Body of European Regulators for Electronic Communications

BEREC

BoR (22) 78

BEREC Annual Reports for 2021

9 June 2022

Contents

Foreword by the BEREC Chair 2021

BEREC's activities in 2021 were underpinned by three pivotal pillars of our newly adopted Strategy 2021-2025. While executing our Work Programme, I put particular emphasis on three aspects: the first is to promote full connectivity and, by doing so, incentivise investments and leadership in Europe in 5G and fibre across the communications sector. The second is to make sure that BEREC is widely acknowledged as a trustworthy partner for the EU institutions in the context of the European digital policy. The third is to upskill the organisation, making Europe fit for the digital age and the related challenges of technological evolution, for the benefit of Europe and its citizens.

Looking back at the past two years, I feel like 2020 was marked by 'keeping everyone connected' and making sure the networks kept going. 2021, on the other hand, was marked by setting new ambitions, new targets, a Digital Compass and a new 5G Action Plan; upgrading our connectivity. 5G is a topic that BEREC kept monitoring actively and closely as the market develops. We focused on issues related to 5G roll-out, such as coverage indicators or electromagnetic fields (EMFs), and also on less visible aspects, such as backhaul and copper switch-off – topics that are also relevant for fixed network deployment.

During the pandemic, BEREC had set up a monitoring mechanism to assess the performance of networks and operators across Europe. Data collection and reporting had started on a weekly basis and was continued on a quarterly basis in 2021, providing an overview of measures taken by NRAs in view of societal needs to mitigate any adverse consequences in Europe, for example relating to inability to pay bills or the use of different tracing applications. This reporting was concluded by a report related to COVID-19, including a set of lessons learned.

In 2021, monitoring the impact of the EECC stayed at the forefront of BEREC's work. Throughout the past two years, BEREC has issued over a dozen sets of Guidelines, aiming to ensure a consistent approach regarding the Code, which came into effect as of 21 December 2021. Whereas national governments were delayed in the process of adopting the European framework at national level, BEREC was already shifting its work towards the implementation of the Code and assessing future technological and market developments related to end-user provisions within the scope of electronic communications and the digital ecosystem in particular.

Other aspects I focused on are that, in a fast-moving digital environment, BEREC sees it as crucial to track developments within the electronic communications sector and adjacent sectors. In light of this, we will continue to deepen our expertise on aspects such as the digitalisation of society, the digital divide, the internet value chain, digital gatekeepers, and finally environmental sustainability. Some of these keywords have always been part of our DNA, others were newer.

A key initiative of BEREC in 2021 was to contribute to the European initiative to regulate digital gatekeepers: the Digital Markets Act. BEREC played an active role in helping to lay the groundwork for an appropriate regulatory framework with well-balanced oversight, to ensure fairness in the provision of the services and enhance competition in the markets.

BEREC also provided its advice to the co-legislators and the European Commission on a number of other initiatives, such as the Roaming Regulation, the Broadband Cost Reduction Directive, the Access Recommendation, the 5G Toolbox and the NIS2.0 Directive.

In September, the European Court of Justice released three rulings concerning 'zero-rating' options offered by ISPs. As these rulings are directly related to the application of the Open Internet Regulation and the BEREC Guidelines on the Open Internet, we assessed the ramifications of our Guidelines and started the process of reviewing them.

The autumn of 2021 allowed us to travel again and meet in person, after a long period of meeting virtually. This allowed us to reconnect and strengthen the interaction between national regulatory authorities, which is essential and a core value of the cooperation. I was very glad that I was able to co-host a high-level summit in September with other regulatory networks (EMERG, EaPeReg and Regulatel) to discuss the main challenges that derive from ensuring connectivity in a digital world, while at the same time exploring how to address these challenges through regulatory cooperation.

I also ensured there was ample discussion with other regulatory bodies and networks. There is a wide array of areas where BEREC's expertise offers added value in providing advice and cooperation. Our existing collaboration with counterparts such as Radio Spectrum Policy Group (RSPG), ERGA, ENISA, OECD, BEUC and the ITU was continued.

The results of 2021 demonstrate BEREC's ability to deliver on its unwavering commitment to achieving its Strategy 2021–2025, guided by a consistent application of the regulatory framework in electronic communications, as well as its role as an independent advisory body for the co-legislators. The output from Reports, Opinions and Guidelines in 2021 on a broad range of topics in the field of electronic communications confirmed the success of BEREC's structure, showing the dedication, knowledge and competence of the Working Group Co-Chairs and experts drawn from all NRAs, who strove to achieve the best outcomes, and the commitment of the Contact Network members and members of the Board of Regulators. Moreover, the good working relationship with the BEREC Office is a core value of the cooperation.

Many thanks to all!

Michel Van Bellinghen

BEREC Chair 2021

PART A: Annual Report on developments in the electronic communications sector in 2021

Executive summary

The Body of European Regulators for Electronic Communications (BEREC) Annual Report for 2021 highlights the key developments and market trends in the electronic communications sector in Europe over the past 12 months, focusing on market dynamics and the development of European Union public policies and regulatory practices. The report presents the perspectives of BEREC, based on the expertise and knowledge of the member national regulatory authorities (NRAs).

In addition, the report describes BEREC's own contribution to the development of the electronic communications sector in Europe. The analysis presented in this report includes qualitative reasoning based on information from BEREC Working Group (WG) activity, and quantitative data based on periodic BEREC data collection exercises and other public documents.

The BEREC Chair 2021, Michel Van Bellinghen (BIPT, Belgium), has noted that the BEREC Work Programme 2021 emphasised the promotion of full connectivity in Europe, the importance of BEREC being acknowledged as a key partner for the EU institutions with respect to European digital policy and the cultivation and continuous improvement of BEREC for the benefit of Europe and its citizens.

Given the COVID-19 pandemic, it would be remiss not to highlight BEREC's work on that matter, and how the NRAs and BEREC both reacted to the crisis throughout 2020 and 2021. In 2021, BEREC continued to regularly publish its Special Reporting Mechanism (SRM) as a means to support individuals and businesses to continue their activities and maintain contacts as best as possible. BEREC published its final iteration of the report in December 2021. In addition, BEREC published a report (BoR (21) 88) in June 2021 on the lessons learned regarding communications networks and services for a resilient society.

Nevertheless, BEREC continued its work (as it did in 2020) in a mostly virtual environment, though more physical meetings began to take place as 2021 progressed, which allowed BEREC to meet with stakeholders more and more and get the message out with respect to its ambitious Work Programme 2021 agenda. 5G will continue to be a key component in BEREC's itinerary for some years to come, and that is reflected in the 5G workshops held by BEREC in 2021, as well as in the report that BEREC has developed on the impact of 5G on regulation and the role of regulation in enabling the 5G ecosystem.

BEREC also showed its ability to react swiftly and with flexibility when, in September 2021, the European Court of Justice issued judgments regarding violation of the EU net neutrality rules. In light of those judgments, BEREC decided to revise and update its Open Internet Guidelines, with the aim of publishing revised Guidelines in Q2 2022, reflecting the ECJ's ruling.

These, among other important aspects of BEREC's work in 2021, are highlighted in this Part A of the document, while Part B summarises the key deliverables that were set out in BEREC's Work Programme 2021 when it was published in late 2020. Those key deliverables highlight BEREC's commitment to its three strategic priorities, as well as how BEREC cooperates with other international organisations, engages with its stakeholders and, last but not least, how BEREC continues to do the underlying analytical and monitoring work (for example its benchmark reports on roaming and termination rates) that helps BEREC to react and provide input and opinions based on robust data gathering and evidence.

1. Introduction

This section of the Annual Report highlights the key developments and market trends in the electronic communications sector in Europe over the past 12 months, focusing on market dynamics and the development of European Union public policies and regulatory practices, under Article 4(1)(j)(v) of the BEREC Regulation.

The following chapters look at the developments in the sector in 2021 and present the perspectives of BEREC, based on the expertise and knowledge of the member national regulatory authorities (NRAs), paying particular attention to market and regulatory trends, topical legislative documents such as the Roaming Review and the Digital Markets Act, the openness of the internet and framework review challenges, as well as international roaming, termination rates and regulatory accounting. In addition, the report describes BEREC's own contribution to the development of the electronic communications sector in Europe.

The analysis presented in this report includes qualitative reasoning based on information from BEREC Working Group (WG) activity, and quantitative data based on periodic BEREC data collection exercises and other public documents.

2. BEREC study on post-COVID-19 measures to close the digital divide

The COVID-19 pandemic has had a significant impact on European electronic communications markets. The crisis has confirmed that connectivity is essential and a must-have for all parts of society. In the autumn of 2021, BEREC published a study[1] regarding post-Covid measures to close the digital divide. The aim of the study is to help NRAs in designing the right conditions to improve digital inclusion for all citizens. It analyses the experience gained during the COVID-19 crisis. The recommendations are based on a literature review, a quantitative analysis and a series of interviews.

[1] https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/10076-study-on-post-covid-measures-to-close-the-digital-divide

The study concludes with a series of specific recommendations for NRAs and other general recommendations through which regulators can cooperate with other stakeholders to jointly address the issue of digital divides. The recommendations are structured according to the problems they intend to solve. In 2022, this topic will be followed up by BEREC during an internal workshop at Heads level, in order to exchange views regarding implementation of the recommendations and best practices on closing the digital divide.

3. Market trends

3.1 Economic context

The COVID-19 pandemic forced the countries of the European Union into repeated lockdowns in 2020 and early 2021, leading to the deepest recession on record in 2020, with the EU-27 suffering a real decline in GDP of -5.9% (deeper even than the experience of 2009). However, economic growth in 2021 has proven to be robust, with Eurostat data showing that real GDP has recouped much of the previous year's losses, with record growth of +5.3%[2], despite lockdown measures remaining in place across Europe for much of the year.

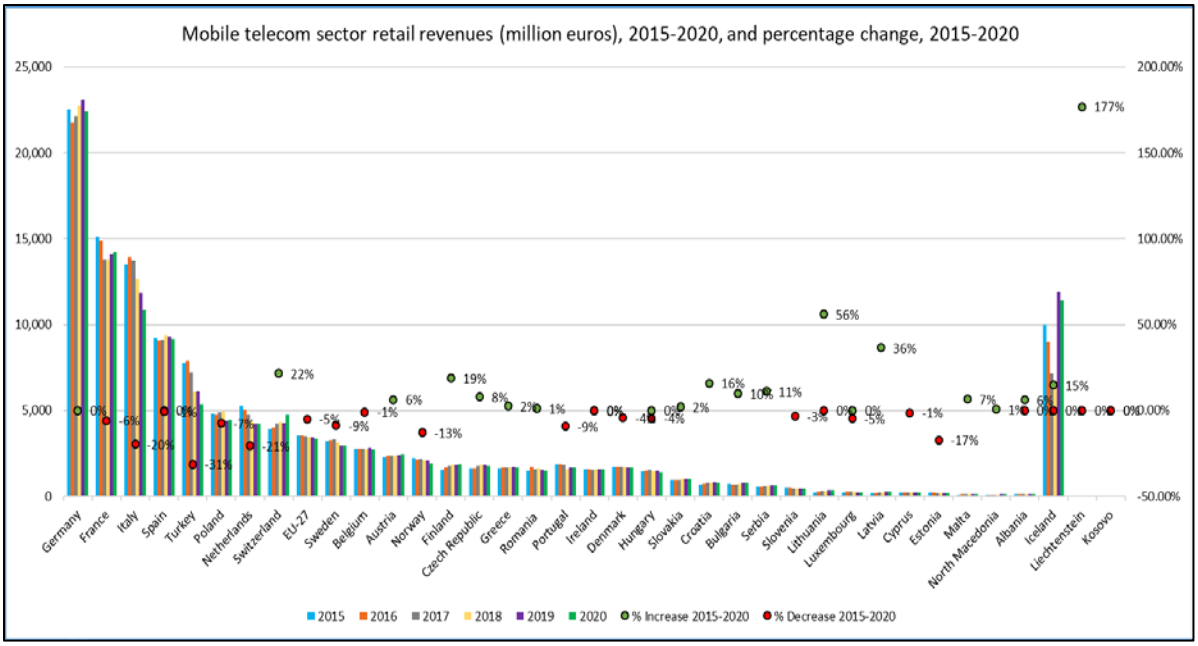
In the telecoms sector, the pandemic is precisely the reason why some NRAs were unable to provide forecasts for 2021, and therefore our analysis is based on the period from 2015 to 2020. For this period, the average retail revenue for the EU-27 fell by 1.87%.

Figures 1 and 2 below present mobile and fixed retail revenue, respectively, between 2015 and 2020 for 36 European countries and the EU-27 average. Figure 1 shows that retail revenue in the mobile communications sector grew for 17 countries but declined for 18. According to NRA data, mobile retail revenue increased substantially in Lithuania, Latvia, Croatia, Liechtenstein and Switzerland, while in Italy, Turkey, the Netherlands, Norway and Estonia it fell by more than 10% in the same period.

Figure 2 shows that, between 2015 and 2020, retail revenue in the fixed communications sector remained either constant or grew for 11 of the 36 countries analysed. However, for 23 countries this revenue fell, and in 13 of these the variation was above 18%. According to the data provided by NRAs, fixed retail revenue grew in 11 countries but decreased in 23 countries. The largest increases in fixed retail revenue were in Germany (by 20%), Croatia (by almost 68%), Luxembourg (by 25%), Malta (by almost 27%), North Macedonia (by almost 21%) and Iceland (by 93%). The largest decreases were in Portugal (by almost 24%), Latvia (by 28%), Serbia (by 35%) and Turkey (by almost 32%).

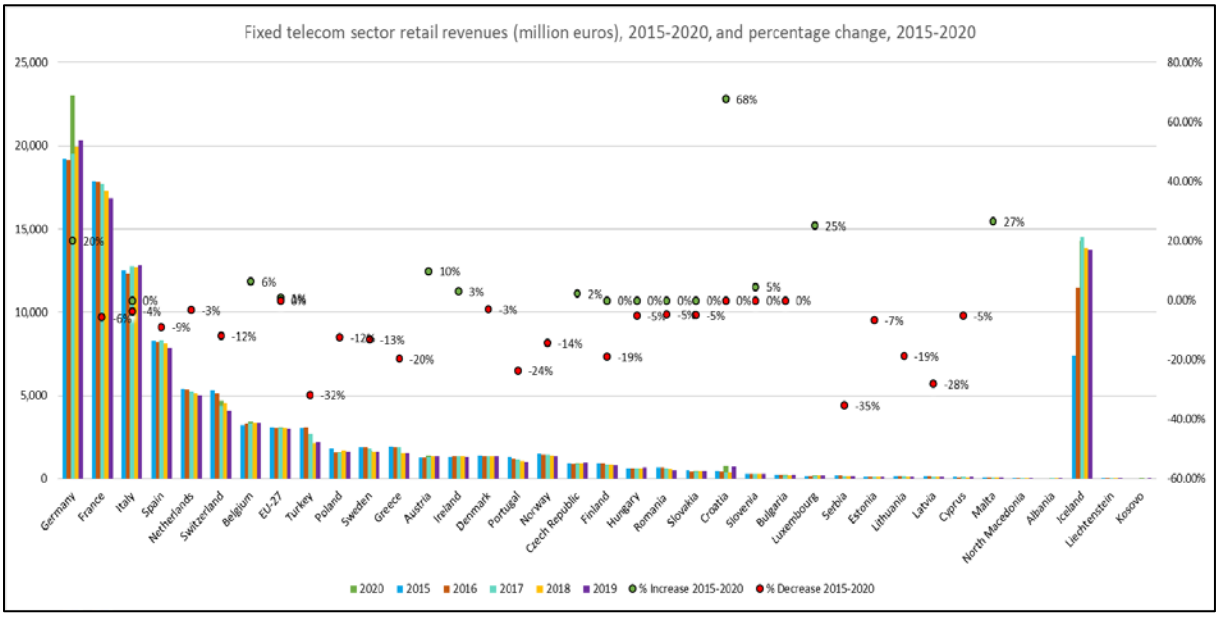
[2] Source: https://ec.europa.eu/eurostat/databrowser/view/tec00115/default/table?lang=en

Figure 1: Mobile telecoms sector retail revenue (in EUR million) and percentage change 2015–2020



Source: BEREC

Figure 2: Fixed telecom sector retail revenue (in EUR million) and percentage change 2015–2020

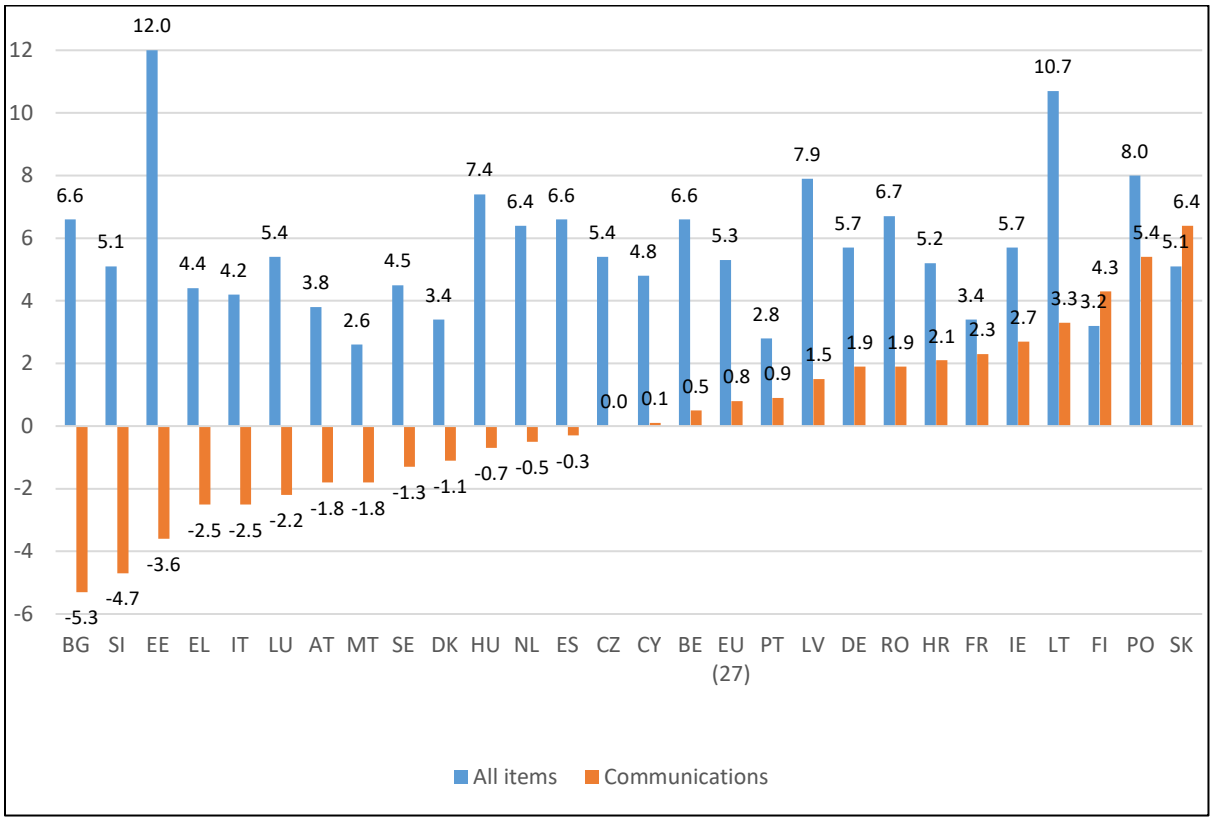


Source: BEREC

Figure 3 below illustrates the change in the overall Harmonised Index of Consumer Prices (HICP) and its communications subcomponent between January and December 2021. In December 2021 the annual inflation in the euro area was 5.4%, while in 2020 – a year of low inflation – the December figure barely reached 0.2%. Inflation in Europe has increased since the second quarter of 2021 as a consequence of the surge in energy prices and grew even more by the last quarter of the year. Communications prices picked up on this inflationary trend with some delay and in a moderate way. By the end of 2021, the HICP index for communications had grown by 0.8% (year on year), while in 2020 communications prices had decreased by -1.8%.

Furthermore, despite the high inflation rates in most of Europe, by the end of 2021, roughly half of the euro countries had experienced reductions in communications prices, while the other half saw prices for communications increase. The most notable reductions in communication prices were in Bulgaria (-5.3%), Slovenia (-4.7%) and Estonia (-3.6%), and the most notable increases in communications prices were in Slovakia (+6.4), Poland (+5.4%) and Finland (+4.3%).

Figure 3: EU-27 percentage change (January–December 2021) in the HICP and the communications subcomponent



3.2 Broadband and Very High Capacity Networks

Article 3(2)(a) of the EECC[3] foresees that the national regulatory and other competent authorities as well as BEREC, the Commission and the Member States shall pursue the new general objective of promoting connectivity and access to, and take-up of, very high capacity networks, including fixed, mobile and wireless networks, by all citizens and businesses of the Union. This objective is also at the core of the EU's ambition towards a Gigabit Society and, therefore, the concept of a very high capacity network is also used in other initiatives taken up by the EU institutions.

Connectivity and the use of electronic communications are an integral element of European society and welfare. Very high capacity networks support innovation in content-rich internet services, strengthen the international competitiveness of the Union and have enormous potential to deliver benefits to consumers and businesses across the Union.

The EECC (Article 2(2)) defines the term 'very high capacity network' and Article 82 provides that BEREC shall issue guidelines on the criteria that a network has to fulfil in order to be considered a very high capacity network, in particular in terms of down- and uplink bandwidth, resilience, error-related parameters, latency and its variation. In October 2020, BEREC published these Guidelines[4] and determined (paragraphs 18 and 21), in accordance with the EECC, that any network that fulfils one (or both) of the two criteria below is a fixed very high capacity network.[5]

(i) Any network providing a fixed-line connection with a fibre roll-out at least up to the multi-dwelling building.
(ii) Any network providing a fixed-line connection which is capable of delivering, under usual peak-time conditions, services to the end-users with the following quality of service:

Quality of Service Parameter	Threshold
Downlink data rate	≥ 1000 Mbps
Uplink data rate	≥ 200 Mbps
IP packet error ratio	≤ 0.05%
IP packet loss ratio	≤ 0.0025%
Round-trip IP packet delay	≤ 10 ms
IP packet delay variation	≤ 2 ms
IP service availability	≥ 99.9% per year

[3] European Electronic Communications Code.
[4] BoR (20) 165, see https://berec.europa.eu/eng/document_register/subject_matter/berec/regulatory_best_practices/guidelines/9439-berec-guidelines-on-very-high-capacity-networks
[5] In addition, these BEREC guidelines (paragraphs 18 and 21) also determined the criteria a network has to fulfil in order to qualify as a wireless very high capacity network.

From this it follows (see paragraph 63 of the Guidelines) that fixed networks based on fibre to the building (FTTB) or fibre to the home (FTTH) qualify as a very high capacity network. Fixed networks with a fibre roll-out that is not at least up to the multi-dwelling building may also qualify as a very high capacity network. However, they have to meet the Quality of Service (QoS) thresholds listed above, which depend not only on the access technology deployed in the fixed network, but also on, for example, the access network architecture (i.e. the extent to which fibre is rolled out, e.g. FTTN/C/dp[6]), the length and quality of the copper loop, and the number of subscribers who share the same coax access network (see BoR (20) 226, question 27, p. 19–20).[7]

Therefore, in general, fixed networks with the access technology G.fast 212 MHz on copper access lines, with copper loop lengths comparable to copper loops in a multi-dwelling building, may qualify as a very high capacity network, as the QoS thresholds of the BEREC Guidelines have been determined based on such a scenario (see BoR (20) 165, Annex 3), but not all fixed networks based on VDSL2 vectoring qualify as a very high capacity network. In general, fixed networks based on DOCSIS 3.1 with a size of coax-based access network comparable to a coax access network within a multi-dwelling building may also qualify as a very high capacity network, as the determination of the QoS thresholds in the BEREC Guidelines also examined this scenario, but not all fixed networks based on DOCSIS 3.1 qualify as a very high capacity network.

The EECC (Article 22) provides that national regulatory and/or other competent authorities shall conduct a geographical survey of the reach of electronic communications networks capable of delivering broadband by 21 December 2023. This geographical survey may also include a forecast of the reach of broadband networks, including very high capacity networks.

The EECC (Article 22(7)) also provides that BEREC shall issue guidelines to assist national regulatory and/or other competent authorities on the consistent implementation of these obligations, which BEREC published in March 2020[8], March 2021[9] and June 2021[10], and use the term ‘very high capacity network’ in line with the EECC (Article 2(2)) and the BEREC Guidelines on very high capacity networks.[11] Therefore, in the future, the deployment of very high capacity networks may be tracked based on these data.

---

[6] FTTN, FTTC and FTTdp stand for ‘Fibre to the node’, ‘Fibre to the cabinet’ and ‘Fibre to the distribution point’.

[7] See https://berec.europa.eu/eng/document_register/subject_matter/berec/others/9724-berec-response-on-the-targeted-public-consultation-on-the-evaluation-of-the-state-aid-rules-for-the-deployment-of-broadband-networks

[8] BoR (20) 42, see https://berec.europa.eu/eng/document_register/subject_matter/berec/regulatory_best_practices/guidelines/9027-berec-guidelines-to-assist-nras-on-the-consistent-application-of-geographical-surveys-of-network-deployments

[9] BoR (21) 32, see https://berec.europa.eu/eng/document_register/subject_matter/berec/regulatory_best_practices/guidelines/9884-berec-guidelines-on-geographical-surveys-of-network-deployments-article-22-2-22-3-and-22-4

[10] BoR (21) 82, see https://berec.europa.eu/eng/document_register/subject_matter/berec/regulatory_best_practices/guidelines/9980-berec-guidelines-on-geographical-surveys-of-network-deployments-verification-of-information

[11] BoR (20) 165, see https://berec.europa.eu/eng/document_register/subject_matter/berec/regulatory_best_practices/guidelines/9439-berec-guidelines-on-very-high-capacity-networks

According to the study 'Broadband coverage in Europe 2020' and its predecessor studies commissioned by the European Commission, FTTP (defined as FTTB and FTTH) coverage in the EU[12] increased significantly between 2013 and 2020, from 16% to 43% of households (see Figure 4 below).

The coverage of fixed very high capacity networks is at least as high as FTTP coverage, as networks based on FTTP qualify as a fixed very high capacity network as do fixed networks without a fibre roll-out at least up to the multi-dwelling building, but which meet the QoS thresholds (see above).

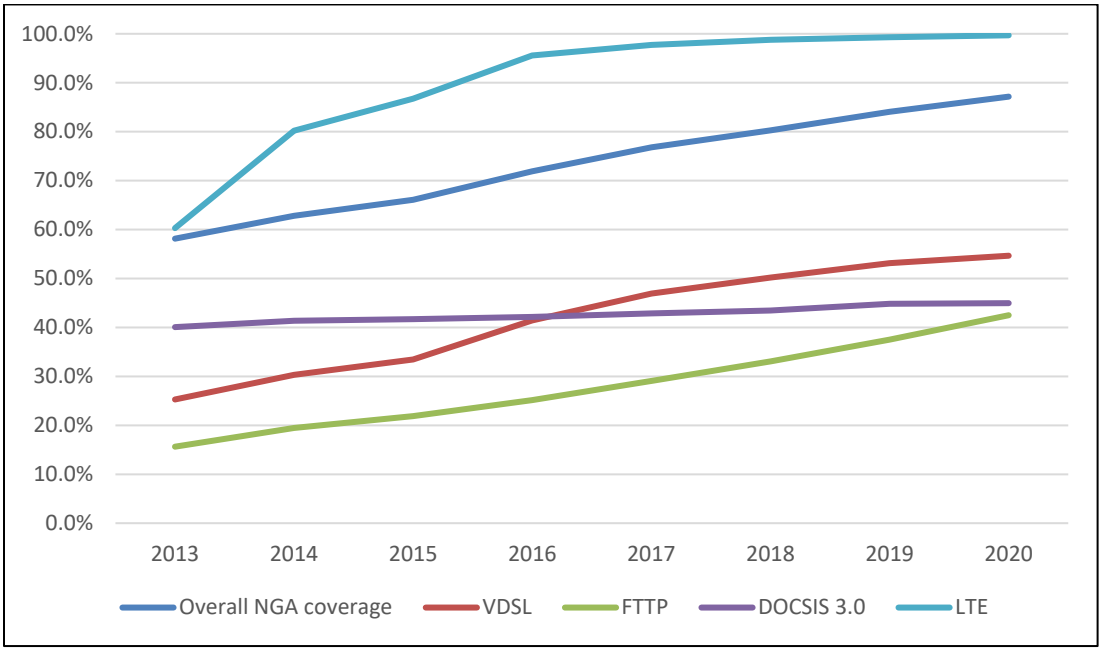
In five countries (LV, ES, PT, SE, RO), the FTTP coverage, and therefore also fixed very high capacity network coverage, is already higher than 75%, while in three countries the FTTP coverage is still below 15% (see Figure 5 below).

The coverage of other types of broadband networks developed in the EU[13] between 2013 and 2020 is as follows: total Next-Generation Access (NGA) coverage in the EU increased significantly from 58% to 87% of households (see Figure 4 below). This increase mainly came from growth in VDSL and FTTP coverage, while cable (DOCSIS 3.0[14]) coverage was fairly constant during this period.

Looking at mobile networks, long-term evolution (LTE) was rolled out from 60% coverage to 99.7% during this period, and in 2020 the coverage of 5G was already 14%. From 2013 to 2020, NGA and FTTP coverage increased fairly steadily, and on average by 4.1% points (NGA) and 3.8% points (FTTP) per year, while the VDSL coverage increase varied between 3.1% points (2015) and 8.0% points (2016) per year.

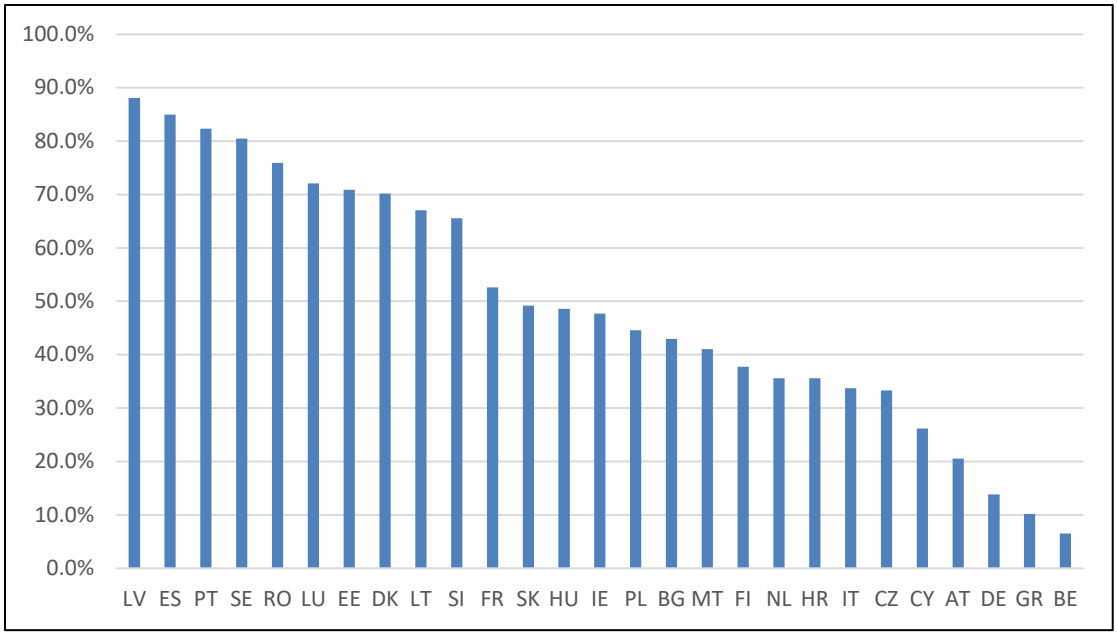
[12] EU-27.
[13] EU-27.
[14] From 2019, including DOCSIS 3.1.

Figure 4: Development of LTE and NGA coverage in the EU by technology 2013–2020



Source: Broadband coverage in Europe 2020[15]

Figure 5: FTTP coverage by country in 2020



Source: Broadband coverage in Europe 2020[16]

[15] https://digital-strategy.ec.europa.eu/en/library/broadband-coverage-europe-2020
[16] https://digital-strategy.ec.europa.eu/en/library/broadband-coverage-europe-2020

3.3 Termination rates

Termination rates at European level

BEREC constantly monitors domestic[17] termination rates (TRs) in Europe and provides an overview report twice a year on fixed termination rates (FTRs) and mobile termination rates (MTRs). Following interventions by NRAs in the two relevant markets, namely Market 1/2014, 'Wholesale call termination on individual public telephone networks provided at a fixed location', and Market 2/2014, 'Wholesale voice call termination on individual mobile networks', and the application of the Commission Recommendation on TRs (Recommendation 009/396/EC), the wholesale rates for both mobile and fixed interconnection have fallen significantly and continue to decrease.

In most EU countries, short message services (SMS) are not subject to a wholesale termination price regulation. Nevertheless, a substantial decrease in SMS TRs has been observed in EU markets over the years.

Mobile termination rates (MTRs)

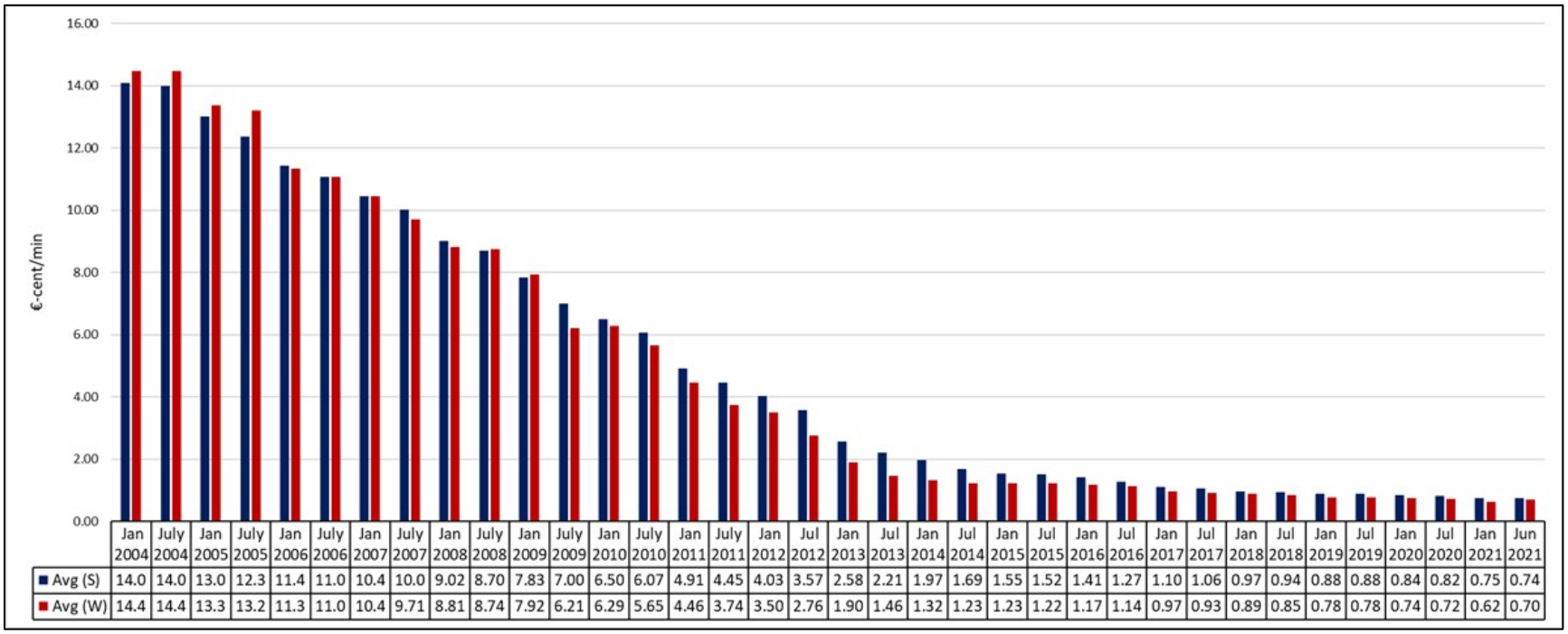
MTRs have been regulated based on cost-oriented pricing in all EU countries since the beginning of the decade. Most NRAs have implemented the Commission Recommendation on TRs (Commission Recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC)), which established pure long-run incremental costs (LRIC) as the cost standard to be applied to the interconnection service for voice calls on mobile networks at wholesale level.

As shown in Figure 6 below, wholesale interconnection rates for mobile telephony services in Europe fell markedly between January 2004 and June 2021: the simple average, Avg (S), fell from 14.08 to 0.74 cents per minute, while the weighted average, Avg (W), fell from 14.47 to 0.70 cents per minute[18].

[17] Referring to calls originating and terminating in the same EU country.

[18] In the BEREC periodic MTR benchmark reports, both simple averages and weighted averages are reported. The latter is calculated by weighting each country's average according to the proportion of the country's subscribers to all subscribers.

Figure 6: Average MTRs: time-series of simple average and weighted average at European level[19]



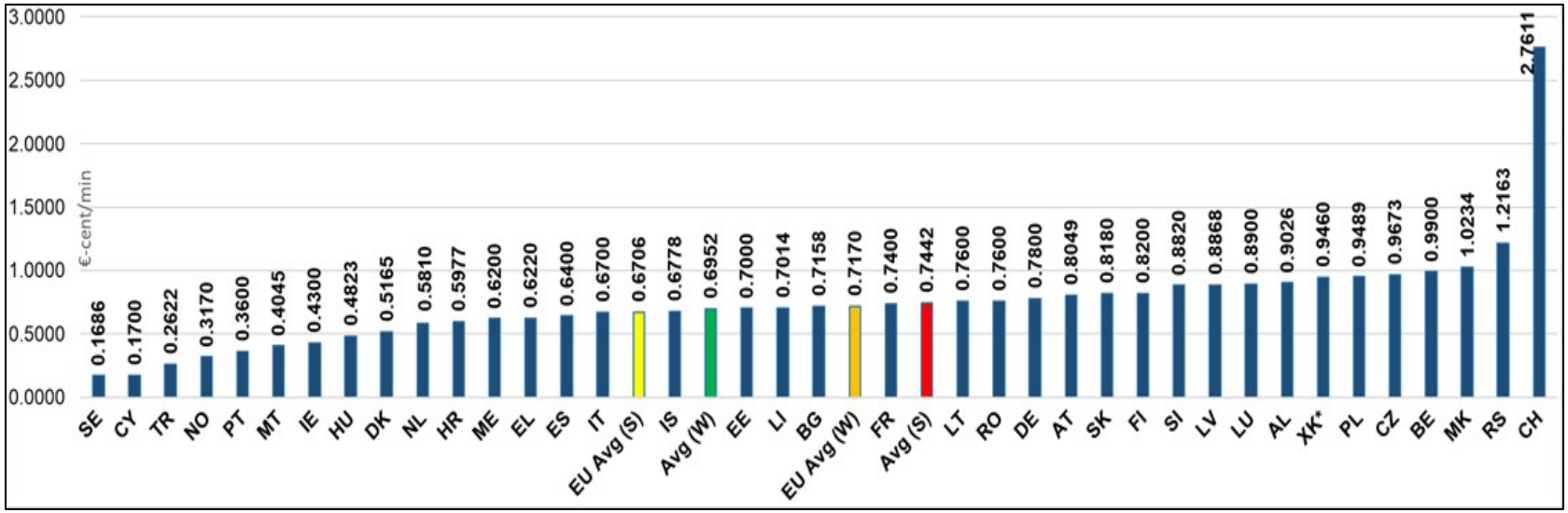
	Jan 2004	July 2004	Jan 2005	July 2005	Jan 2006	July 2006	Jan 2007	July 2007	Jan 2008	July 2008	Jan 2009	July 2009	Jan 2010	July 2010	Jan 2011	July 2011	Jan 2012	Jul 2012	Jan 2013	Jul 2013	Jan 2014	Jul 2014	Jan 2015	Jul 2015	Jan 2016	Jul 2016	Jan 2017	Jul 2017	Jan 2018	Jul 2018	Jan 2019	Jul 2019	Jan 2020	Jul 2020	Jan 2021	Jun 2021
Avg (S)	14.0	14.0	13.0	12.3	11.4	11.0	10.4	10.0	9.02	8.70	7.83	7.00	6.50	6.07	4.91	4.45	4.03	3.57	2.58	2.21	1.97	1.69	1.55	1.52	1.41	1.27	1.10	1.06	0.97	0.94	0.88	0.88	0.84	0.82	0.75	0.74
Avg (W)	14.4	14.4	13.3	13.2	11.3	11.0	10.4	9.71	8.81	8.74	7.92	6.21	6.29	5.65	4.46	3.74	3.50	2.76	1.90	1.46	1.32	1.23	1.23	1.22	1.17	1.14	0.97	0.93	0.89	0.85	0.78	0.78	0.74	0.72	0.62	0.70

Source: BEREC, Termination rates at European level, June 2021

[19] Averages are based on nominal rates per minute of service. The number of countries and operators considered has increased over the years, which affects the average slightly. Moreover, the weighted average does not take into account countries not providing the total number of subscribers and those that could have changed over the years. The graph therefore shows the general trend.

The simple average of MTRs at EU level (EU Member States only (EU Avg (S))) stands at 0.6706 cents per minute, whereas the Avg (W) at EU level is estimated at 0.6952 cents per minute. For June 2021, individual Member States' and observers'[20] average rates[21], together with European and EU simple and weighted averages, are shown in Figure 7.

Figure 7: MTRs by country, June 2021 (euro cents per minute of service)



Source: BEREC, Termination rates at European level, June 2021

[20] 27 EU Member States plus 4 EFTA states (Switzerland, Iceland, Norway and Liechtenstein) and five economies of the Western Balkans (Albania, Montenegro, North Macedonia, Serbia and Kosovo*). The data for Turkey and the UK is carried over from the previous Termination Rates Report. The United Kingdom withdrew from the European Union on 31 January 2020 with the transition period lasting until 31 December 2020 (the UK officially left the EU on 1 January 2021).

* This designation is without prejudice to positions on status and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo declaration of independence.

[21] Average MTRs per country are obtained by weighting the average MTR of each operator by its market share, measured in terms of subscribers.

Fixed termination rates

From the beginning of the liberalisation period, when incumbent operators served all end-users of fixed network services, the termination service was regulated not only in relation to price but also in relation to service characteristics and quality parameters. The regulation of voice termination in fixed networks has resulted in a clear overall decline in FTRs over the past decade, although this is of a smaller magnitude than the decline in MTRs.

However, in the last three years, a significant reduction in this regulated price has taken place in the EU countries, thanks to the increasing implementation of the Commission Recommendation on TRs.

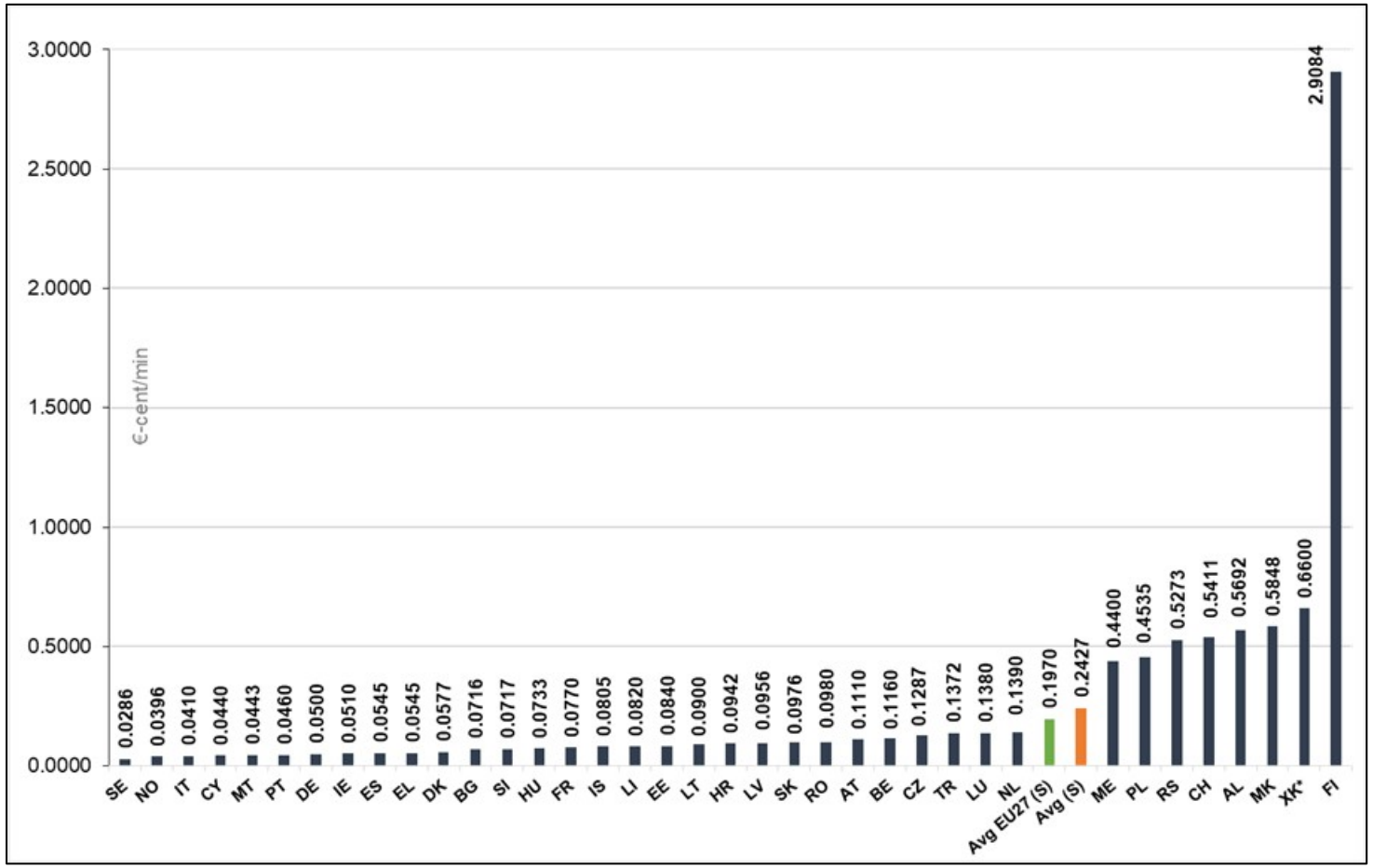
Although the regulation of FTRs had been harmonised by the Recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (Recommendation 2009/396/EC), some differences can be found between national regulatory regimes.

In some cases, the TR is a two-part tariff, consisting of a variable part (to be paid for each minute of a call) plus a set-up or fixed part (to be paid for each call). In other cases, termination prices consist only of the variable part.

An overview of incumbents' lowest regulated FTRs per country is provided below in Figure 8. Data refer to 30 June 2021 and include simple averages at European level as well as the simple average of EU-27 incumbents. The simple average of the lowest regulated[22] FTR of incumbents at European level (all 37 countries) stood at 0.2427 cents per minute. The simple average of the lowest FTR of EU incumbents (EU-27) stood at 0.1970 cents per minute.

[22] Interconnection services in fixed networks are provided at different levels in the hierarchy of the incumbents' networks, called layers. Although some peculiarities in specific countries exist, in general three main layers for interconnection are defined: layer 1, or local level service provision (defined as the closest possible interconnection level to the network termination point); layer 2, or regional level service provision (single transit); and layer 3, national level service provision (double transit). As a result of increasing symmetry and the decreasing relevance of the layers, the TR report features a ranking of the lowest regulated rates as well as a weighted average of peak and off-peak rates.

Figure 8: Overview of incumbents' lowest regulated fixed termination rates per country, June 2021 (euro cents per minute of service)



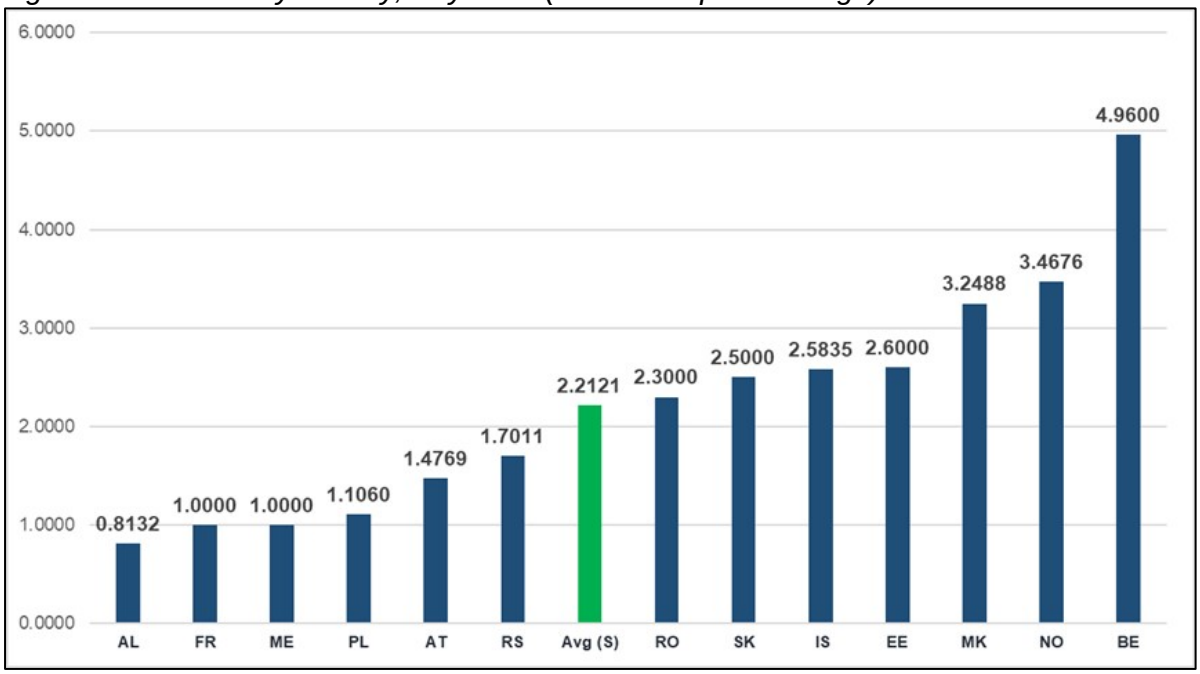
Source: BEREC, Termination rates at European level, June 2021

Short message service termination rates

A traditionally important service in terms of revenue generated is the messaging (SMS/MMS) service. Just like voice calls, each SMS that originates from one network and is sent to an end-user on another network will need an interconnection, and thus a termination service. In general, off-net wholesale SMS services have not been subject to price regulation in most of the EU-27 Member States (i.e. they were freely set by commercial agreements between operators).

As of 30 June 2021, the simple average of SMS TRs at European level was 2.2121 cents per SMS (Figure 9). Since not all EU Member States report their SMS TRs, BEREC did not calculate any averages at EU level.

Figure 9: SMS TRs by country, July 2020 (euro cents per message)



Source: BEREC, Termination rates at European level, June 2021[23]

[23] TR (Turkey), MK (North Macedonia), AL (Albania), FR (France), ME (Montenegro), PL (Poland), RS (Serbia), LV (Latvia), SK (Slovakia), AT (Austria), EE (Estonia), IE (Ireland), IS (Iceland), NO (Norway) and BE (Belgium).

3.4 Regulatory accounting (RA)

The overall picture of the cost accounting methodologies 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 a price cap, although 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 a 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 Regulatory Accounting in Practice Report 2021 provides an analysis more oriented on single products (increasing the scope of monitoring) with respect to the previous editions. The 2021 report in fact collects information for 23 main products (compared with 13 in 2015).

The regulation of legacy products in markets 3a and 3b is more frequent: 90% of EU NRAs still maintain significant market power (SMP) remedies on local loop unbundling (LLU), and 81% on market 3b over the legacy copper network (the same as in the last year's report). In the case of FTTC, the situation in both market 3a (virtual unbundled local access – VULA) and market 3b are substantially unchanged. In the case of FTTH, there is an increase in the number of NRAs that apply regulation in both market 3a and 3b through FLLU and Bitstream. 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 application of remedies), has increased with respect to last year for most markets/products. An increasing trend can be seen in market 3b, where the number of NRAs that apply a geographically differentiated approach to regulation has increased, reaching about 50% of NRAs applying such regulation to the product/market for the legacy network and about 60% to market 3b over an FTTH network. This is also the case for market 4 over NGA (Ethernet). In comparison with last year, an increasing trend in that direction can also be seen for products in market 3a.

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 can become less intrusive.

As a stable result over 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.

ERT price control methodology is still mainly used complementarily to cost orientation, albeit with a slightly increased use of the ERT, at least for NGA/very high capacity networks (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 substitutability, with respect to a legacy copper product, may occur. In case no intermediate steps such as FTTC for VHCN transition are in force, more flexibility is generally granted when regulating FTTH, also with the application of ERT. More generally, 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 the access market, as well as at the level of the price flexibility tool according to the Code, other than the application of non-discrimination rules such as Equivalence of Inputs (EoI).

Overall, the application of EoI models is increasing over the years. The cumulative percentage of Equivalence of Outputs (EoO) and/or EoI is more frequent in relative terms in the 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 with 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 the legacy network. With respect to last year, a reduction in the use of FDC can also be detected for market 3b for legacy products and NGA products.

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 the BU-LRIC approach and a reduction of accounting methodologies based on FDC; the TD approach is by far less frequent.

The analysis of the structural data 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 with the BEREC WACC Parameters Report 2021 (BoR (21) 86), this BEREC Regulatory Accounting Report WACC chapter is of a more descriptive nature, aimed 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 highlights that all NRAs use the Capital-Asset-Pricing-Model (CAP-M)[24], and hence similar parameters for determining the WACC. However, the value of these parameters naturally differs, reflecting different national financial market conditions. Statistical analysis (regression) of the data shows – in line with the previous exercises – that the differences in the final WACC values over time are mainly explained by parameters in the WACC calculation that are more 'country related', such as the risk free rate (RFR), equity risk premium (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 by NRAs a long time prior to the WACC Notice.

By taking into account only the most recent estimation in the pooled regression analysis, the results show that the ERP, which was the second most relevant parameter after RFR in explaining current WACC differences until last year, is becoming less relevant with respect to the 'tax' parameter in explaining the differences in final WACC values between NRAs as of this year. This result is in line with the fact that, owing to the application of the Commission Notice, the ERP estimation through a notional approach by most NRAs is reducing its spread. This is reflected in the time-series panel data that has shown that the most relevant parameters are from this year's RFR and tax to explain the WACC differences, which are typically own country parameters. It is the first time it has happened since 2017. ERP, beta, gearing and debt premium provide, in this order of relevance, a less significant contribution to explaining differences in final WACC value if we take into account the most recent data estimation, which shows that the application of the WACC Notice starts to have a material convergent effect.

Overall, the 2021 data confirm 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 regulatory strategy.

3.5 5G

5G is a topic that BEREC monitors actively and closely, as the market develops. In 2021, we focused on issues related to 5G roll-out, such as coverage indicators, infrastructure sharing and EMF, but also on less visible aspects such as backhaul and copper switch-off – topics that are also relevant for fixed network deployment. BEREC analysed a wide array of aspects related to the network and application to determine how 5G will impact the ecosystem, and developed a report on the impact of 5G on regulation and the role of regulation in enabling the 5G ecosystem. This report builds further on a radar that BEREC drew up to plot 5G developments according to the anticipated time horizon. The challenges that are addressed range from work on standards, interoperability, new business models, spectrum availability and network sharing, coverage, QoS, security and resilience.

While doing these assessments, we also focus on sustainability aspects related to the networks. We are convinced that the upgrade to newer technologies and infrastructure, as well

[24] Cf. BoR (13) 110.

as coordination of civil works and joint use of existing physical infrastructure, will reduce the environmental impact of electronic communications networks deployment.

More specifically, one of the challenges BEREC tackled this year was the misinformation about EMFs and 5G. Misinformation exploits the gap between the public perception about the risks from exposure to radio frequency EMF and the scientific facts. To explore this challenge, BEREC held an expert-level workshop on 'How best to promote science-based EMF limits recommended by experts' and also gathered the views of undisputed experts such as ICNIPR, IEEE, ANFR and the Joint Research Centre. One of the successful outputs from the workshop is set out in a unique database of information about the different levels of cooperation between competent bodies in countries, and about national policies around monitoring, communicating and implementing EMF-related issues. BEREC believes that the information in this database, which identifies practices that can be shared between competent authorities, can prevent misinformation from becoming an unwanted barrier to the timely roll-out of 5G networks.

3.6 Digital Platform Regulation and BEREC's work related to the DMA

Electronic Communication Services (ECS) and electronic communication networks (ECNs) are just two parts of a vast and complex ecosystem that allows end-users and the whole of society to benefit from the extraordinary potential of a large variety of services provided via the internet.

In recent years, other elements above the network layer have gained significant relevance for BEREC, since terminals, operating systems and online intermediation services (app stores, search engines, social networking services, etc.), for example, can have an impact on the networks and services that are currently in BEREC members' regulatory realm.

Since 2018, BEREC has thus adopted a prospective approach and has analysed other elements beyond the network layers. The results are summarised in BEREC reports on the impact of premium content on ECS markets and the effect of devices on the open use of the internet[25] (2018), on the data economy[26] (2019), and BEREC's response to the public consultation on the DSA Package and the New Competition Tool[27] (2020).

On 15 December 2020, the European Commission (EC) published a proposal for a Digital Markets Act (DMA), proposing a series of *ex-ante* rules for platforms acting as 'gatekeepers' in the digital sector. BEREC strongly supported the EC's ambition to create contestable and fair markets in the digital sector for the benefit of European citizens and businesses, and made concrete proposals, based on its experience, to reinforce this *ex-ante* asymmetric regulatory intervention. The aim is to ensure that competition and innovation are encouraged, that end-users' interests are protected, and that the digital environment is open and competitive.

[25] https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/8013-berec-report-on-the-impact-of-premium-content-on-ecs-markets-and-the-effect-of-devices-on-the-open-use-of-the-internet

[26] https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/8599-berec-report-on-the-data-economy

[27] https://berec.europa.eu/eng/document_register/subject_matter/berec/others/9411-berec-response-to-the-public-consultation-on-the-digital-services-act-package-and-the-new-competition-tool

To this end, in 2021 BEREC published seven documents on the regulation of digital platforms:

- BoR (21) 35: BEREC Opinion on the European Commission's proposal for a Digital Markets Act
- BoR (21) 34: Draft BEREC Report on the *ex-ante* regulation of digital gatekeepers
- BoR (21) 94: BEREC proposal on remedies-tailoring and structured participation processes for stakeholders in the context of the Digital Markets Act
- BoR (21) 93: BEREC proposal on the set-up of an Advisory Board in the context of the Digital Markets Act
- BoR (21) 85: BEREC Report on the interplay between the EECC and the EC's proposal for a Digital Markets Act concerning number-independent interpersonal communications services
- BoR (21) 131: BEREC Report on the *ex-ante* regulation of digital gatekeepers
- BoR (21) 130: BEREC Report on the outcome of the public consultation on the Draft BEREC Report on the *ex-ante* regulation of digital gatekeepers.

BEREC tested its proposals with the relevant stakeholders. Most of these documents were submitted to public consultations and integrate the comments received, and BEREC organised two main workshops on the topic, gathering representatives from the EC, the European Parliament, industry, consumers' associations and civil society, as well as experts and academics.

All this work and contributions enabled BEREC to gain relevant expertise and be identified as a legitimate contributor to the debate on topics connected to its core competences. In 2020 and 2021, BEREC was invited to contribute, based on its experience in the application of *ex-ante* regulation, to several European and international conferences and share its views and proposals on the regulation of digital gatekeepers with key institutions, stakeholders and academics.

In 2021 BEREC also launched its work on the internet ecosystem, which will provide a holistic view on how the different elements of the ecosystem (to include digital platforms) are interconnected and impact one another. The draft report is expected to be opened up to public consultation in mid-2022.

3.7 Forward-looking trends in the electronic communications sector

The continuously growing dependence on digital applications, resulting in the need to connect everything and everyone, has been acknowledged by policy makers, innovators, enterprises, and wider society for a number of years. But the COVID-19 pandemic has shed a spotlight on the threat that the digital divide poses to our society. Access to high-speed reliable internet reduced not only the economic impact of the COVID-19 pandemic but in a way also safeguarded the well-being of those who were digitally well connected, highlighting the importance of digital equity. For example, one of the mitigating measures adopted by a number of Member States was online schooling, which put those families who did not have access to

broadband connectivity and to digital devices at a significant disadvantage, resulting in a worsening of the educational inequality experienced.[28] Similarly, those businesses that could turn to e-commerce and remote working mitigated the economic impact of the pandemic, unlike those that could not.

Policy makers have relentlessly stressed the importance of addressing the digital divide, improving existing connections, ensuring global coverage and enhancing digital literacy. In 2016, the European Commission had defined its vision for a European Gigabit Society,[29] aiming to achieve the following goals by the year 2025:

- gigabit connectivity for all main socio-economic drivers;[30]
- all urban areas and all major terrestrial transport paths are to have uninterrupted 5G coverage;
- all European households, rural or urban, will have access to internet connectivity offering a downlink of at least 100Mbps, upgradable to gigabit speed.

The Commission proposed more ambitious targets in the 2030 Digital Compass, aiming for gigabit connectivity to every European household and 5G coverage of the entire populated areas by 2030.[31]

Furthermore, Information and Communication Technologies (ICTs) are identified as critical enablers for progress in the implementation of the trans-sectoral UN 'Sustainable Development Goals' and EU Green Deal objectives. Digitalisation and ECNs play an essential role in responding to societal challenges, including the needed environmental transition. However, the undeniable positive effects of digital technologies on other sectors should not prevent the digital sector itself from complying with EU environmental standards and from minimising its own environmental footprint. In that sense, the EU Green Deal[32] and the EC's digital strategy[33] provided new objectives, including the implementation of circular economy principles for ICTs, the objectives of climate neutrality and increased environmental transparency for electronic communications and data centres.

While policy makers actively develop and promote ways to ensure that the digital divide is mitigated, market and technological developments seek to increase efficiency, decrease costs, and/or deliver more advanced digital applications. One such example is the development of Fixed Wireless Access (FWA), which is viewed as a possible cost-effective solution to address the digital divide. It is predicted that FWA will see an upward market trend globally, from 60 million connections in 2020 to roughly 88 million in 2022.[34] This upward trend

---

[28] https://resourcecentre.savethechildren.net/pdf/the_impact_of_covid19_on_children_in_europe.pdf/
[29] COM(2016) 587 final.
[30] Schools, transport hubs, main providers of public services, digitally intensive enterprises.
[31] COM(2021) 118 final.
[32] Communication 'The European Green Deal', 11.12.2019 COM(2019). https://ec.europa.eu/info/sites/default/files/european-green-deal-communication_en.pdf
[33] Shaping Europe's digital future, 19.2.2020 COM(2020) 67 final. https://ec.europa.eu/info/sites/default/files/communication-shaping-europes-digital-future-feb2020_en_4.pdf
[34] 'Technology, Media and Telecommunications (TMT) Predictions 2022', Deloitte's TMT Group, December 2021. Source: https://www2.deloitte.com/content/dam/Deloitte/tw/Documents/technology-media-telecommunications/rp20211228-2022-tmt-trend.pdf

is expected to continue, with a projection of more than 165 million FWA connections by the year 2026, with 39% being the result of 5G FWA. Ericsson predicts that 800 million people will be offered a FWA broadband connection via 230 million FWA connections by the year 2027.[35] While FWA has been regarded as economically more feasible and able to address the digital divide better than other fixed broadband access technologies, especially in rural areas, the increase in the percentage of 5G FWA connections is linked to the spectral efficiency of 5G.

5G has garnered a lot of attention and raised expectations over the past couple of years, but now society is actually starting to experience 5G, as the number of 5G deployments are continuously on the rise throughout Europe. Looking at the estimates published by Ericsson, one can note that by the end of the year 2021, it is expected that there were 660 million 5G subscriptions and 23% of the handsets were 5G-enabled. Ericsson's Mobility Report also predicts that by 2027, 49% of all mobile subscriptions will be 5G, resulting in the fastest growth of any of the mobile technologies.[36] A more detailed analysis by Ericsson reports that by the year 2027, 4G would account for 59% of the mobile subscriptions in Central and Eastern Europe. On the other hand, Ericsson's Mobility Report is predicting that, by 2027, 83% of in Western Europe mobile subscriptions will be 5G.

The development of chipsets and devices will be influenced by time-critical services, new form factors such as those necessary for Extended Reality (XR) and the need for mmWave-capable devices. These developments are paving the way for the delivery of more complex 5G applications that go beyond gigabit connectivity – applications which rely on the use of massive Machine Type Communications and/or ultra-Reliable Low Latency Connectivity. During the BEREC Workshop on 5G[37] held on 3 June 2021, experts in the field of 5G applications discussed expectations for commercial launches of 5G applications. Different sectors have gained different levels of maturity in terms of the adoption of 5G use cases, with some near market, such as the manufacturing vertical, while others are still 5 to 10 years from commercial launch.

The deployment of more innovative and more complex 5G use cases also relies on the deployment of 5G standalone networks. The deployment of 5G standalone networks has been slower than initially anticipated.[38] 5G mobile networks will also result in more intense collaboration between mobile network operators, cloud providers, system integrators, etc., influencing the availability of mobile edge computing, virtualisation and multi-vendor approach.

Despite the continuous growth of mobile network data traffic, ETNO reports that nine tenths of all data traffic in Europe is fixed data traffic.[39] Video consumption accounts for a significant portion of fixed data traffic, in fact even video-streaming to smartphones and mobile applications that rely on video content are mostly used when connected to Wi-Fi or fixed connections rather than mobile broadband access. During the COVID-19 pandemic, a steeper increase in fixed data traffic was experienced as a result of the various mitigating measures

[35] Ericsson Mobility Report, November 2021. Source: https://www.ericsson.com/4ad7e9/assets/local/reports-papers/mobility-report/documents/2021/ericsson-mobility-report-november-2021.pdf
[36] Ericsson Mobility Report, November 2021. Source: https://www.ericsson.com/4ad7e9/assets/local/reports-papers/mobility-report/documents/2021/ericsson-mobility-report-november-2021.pdf
[37] https://berec.europa.eu/eng/events/berec_events_2021/282-berec-workshop-on-5g
[38] Ericsson Mobility Report, November 2021. Source: https://www.ericsson.com/4ad7e9/assets/local/reports-papers/mobility-report/documents/2021/ericsson-mobility-report-november-2021.pdf
[39] 'State of Digital Communications, 2022' ETNO, February 2022. Source: https://etno.eu/component/attachments/attachments.html?task=download&id=8165

adopted, such as remote working and online schooling. These measures also led to an increase in uplink traffic.

ETNO reports that the expected trends for fixed broadband connectivity include migration from xDSL to FTTH and from cable to FTTH, with the former at a more accelerated pace than the latter. It is also noteworthy that Wi-Fi is still in demand – a Deloitte study surveying the opinion of networking executives highlighted that both 5G and Wi-Fi 6 are perceived as two of the top three critical wireless technologies by the majority of those surveyed.

All these predictions of technologies' development may have a significant impact on the environment. Therefore, the future support of connectivity must be accompanied by improving knowledge of digitalisation's effect on the environment and the promotion of sustainable networks and devices. Circular economy principles as well as positive incentives for more environmentally sober practices could constitute means to support the deployment of environmentally sustainable infrastructure. Moreover, the empowerment of consumers would play an important role in making them aware of the environmental impact of using digital services and devices. Software and hardware durability, the reparability of devices and recycling/re-use of digital equipment should be considered as relevant levers for reducing the overall environmental footprint from ICTs.

4. Regulatory framework

Although the deadline for transposition of the EECC was 21 December 2020, during 2021 several EU Member States continued working on its implementation. As of December 2021, 13 EU Member States had completed the EECC transposition. After the letters of formal notice were sent in February to 24 Member States, the European Commission moved to the second step of infringement proceedings and forwarded reasoned opinions to the countries concerned, asking them to adopt the necessary transposition measures within two months.

Throughout 2021, parallel to exerting its statutory advisory role vis-à-vis the Commission (e.g. on its legislative proposals around mobile roaming, digital markets and the review of the Broadband Cost Reduction Directive), BEREC has been following up on its additional duties under the EECC, and accordingly adopted the Guidelines and Opinions envisaged herein. These include the Guidelines on geographical surveys under Article 22 EECC, the Opinion on the market and technological developments and the impact on the application of the rights of end-users in the EECC, under Article 123.1 EECC, and the Opinion on the national implementation and functioning of the general authorisation, under Article 122.3 EECC.

BEREC also continued to operate as a platform for its member NRAs to exchange views on any national transposition, as well as other matters.

5. Developments related to the openness of the Internet

In 2021, as BEREC stopped its work on the Net Neutrality tool project,[40] BEREC members continued to collaborate to help improve their respective tools or to introduce a new tool. The relevant working group provided a forum for the exchange of best practices, including a 'code repository tree', which is essentially a collection of the tool components used by NRAs and other existing codebases. The key findings of BEREC's work on this matter showed that 22 NRAs provide or promote a national measurement tool to monitor the performance of internet access services, and that while all of those NRA tools are offered to end-users via web browsers, three quarters of those NRAs also offer an app for Android and iOS.

In light of the rulings[41] of the Court of Justice of the European Union (ECJ) regarding the application of the Open Internet Regulation and the implications of those rulings, in addition to continuous information-sharing with the aim of aligning NRA enforcement and supervision actions, BEREC did the following:

- carried out an internal legal analysis of the judgments;
- held a call for stakeholder input;
- initiated an update to the BEREC Open Internet Guidelines.

In its preliminary conclusions from the 2021 ECJ rulings, BEREC found that zero-tariff offers are incompatible with the equal treatment obligation in Article 3(3) of the Open Internet Regulation (OIR), and that the ECJ did not assess the individual limitations of use. BEREC will launch a public consultation on the draft updated Guidelines in March 2022, with an expectation that the final Guidelines will be published in June 2022.

In December 2021 BEREC launched a public consultation on its net neutrality regulatory assessment methodology (NN RAM) with the intention to update the methodology in order to help NRAs in the monitoring and supervision of the provisions of the OIR, based on various net neutrality measurement tools.

Finally, throughout 2021 (though in a more limited manner than in 2020 and with a final report in December 2021), BEREC continued to gather data from NRAs and publish its summary report on the status of internet traffic in Member States and on the status of networks based on a 'traffic light' illustration. During the entire reporting period (i.e. since BEREC first published a report on how the COVID-19 crisis impacted on internet capacity, etc.), 33 NRAs shared data about the impact of the crisis on ECNs and the actions taken so far in their respective Member States.

In general, three phases in the evolution of internet traffic were observed during the crisis: a sharp increase in its early weeks, a subsequent stabilisation and, through the latter part of 2020 and through 2021, a decrease from the peak (experienced early in the crisis). Regarding the status of networks across Europe as at December 2021, all BEREC NRAs indicated 'status green', i.e. networks are working well, and COVID-19 is not creating issues for the availability

[40] With all source code uploaded to GitHub and available to NRAs.
[41] Three German cases: C-34/20 Telekom Deutschland (StreamOn, video throttling); C-5/20 Vodafone (Vodafone Pass, tethering); C-854/19 Vodafone (Vodafone Pass, roaming).

or general quality of internet access service (IAS). No exceptional traffic management measures are justified.

6. International roaming developments

Roaming charges in the European Union and the European Economic Area (EEA) became a thing of the past on 15 June 2017. The Roaming Regulation (Regulation (EU) 2015/2120, published in the Official Journal of 26 November 2015, amending Regulation (EU) No 531/2012) entered into force, enabling consumers to use their mobile phones anywhere in the EU, just like in their home country, without any additional surcharge ('Roam Like at Home' – RLAH). Only in exceptional cases may the operator levy a surcharge for EU roaming.

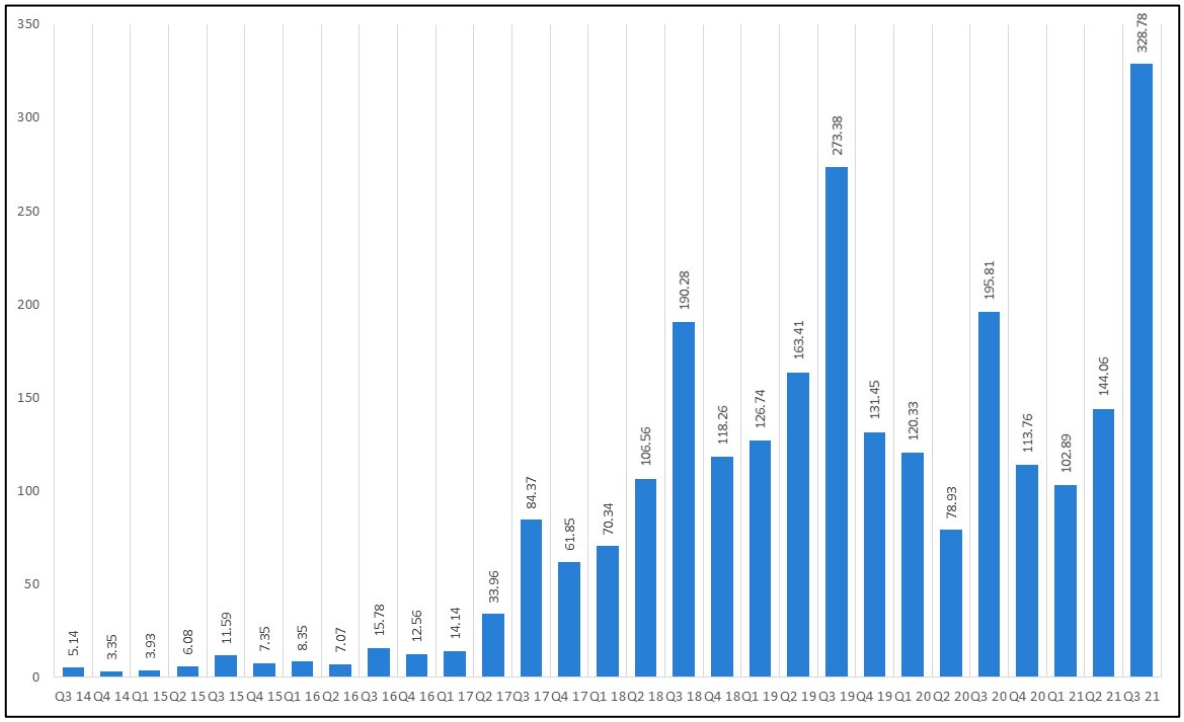
To assess the competitive developments and the impact of RLAH on the EU-wide roaming markets, BEREC regularly collects data from NRAs on the development of retail and wholesale charges for regulated voice, SMS and data roaming services. It also includes wholesale charges applied for balanced and unbalanced roaming traffic. BEREC must also collect data on wholesale roaming agreements that are not subject to the maximum wholesale roaming charges, and on the implementation, at wholesale level, of contractual measures that aim to prevent permanent roaming or anomalous or abusive usage of wholesale roaming access for purposes other than roaming.

On the basis of the data collected, BEREC reports regularly on the evolution of pricing and consumption patterns in the Member States for both domestic and roaming services, the evolution of actual wholesale roaming rates for unbalanced traffic between roaming providers, and the relationship between retail prices, wholesale charges and wholesale costs for roaming services.

The introduction of RLAH services, coupled with the growing demand for data services, has changed the international roaming market. A relevant point is that RLAH services have enabled a substantial increase in international roaming traffic. However, the continuing travel restrictions imposed during 2021, due to the COVID-19 pandemic, have led to a noticeable decrease in roaming data consumption, as can be observed from BEREC's monitoring in the context of the Roaming Regulation.

Up until the onset of the pandemic, the total roaming volume for data services had been constantly increasing in recent years, also taking seasonality into account. The overall data traffic throughout 2020 and indeed in Q1 2021 has been at its lowest since 2018 (see Figure 10 below), while the consumption of roaming data initially increased in Q2 2021 and then significantly in Q3 2021 (328.78 million GB), higher even than the same quarter in 2019 (273.38 million GB).

Figure 10: EEA Retail data traffic (millions of GB)[42]

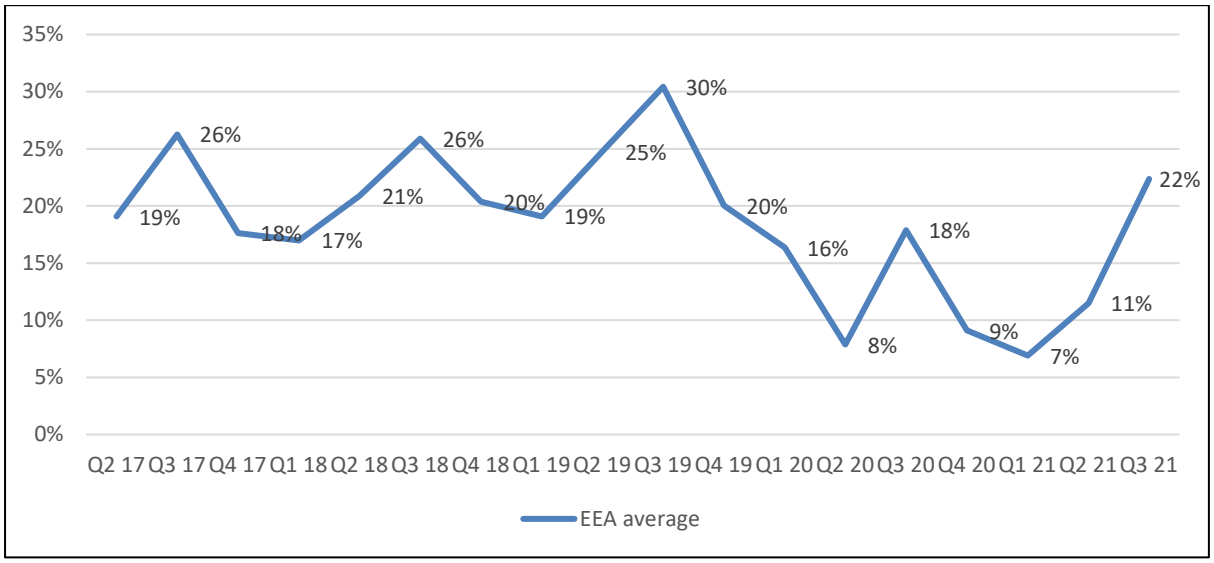


Source: BEREC, International Roaming, BEREC Benchmark Data Report April 2021–September 2021

This reduction in roaming voice services was also noticeable throughout the period of the pandemic, though the effects of seasonality are now visible once again. According to the data collected (presented in Figure 11), the percentage of roaming-enabled subscribers actually using roaming services remained low in 2021, with a value of 11% in Q2 2021 (against 8% in Q2 2020 and 25% in Q2 2019) and a value of 22% in Q3 2021 (against 18% in Q3 2020 and 30% in Q3 2019).

[42] The conversion of gigabytes to megabytes was done in line with Recital 17 of Regulation (EU) 2017/920 of the European Parliament and of the Council of 17 May 2017, amending Regulation (EU) No 531/2012, which results in 1 gigabyte being equal to 1000 megabytes.

Figure 11: Percentage of subscribers that were roaming at least once in the quarter in question in the EEA, compared to the total number of subscribers who have roaming-enabled subscriptions

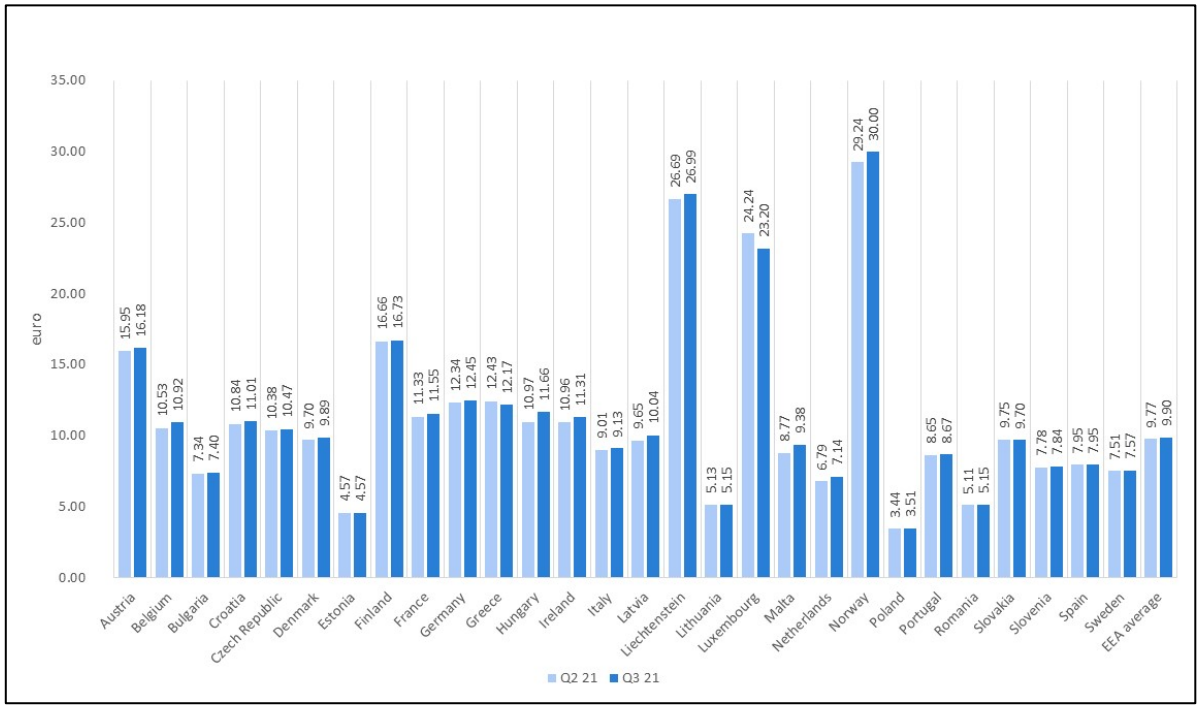


Source: BEREC, International Roaming, BEREC Benchmark Data Report April 2021–September 2021

BEREC analysed domestic retail prices and found it hard to disaggregate the different mobile communications services, since they are often provided as part of a bundle of several services. This includes intra-EEA roaming communications and, in several cases, also non-mobile services. Operators are finding it difficult to organise their revenue data by individual service categories, such as fixed telephony, mobile telephony, fixed broadband or intra-EEA roaming communications, and no common methodology has been defined for this purpose. Bundles challenge this practice, as individual service categories require bundle revenue to be allocated to their components.

In light of the above, BEREC examined the alternative of presenting data on the evolution of the average retail revenue per user (ARRPU). Any further conclusions on the price levels of mobile communication services can only be made through a thorough review of retail prices. In spite of the limitations and the lack of a common methodology, as mentioned above, BEREC has calculated the ARRPU. However, the results should be interpreted with caution. For this calculation, BEREC used data relating to domestic mobile services submitted by operators. The domestic monthly ARRPU for Q3 2021 varies considerably between countries, ranging from EUR 3.51 per month to EUR 30.00 per month, with a weighted EEA average of EUR 9.90. The differences between individual ARRPUs could be caused by the different methodologies used by operators to allocate revenue relating to different domestic mobile services.

Figure 12: Domestic mobile service: monthly retail revenue per total number of subscribers (ARRPU)



At wholesale level, the voice, SMS and data roaming charges set between operators have fallen significantly below the regulated average caps. However, in some cases, the EEA average prices in Q2 2021 and Q3 2021 were higher than those of 2019, and this is most probably because of the significantly lower volumes as a result of COVID-19 restrictions. The applicable price caps and the related EEA average prices during the data collection period were as follows:

Service at wholesale level (no VAT)	Q2 2021		Q3 2021	
	Price Cap	EEA Average	Price Cap	EEA Average
Wholesale voice (€c/minute)	3.2	1.91	3.2	1.97
Wholesale SMS (€c/SMS)	1	0.28	1	0.28
Wholesale data (€/GB[43])	3	1.35	3	1.39

[43] The conversion of gigabytes to megabytes was done in line with Recital 17 of Regulation (EU) 2017/920 of the European Parliament and of the Council of 17 May 2017 amending Regulation (EU) No 531/2012, which results in 1 gigabyte being equal to 1000 megabytes.

7. Conclusions

In mid-2020, BEREC published its strategy for the coming five years, in which BEREC considered the impact of rapidly changing markets, new network technologies and expected policy developments in this period, as well as the increasingly cross-border nature of digital services. This strategy identified the main work pillars among three high-level strategic priorities, reflecting the main challenges and opportunities in the sector. The keywords in the strategy reflect our primary concerns: gigabit society, 5G, digitalisation of society, digital divide, digital platforms and, last but not least, climate change. Some of these keywords have always been part of our DNA, while others are completely new but highly related to the digital transformation of our society.

A significant development occurred in the field of Open Internet: BEREC took note of the three judgments[44] issued by the Court of Justice of the EU on 2 September regarding violation of the European Union's net neutrality rules. The CJEU judgments state that the practices by two German mobile operators (Telekom Deutschland and Vodafone) were incompatible with the EU OIR, and in particular with the obligation of equal treatment of traffic. In that light, BEREC decided to revise and update its Open Internet Guidelines, with the aim of publishing revised Guidelines in Q2 2022, reflecting the ECJ's ruling.

In the field of digital platform regulation, 2021 was marked by a flagship new legislative initiative, proposing a series of *ex-ante* rules for platforms acting as 'gatekeepers' in the digital sector. BEREC strongly supported the EC's ambition to create contestable and fair markets in the digital sector and, to this end, in 2021 BEREC published seven documents on the regulation of digital platforms. We also organised several workshops to test our ideas and gather insights with representatives from the EC, the European Parliament, industry, consumer associations and civil society, as well as experts and academics.

Looking ahead, in the long run we observe that technological developments are ongoing, but the key building block is connectivity. Since the pandemic, the need for Europe to strengthen connectivity and investments has gained even greater attention. With the digital transformation, the requirements concerning the capabilities of ECNs are constantly increasing and the response to that demand is to bring optical fibre closer and closer to the user. The transition from legacy copper networks to new VHCNs will characterise the coming years and represent one of the main challenges to be addressed in order to promote high-quality connectivity. BEREC aims to ensure this smooth transition from legacy infrastructure while also ensuring competition.

During 2021, BEREC also strived for deeper cooperation between regulators, by hosting a quadrilateral summit with representatives from BEREC, EaPeReg, REGULATEL and EMERG. With challenges arising from connectivity in the digital world, continual cooperation among regulators is crucial.

[44] See press release: https://berec.europa.eu/eng/document_register/subject_matter/berec/press_releases/10214-press-release-berec-publishes-updated-open-internet-guidelines-for-public-consultation

PART B: Annual Report on BEREC activities in 2021

1. Introduction

In this Annual Report, the activities of the Body of European Regulators for Electronic Communications (BEREC) in 2021 are presented in accordance with Article 22 of the BEREC Regulation.

The report focuses on the work streams and priorities stated in the BEREC Work Programme 2021 and updated throughout the year; activities mainly carried out by BEREC's Working Groups and ad hoc working groups. The final documents (among them BEREC Guidelines, Opinions, Reports and others) were published after approval by BEREC's Board of Regulators.

The objectives of BEREC's 2021 work were aligned with the BEREC 2021–2025 Strategy, the three high-level priorities (promoting full connectivity, supporting sustainable and open digital markets, empowering end-users), and the priorities set for institutional and international cooperation. The BEREC 2021–2025 Strategy is based on market developments and relates to the strategic objectives of the EECC. In addition to these three priorities, the facilitation of successful implementation and consistent application in all areas of the EECC, including spectrum, universal service and consumer protection, are important horizontal principles that form an essential part of the high-level priorities.

A key policy objective is to ensure that VHCNs and 5G services are available in a timely manner. In this respect, BEREC aimed to continue to promote the roll-out of fibre and 5G.

We worked intensively on several essential tasks that have been entrusted to BEREC by the co-legislators. In addition, BEREC provided guidance to the co-legislators and the European Commission on a number of initiatives, such as the Roaming Regulation, the Digital Markets Act, the Broadband Cost Reduction Directive, the Access Recommendation, the 5G Toolbox, and the NIS2.0 Directive.

In 2021, much of our work shifted from providing Guidelines related to the EECC towards assessing future technological and market developments related to end-user provisions within the scope of electronic communications and the digital ecosystem.

The COVID-19 pandemic, which has made us all recognise the crucial aspect of communication networks, was a stark reminder of the necessity of digital connectivity. Our telecommunications networks had been put to the test by compulsory teleworking and e-learning, among others, but they stood their ground. As of mid-March 2020, BEREC and the NRAs started a monitoring mechanism to keep track of the impact of COVID-19 on internet capacity. In 2021, BEREC evaluated the measurements of the NRAs and other market players taken during the pandemic and identified the steps needed to strengthen Europe's digital capabilities and increase the resilience of the electronic communications market for dealing with situations such as the COVID-19 crisis.

BEREC also made significant steps in the field of sustainability. Our experts started a thorough assessment in light of the Green Deal and 2030 Agenda targets, getting a better

understanding of how to reduce the carbon footprint of providing digital and telecommunications services.

BEREC also aimed to contribute, through cooperation with other competent institutions and stakeholders, to ensuring that future network technologies meet their connectivity targets in line with European values and interests (security, protection of the end-user, environmental challenges, etc.).

2. Work Programme 2021

2.1 Strategic priority 1: promoting full connectivity

2.1.1. Report on a consistent approach to migration and copper switch-off

Network operators are rolling out optical fibre closer and closer to the end-users, and the importance of the copper-based access network therefore decreases and NRAs are increasingly confronted with a situation where the Significant Market Power Operator (SMPO) wants to decommission its legacy copper-based access network and close Main Distribution Frames (MDFs). BEREC published the draft BEREC Report on a consistent approach to migration and copper switch-off in response to this development on 15 December 2021, followed by a public consultation until 28 January 2022.

The objectives of this report are: (i) to provide an overview of the current status of the SMPOs' copper switch-off and the SMPOs' plans to switch off their copper network in the future; (ii) to analyse in detail the rules set by the NRAs for the migration process and copper switch-off; and (iii) to also examine further aspects of the migration process and copper switch-off (e.g. the SMPOs' framework for migration and copper switch-off). Finally, the report aims to identify a consistent approach to migration and copper switch-off.

The report shows that, in 20 of the 32 European countries where the NRA provided data, the SMPO has already announced that it plans to switch off its legacy copper access network (e.g. close MDFs); in 13 of them the SMPO has already closed copper-based network elements (e.g. MDFs); and in 17 countries the NRA has already set rules for the migration process and copper switch-off.

A consistent approach to migration and copper switch-off results from a detailed analysis of the rules set by the NRAs in these 17 countries, as follows.

- Type of procedure: the NRAs typically set the rules for the migration process and the copper switch-off in a market analysis procedure.
- Level (granularity) of the rules: the level (e.g. MDF or street cabinet) of the rules set by the NRA typically depends on which copper switch-off the SMPO pursues.
- Scope of the rules: the rules set by the NRA apply to the SMPO and to the geographic area where the NRA imposed access remedies on the SMPO.
- Stakeholder involvement: NRAs normally involve the stakeholders by means of a public consultation on the draft measures and, depending on national law,

stakeholders may also be a party in the procedure that sets the rules for the copper switch-off.

- Notice period: the notice period typically depends on which, if any, copper-based wholesale access products ANOs use for the SMPO.
- Alternative wholesale access products: typically, the fibre-based wholesale access products imposed on the SMPO as a 'usual' remedy in a market analysis procedure are sufficient for the copper switch-off.
- Legacy copper-based wholesale access products: typically, the SMPO has to provide the legacy copper-based wholesale access products until the copper is switched off (e.g. MDF closure).
- Migration costs: the NRAs typically apply price regulation to the legacy copper-based wholesale access products and the alternative wholesale access products in a market analysis procedure. Therefore, in many cases there is no need for further rules on the migration costs.
- Information from the SMPO and monitoring: typically, the SMPO has to inform ANOs on the migration process and copper switch-off. In many countries, the NRA monitors the migration process and copper switch-off, which may be mandatory depending on the transposition of Article 81 (2) EECC.
- Further rules: the NRAs typically also set some further rules on the migration process and copper switch-off (e.g. publication of a reference offer for the alternative wholesale access products).

Permission to close MDFs: the SMPOs have the possibility of closing MDFs if the rules set by the NRA are fulfilled, and normally they do not need any further explicit formal permission.

Document:
BoR (21) 171: Draft BEREC Report on a consistent approach to migration and copper switch-off
Adoption of final Report at Plenary 2 2022

2.1.2. Report on regulatory treatment of backhaul

Backhaul infrastructure is key to enabling 5G and facilitating the deployment of very high-speed networks in areas that are not densely populated. Moreover, the recommendation on relevant markets that entered into force in December 2020 addresses the issue of how to take account of backhaul in the process of relevant markets by NRAs.

For these reasons, in 2021 BEREC prepared a report on the regulatory treatment of fixed and mobile backhaul (BoR (21) 130) that was opened to public consultation in October 2021. The objectives of the report are to list the legal provisions applicable to mobile and fixed backhaul, the regulation and use of different types of backhaul networks and services in Europe, and views expressed by operators on their current and future needs for backhaul.

The report is based on the responses received to two BEREC questionnaires, one for NRAs on the regulatory treatment of backhaul in each country, and another for operators where data

on actual use of different backhaul technologies as well as views on the regulation and future use of backhaul were collected.

The final report will be published in early 2022, together with a summary of the outcome of the public consultation.

Document:

BoR (21) 130: Draft BEREC Report on the regulatory treatment of fixed and mobile backhaul

2.1.3. Workshop on 5G

In June 2021, BEREC organised a public online workshop on 5G, consisting of two panel discussions – one focused specifically on the theme 'New Business Models and Value Chains', identified in the BEREC 5G Radar, and the second focused on the 'Anticipated Pace of Innovation'. The first panel on 'New Business Models and Value Chains' brought together stakeholders representing some of the key players who will form part of the 5G ecosystem and who are experts in the possible diversification that 5G may enable. The panellists were: Mr Wreschner, Vodafone; Mr Bonifay, Transatel; Mr Summer, Ericsson; Mr Pujol, Cellnex Telecom; Mr Budník, Thein; and Dr Matinmikko-Blue, University of Oulu. The second panel delved more into some of the 5G pilots and trials to address the question of when we should expect 5G use cases to be launched commercially. The panellists were: Dr Willcock, 5G Infrastructure Association (5G IA); Dr Siddiqui, 5G Zorro; Prof. Bernardos Cano, 5Growth; Dr Hetzer, 5GCroCo; Dr Pagano, COREALIS Project; and Mr Neira Rey, AXON Partners Group.

Following the organisation of this workshop, BEREC published a report highlighting the key remarks made by the speakers that may be taken into account to anticipate BEREC's future work with the widespread adoption of 5G use cases. It has been claimed that the connectivity sector is no longer a standalone sector and its success relies on partnerships. These partnerships and the increased need for collaboration will result in the emergence of new players such as software developers and hardware manufacturers to develop solutions that rely on open interfaces and standards.

Embedded SIMs are also expected to become commonplace and used to connect also laptops and tablets. The workshop also touched upon the neutral host model. Speakers also mentioned the role that emerging technologies such as Distributed Ledger Technologies and Artificial Intelligence may play in the diversification of the 5G ecosystem and the possibility that these are used to extend network coverage.

Another aspect that was mentioned by a number of speakers was private networks and how these can improve the operations model of certain verticals. The combination of public and private networks may be commonplace, with automotive identified as one of those vertical sectors that will make use of both public and private networks. The panellists also discussed the benefits of the use of network slicing and how it enables the same physical network to serve the different needs of the various use cases.

What differentiates 5G from previous generations is the ability to digitise other industries beyond telecoms. However, different sectors have gained different levels of maturity in terms of the adoption of 5G use cases, with some near markets such as the automotive sector or

manufacturing, while others are still 5 to 10 years from commercial launch. 5G in manufacturing and industrial automation has garnered a lot of attention and was also referenced as an example by a number of panellists.

2.1.4. Workshop on NRA experiences with 5G

BEREC has undertaken various activities related to 5G topics in the past two years. For example, BEREC issued its feasibility study on the development of coverage information for 5G deployments,[45] published Guidelines detailing QoS Parameters,[46] as well as a Handbook of BEREC Guidelines on geographical surveys of network deployments with relevant considerations for mobile service mapping and fixed infrastructure mapping.[47] In addition, BEREC consulted on and finalised the 5G Radar and Guide to the 5G Radar.[48]

Given this context, and observing that BEREC's Common Position on Information to Consumers on Mobile Coverage[49] may address 5G in the future, BEREC sought to conduct an expert workshop to explore this point.

BEREC's desk research underscored how connectivity for consumers consists of different inputs, which may complicate how to present 5G information to consumers. For example, connectivity is influenced by usage patterns, perceptions, and experiences of mobile phone users in the market. Connectivity is also impacted by receiver designs, handsets, building materials and network types.

BEREC conducted a workshop for experts on 23 September, to continue to develop an understanding of how service availability in mobile networks using 5G technology can be predicted/calculated. One main objective of the workshop was to build a collective appreciation of how to manage generating information to users on 5G, so that there would not be a wide gap between predicted and actual service/experience levels in terms of coverage.

In summary, the workshop was an internal forum for experts to exchange relevant experiences. In total, 72 participants attended the workshop.[50] The workshop achieved its main objective of building a collective appreciation of how to manage generating information to users on 5G that does not have a wide gap between predicted and actual service/experience levels in terms of coverage.

However, the reality of mapping 5G remains largely unclear. BEREC intends to continue to monitor developments and to facilitate information-sharing between NRAs, which may result in defining a suitable project on this topic in the coming years.

---

[45] https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/9030-feasibility-study-on-development-of-coverage-information-for-5g-deployments

[46] BEREC Guidelines detailing Quality of Service Parameters (europa.eu)

[47] https://berec.europa.eu/eng/document_register/subject_matter/berec/regulatory_best_practices/guidelines/9990-handbook-of-berec-guidelines-on-geographical-surveys-of-network-deployments

[48] Guide to the BEREC 5G Radar and 5G Radar (europa.eu)

[49] BEREC Common Position on information to consumers on mobile coverage (europa.eu)

[50] The participants included 44 experts from 25 NRAs, 6 representatives from the EU Commission, 11 experts from 6 other competent authorities; 4 seconded national experts from the BEREC Office, and 7 industry participants who were invited to speak to experts during dedicated slots (Cisco, Ericsson, ETNO, GSMA, Telefonica and Rohde-Schwartz).

Document:

BoR (21) 163: Summary report on BEREC Workshop on 'NRA experiences with 5G', 23 September 2021

2.1.5. Workshop on EMF: How can BEREC best promote science-based EMF exposure limits recommended by experts?

BEREC organised a workshop on 21 September 2021 on Electromagnetic Frequency (EMF) related issues. The workshop was entitled 'How best to promote science-based EMF limits recommended by experts' and was addressed to heads, senior policy makers and experts from BEREC's NRAs.

The workshop served a two-fold purpose, namely to give the audience an overview of the current state of research by experts on EMF, and to present different case studies outlining how various countries were handling public EMF concerns, and introducing cooperation between competent authorities so as to make their efforts more effective.

The workshop was divided into two major panels. In the first one, speakers from the International Commission for Non-ionising Radiation Protection (ICNIRP), the Institute of Electrical and Electronics Engineers / the International Committee on Electrical Safety (IEEE/ICES), the French national frequency agency (ANFR) and the Joint Research Centre (JRC) shared their current research and measures taken in their area of expertise. In the second panel, representatives from Malta (MCA), the Netherlands (radiocommunications agency), Norway (Nkom) and the United Kingdom (Ofcom) reported on successful measures adopted in their countries regarding EMF.

In addition to the two major panels, BEREC co-chairs and a representative from the European Commission provided information on other related activities in the field of EMF.

The co-chairs of BEREC's Wireless Network Evolution (WNE) working group provided some remarks about various ongoing activities in preparation for the workshop. For example, they set out that BEREC and the RSPG had adopted a joint position on EMF issues in 2020. They set out that accurate public information on the new technology and its interplay with EMF is also key to the successful acceptance of 5G networks.

In addition, the co-chairs were pleased to announce that BEREC had recently published information summarising the different levels of cooperation between competent bodies in European countries and some national policies associated with monitoring, communicating and implementing EMF-related issues. For more information, please refer to https://berec.europa.eu/eng/about_berec/tasks/EMF/, which lists some of the country-specific information gathered by BEREC.

In total, 125 participants[51] attended the workshop.

The workshop achieved its main objectives. It built a collective appreciation of the science-based research and communications activities by some competent bodies carried out to date with regards to EMF. Moreover, it presented NRAs and other competent authorities with instances of how they could promote EMF exposure limits, backed up by this scientific research.

BEREC's publication of information encapsulating the different levels of cooperation between competent bodies in countries, and the national policies related to monitoring, communicating and implementing EMF-related issues, also establishes a good reference page for interested parties and citizens alike. BEREC will maintain and refresh this information webpage to reflect the latest information on EMF in the various countries.

In light of the workshop, BEREC encourages NRAs to:

- keep abreast of any relevant EMF-related developments, particularly in the area of risk communication (such as publications by the ITU, IEEE/IEC, WHO, IARC and others);
- keep track of the efforts made by their counterparts in other countries with respect to EMF. Certain practices may easily be adapted and tailored to be deployed in multiple countries.

In conclusion, BEREC's work on EMF is valuable support not only to NRAs but also to other competent authorities on EMF and Member States, considering the Common Union Toolbox for Connectivity, which consists of agreed best practices to boost the timely deployment of 5G.[52]

Document:

BoR (21) 164: Summary report on the expert workshop on 'How BEREC can best promote science-based EMF exposure limits recommended by experts'

2.1.6. Report to enable comparable national broadband coverage indicators throughout Europe

The BEREC Report to enable comparable national broadband coverage indicators throughout Europe deals with the Broadband Coverage in Europe Study.[53] This is the most comprehensive European study providing information about Member States' progress towards the broadband objectives established by the European Commission in the Digital Agenda for

[51] 85 experts from 31 NRAs, 7 participants from EU Commission, 23 participants from 12 different OCAs, 3 participants from university Institutions, 3 participants from 2 international organisations (ITU, ICNIRP) and 4 participants from the BEREC Office.

[52] Connectivity Toolbox: Member States agree on best practices to boost timely deployment of 5G and fibre networks | Shaping Europe's digital future (europa.eu), see sections 37, 38 and 39 therein.

[53] For the most recent published study, see: https://digital-strategy.ec.europa.eu/en/policies/desi-connectivity. Please note that the data collection for the Study was done for the 27 EU member states, as well as for Iceland, Switzerland, Norway and the UK, in 2020.

Europe and the corresponding following communications (i.e. the Digital Compass[54]). Some of its most important indicators are showcased in the Digital Economy Society Index (DESI) and the related Reports, more specifically in its connectivity dimension.

In this report, BEREC reflects on possible improvements that can be brought to the present state of the art in the provision of information for the study and provides a series of recommendations to be considered by authorities when reporting on the coverage information and by the European Commission when designing the data collection, interpreting the data results and publishing the Broadband Coverage in Europe Reports.

These recommendations partly build on the extensive work that BEREC has done towards the consistent application of the provisions of Article 22 of the EECC and endeavour to align the study with the BEREC Guidelines on geographical surveys of network deployments.[55] They partly reflect the findings ascertained through information exchanges with public authorities and operators regarding, among others, the sourcing of the data, the methodologies applied and the definitions used, as well as the difficulties encountered when dealing with the coverage data.

BEREC considers that the Guidelines on Article 22 should provide a better basis for the comparability of aggregate broadband indicators resulting from the agreed definitions and indicators, such as 'premises passed'. Second, BEREC insists on the indispensability of granular data collection, as highly granular data will allow authorities to rely on the best information to inform their decision-making, and the public will avoid the need to use an untestable hypothesis to estimate coverage in areas served by several operators or technologies. In that regard, the Report provides a couple of recommendations dealing with the treatment of overlapping and aggregation. Third, the report highlights the role that public authorities need to play in assuring the quality of data, which is indispensable for rigorous monitoring of broadband coverage developments.

Finally, it is worth noting that Article 22 of the BEREC Guidelines and other previous work done by BEREC on related topics[56] have paved the way for better and more comparable broadband coverage and performance data. BEREC continues to be committed to this objective, as showcased by this report and by other BEREC activities, such as the delivery in 2021 of a Workshop on NRAs' experiences with 5G and the organisation in 2022 of a Workshop to share experiences on the implementation of Article 22 of the EECC. The reporting of appropriate and relevant indicators is subject to change, as a consequence of markets' and technologies' evolution, the updating of European connectivity targets, improvements in available information tools and the harmonisation efforts promoted by different institutions, and BEREC therefore sees a further role to play in monitoring and adapting the coverage statistics to all these developments.

---

[54] The Digital Compass establishes that, by 2030, all European households should be covered by a Gigabit network, with all populated areas covered by 5G. More information can be found here: https://digital-strategy.ec.europa.eu/en/policies/digital-compass

[55] https://berec.europa.eu/eng/document_register/subject_matter/berec/regulatory_best_practices/guidelines/9990-handbook-of-berec-guidelines-on-geographical-surveys-of-network-deployments

[57] https://berec.europa.eu/eng/document_register/subject_matter/berec/others/8602-working-arrangement-between-berec-and-rspg

Document:

BoR (21) 172: BEREC Report to enable comparable national broadband coverage indicators throughout Europe

2.2 Strategic priority 2: thriving sustainable and open digital markets

2.2.1 BEREC Opinions and Report on digital gatekeepers

In December 2020, the European Commission (EC) published a proposal for a Digital Markets Act (DMA), introducing a series of rules for platforms acting as gatekeepers in the digital sector. The DMA proposal is currently being discussed by the EU Parliament and the Council of the EU, and is likely to be adopted in mid to late 2022. Some of the key features in the *ex-ante* model that BEREC proposed in its response to the public consultations on the Digital Services Act Package and the New Competition Tool (BoR (20) 138) were integrated by the EC in its proposal.

Building on previous work on digital platforms and the digital economy, BEREC has been actively contributing to the EU debate on how to shape regulatory intervention on digital gatekeepers in 2021. All this work aims to contribute to informing and supporting the European institutions, building on NRAs' expertise in *ex-ante* regulation.

In March 2021, BEREC adopted an Opinion on the DMA proposal (BoR (21) 34) and published a draft report on the *ex-ante* regulation of digital gatekeepers for public consultation (BoR (21) 35), highlighting the main proposals for making this EU regulatory intervention swift, effective, and future-proof.

To make sure that its proposals were fit for purpose, in April and May 2021, BEREC organised two public workshops with different types of relevant stakeholders to gather their views and test and enrich its proposals on market entry and end-users' empowerment in the context of the DMA.

In June, BEREC also published two proposals focusing on two relevant topics: remedies-tailoring and structured participation processes for stakeholders (BoR (21) 94), and the set-up of an Advisory Board (BoR (21) 93) to support the application and enforcement of the DMA, as well as a report on the interplay between the EECC and the DMA proposal regarding number-independent interpersonal communication services covered under both pieces of the regulation (BoR (21)).

The final Report on the *ex-ante* regulation of digital gatekeepers, taking account the input raised by stakeholders in the public consultation, and comprising all proposals made by BEREC up until that moment, was adopted in October 2021. In October, BEREC also published a report summarising views and proposals from different stakeholders, as well as BEREC feedback on them (BoR (21) 130).

Documents:

BoR (21) 35: BEREC Opinion on the European Commission's proposal for a Digital Markets Act

BoR (21) 34: Draft BEREC Report on the *ex-ante* regulation of digital gatekeepers

BoR (21) 94: BEREC proposal on remedies-tailoring and structured participation processes for stakeholders in the context of the Digital Markets Act

BoR (21) 93: BEREC proposal on the set-up of an Advisory Board in the context of the Digital Markets Act

BoR (21) 85: BEREC Report on the interplay between the EECC and the EC's proposal for a Digital Markets Act concerning number-independent interpersonal communication services.

BoR (21) 131: BEREC Report on the *ex-ante* regulation of digital gatekeepers

BoR (21) 130: BEREC Report on the outcome of the public consultation on the Draft BEREC Report on the *ex-ante* regulation of digital gatekeepers

2.2.2 Report on the harmonised collection of data regarding OTT services relevant to electronic communication markets

The BEREC Report on harmonised definitions for indicators regarding over-the-top (OTT) services relevant to the electronic communications markets has the aim of identifying harmonised metrics which are of interest to most of the NRAs in the scope of fulfilling their tasks. The Report includes a list of indicators which are considered important for NRAs and BEREC to ensure conformity with the provisions of, or decisions adopted under, the EECC and the BEREC Regulation (Regulation (EU) 2018/1971). With the identification of these common indicators, BEREC expects to reduce providers' costs of complying with the data requests of different authorities.

As Article 2 of the EECC provides for a new definition of the 'interpersonal communications services', extending the scope of the European regulatory framework for electronic communications to 'number-independent interpersonal communications services' ('NI-ICS'), BEREC considered it opportune to expand on particularly relevant indicators and harmonised definitions for those. At the same time, the Report has a section dealing with indicators concerning video-streaming services.

Concerning the actual indicators proposed by BEREC for NI-ICS, 'by country' metrics related to registered and active users and the number of originated calls/messages were defined. With respect to the video-streaming metrics, BEREC found no major technical issues or constraints for the provision of data concerning the number of registered/active users, 'simultaneous streams', content pieces and revenue-related metrics.

BEREC's intention with this report is neither to impose on NRAs the obligation to collect data from OTT providers, not to instruct NRAs on the scope, modalities and frequency of such data collections. Thus, the metrics included within should be considered for reference only.

Moreover, the indicators are not meant to cover all of NRAs' information needs, as national specificities may entail that some NRAs have extended requirements.

In the future, BEREC will continue to evaluate the list of indicators and may add, remove or adjust those indicators to reflect on NRAs' needs and their evolution based on the learning experience of the NRAs which collect data, so that their accumulated knowledge can be put to use and ultimately benefit end-users and citizens.

Document:

BoR (21) 127: BEREC Report on harmonised definitions for indicators regarding over-the-top services

2.2.3 Implementation of Regulation (EU) 2015/2120 and the BEREC Guidelines on the implementation of the Open Internet (OI) Regulation as well as the upcoming review of the OI Guidelines in light of the ECJ judgments

The ECJ released three decisions on 2 September 2021 concerning three German cases:

- C-34/20 Telekom Deutschland (StreamOn, video throttling)
- C-5/20 Vodafone (Vodafone Pass, tethering)
- C-854/19 Vodafone (Vodafone Pass, roaming)

The three cases consist of internet access services offers including a 'zero-tariff' or 'zero-rating' option. This means that the traffic generated by specific (categories of) applications is not counted towards the data volume of the basic package.

All three judgments refer to the obligation of equal treatment of traffic (OIR Article 3(3)) and the practice of differentiated billing based on commercial considerations (note: in only one of the three cases was differentiated traffic management with an impact on the QoS of the traffic in place).

As these practices are deemed incompatible with European law according to the judgments, according to the majority view of the NRAs in the OI WG, it seems that the BEREC Open Internet Guidelines are in conflict with the judgments, as the Guidelines do not treat differentiated billing under the equal treatment of traffic section of the Guidelines. As a consequence, the Guidelines need to be revised in a timely manner to reflect the judgments.

BEREC also prepared an internal legal note on the matter, which deepens the assessment of the rulings from a legal point of view, and serves as a basis for the forthcoming update of the BEREC Open Internet Guidelines. It also assists NRAs in planning their supervision and enforcement actions, contributing to the consistent application of the OIR and ECJ rulings.

The note analyses what the preliminary rulings mean and what their implications are, as well as whether there are possible permissible IAS tariffs and what the consequences for existing contracts are.

Document:

BoR (21) 128: (Internal) Discussion paper on the recent rulings of the CJEU related to the application of the OIR and their implications

BoR (21) 173: (Internal) Draft internal legal analysis on the ECJ rulings

2.2.4 Collaboration on the Net Neutrality Measurement tools and evolution of the regulatory assessment methodology

In 2021, BEREC prepared an internal report to assess the components that are available for NRAs to deploy a national Net Neutrality Measurement tool. The objective of the report is to support NRAs in their national measurement tool deployments by providing information, and to support work towards a harmonised measurement framework.

The report gives an overview of the different tools used by NRAs and their source code. In addition, it covers other Open Source and commercial tools available on the market. The NRAs' Open Source tools are classified into families and their components are discussed.

BEREC's regulatory assessment methodology (published for public consultation) is intended to provide guidance to NRAs in relation to the monitoring and supervision of the net neutrality provisions of the OIR 2015/2120, and the possible implementation of net neutrality measurement tools on an optional basis. This methodology is also intended to contribute to the harmonisation of net neutrality measurement methodologies. This updated work builds upon previous BEREC guidance on net neutrality, IAS quality monitoring and best practices.

The report covers the matters listed below.

- Guidance on a harmonised QoS measurement methodology. The speed measurement methodology is, by default, based on multiple transport layer connections, and the document describes the subsequent calculation of the measured speed.
- Recommendations on methods for detecting traffic management practices that impact on individual applications and include recommendations for detecting traffic management practices that affect connectivity and ultimately a possibility of using and providing individual applications.
- The most important factors that should be considered when assessing the measurement results and giving guidance on information collection. Thus, a number of end-user environment factors may impact the results. These factors include Wi-Fi usage, modem and computer performance, and radio conditions when measuring speed for a mobile subscription.
- Recommendations for the validation, post-processing and market-level analysis of the collected measurement results.
- Guidance on the criteria that NRAs could take into account when providing their own certified monitoring mechanism or certifying a third-party mechanism.

Document:

BoR (21) 165: Draft net neutrality regulatory assessment methodology

2.3 Strategic priority 3: empowering end-users

2.3.1 BEREC study on consumer behaviour and attitudes towards digital platforms

Digital platforms play a vital role in society and are an increasingly important part of the European economy. Despite this increasing importance of digital platforms for society and the economy, there is a lack of knowledge of European consumers' attitudes and behaviours towards the communications services provided by digital platforms.

To get a better understanding of digital platforms and consumers' views on digital platforms, and specifically of their role as providers and distributors of digital services, BEREC has published a study entitled 'Analysing EU consumer perceptions and behaviour on digital platforms for communication', commissioned from PPMI, a leading European research and policy analysis centre.

The objective was also to provide evidence to feed into BEREC's further work on digital platforms and other related areas, and thereby contribute to the wider discourse and policy debate on, for example, market failures in connection with digital platforms.

The study examined the usage of 17 very popular and widely used digital platforms that facilitate communication services, with an emphasis on interpersonal communication services (e.g. WhatsApp, FaceTime, Snapchat) and the interactive exchange of information and media (e.g. Facebook, YouTube, Twitter, TikTok). It focused on consumer attitudes, behaviours and preferences relating to the use of the selected digital platforms, and the survey output is based on a sample size of 12,399 responses from messenger application users from 12 BEREC members, obtained in September and October 2020.

The study found that:

- most consumers use multiple social network sites to access different types of information and different messenger applications to communicate with friends and family from different social circles, generations and countries ('multihoming');
- consumers have developed a strong attachment and loyalty to their main messaging application services;
- the main reasons for using application services are that they can be accessed and used free of charge, that they are easy and convenient to use, and that they provide connections with family and friends who are on the network;
- the importance of the zero-cost of digital platform communication services for consumers is very high (it is a more important feature in the choice of interpersonal

communication services than convenience of use, display of advertising, and stronger data/privacy standards added together).

For secure and private communication, a slightly stronger reliance on traditional electronic means of communication was observed, even though messenger apps were still the choice for a larger share of respondents. For urgent communication only, more respondents reported using traditional electronic means of communication.

Document:

BoR (21) 89: Analysing EU consumer perceptions and behaviour on digital platforms for communication

2.3.2 Report on how to handle third-party payment charges on mobile phone bills

The mobile phone bill has evolved to become an instrument not only for mobile operators to collect mobile phone charges, but also for third-party services providers to easily apply charges for goods or services purchased by end-users.

The report on how to handle third-party payment charges on mobile phone bills is aimed at understanding what charges are being collected on behalf of third-party providers and shedding some light on the provisions that existed prior to the transposition of the EECC. This was done by collecting information by means of a questionnaire issued in September 2020. The answers received also provided insights on the legal status of third-party services, the responsibilities of NRAs/competent authorities and on the scope of present legal and regulatory obligations.

The report shows that, in almost all countries, NRAs/competent authorities have duties and powers regarding Premium Rate Services (PRS), but only one third of them has similar responsibilities for Direct Carrier Billing (DCB). Given this, it is not surprising that existing consumer protection measures are almost always more common for PRS than for DCB. For instance, while in a significant majority of Member States information and transparency measures or tools are in place for PRS, in less than half of them similar measures are in place for DCB. Similarly, obligations to provide detailed billing are twice as often in place for PRS as for DCB, and obligations to provide end-users with facilities to manage services via a customer area or customer support are three times as common for PRS as for DCB.

However, measures designed to protect consumers from bill shock or forced purchases are only imposed to a very limited extent for both types of services. Obligations to provide alert services in case of anomalous traffic or spend reminders for PRS are in place in only a few countries, and those measures are in place for DCB in even fewer countries. The report should provide a useful benchmark and insight into how Member States currently handle third-party payment charges on mobile phone bills and what protections are available to end-users. The same exercise will be considered as part of the BEREC Work Programme in 2023.

The report was subject to public consultation in March 2021 and was subsequently adopted at the BEREC Plenary 3 (October 2021).

Document:

BoR (21) 118: BEREC Report on the handling of third-party payment charges on mobile phone bills

2.3.3 BEREC Opinion on market and technological developments and on their impact on the application of rights of end-users in the EECC

According to Article 123(1) of the EECC, a BEREC Opinion on market and technological developments and the impact on the application of rights of end-users in the EECC (Title III of Part III) are due to be published by 21 December 2021.

Article 123 requires BEREC to analyse:

a) to what extent end-users of all ECS are able to make free and informed choices, including on the basis of complete contractual information, and are able to easily switch their provider of ECS;

b) to what extent any lack of abilities referred to in point (a) has resulted in market distortions or end-user harm;

c) to what extent effective access to emergency services is appreciably threatened, in particular because of an increased use of NI-ICS, by a lack of interoperability or technological developments;

d) the likely cost of any potential readjustments of obligations in Title III of Part III or impact on innovation for providers of electronic communications services.

BEREC carried out its tasks by gathering useful evidence for the assessment required, through targeted requests for information sent to NRAs, as well as bodies and associations representing stakeholders' interests at European level.

The major outcome of the Opinion is that BEREC does not consider it likely that there will be significant market and technological developments over a three-year time horizon that would impact on the application of end-user rights, or that such developments point to a significant risk of the objectives of Article 3 of the EECC not being met. Nonetheless, given the limited experience of the application of Title III of Part III, and the dynamic nature of some of the market developments that have been identified, there is potential for significant change in this area within that time period. Specifically, BEREC suggests that NRAs closely follow issues regarding contract duration, eSIM, email forwarding and bundles, and how the EECC, once transposed, is able to address any emerging or application issue that might arise regarding these matters. BEREC also considers the continued monitoring of the accessibility of emergency services to be important. BEREC therefore considers the continued monitoring of market and technology trends to be important.

Furthermore, BEREC deems it appropriate to again analyse the effect of full harmonisation on existing end-user protections the next time BEREC delivers an opinion based on Article 123 of the EECC.

The BEREC Opinion will be taken into utmost account by the European Commission, which shall publish a report on the application of Title III of Part III ('End-user rights') and shall submit a legislative proposal to amend that Title where it considers this to be necessary to ensure that the objectives set out in Article 3 ('General objectives') continue to be met.

Document:
BoR (21) 177: BEREC Opinion on the market and technological developments and on their impact on the application of rights of end-users in the EECC.

2.4 Cooperation with EU institutions and institutional groups

2.4.1 Institutional cooperation

Recognising the importance of cooperating with different EU bodies and institutions, BEREC developed a Medium-Term Strategy (MTS) for relations with other institutions for the period 2022 to 2025. This MTS seeks to address the need to establish and maintain relationships that, in line with Article 35 of Regulation (EU) 2018/1971, are beneficial to the execution of BEREC's tasks and ultimately contribute to achievement of the objectives of the EU regulatory frameworks, as laid down in Article 3 of the EECC. The MTS identifies institutional relationships which are most beneficial to the attainment of BEREC's priorities and fulfilment of its work programme, in line with BEREC's resources identifying both the institutional body and the topic of interest.

In order to develop this strategy, BEREC organised a Heads Workshop during which the heads of BEREC's members and participants discussed BEREC's key topics of interest, institutional partners and the type of cooperation that could be sought during the period 2022 to 2025. The ideas shared during this Heads Workshop were taken into account when drafting the MTS.

The MTS highlights that BEREC will prioritise cooperation with the RSPG, focusing on Spectrum-Related Matters and EMF. In accordance with Article 35 of the EECC and the working arrangement[57] between BEREC and the RSPG, BEREC will also prioritise collaboration with the RSPG in the Peer Review Forum. BEREC will also continue collaborating with the European Union Agency for Cybersecurity (ENISA), the ECASEC WG under ENISA and the Network and Information Systems Cooperation Group (NIS CG) on matters related to cybersecurity and the implementation of the 5G cybersecurity toolbox. Collaboration with the Cost Reduction Sub-group of the Connectivity Special Group of COCOM shall be sought during the medium-term period identified by this strategy, especially on work focusing on Infrastructure Sharing and the Broadband Cost Reduction Directive.

BEREC will also seek collaboration with the European Regulators Group for Audiovisual Media Services (ERGA), the European Regulators Group for Postal Services (ERGP), the European

[57] https://berec.europa.eu/eng/document_register/subject_matter/berec/others/8602-working-arrangement-between-berec-and-rspg

Data Protection Board (EDPB) and the European Competition Network (ECN) on work that relates to the functioning of digital markets. Sustainability was another priority area identified, resulting in possible collaboration with the European Environment Agency (EEA), the Agency for the Cooperation of Energy Regulators (ACER) and the Council of European Energy Regulators (CEER).

2.4.2 International cooperation

BEREC published the MTS for international cooperation for the period 2022 to 2025, which seeks to evaluate BEREC's current international commitments and spell out, in a transparent manner, what type of cooperation and engagement could be envisaged with each of BEREC's international partners. Similar to the BEREC MTS for institutional cooperation, the MTS on international relations is developed in line with the needs stipulated in Article 35 of Regulation (EU) 2018/1971. Thus, BEREC's MTS for international cooperation identifies those international relationships which are most beneficial to the attainment of BEREC's priorities and fulfilment of its work programme, in line with BEREC's resources.

The MTS identifies the needs that BEREC's cooperation with international bodies seeks to fulfil. BEREC frequently engages in exchanges with international parties that request further information and clarification on various aspects of the European regulatory framework and its implementation. The topics of interest are broad and include, but are not limited to, wholesale access, end-users' protection, spectrum and universal service, international roaming, and open internet regulations. On the other hand, BEREC may wish to learn from the experiences of other bodies which are further along a particular regulatory path or cooperate with international bodies to exchange information and ideas on digital topics.

BEREC's MTS acknowledges the importance of ensuring the appropriate amount of resources are dedicated to each commitment, to ensure the best outcome for BEREC and the international bodies it cooperates with. For this reason, BEREC's MTS for international cooperation defines a list of strategic principles that are to be applied when deciding the nature and level of engagement with international bodies.

2.5 BEREC obligatory work

2.5.1 BEREC Opinion on the Review of the Broadband Cost Reduction Directive

The Broadband Cost Reduction Directive (BCRD)[58] aims to facilitate and incentivise the roll-out of high-speed ECNs by promoting the combined use of existing physical infrastructure and by enabling the more efficient deployment of new physical infrastructure so that such networks can be rolled out at lower cost. In June 2020, the European Commission published a roadmap on the review of the BCRD and, at the end of October 2020, the European Commission asked

[58] Directive 2014/61/EU of the European Parliament and of the Council of 15 May 2014 on measures to reduce the cost of deploying high-speed electronic communications networks.

BEREC to provide an Opinion on the review of the BCRD. BEREC published and delivered this opinion to the European Commission in March 2021, and its main points are set out below.

- General aspects: BEREC considers access to existing physical infrastructure and coordination of civil works to be important to reducing the cost of deploying high-speed ECN. The main problems are that the network operators depend on the physical infrastructure of other operators and that the other operators typically do not have any interest in, or even strongly reject, making their existing physical infrastructure available to ECN operators.
- Dispute settlement body (DSB): the principle of the dispute settlement process foreseen in the BCRD is very positive. Measures are important, which make the outcome of dispute settlement procedures more foreseeable for ECN operators. BEREC considers NRAs best placed to perform the functions of the national DSB.
- Single Information Point (SIP): BEREC's overall evaluation of the functioning of the SIP is positive. It is appropriate that public sector bodies and other organisations (e.g. network operators) make information on existing physical infrastructure available via the SIP. BEREC considers NRAs best placed to perform the functions of the national SIP; at least the NRAs which already perform these functions.
- Access to existing physical infrastructure: BEREC highlights the advantages of expanding the access obligation in terms of the effectiveness of BCRD, but at the same time would place attention on the increased effort for the DSB as a consequence of such expansion. Further guidance on the costing methodology is not needed in the revised BCRD and would even risk overruling the Guidelines or cost-sharing/pricing principles already issued by DSBs, based on the experiences of national authorities in charge.
- Coordination of civil works: BEREC agrees that there is potential to leverage coordination of civil works and understands the availability of information and planning security for undertakings concerning cost allocation mechanisms to be the most promising instruments for that. However, further guidance in the revised BCRD on pricing for the coordination of civil works is neither necessary nor advisable.
- Permit-granting procedures: NRAs typically do not have legal competence to grant permits. BEREC is of the view that it is appropriate that the permit fees do not exceed the administrative costs. It would not be appropriate to establish the SIP as a centralised permit-granting authority.
- Access to in-building physical infrastructure: in one country the number of disputes with regard to access to in-building physical infrastructure is particularly high. A few other NRAs report positive experiences. The scope of Article 9 BCRD and Article 61(3) EECC differ, and therefore there is no need to adjust the definition of the term 'access point' in the revised BCRD if its scope were to remain unchanged.
- Expanding physical infrastructure: the suggested requirement to deploy physical infrastructure suitable for hosting VHCN elements along new or majorly renovated communication routes (e.g. roads, railways), transport hubs and public supply networks might be very helpful to facilitate VHCN deployment. However, this should be confined to specific cases (e.g. major transport routes and in urban areas). The suggestion that new deployments of ECN deploy excess capacities for other operators has certain advantages and disadvantages.

- Environmental impact: coordination of civil works and joint use of existing physical infrastructure might contribute to reducing the environmental impact of ECN deployment, since they avoid civil works.

Document:

BoR (21) 30: BEREC Opinion on the revision of the Broadband Cost Reduction Directive

2.5.2 BEREC Opinion on the Draft Procedural Recommendation

BEREC submitted its Opinion on the Draft Procedural Recommendation on Internal Market Procedures under Article 32/33 EECC and its Annexes to the Commission on 12 February 2021. The Commission had requested BEREC's Opinion on 12 December 2020. In the light of the new provisions of the EECC regarding Article 32/33 notifications, the 2008 Procedural Recommendation on Article 7/7a FD needed to be updated. In particular, the two cases of the newly introduced double lock veto require attention in terms of procedure.

BEREC's main point is to streamline the process in the interests of all actors involved (NRAs, European Commission and BEREC), as BEREC considers the draft too detailed in a number of places.

Furthermore, BEREC points out that, in a number of cases, the draft Recommendation goes beyond the legal provisions of the Code and should therefore be removed or brought into line with the relevant provisions. All in all, BEREC has 18 points commenting on the draft Recommendation and the Annexes.

Document:

BoR (21) 20: BEREC Opinion on the Draft Procedural Recommendation on the form, content, time limits and level of detail to be given in notifications under the procedures set in Articles 32 and 33 of Directive (EU) 2018/1972 of the European Parliament and of the Council establishing the European Electronic Communications Code

2.5.3 Peer review process

BEREC and RSPG agreed on working arrangements on 13 June 2019 (see also BoR(19) 100). The arrangements set out cooperation methods for the purpose of BEREC's participation in the Peer Review Forum. This was done having regard to the requirements of Article 35 of the European Electronic Communications Code. The cooperation methods are as follows:

- to use the Peer Review Forum as an instrument of peer learning;
- to promote the view that the Peer Review Forum brings the greatest benefit, as it convenes national NRAs and other competent authorities with expertise on comparative or competitive selection procedures under the electronic communications' regulatory framework;
- to cooperate on the implementation of the Peer Review Forum;

- to appoint 'liaison officers' in both BEREC and RSPG, to strengthen the relationship between the two bodies and to facilitate the implementation of this arrangement. The WNE Co-chairs are BEREC's liaison officers.

The Peer Review Forum is convened by RSPG only when required. BEREC experts participated in four Peer Review Forums held by Malta, Croatia, Netherlands and Lithuania.

2.5.4 BEREC Opinion on NIS2.0

On 16 December 2020, the Commission published a proposal for a revised Directive on Security of Network and Information Systems (NIS 2 Directive). The proposal expands the scope of the current NIS Directive by adding new sectors based on their criticality for the economy and for society – providers of public ECNs, referred to in point (8) of Article 2 of Directive (EU) 2018/1972(26), and providers of electronic communications services referred to in point (4) of Article 2 of Directive (EU) 2018/1972, where their services are publicly available, fall within its scope as essential entities.

The proposal further strengthens security requirements for the relevant entities, with a minimum list of basic security elements to be applied, and introduces more detailed provisions on the incident reporting procedure, the content of the reports and deadlines.

After the EECC and the 5G Toolbox, this proposal comes as a new regulatory act in the field of cybersecurity and critical infrastructure protection. With the NIS 2 proposal, Articles 40 and 41 of the EECC, which regulate the security of ECNs and services, would be repealed. The BEREC 5G Cybersecurity WG has prepared an independent BEREC Opinion on the proposal.

Document:

BoR (21) 60: BEREC Opinion on the proposed NIS 2 Directive and its effect on Electronic Communications

2.5.5 Ad hoc work relating to the Recommendation on Connectivity

On 18 September 2020, the European Commission adopted a Recommendation calling on Member States to develop and agree on a common Union Toolbox of best practices to foster connectivity (Connectivity Toolbox) and, in particular, the deployment of VHCNs, including fibre and 5G.[59] This Recommendation (paragraph 3(a)) also provides that the Member States shall involve BEREC where appropriate. In the first phase, which ended on 20 December 2020, the Member States identified and shared best practices among themselves and with the Commission. In the second phase, which ended on 31 March 2021, the Member States agreed on the Toolbox. In the third phase, Member States were to implement the Toolbox in close cooperation with other Member States, the Commission and other relevant stakeholders.

[59] Commission Recommendation (EU) 2020/1307 of 18 September 2020 on a common Union toolbox for reducing the cost of deploying very high capacity networks and ensuring timely and investment-friendly access to 5G radio spectrum, to foster connectivity in support of economic recovery from the COVID-19 crisis in the Union.

COCOM set up a special group for developing this common Union toolbox for connectivity with two sub-groups, one of them being the Cost Reduction Sub-Group. BEREC participated in this Cost Reduction Sub-Group and provided input to phase one based on the following documents:

- BEREC Report on the implementation of the Broadband Cost Reduction Directive, BoR (17) 245
- BEREC Report on pricing for access to infrastructure and civil works according to the BCRD, BoR (19) 23
- BEREC Guidelines on very high capacity networks, BoR (20) 165.

In the second phase, on 2 February 2021 BEREC held a joint workshop with the Cost Reduction Sub-Group, focusing on section 3 of the Connectivity Toolbox Recommendation, best practices for reducing costs and increasing the speed of deploying VHCNs, and in particular best practices with regard to the SIP and the dispute resolution body (DSB) of the BRCD. NRAs are the DSB in 22 Member States, and 11 Member States perform the functions of the SIP, and in 3 further Member States some functions of the SIP. NRAs therefore have extensive experience in these areas. At this joint workshop, a total of seven NRAs presented best practices, four (ANACOM, RTR, TRAFICOM and UKE) with regard to the SIP, two NRAs (AGCOM, CNMC) with regard to the DSB and one NRA (ARCEP) on cost reduction in general. The presentations also discussed the benefits of the best practices and their applicability at EU level.

BEREC mandatory tasks in line with EU legislation (EECC, Roaming Regulation and dealing with intra-EEA communications)

2.5.6 International roaming benchmark data report

Under Article 19 of the Roaming Regulation, BEREC must regularly monitor the retail and wholesale roaming prices for voice, SMS and data services, as well as the volume and revenue generated by mobile operators across Member States. Moreover, following the amendments to Article 19, BEREC must report regularly on the development of pricing and consumption patterns in the Member States for both domestic and roaming services, and on the development of actual wholesale roaming rates for unbalanced traffic between roaming providers. These benchmark data reports are widely acknowledged by the relevant stakeholders and are used by the Commission to review the effectiveness of the Roaming Regulation. BEREC published its 26th benchmark report in March 2021 and its 27th benchmark report in October 2021. Following the agreement signed on 4 April 2019, both reports contain a report on international roaming in the Western Balkans, attached as an annex.

Document:

BoR (21) 23: International Roaming BEREC Benchmark Data Report and BEREC Report on Western Balkan Roaming April 2020–September 2020

BoR (21) 115: International Roaming BEREC Benchmark Data Report October 2020–March 2021 and BEREC Report on Western Balkan Roaming October 2020–March 2021

2.5.7 Transparency and comparability of international roaming tariffs

Under Article 19 of the Roaming Regulation, BEREC is responsible for regularly monitoring the transparency and comparability of roaming tariffs, and must present its findings in an Annual Report. The objective of the report is to monitor and increase consumer awareness of the wide range of roaming tariffs, to promote transparent market conditions, and to increase the ability of customers to make well-informed decisions. The report addresses the key issues of whether information on price and tariff conditions is made available in a clear and convenient manner, and whether consumers are able to compare those tariffs.

In July 2021, operators and regulators were asked several questions relating to these two key issues. BEREC published its ninth BEREC Report on the Transparency and Comparability of Tariffs in December 2021. The report covers the results of the questionnaire regarding the implementation of RLAH with a fair-use policy and sustainability applications, in line with the amendments to the Telecoms Single Market Regulation.

In the questionnaire for NRAs, BEREC sought information concerning complaints relating to transparency issues that NRAs received between August 2020 and July 2021. The questionnaire for operators focused on obtaining information about the structure of tariffs for international roaming, the structure of alternative tariffs and non-roaming tariffs.

In addition, operators were asked questions regarding the information provided by operators for roaming in general and about the available price comparison tools for international roaming. Questions regarding the QoS and – for the first time – regarding value-added services were also included in the questionnaire. The report shows that 15 derogation applications were received in 2020. Of these applications, 14 were granted.

Document:

BoR (21) 158: BEREC Report on transparency and comparability of international roaming tariffs

2.5.8 Inputs to the legislative negotiations regarding the revision of the Roaming Regulation

On 24 February 2021, the European Commission (EC) published a proposal for a recast for a Regulation of the European Parliament and of the Council on roaming on public mobile communications networks within the Union, as the currently applicable Regulation (EU) No 531/2012 expires on 30 June 2022. The aim of the proposal is to extend the Regulation, adjust the maximum wholesale charges, and introduce new measures that are intended to

ensure a similar roaming experience as at home with regard to the QoS, to increase transparency for value-added services, and to ensure cost-free access to emergency services for roaming subscribers.

BEREC provided its Opinion and input to the European Commission in 2019 and 2020, in which it analysed the benefits of the Roaming Regulation as well as the functioning of the retail and the wholesale roaming market and made suggestions for the future regulation. Against this background, BEREC analysed the Commission's proposal and provided its expert opinion on the impact of the proposed measures in April 2021. In particular, BEREC evaluated the provisions regarding QoS, value-added services, emergency services, the additional transparency measures (e.g. in the case of roaming in satellite networks) and the additional measures for MVNOs, as well as the wholesale caps.

Document:

BoR (21) 59: BEREC Opinion on the proposal of the Commission for amending the Roaming Regulation

2.5.9 BEREC input on the weighted average of maximum mobile termination rates across the EU

According to Article 6e(2) of the Roaming Regulation, as amended, the European Commission must review the Implementing Acts annually, following consultation with BEREC, setting out the weighted average of the maximum mobile termination rates (MTRs). On 8 October 2021, BEREC provided input to the Commission on the weighted average of the maximum MTRs.

Document:

BoR (21) 144: BEREC input on the weighted average of maximum mobile termination rates

2.5.10 Intra-EU communications benchmark report

Under Article 5(a)(6) of Regulation (EU) 2015/2120 of the European Parliament and of the Council of 25 November 2015, as amended by Regulation (EU) 2018/1971 of the European Parliament and of the Council of 11 December 2018, NRAs must monitor market and price developments for regulated intra-EU communications and report to the European Commission. In October 2021, BEREC published its second intra-EU communications BEREC Benchmark Report, covering the period April 2020 to March 2021 and including information about intra-EU communication services volumes, revenue and subscribers. BEREC also collected data for the previous reporting period (April 2019–March 2020) as well as a 6-month period (1 October 2018–31 March 2019) before the implementation of this regulation; for reasons of comparability, some figures in the report therefore also include data from operators during this earlier period.

Document:

BoR (21) 116: Intra-EU communications BEREC Benchmark Report April 2020–March 2021

2.5.11 National implementation and functioning of the general authorisation

As envisaged by the EECC, BEREC has adopted an Opinion taking stock of the functioning of the General Authorisation regime in the Union, in view of potential legislative review initiatives on the subject by the Commission. As not all EU Member States had finalised the EECC transposition as of December 2021, and sufficient experience had therefore not yet been gained on the General Authorisation-related provisions introduced via the EECC, in that Opinion BEREC did not draw conclusive reflections on the national implementation formulas and on the effectiveness of the new General Authorisation provisions, but rather provided a snapshot of their national implementation trends.

The Opinion identifies potential areas for reflection on the operational functioning of the General Authorisation scheme for the EC's consideration. BEREC found that while some matters concern operational issues that fall outside the NRAs' remit, some others lie with the national implementation choices of the EU electronic communications legislative framework. The Opinion expresses overall satisfaction with the main features of the General Authorisation scheme to date, clarifies that the operational challenges identified – mainly relating to EU sector legislation in force before the latest sectoral review – are expected to be addressed through full EECC transposition and suggests further analysis at a later point in time.

Document:

BoR (21) 178: BEREC Opinion on the national implementation and functioning of the general authorisation, and on their impact on the functioning of the internal market, under Article 122, paragraph 3 EECC

Monitoring quality, efficiency and sustainability

2.5.12 Report on the COVID-19 crisis – lessons learned regarding communication networks for a resilient society

In continuity with 2020, in 2021 BEREC continued looking into the impact of the COVID-19 pandemic on electronic communications markets, especially in terms of Internet capacity and relevant measures adopted at national level to preserve it. Against the background of the regular monitoring exercise carried out in 2020 and the experience acquired on the subject, in 2021 BEREC released a report taking stock of the sectoral measures adopted nationally in the face of the pandemic and of the impact of the latter on the sector. The report also identifies significant case studies, as well as further measures that NRAs could consider adopting in order to increase their preparedness in case of similar situations in the future. The document takes account of the external study 'Post-COVID measures to close the digital divide', with a view to duly considering digital inclusion aspects.

Document:

BoR (21) 180: BEREC Report on the COVID-19 crisis – lessons learned regarding communication networks and services for a resilient society

2.5.13 Report on Regulatory Accounting in Practice

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.

This is the seventeenth RA Annual Report to summarise the findings of a detailed survey of regulatory accounting systems across Europe. Information has been gathered from NRAs and covers the implementation of regulatory cost accounting methodologies. It includes the state of play in terms of remedies of market regulation and focuses on price control, and the way in which it is defined in practice. The report also provides (i) elements about structural parameters of each country, (ii) WACC methodologies applied by NRAs and WACC values currently in force.

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

The report focuses on the analysis of services in key wholesale markets: Wholesale Local Access (Market 3a/2014), Wholesale Central Access (Market 3b/2014) and Wholesale High-Quality Access (Market 4/2014). Given that the cut-off date was 1 April, the report does not yet refer to the 2020 Recommendation on relevant markets susceptible to *ex-ante* regulation ((EU) 2020/2245).

For the fourth time, the report also provides information about the regulatory and competitive framework in each Member State, such as the presence of a geographical regulation, the equivalence model applied, the application of the retail margin squeeze test, and the cable regulation. A brief analysis of symmetric remedies is included. Outcomes of the survey are simply reported in 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, such as copper access (including LLU, SA, and 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 (paragraph 3.5).

Furthermore, as in last year's 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 and on the mobile market. The WACC chapter summarises the main methodologies currently used by NRAs and sets out the reasons behind the estimation of single parameters needed to evaluate the cost of capital under the CAP-M model.

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

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 convergence in the application of the 2013 Recommendation on consistent non-discrimination obligations and costing methodologies. In 2022 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 was to be transposed by Member States by 21 December 2020. This entails looking at which ways 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 WACC Notice will be followed up.

Document:
BoR (21) 161: BEREC Report on Regulatory Accounting in Practice 2021

2.5.14 Weighted Average Cost of Capital (WACC) parameter calculation according to the European Commission Notice

In this second BEREC WACC parameters report, BEREC calculates the WACC parameters following the Commission's non-binding WACC Notice on the calculation of the cost of capital for legacy infrastructure, in the context of the Commission's review of national notifications in the EU electronic communications sector of 6 November 2019.[60] The cost of capital is the core element of any regulatory pricing decision NRAs take. The Notice aims to ensure a consistent calculation of the WACC by NRAs, thereby contributing to the development of the internal electronic communications market.

As the Commission's Notice has not changed, BEREC is following the same methodology (including 'technical choices') as in last year's report, providing utmost continuity.

BEREC applied three general principles:

[60] https://ec.europa.eu/digital-single-market/en/news/commission-publishes-notice-calculation-cost-capital-legacy-infrastructure.

- follow the Notice as closely as possible, which mainly refers to the methodologies to be used for the estimations;
- be transparent, using publicly available data where possible or using data which is widely used and accepted in the financial markets, and which refers to the data sources to be used for the estimations;
- explain every step of the calculation and proceed in a straightforward manner, which refers to the calculations as such.

For each of the parameters of the WACC formula (using the CAP-M approach), the report sets out:

- the application of the methodologies according to the WACC Notice;
- the assumptions and choices made;
- the data and data sources used;
- the steps of the calculations;
- the results.

By explaining precisely and transparently how the results were derived, NRAs will be able to follow the BEREC calculation steps from start to end, and fully understand the logic of the calculation process so that they can replicate the results shown in the WACC parameters Report. This ensures that NRAs are confident that the results are robust and were derived using state-of-the-art professional standards, as well as following the Notice as closely as possible, also taking into account best regulatory practices where the Notice provides for NRA flexibility.

All results were cross-checked and verified to ensure that no methodological mistakes have been made, no questionable data has been used and no calculation errors have occurred, so that BEREC was able to exclude any systematic bias. Only after these checks were carried out was BEREC satisfied that the results were correct and that NRAs would be confident to use them in their own WACC calculations. The following table provides a summary of the structure of the 2021 WACC parameters Report, BEREC's calculations and (references to) the results derived from it.

Chapter	Parameter	Results	Reference (Table)
Chapter 1	Introduction WACC formula		
Chapter 2	RFR	RFR for each EU Member State	Table 2
Chapter 3	Peer group	BEREC Peer Group 2021	Table 3

		comprising 14 companies	
Chapter 4	Debt premium Cost of debt	Debt premium, Cost of debt for each of the 14 companies of the BEREC Peer Group	Table 4
Chapter 5	Equity beta Gearing Asset beta	Equity beta, Gearing, Asset beta for each of the 14 companies of the BEREC Peer Group	Table 6
Chapter 6	ERP	EU-wide ERP	Table 10 + 11
Chapter 7	Summary	All WACC parameters as calculated by BEREC	Table 12 + 10

The novelty of the Notice and the WACC parameters Report is the calculation of an EU-wide ERP. Based on the calculations described in Chapter 6, BEREC considers that the appropriate value of the single EU-wide ERP (without the UK) is 5.50% (AM). As the same methodology as last year was used, the increase from 5.31% (AM 2020) to 5.50% in 2021 is mainly attributable to the one-off effect of the UK leaving the EU. For the first time, BEREC additionally estimated a separate EU/EEA ERP for exclusive use by Nkom (Norway), PFS (Iceland) and AK (Liechtenstein)[61].

BEREC will publish the estimated WACC parameter values, and NRAs are assumed to take into account those parameter values when carrying out their own calculations for their national regulatory decisions, but they do have some flexibility within this framework to take account of national specificities. For reference by NRAs, the report was to be published by 1 July 2021, when the Commission started applying the Notice when reviewing NRAs' notifications in the EU electronic communications sector. BEREC has taken the utmost care to develop this report according to the best knowledge and technical expertise of its members. Nevertheless, improvements may be necessary in the future yearly update, where deemed appropriate.

[61] As no data is available for Liechtenstein, the separately estimated EU/EEA ERP only includes data for Norway and Iceland.

Document:

BoR (21) 86: BEREC WACC parameters Report 2021

2.5.15 Termination Rates at European Level

For more than ten years, BEREC has monitored and published information regarding domestic fixed and mobile termination rates in Europe. During 2021, BEREC published two reports, providing semester information on termination rates (TRs) for fixed and mobile voice call services and end-of-year information (as of 2021) on SMS TRs. This information is summarised in section 3.3 of this Annual Report. BEREC's continuous exercise has shown an important decrease in voice TRs since 2003, when the relevant markets for wholesale fixed and mobile voice call termination services were first listed in the Recommendation on relevant markets susceptible to *ex-ante* regulation. For the future, in 2022, BEREC will review the contents of the Termination Rate Reports and its value-added in the light of the provisions of the EECC and, in particular, of Delegated Regulation (EU) 2021/654, which sets a single maximum Union-wide MTR and a single maximum Union-wide FTR for countries in the Union.

Document:

BoR (21) 71: Termination rates at European level – January 2021

BoR (21) 159: Termination rates at European level – 30 June 2021

2.5.16 Sustainability: assessing BEREC's contribution to limiting the impact on the environment

In 2021, BEREC included sustainability as an important element of its work programme, with special attention to both the internal and external dimensions of BEREC's potential environmental contribution. As a result, BEREC started investigating its own environmental footprint as an organisation, namely the 'internal dimension' through the work of the Expert Networking Group on Sustainability. In addition, BEREC initiated new workstreams to deal with the above-mentioned aspects of the ICT sector's impact on the environment and develop an understanding of how regulatory actions by NRAs can influence the environmental footprint of assessing the 'external dimension' of BEREC's potential contribution to sustainability. Answering this will enable BEREC to better understand how NRAs might encourage the sector to move forward in line with both their mandate and the Green Deal's guiding principles. A separate ad hoc WG on Sustainability was set up for this purpose, which subsequently became a permanent WG in December 2021.

To enable BEREC to position itself on the subject of effective deployment of circular economy and energy efficiency solutions in the lifecycle of broadband networks and ECS, and to provide BEREC with a preliminary knowledge base that could usefully be shared among NRAs, thus enabling BEREC to position itself as a trusted third party for the EU institutions in upcoming discussions on this subject, the WG Sustainability commissioned an external study entitled 'Environmental impact of electronic communications'. This highly anticipated study will be published in March 2022. An internal expert workshop on the key findings of the study was

organised by WIK and Ramboll for NRAs' interested experts in December 2021. The conclusions of the study were also reflected in the final report of the WG on identifying actions available to BEREC to limit the digital sector's impact on the environment.

This second workflow began in 2021 and will be finished in June 2022. Within 2021, the WG initiated a series of bilateral meetings with selected stakeholders and partner organisations in order to be fully aware of ongoing studies and research on the sector's environmental impact. It brought a variety of initiatives and research that are carried out within the telecommunications, digital, and postal sectors. In order to identify all the issues on sustainability that may arise across different aspects of the telecoms regulation, the Sustainability WG also involved the relevant BEREC WGs in the process through bilateral meetings between the co-chairs of the ad hoc Sustainability WG and the co-chairs of the relevant BEREC WGs. The Sustainability WG compiled the most interesting outputs of this work in a report together with the conclusions of the external study, reflected on good practices from the sector and country-specific NRA initiatives. The expected report will also provide a set of recommended actions for NRAs and for BEREC for their future work on sustainability issues in the digital sector.

2.6 Stakeholder engagement

2.6.1 Stakeholder Forum

On 28 October 2021, BEREC held its Stakeholder Forum in Brussels, Belgium, to meet stakeholders to discuss topics relevant to the telecommunications market. The event kicked off with a new type of engagement with stakeholders, namely, 'Meet & Greet' sessions with the BEREC Working Groups' Co-chairs. It was followed by the conference and concluded with the Q&A sessions and the networking reception. The 'Meet & Greet' sessions were informal meetings, during which the registered stakeholders could exchange ideas and discuss the sector's challenges.

During the conference, the incoming BEREC Chair, Annemarie Sipkes (ACM, the Netherlands), presented the draft BEREC Work Programme 2022. Together with the BEREC Chair, Michel Van Bellinghen (BIPT, Belgium), and the BEREC Chair for 2023, Konstantinos Masselos (EETT, Greece), Annemarie answered questions regarding BEREC's work and its plans for the future. The participants had the opportunity to follow the discussion and take part in the Q&A sessions.

Juan Pablo Villar Garcia (Iclaves) presented a study on post-Covid measures to close the digital divide, which was followed by a Q&A session. Finally, Scott Marcus, an independent consultant presented the 'Introduction of the study on regulatory incentives for deploying very high capacity networks: Commission's Access recommendations'. As a follow-up, BEREC Vice-chair Dan Sjöblom (PTS, Sweden), Luc Hindryckx (ECTA), Kamila Kloc (DG CNECT, EC) and Paolo Grassia (ETNO), took part in the panel discussion on the study presented. The incoming BEREC Chair, Annemarie Sipkes, assisted by Philippe Defraigne (Cullen International), gave the closing remarks.

2.6.2 BEREC Annual Reports for 2020

BEREC published its Annual Reports for 2020 on 15 June 2021. The Annual Report on developments in the electronic communications sector in 2020 had a foreword by Mr Dan Sjöblom, BEREC Chair 2020, who highlighted that a major focus for BEREC in 2020 was to assist in keeping the European ECNs and markets functioning well during the COVID-19 pandemic. In addition, the implementation of the new Electronic Communications Code continued to be at the forefront of BEREC's work, with a high number of decisions on Guidelines taken in 2020.

The BEREC Chair 2020 stated BEREC's capacity to deliver on its commitments and highlighted its vital role in contributing to the consistent application of the regulatory framework, as well as its role as an independent advisory body for the co-legislators. The situation in 2020 confirmed the success of the BEREC structure, showing the dedication, knowledge and competence of all NRAs, who strove to achieve the best outcomes. This diversity of expert inputs gave BEREC its strength and, coupled with positive engagement with the stakeholders, their ongoing contributions would continue to serve BEREC well into the future.

Document:

BoR (21) 70: BEREC Annual Reports for 2020

2.6.3 BEREC Communications Plan 2022

The BEREC Communications Plan 2022 sets out the communications activities that are planned for the year. The objective is to strengthen the perception of BEREC as an impartial, independent, European, forward-looking expert body and in support of BEREC's overall strategic objectives – including promoting competition, investment and the internal market, and empowering and protecting end-users. This plan complements the BEREC External Communications Strategy, which sets out BEREC's overall approach to communications. The communications activities for 2022 will continue the work of the BEREC Communications Plan 2021. The main idea of the activities is to develop and provide qualitative information to BEREC's key target audience and to NRAs, which could be a source of information for them in their communications activities.

2.6.4 Developing the BEREC Work Programme 2022

The BEREC Work Programme 2022 was adopted in December 2021 and sets out the priority work areas that the Board of Regulators has identified for 2022. These areas may be complemented by other emerging topics of interest during the year. The objectives of the Work Programme are aligned with the BEREC 2021–2025 Strategy, with a close focus on the three high-level priorities (promoting full connectivity, supporting sustainable and open digital markets and empowering end-users) and the priorities set for institutional and international cooperation. In 2022, BEREC is set to support the further implementation of the European Electronic Communications Code at national level, since it is expected that the delay in implementing the EECC in national legislation will be caught up on in numerous Member States. Thus, all NRAs are ready to act and BEREC will start to gather experiences and develop best practices.

BEREC will enable a consistent and harmonised application of the framework among the NRAs, through monitoring and (internal) workshops. Promoting full connectivity for consumers and businesses remains a key priority for BEREC in 2022. In line with the European ambition to create a Europe fit for the digital age, BEREC will contribute by facilitating the roll-out of VHCNs and stimulating their contribution to closing the digital divide. Mapping the deployment of VHCNs in various national markets is one specific way in which BEREC will enable governments to stimulate further roll-out without unduly hampering market dynamics. Through cooperation with other competent authorities and stakeholders, BEREC will also help to ensure that future network technologies meet their connectivity targets in line with European values and societal needs such as cybersecurity, safety and environmental challenges.

Document:

BoR (21) 175: BEREC Work Programme 2022

2.7 Possible work for 2022 and beyond

Given the number of workstreams for BEREC resulting from the implementation of the EECC, several important proposals could not be initiated. In order not to lose track of these potential workstreams, BEREC committed to maintaining a repository of workstreams that it could potentially focus on at a later date, if relevant. This repository will be reviewed and updated as appropriate. However, BEREC cannot commit to the exact scope of any of the proposals should they be included in work carried out in future years. The list of items mentioned below is therefore informative and is not a final list. Some of the topics proposed included the following:

- multiple regional operators of NGA-networks
- further work related to the DMA, in particular in relation to the issue of interoperability of the NI-ICS
- compensation in the case of early termination of contracts
- non-discrimination on QoS
- monitoring and encouraging transition to IPv6
- reporting on key elements of the functioning of the EECC
- experience-sharing on the Implementation of Guidelines
- state of Mobile roaming: 5G including cross-network slicing
- an assessment of 5G & OpenRAN
- workshops on wholesale replicability testing, IP peering.

Annex 1 Meetings with the European institutions and other European Union bodies

A. Meetings with the European Commission

Dates/place	Event
25 January 2021, Virtual meeting	Bilateral call with DG CONNECT
28 January 2021, Virtual meeting	Meeting with Mrs. Filomena Chirico - Member of Commissioner Thierry Breton's Cabinet
4 February 2021, Virtual meeting	Meeting on the Digital Markets Act with DG CONNECT
5 May 2021, Virtual meeting	Meeting on BEREC's Opinion on the Digital Markets Act with Mrs. Inge Bernaerts (Director, Policy and Strategy DG Competition, European Commission)

B. Meetings with the European Parliament/European Council

Dates/place	Event
7 April 2021, Virtual meeting	Meeting on BEREC's Opinion on the Digital Markets Act with MEP Marcel Kolaja (Greens/EFA, IMCO Shadow Rapporteur)
27 April 2021, Virtual meeting	Meeting on BEREC's Opinion on the Roaming Regulation with MEP Angelika Winzig (ITRE Rapporteur, EPP)

Dates/place	Event
3 May 2021, Virtual meeting	Meeting on BEREC's Opinion on the Digital Markets Act with MEP Andreas Schwab (IMCO Rapporteur, EPP)
4 May 2021, Brussels, Belgium	Presentation of BEREC's Opinion on the Roaming Regulation at the Council Working Party Telecommunications
21 May 2021, Virtual meeting	Meeting on BEREC's Opinion on the Roaming Regulation with MEP Izaskun BILBAO BARANDICA (ITRE Substitute, Renew Europe Group)
17 June 2021, Brussels, Belgium	BEREC Chair 2021 attendance at European Parliament ITRE meeting

C. Meetings and workshops with other EU bodies

Dates/place	Event
12 April 2021, Virtual meeting	Meeting on the Digital Markets Act with ERGA (the European Regulators Group for Audiovisual Media Services)
23 April 2021, Virtual meeting	Meeting on BEREC's Opinion on the Digital Markets Act with the European Data Protection Supervisor, Mr. Wiewiorowski
23 April 2021, Virtual meeting	Exchange of views on the Digital Markets Act with the European Regulators Group for Postal Services (ERGP) and BEREC
26 April 2021, Virtual meeting	Meeting on BEREC's Opinion on the Digital Market Act with the European Consumer Organisation (BEUC)

Annex 2 Public debriefings and BEREC engagement with stakeholders

Dates/place	Event
17 March 2021, Virtual meeting	Public debriefing on outcomes of the 46th BEREC ordinary meetings
1 April 2021, Virtual meeting	9th BEREC Stakeholder Forum
28 April 2021, Virtual meeting	BEREC workshop on market entry in the context of the Digital Markets Act
18 May 2021, Virtual meeting	BEREC workshop on end-users in the context of the Digital Markets Act
19 May 2021, Virtual meeting	BEREC public technical workshop on IPv6 deployment across Europe
16 June 2021, Virtual meeting	Public debriefing on the outcomes of the 47th BEREC Ordinary meetings
21 September 2021, Virtual meeting	Public debriefing on the outcomes of the 48th BEREC Ordinary meetings
28 October 2021, Brussels, Belgium	BEREC Stakeholder Forum
15 December 2021, Virtual meeting	Public debriefing on the outcomes of the 49th BEREC Ordinary meetings

Annex 3 International events[62]

Dates/place	Event
20 January 2021, Virtual meeting	ITU-BEREC coordination call
26 January 2021, Virtual meeting	Forum Europe – Europe's Open Strategic Autonomy – building a consensus
23 January 2021, Virtual meeting	Forum Europe – The European 5G Conference
17 March 2021, Virtual meeting	GSMA Europe Policy Group Meeting
18 March 2021, Virtual meeting	Renaissance Numérique / Petit Déjeuner Numérique (Digital breakfast)
7 April 2021, Virtual meeting	EMERG Plenary Meeting 1
14 April 2021, Virtual meeting	ITU – The Regional Regulatory Roundtable for Europe and Africa
11 May 2021, Virtual meeting	Forum Europe – A Green and Digital Europe with Full-fibre: Opportunities, Challenges and Best Practices

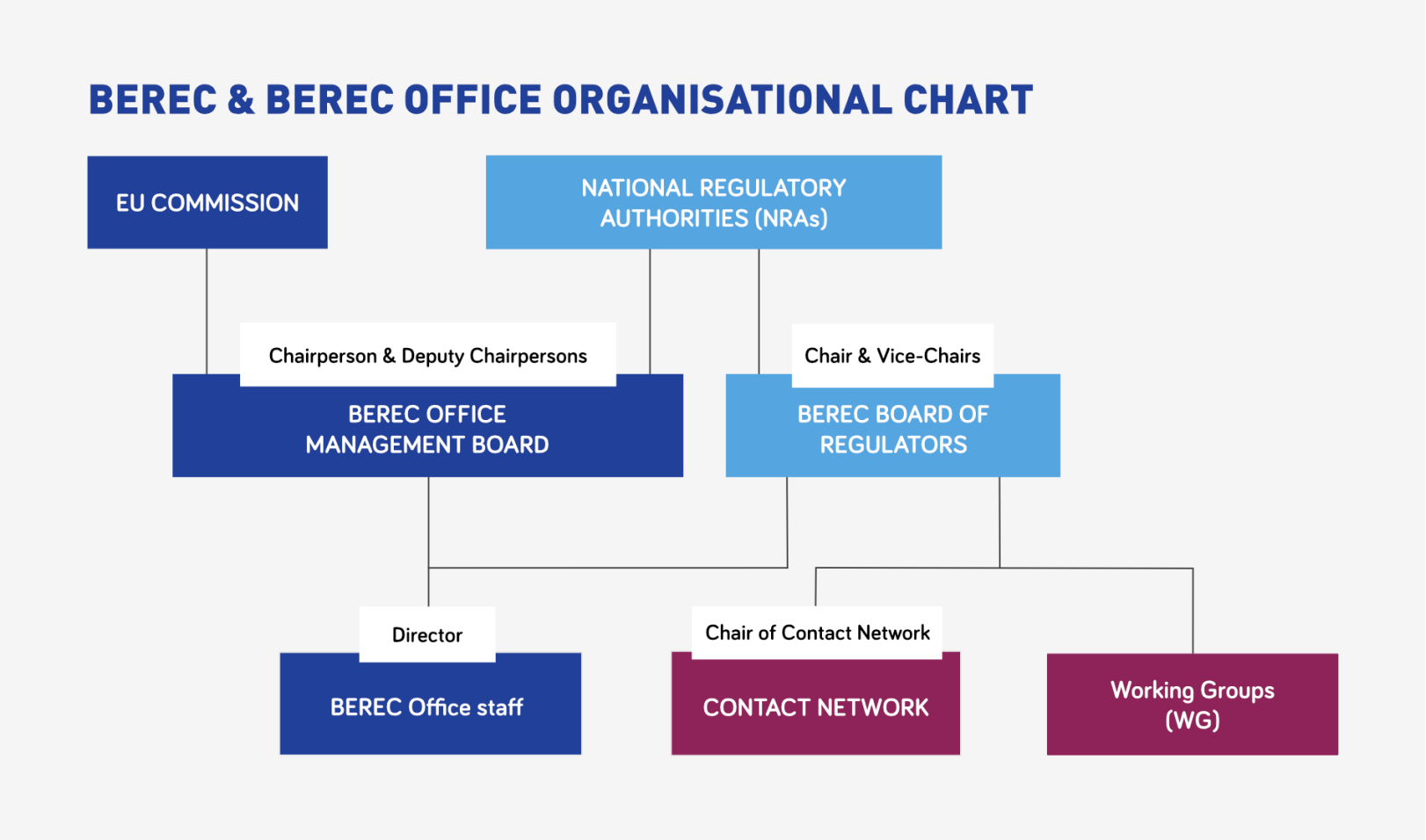
[62] Further details available at https://berec.europa.eu/eng/about_berec/berec_chair/external_meetings_of_the_berec_chair_2021/

Dates/place	Event
12 May 2021, Virtual meeting	CERRE – Heads of Regulators Networks: Breaking Down the Silos
19 May 2021, Virtual meeting	Meeting with ESOA (The EMEA Satellite Operators Association) to discuss BEREC's and ESOA's activities
26-27 May 2021, Virtual meeting	IIC & BEREC – Telecommunications & Media Forum 2021
2 June 2021, Virtual meeting	BEREC-REGULATEL Summit
8 June 2021, Virtual meeting	PEER Regulatory Roundtable on Digital Comparison Tools in Customer Journeys
17 June 2021, Virtual meeting	GLOBSEC Bratislava Forum 2021
21-23 June 2021, Virtual meetings	ITU Global Symposium of Regulators: Heads of Regulators Executive Roundtable; Regional Regulators Association Meeting; Connectivity4digital transformation: regulatory enablers
24 June 2021, Virtual meeting	IIC-NBTC Symposium
28-30 June 2021, Virtual meetings	GSMA MWC 2021: BEREC-GSMA Roundtable; EIF-GSMA High-level virtual discussion on Europe's Digital Transformation: Now to 2030

Dates/place	Event
16 July 2021, Rimini, Italy	Digital & Social Innovation Festival “We Make Future”
22 July 2021, Virtual meeting	EaPeReg Plenary Meeting
16 September 2021, Virtual meeting	The FTTH Council Europe
24 September 2021, Virtual meeting	The Digital 5G World – Informa Tech
6 October 2021, Virtual meeting	IIC Annual Conference
22 October 2021, Brussels, Belgium	The General Assembly of ETNO
25 October 2021, Virtual meeting	CERRE's Co-investment in Networking Sharing Conference
18 November 2021, Virtual meeting	Ericsson Day: 5G, the tool for sustainable growth
24 November 2021, Virtual meeting	5G Techritory Conference
25 November 2021, Virtual meeting	Joint ETNO-GSMA meeting with the BEREC Miniboard related to the review of the Open Internet Guidelines

Dates/place	Event
29 November 2021, Virtual meeting	2021 Tech & Politics Forum: Digital Summit hosted by the Financial Times and ETNO
3 December 2021, Virtual meeting	EaPeReg 18th Plenary meeting
15 December 2021, Virtual meeting	Meeting with the Regulatory Cooperation Council of the West-Balkan countries

Annex 4 BEREC and BEREC Office organisational structure



The work of BEREC is organised into Working Groups (WGs), which work on specific topics that are included in the BEREC Work Programme or that arise on an ad hoc basis, following requests for advice or opinions from the EU Institutions. The WGs are led by two Co-Chairs from different NRAs and include their respective experts.

Annex 5 Plenary meetings of the Board of Regulators (BoR)

Dates/place	Event	Agenda and Conclusions
11 March 2021, Virtual meeting	46th BEREC ordinary meetings	46th Plenary
10-11 June 2021, Virtual meeting	47th BEREC ordinary meetings	47th Plenary
30 September – 1 October 2021, Dubrovnik, Croatia	48th BEREC ordinary meetings	48th Plenary
9-10 December 2021, Stockholm, Sweden	49th BEREC ordinary meetings	49th Plenary

Annex 6 Meetings of the Contact Network (CN) established prior to the Board of Regulators (BoR)

Dates/place	Event	Agenda and Conclusions
12 January 2021, Virtual meeting	Extraordinary BEREC Contact Network meeting	Extraordinary CN
11-12 February 2021, Virtual meeting	1st BEREC Contact Network meeting in 2021	CN1
20-21 May 2021, Virtual meeting	2nd BEREC Contact Network meeting in 2021	CN2
9-10 September 2021, Jurmala, Latvia	3rd BEREC Contact Network meeting in 2021	CN3
18-19 November 2021, Ljubljana, Slovenia	4th BEREC Contact Network meeting in 2021	CN4

Annex 7 Publicly available documents approved by the Board of Regulators (BoR) in 2021

A. BEREC Opinions

Document number	Description	Date
BoR (21) 20	BEREC Opinion on the draft Procedural Recommendation	12 February 2021
BoR (21) 37	Scoping Document - BEREC Opinion on the national implementation and functioning of the general authorisation (Article 122, paragraph 3 EECC)	11 March 2021
BoR (21) 30	BEREC Opinion on the Revision of the Broadband Cost Reduction Directive	11 March 2021
BoR (21) 35	BEREC Opinion on the European Commission's proposal for a Digital Markets Act	11 March 2021
BoR (21) 59	BEREC Opinion on the proposal of the Commission for amending the Roaming Regulation	30 April 2021
BoR (21) 60	BEREC Opinion on the proposed NIS 2 Directive and its effect on Electronic Communications	19 May 2021
BoR (21) 90	Scoping document on the BEREC Opinion on the market and technological developments and on their impact on the application of rights of end-users in the EECC	10 June 2021
BoR (21) 87	BEREC Opinion on the General Authorisation regime pursuant to Article 122.3 EECC - Questionnaire addressed to interested stakeholders	10 June 2021
BoR (21) 109	BEREC Opinion on Phase II investigation pursuant to Article 32 of Directive (EU) 2018/1972: Cases IE/2021/2332-2333. Market for access to the public telephone network at a fixed location for residential and non-residential customers (M1/2007) in Ireland. Market for call origination on the public telephone network provided at a fixed location (M2/2007) in Ireland	17 August 2021

Document number	Description	Date
BoR (21) 178	BEREC Opinion on the national implementation and functioning of the general authorisation, and on their impact on the functioning of the internal market, pursuant to article 122, paragraph 3 EECC	9 December 2021
BoR (21) 177	BEREC Opinion on the market and technological developments and on their impact on the application of rights of end-users in the EECC	9 December 2021

B. BEREC reports

Document number	Description	Date
BoR (21) 23	International Roaming BEREC Benchmark Data Report and BEREC Report on Western Balkan Roaming April 2020 - September 2020	11 February 2021
BoR (21) 25	Internal report on a preliminary assessment of the transition to IPv6 in Europe and a proposal for next steps by BEREC on the matter	11 March 2021
BoR (21) 26	Summary report on BEREC Sustainability ENG Workshops: Sustainability within the digital sector: what is the role of BEREC?	11 March 2021
BoR (21) 38	Scoping Document - Report on COVID-19 crisis - lessons learned regarding communications networks and services for a resilient society	11 March 2021
BoR (21) 31	BEREC Report on the outcome of the public consultation on the draft BEREC Guidelines on Geographical surveys of network deployments. Art 22 (2), 22(3) and 22(4) of the EECC	11 March 2021

Document number	Description	Date
BoR (21) 39	Summary Report on BEREC Sustainability ENG Workshops: Sustainability within the digital sector: what is the role of BEREC?	11 March 2021
BoR (21) 36	Draft BEREC Report on the handling of third-party payment charges on mobile phone bills	11 March 2021
BoR (21) 34	Draft BEREC Report on the ex-ante regulation of digital gatekeepers	11 March 2021
BoR (21) 33	Draft BEREC Report on harmonised definitions for indicators regarding OTT services, relevant to electronic communications markets	11 March 2021
BoR (21) 58	BEREC Summary Report on the status of internet capacity, regulatory and other measures in light of the Covid-19 crisis	31 March 2021
BoR (21) 74	Scoping Document for the BEREC Report on the Internet Ecosystem	10 June 2021
BoR (21) 71	Termination rates at European level January 2021	10 June 2021
BoR (21) 83	BEREC Report on the outcome of the public consultation on the draft BEREC Guidelines on Geographical surveys of network deployments. Verification of information	10 June 2021
BoR (21) 86	BEREC Report on WACC parameter calculations according to the European Commission's WACC Notice of 6 November 2019	10 June 2021
BoR (21) 88	Draft BEREC Report on COVID-19 crisis - lessons learned regarding communications networks and services for a resilient society	10 June 2021

Document number	Description	Date
BoR (21) 89	Analysis report: Analysing EU consumer perceptions and behaviour on digital platforms for communication	10 June 2021
BoR (21) 85	BEREC Report on the interplay between the EECC and the EC's proposal for a Digital Markets Act concerning number-independent interpersonal communication services	10 June 2021
BoR (21) 105	BEREC Summary Report on the status of internet capacity, regulatory and other measures in light of the Covid-19 crisis	25 June 2021
BoR (21) 140	BEREC Internal Report about the ECA questionnaire for NRAs on security of 5G networks	30 September 2021
BoR (21) 120	BEREC Internal report regarding components and guidance for net neutrality measurement tools	30 September 2021
BoR (21) 131	BEREC Report on the ex-ante regulation of digital gatekeepers	30 September 2021
BoR (21) 130	BEREC Report on the outcome of the public consultation on the Draft BEREC Report on the ex-ante regulation of digital gatekeepers	30 September 2021
BoR (21) 127	BEREC Report on harmonised definitions for indicators regarding over-the-top services, relevant to electronic communications markets	30 September 2021
BoR (21) 115	International Roaming BEREC Benchmark Data Report October 2020 - March 2021 and BEREC Report on Western Balkan Roaming October 2020 - March 2021	30 September 2021
BoR (21) 116	Second BEREC Benchmark Data Report on Intra-EU communication April 2020 - March 2021	30 September 2021

Document number	Description	Date
BoR (21) 126	BEREC Report on the outcome of the public consultation of the BEREC Draft Report on harmonised definitions for indicators regarding OTT services, relevant to electronic communications markets	30 September 2021
BoR (21) 118	BEREC Report on the handling of third party payment charges on mobile phone bills	30 September 2021
BoR (21) 119	BEREC Report on the implementation of Regulation (EU) 2015/2120 and BEREC Open Internet Guidelines 2021	30 September 2021
BoR (21) 117	BEREC Report on the outcome of the public consultation on the Draft BEREC Report on the handling of third party payment charges on mobile phone bills	30 September 2021
BoR (21) 129	Draft BEREC Report on the regulatory treatment for fixed and mobile backhaul	30 September 2021
BoR (21) 138	Study on post Covid measures to close the digital divide (iClaves – Esade)	25 October 2021
BoR (21) 184	BEREC Summary Report on the status of internet capacity, regulatory and other measures in light of the Covid-19 crisis	29 November 2021
BoR (21) 171	Draft Report on a consistent approach to migration and copper switch-off	9 December 2021
BoR (21) 162	BEREC Internal Report on the Open Radio Access Network (RAN)	9 December 2021
BoR (21) 172	BEREC Report to enable comparable national broadband coverage indicators throughout Europe	9 December 2021
BoR (21) 179	BEREC Report on the outcome of the public consultation on the draft BEREC Report on COVID-19 crisis - lessons learned regarding communication networks and services for a resilient society	9 December 2021

Document number	Description	Date
BoR (21) 174	BEREC Report on the outcome of the public consultation on the draft BEREC Work Programme 2022	9 December 2021
BoR (21) 180	BEREC Report on COVID-19 crisis - lessons learned regarding communication networks and services for a resilient society	9 December 2021
BoR (21) 161	BEREC Report Regulatory Accounting in Practice 2021	9 December 2021
BoR (21) 163	Summary report on BEREC Workshop on “NRA experiences with 5G”, 23 September 2021	9 December 2021
BoR (21) 158	9th BEREC Report on transparency and comparability of international roaming tariffs	9 December 2021
BoR (21) 160	Report on the diversification of the 5G ecosystem	9 December 2021
BoR (21) 159	Report on termination rates at the European level – 30 June 2021	9 December 2021
BoR (21) 164	Summary report on expert workshop on “How BEREC can best promote science-based EMF exposure limits recommended by experts”	9 December 2021

C. BEREC public consultations

Document number	Description	Date
BoR (21) 49	Notice for the launch of the public consultation on BEREC Draft Report on harmonised definitions for indicators regarding OTT services, relevant to electronic communications markets	16 March 2021
BoR (21) 53	Notice for the launch of public consultation for the draft BEREC Report on the handling of third-party payment charges on mobile phone bills	16 March 2021
BoR (21) 50	Notice for the launch of the public consultation on the draft BEREC Report on the ex-ante regulation of digital gatekeepers	16 March 2021
BoR (21) 98	Notice for the launch of the call for input for preparation of the BEREC Opinion on the General Authorisation regime	14 June 2021
BoR (21) 99	Notice for the launch of the public consultation on the draft BEREC Report on COVID-19 crisis – lessons learned regarding communications networks and services for a resilient society	14 June 2021
BoR (21) 148	Notice for the launch of the public consultation on the draft BEREC Report on the regulatory treatment for fixed and mobile backhaul	4 October 2021
BoR (21) 150	Notice for the launch of the public consultation on the BEREC Work Programme 2022	6 October 2021
BoR (21) 149	Call for stakeholder input to feed into the incorporation of the ECJ judgments on the Open Internet Regulation in the BEREC Guidelines	6 October 2021
BoR (21) 189	Notice for the launch of the public consultation on the draft BEREC Report on a consistent approach to migration and copper switch- off	15 December 2021
BoR (21) 187	Notice for the launch of the public consultation on the Draft Update to the BEREC Net Neutrality Regulatory Assessment Methodology	15 December 2021

D. Strategies, annual work programme and annual reports

Document number	Description	Date
BoR (21) 01	Outline for BEREC Work Programme 2022	27 January 2021
BoR (21) 134	BEREC's Internal Medium-Term Strategy for International Cooperation 2022-2025	30 September 2021
BoR (21) 136	BEREC's Internal Medium-Term Strategy for relations with other institutions 2022-2025	30 September 2021
BoR (21) 133	Draft BEREC Work Programme 2022	30 September 2021
BoR (21) 137	BEREC's Medium Term Strategy for relations with other institutions 2022-2025	30 September 2021
BoR (21) 135	BEREC's Medium-Term Strategy for international cooperation for the period 2022-2025	30 September 2021
BoR (21) 175	BEREC Work Programme 2022	9 December 2021

E. Regulatory best practices (Common approaches/positions, Guidelines, Methodologies)

Document number	Description	Date
BoR (21) 32	BEREC Guidelines on Geographical surveys of network deployments. Article 22 (2), 22 (3) and 22 (4)	11 March 2021
BoR (21) 82	BEREC Guidelines on Geographical surveys of network deployments: verification of information	10 June 2021
BoR (21) 104	Handbook of BEREC Guidelines on Geographical surveys of network deployments	15 June 2021
BoR (21) 165	Draft BEREC Net Neutrality Regulatory Assessment Methodology	9 December 2021

F. Other documents

Document number	Description	Date
BoR (21) 24	BERECNET+ Governance Paper	11 March 2021
BoR (21) 73	BEREC Scoping and Discussion document on updating the Net Neutrality Regulatory Assessment Methodology	10 June 2021
BoR (21) 93	BEREC proposal on the set-up of an Advisory Board in the context of the Digital Markets Act	10 June 2021
BoR (21) 94	BEREC proposal on remedies-tailoring and structured participation processes for stakeholders in the context of the Digital Markets Act	10 June 2021
BoR (21) 132	Preliminary results on the effect of electronic communications on the environment: actions and impacts (WIK-Consult GmbH and Ramboll Management Consulting)	30 September 2021
BoR (21) 144	BEREC input on weighted average of maximum mobile termination rates	8 October 2021
BoR (21) 176	PRDs for 2022	9 December 2021

Annex 8 Board of Regulators electronic voting procedures

No.	Subject	Comments round Date/link to documents	Voting round Date/link to documents
1.	Outline BEREC Work Programme 2022	14 January 2021	25 January 2021
2.	5G Cybersecurity Project Requirement Documents	20 January 2021	29 January 2021
3.	BEREC Opinion on the draft Procedural Recommendation	29 January 2021	8 February 2021
4.	BEREC Opinion on the proposal for amending the Roaming Regulation	22 April 2021	27 April 2021
5.	BEREC Opinion on the NIS2 review	29 April 2021	12 May 2021
6.	BEREC Opinion on Phase II Case IE/2021/2332-2333	9 August 2021	13 August 2021
7.	BEREC input on weighted average of maximum Mobile Termination Rates	30 September 2021	7 October 2021

No.	Subject	Comments round Date/link to documents	Voting round Date/link to documents
8.	BEREC Opinion on Phase II Case DK/2021/2346	23 December 2021	30 December 2021

Annex 9 BEREC Members and Observers of the Board of Regulators by end 2021

List of the members and observers of the Board of Regulators established pursuant to Article 7(1) of Regulation (EU) 2018/1971 of the European Parliament and of the Council of 11 December 2018 establishing the Body of European Regulators for Electronic Communications (BEREC) and the Agency for Support for BEREC (BEREC Office)

No	Country (if applicable)	Title	Name(s)	Surname(s)	Name of organisation	Member or observer
1.	Albania	Mr	Tomi	**Frasheri**	Electronic and Postal Communications Authority of Albania, AKEP	Observer
2.	Austria	Mr	Klaus	**Steinmaurer**	Austrian Regulatory Authority for Broadcasting and Telecommunications (RTR-GmbH)	Member
3.	Belgium	Mr	Michel	**Van Bellinghen**	Institut Belge des Postes et Télécommunications (IBPT / BIPT)	Member
4.	Bulgaria	Mr	Ivan	**Dimitrov**	Communications Regulation Commission (CRC)	Member
5.	Croatia	Mr	Tonko	**Obuljen**	Croatian Regulatory Authority for Network Industries (HAKOM)	Member
6.	Cyprus	Mr	George	**Michaelides**	Office of the Commissioner of Telecommunications and Postal Regulation (OCECPR)	Member
7.	Czechia	Ms	Hana	**Továrková**	Czech Telecommunication Office (CTU)	Member
8.	Denmark	Mrs	Katrine	**Windning**	Danish Business Authority (DBA)	Member
9.	Estonia	Mr	Kaur	**Kajak**	Estonian Technical Regulatory Authority (ETRA)	Member

No	Country (if applicable)	Title	Name(s)	Surname(s)	Name of organisation	Member or observer
10.	Finland	Ms	Kirsi	**Karlamaa**	Finnish Communications Regulatory Authority (FICORA)	Member
11.	North Macedonia	Mr	Jeton	**Akiku**	Agency for Electronic Communications (AEC)	Observer
12.	France	Mr	Emmanuel	**Gabla**	Autorité de régulation des communications électroniques, des postes et de la distribution de la presse (ARCEP)	Member
13.	Germany	Mr	Wilhelm	**Eschweiler**	Federal Network Agency (BNetzA)	Member
14.	Greece	Mr	Konstantinos	**Masselos**	Hellenic Telecommunications and Post Commission (EETT)	Member
15.	Hungary	Mrs	Monika	**Karas**	National Media and Infocommunications Authority (NMHH)	Member
16.	Iceland	Mr	Hrafnkell	**Gislason**	Post and Telecom Administration (PTA)	Observer
17.	Ireland	Mr	Robert	**Mourik**	Commission for Communications Regulation (COMREG)	Member
18.	Italy	Mr	Giacomo	**Lasorella**	Autorità per le Garanzie nelle Comunicazioni (AGCOM)	Member
19.	Kosovo	Mr	Ilir	**Imeri**	Regulatory Authority of Electronic and Postal Communications (ARKEP)	Observer
20.	Latvia	Ms	Alda	**Ozola**	Public Utilities Commission (SPRK)	Member
21.	Liechtenstein	Mr	Rainer	**Schnepfleitner**	Office for Communications / Amt für Kommunikation (AK)	Observer

No	Country (if applicable)	Title	Name(s)	Surname(s)	Name of organisation	Member or observer
22.	Lithuania	Mr	Feliksas	**Dobrovolskis**	Communications Regulatory Authority (RRT)	Member
23.	Luxembourg	Mr	Luc	**Tapella**	Institut Luxembourgeois de Régulation (ILR)	Member
24.	Malta	Mr	Jesmond	**Bugeja**	Malta Communications Authority (MCA)	Member
25.	Montenegro	Mr	Branko	**Kovijanic**	Montenegro Agency for Electronic Communications and Postal Services (EKIP)	Observer
26.	Norway	Mr	Pål Wien	**Espen**	Norwegian Communications Authority Nkom	Observer
27.	Poland	Mr	Jacek	**Oko**	Office of Electronic Communications (UKE)	Member
28.	Portugal	Mr	Joao Antonio	**Cadete de Matos**	Autoridade Nacional de Comunicações (ANACOM)	Member
29.	Romania	Mr	Vlad	**Stoica**	National Authority for Management and Regulation in Communications (ANCOM)	Member
30.	Serbia	Mr	Dragan	**Pejovic**	Regulatory Agency for Electronic Communications and Postal Services (RATEL)	Observer
31.	Slovak Republic	Mr	Ivan	**Martak**	Regulatory Authority for Electronic Communications and Postal Services (RÚ)	Member
32.	Slovenia	Mrs	Tanja	**Muha**	Agency for Communication Networks and Services of the Republic of Slovenia (AKOS)	Member

No	Country (if applicable)	Title	Name(s)	Surname(s)	Name of organisation	Member or observer
33.	Spain	Ms	Alejandra	**Iturriaga de Gandini**	Comisión Nacional de los Mercados y la Competencia **(**CNMC)	Member
34.	Sweden	Mr	Dan	**Sjöblom**	National Post and Telecommunications Agency (PTS)	Member
35.	The Netherlands	Mrs	Annemarie	**Sipkes**	Authority for Consumers and Markets (ACM)	Member
36.	Turkey	Mr	Ömer Abdullah	**Karagözoğlu**	Information and Communication Technologies Authority (ICTA)	Observer
37.		Mr	Roberto	**Viola**	European Commission	Observer
38.		Ms	Jonina Sigrun	**Larusdottir**	European Free Trade Association (EFTA) Surveillance Authority (ESA)	Observer

Riga, 24 November 2021
BEREC Office

Annex 10 List of acronyms

ANO: Alternative Network Operator

ARRPU: Average Retail (mobile) Revenue per User

BCRD: Broadband Cost Reduction Directive

BEREC: Body of European Regulators for Electronic Communications

BEUC: European Consumer Organisation

BoR: Board of Regulators

BU-LRIC: Bottom Up Long Run Incremental Cost

CAPM: Capital Asset Pricing Model

CRTC: Canadian Radio-television and Telecommunication Commission

DESI: Digital Economy and Society Index

DMA: Digital Markets Act

DOCSIS: Data Over Cable Service Interface Specification

EaPeReg: Eastern Partnership Electronic Communications Regulators Network

ECS: Electronic Communications Service(s)/Sector

EEA: European Economic Area

EECC: European Electronic Communications Code

EITO: European IT Observatory

EMERG: Euro-Mediterranean Regulators Group

ENISA: European Union Agency for Network and Information Security

ERP: Equity Risk Premium

ERGA: European Regulators Group for Audiovisual Media Services

ERGP: European Regulators Group for Postal Services

EU: European Union

FCC: Federal Communications Commission (United States of America)

FDC: Fully-Distributed Costs

FTR: Fixed Termination Rate

FTTC: Fibre-To-The-Cabinet

FTTH: Fibre-To-The-Home

FTTP: Fibre-To-The-Premises

HICP: Harmonised Index of Consumer Prices

HSPA: high speed packet access

IoT: Internet of Things

IPv6: Internet Protocol version 6

ITRE: European Parliamentary Committee on Industry, Research and Energy

ITU: International Telecommunications Union

LLU: Local Loop Unbundling

LRAIC: Long-Run (Average) Incremental Costs

LRIC: Long-Run Incremental Costs

LTE: Long-Term Evolution

L2 WAP - Layer 2 wholesale access product

M&A: Mergers and Acquisitions

MNO: Mobile Network Operator

MoU: Memorandum of Understanding

MTR: Mobile Termination Rate

MVNO: Mobile Virtual Network Operator

NCA: National Competition Authority

NGA: Next Generation Access

NIS: Network and Information Systems

NRA: National Regulatory Authority

NTP: Network Termination Point

OCA: Other Competent Authority

OTT: Over The Top (service/operator)

REGULATEL: Latin American Forum of Telecommunications Regulators

RFR: Risk Free Rate

RLAH: Roam Like At Home

RSPG: Radio Spectrum Policy Group

SMP: Significant Market Power

SMS: Short Message Service

TR: Termination Rate

TRAI: Telecom Regulatory Authority of India

ULL: Unbundled Local Loop

VDSL: Very-High-Bit-Rate Digital Subscriber Line

VHCN: Very High Capacity Network

VULA: Virtual Unbundled Local Access

WACC: Weighted Average Cost of Capital