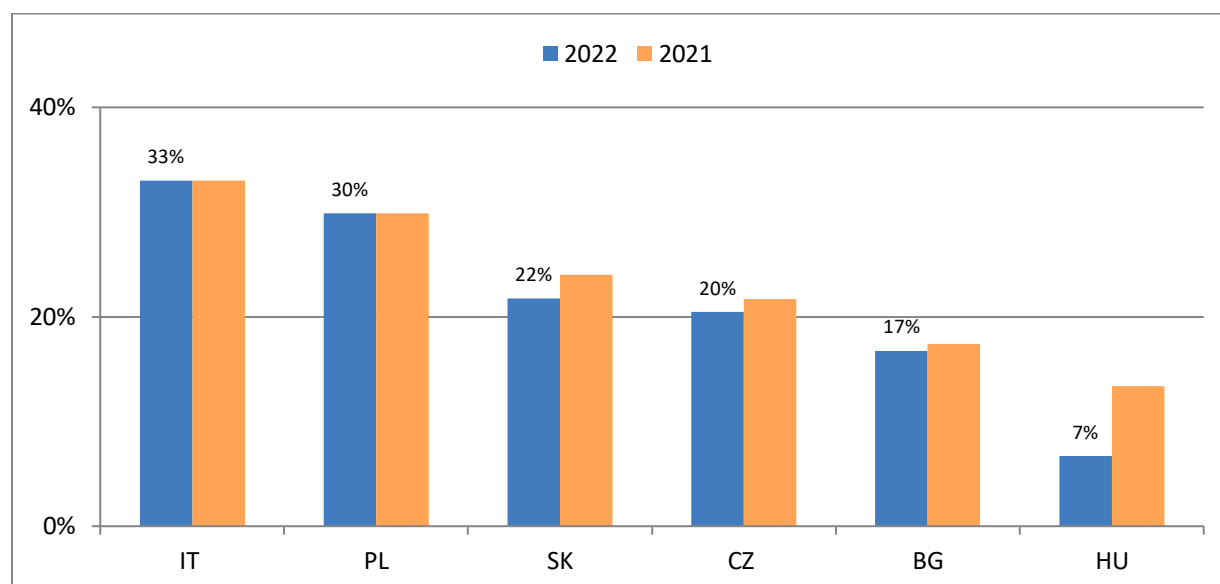


Source: BEREC RA database 2022

⁹⁰ SMP cable coverage: total coverage if more than one operator is present. Confidential in BG and not available in DE, DK, EE, EL, FI, HR, IE, LV, NO, RO, SE.

The total coverage of the **main OAO Fibre to the Building/Curb (FTTB/C) as a percentage of total households**⁹¹ is provided in 2022 by 11 NRAs (not shown in the graph are CY, ES (no FTTB/C infrastructure), FR, LI, RS with 0 per cent). The decrease in CZ is due to a change in methodology of reporting access lines.

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



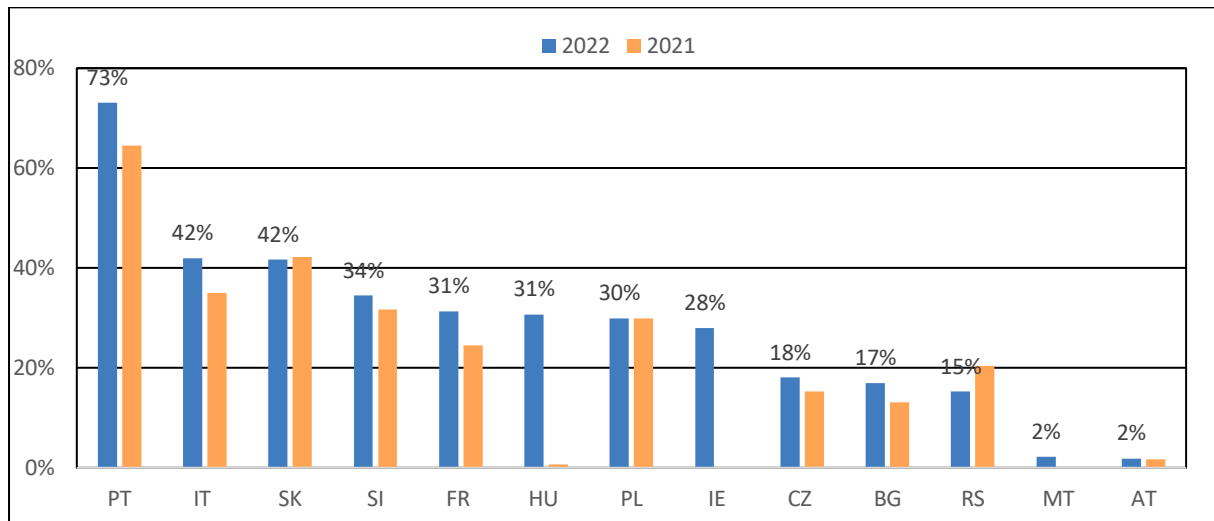
Source: BEREC RA database 2022

Fibre to the Home (FTTH) coverage of the main OAO via their own infrastructure (as a percentage of total households)⁹² resulted in 16 NRAs reporting data in 2022. Of those, CY, LI (0%) and NL are not shown in the graph since coverage is zero or data is confidential. The highest coverage is recorded in Portugal and Italy.

⁹¹ OAO own infrastructure (including third party civil infrastructure) vertically integrated operator FTTB/C BB coverage: total coverage if more than one operator is present. Not available in AT (FTTB not available), BE, DE, DK, EE, EL, FI, HR, IE, LV, MT, NL, NO, PT, RO, SE, SI. SK: The 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 incl. only FTTB technology.

⁹² OAO own infrastructure (including third party civil infrastructure) vertically integrated operator FTTH BB coverage: total coverage if more than one operator is present. Confidential in CY, NL. Not available in BE, DE, DK, EE, EL, ES, HR, IE, LV, NO, RO, SE. IE: Siro/Virgin Media/NBI premises passed / no. of households. IT: OAO is equal to wholesale operator. PT: As % of total premises. If 2 or more operators are cabling in the same area, the overall effect is not taken into account (double counting). SK: The 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. 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.

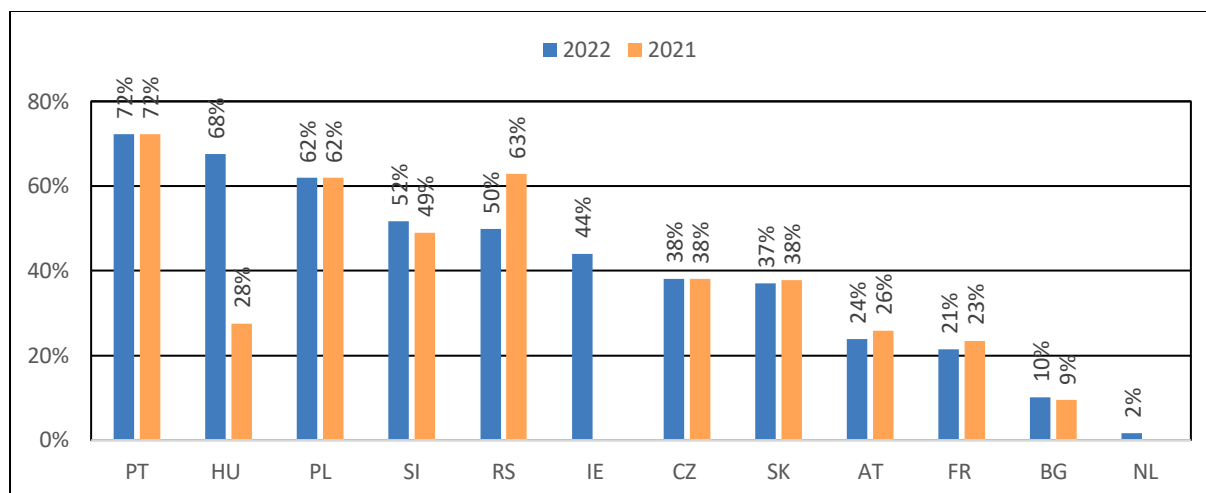
Figure 76 - Main OAO Coverage on Own Network FTTH: % of households



Source: BEREC RA database 2022

The total **cable coverage of OAO on own cable network (as a percentage of total households)**⁹³ resulted in a response of a total of 16 NRAs in 2022. Not shown are CY, LI (confidential), IT and MT (0%). Coverage has remained largely unchanged in comparison to the previous year⁹⁴.

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



Source: BEREC RA database 2022

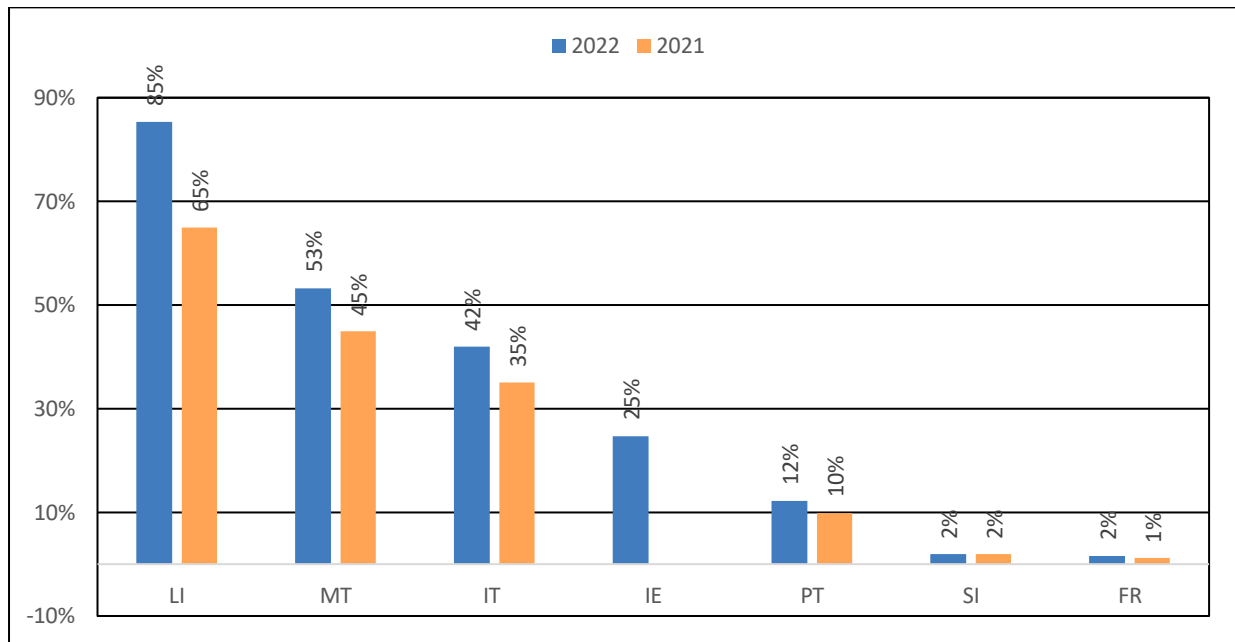
Total **wholesale only OAO FTTH coverage (as a percentage of total households)**⁹⁵ resulted in a response of 11 NRAs in 2022, of which AT, CY, HU, RS are not shown in the graph because their coverage is 0 per cent. Not many countries record wholesale OAO FTTH coverage and those that do seem to have very differing market circumstances (see footnotes).

⁹³ OAO own infrastructure (including third party civil infrastructure) cable coverage: total coverage if more than one operator is present. Confidential in CY, LI and not available in BE, DE, DK, EE, EL, FI, HR, IT, LV, MT, NO, RO, SE. IE: Virgin Media passed premises / no. of 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).

⁹⁴ 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.

⁹⁵ 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%.

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



Source: BEREC RA database 2022

Appendix I

List of Participating Countries/NRAs

The following countries / NRA's have provided data for the 2022 RA Report:

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)
LV	Latvia (SPRK)
LT	Lithuania (RRT)
LU	Luxemburg (ILR)
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)



