

BEREC supplementary analysis on wholesale roaming costs

September 2019

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Executive Summary

The European Commission (EC) is set to publish a review of the Roaming Regulation after having consulted the Body of European Regulators for Electronic Communications (BEREC) by the end of 2019¹. BEREC has already in June 2019 provided input based on information collected from national regulatory authorities (NRAs) and operators (MNOs and MVNOs/resellers) for the elements that are laid down in Article 19 (3) of the Roaming Regulation apart from item (g), for which additional input from the EC/Axon cost study was required. In the BEREC Opinion submitted in June 2019, BEREC recognized that the overall objective of the RLAH regulation has been a success and suggested a series of issues that the EC could consider in any future review of the Roaming Regulation as BEREC does not expect that the competitive conditions in the roaming market will change in the near future in a way that a regulatory intervention is not required any more.

Herewith, BEREC provides additional input on an aspect not covered in the published opinion²: the supplementary analysis regarding the relation between wholesale prices and costs. For this analysis, BEREC used the output of the cost study that Axon conducted on behalf of the EC.

The results of this analysis show that for voice roaming services, the maximum unit costs for voice roaming services are 40 % lower than the price cap imposed and the minimum unit costs are 60 % lower than the cap of the first half of 2022. The analysis also shows that, in nearly two thirds of the countries, the total wholesale rates applied for Q1-Q3 2018 for voice roaming service are higher than the maximum unit costs calculated.

The results for SMS roaming services are even more compelling. The maximum and minimum costs for SMS are 70% lower than the SMS wholesale cap imposed. In addition, it can be concluded that in almost all cases, the wholesale rates applied for SMS are significantly above the unit cost calculated.

Furthermore, BEREC determines that the maximum unit costs for data roaming services for 2022 are 25% lower than the caps and the minimum unit costs are 50% lower than the caps. Comparing the costs with wholesale rates, it can be concluded that in less than one third of the countries the wholesale rates applied in the first three quarters of 2018 for total traffic do not diverge significantly from the unit cost calculated. In twelve countries the total rate applied is higher than the unit costs, while in seven countries the opposite holds true.

BEREC advises the EC to consider the results of this analysis together with the findings in the BEREC opinion published in June 2019. One of the proposed measures in this opinion was to further reduce the wholesale caps, in order to increase the competitive strength for MVNOs in the years to come. The results of this supplementary analysis show that there is some room for further reduction of the wholesale caps, while still guaranteeing that operators

¹ Regulation (EU) 531/2012 of the European Parliament and of the Council of 13 June 2012 on roaming on public mobile communications network within the Union.

² https://berec.europa.eu/eng/document_register/subject_matter/berec/opinions/8595-berec-opinion-on-the-functioning-of-the-roaming-market-as-input-to-ec-evaluation

are able to recover their efficiently occurred costs for providing wholesale roaming services, and at the same time still leaving room for negotiating prices below the wholesale caps.

Last but not least, BEREC would like to note that there is some uncertainty regarding the wholesale costs for the last period of the estimates in the cost model, as the Axon cost model has not modelled costs for 5G. In addition, as also noted in the BEREC Opinion published in June, it is too early to draw strong conclusions regarding 5G and potential changes required in the regulation, but BEREC suggests closely monitoring the market and follow up this assessment, especially with regard to the question if new regulatory approaches are required and whether different charging mechanisms would better suit the peculiarities of M2M and IoT. Because of the successful implementation of the regulation, the roaming rules should remain in their current shape/structure until a new assessment, taking into account future market developments, is done.

1. Introduction

In its letter from 1 October 2018, the EC requested BEREC to provide its input for the review of the roaming rules until 19 June 2019. This input is supposed to cover the lists of elements that are laid down in Article 19 (3) of the Roaming Regulation as well as serve as an input to amending the CIR. On 19 June 2019, BEREC provided, as requested, its opinion on the functioning of the Roaming market³, but purposely did not include an analysis of the wholesale roaming costs in light of the ongoing work of the roaming wholesale cost study commissioned by the EC. Therefore, BEREC is now providing its supplementary analysis of the roaming wholesale costs. The basic input for the analysis regarding the ability of visited network operators to recover the efficiently incurred costs of providing regulated wholesale roaming services as well as the relationship between wholesale costs and charges stems from a study commissioned by the EC to Axon Consultants which was published on 24 July 2019.⁴

The Regulation (EU) 531/2012 of the European Parliament and of the Council of 13 June 2012 on roaming on public mobile communications network within the Union amended by the Regulation 2017/920 of the European Parliament and the Council of 17 May 2017⁵ (hereinafter Roaming Regulation) requires the EC to review the effects of RLAH by December 2019 and, if appropriate, make legislative proposals to amend the maximum wholesale charges for regulated roaming services. Under the review required by the Roaming Regulation, the EC shall, inter alia, assess the ability of visited network operators to recover the efficiently incurred costs of providing regulated wholesale roaming services. Against this background, during the first quarter of 2018, the EC selected Axon Partners Group Consulting (Axon) to develop a cost model to estimate the costs of providing mobile services in the EU. BEREC was asked to form a steering committee to give advice during this process. The objective of the Axon study was to build on the experience of the previous review of the Roaming Regulation and further develop a bottom-up cost model to estimate the efficiently incurred costs of providing wholesale roaming services (including voice origination, SMS and data roaming services) and mobile voice call termination services by mobile network operators in the EEA. The study is expected to contribute to the EC's decision whether to make legislative proposals to amend the maximum wholesale charges for regulated roaming services.

In the context of the Axon study, the EC and Axon invited all interested stakeholders (NRAs and operators) shortly after the launch of the project to participate in a technical Workshop that took place on 10 April 2018. During this workshop, Axon explained their ideas about developing the cost model and sought to gather stakeholders' views. During the end of Q2 2018, the EC and Axon ran a data gathering exercise to populate the cost model. On 29 October 2018, the EC launched its first public consultation on the wholesale roaming and mobile termination cost model. Taking into account the comments and data provided by the

³ BoR (19) 101

⁴ <https://ec.europa.eu/digital-single-market/en/news/finalisation-mobile-cost-model-roaming-and-delegated-act-single-eu-wide-mobile-voice-call>

⁵ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R0920&from=de>

stakeholders (NRAs and operators) as a reply to the first public consultation, Axon updated the cost model and initiated a second public consultation on 18 February 2019. A final technical workshop took place on 28 May 2019 during which the EC and Axon provided an overview of the process and presented the way forward based on the feedback provided by the stakeholders as well as the final results of the cost model. The final output of the cost study was published on 24 July 2019⁶.

During the two consultations, the EC and Axon received comments from stakeholders on some of the proposed modelling approaches and parameters used. In addition, some NRAs, based on the information received during the preparation of the Axon cost model, raised some concerns. It seems that the EC/Axon model has some limitations in the methodology used, for example, to estimate the values of cell radii per country. In addition, it was noted that the model results in fluctuations and reductions in number of sites which should not be expected taking into account the increased future mobile data demand. In some countries, it was also considered that the number of sites and the total cost base calculated by the model are not representative of the size of the modelled efficient operator. For the last issue, a variety of parameters might be involved (e.g. equipment unit cost, equipment lifetime, network parameters used). Finally, it could be noted that the unit cost of some modelled services for some countries under some scenarios exhibits unreasonable fluctuations. Despite the above mentioned limitations as well as the fact that the results of the cost study for some countries may not fully reflect national specificities (due to some limitations in the data provided by NRAs/operators), BEREC considers that the cost model provides a range of reliable results to be used for its supplementary analysis

Axon has incorporated a number of alternatives for a series of parameters/methodological approaches in the model and published the output for all possible combinations of parameters/methodological approaches so as to provide decision makers with a range of unit costs for each modelled service (72 scenarios and 8,928 cost results per year).

In addition to the EC/Axon study, the supplementary analysis further draws on data collected by BEREC in the context of preparing its biannual International Roaming data reports, in particular the International Roaming BEREC Benchmark Data Reports for the periods (i) April 2017 – September 2017⁷, (ii) October 2017 – March 2018⁸, and (iii) April 2018 – September 2018⁹.

⁶ Please note that the model does not calculate unit costs for Luxembourg, Iceland and Liechtenstein because the NRAs/operators of these three countries did not provide the required data.

⁷ BoR (18) 31

⁸ BoR (18) 160

⁹ BoR (19) 21

2. Background and methodology

In this chapter, BEREC presents the outcome of the EC/Axon study for voice, SMS and data roaming services unit costs for the period 2017-2025¹⁰. As it has been noted above, the Axon study does not provide one single result for each type of service, country and year, but 72 scenarios. To illustrate, for roaming voice service in Austria for the year 2020, the model calculates 72 different unit costs depending on the combination of parameters and methodological approaches under which the model is run. BEREC does not present the complete set of results, but instead shows the range of results by using the minimum, and maximum unit costs.

For the comparison of the calculated costs with the wholesale price caps, it is however important to not consider only Axon results, but also take into account the additional costs that the visited network has to bear. A detailed description of traffic and financial flows can be found in the Annex I of this document. BEREC notes in the conclusion that apart from the unit costs derived from the Axon cost study which models the network costs of an efficient wholesale operator, the following costs need to be added in order to allow the visited network operator to recover its costs (network costs + outpayments) for providing the wholesale roaming service:

- an estimate of transit charges paid (for voice and data roaming services¹¹) and
- termination costs for voice roaming services.

BEREC compares these results with the price caps set out in the Roaming Regulation and the reported actual charges operators apply for all roaming services (separately for unbalanced traffic¹² and for total traffic).

2.1. Description of the methodology used

BEREC employed two methodologies for deriving the minimum/maximum data depicted in the graphs described below. An advantage of using two different ways to present the ranges is that this also provides a good way to check whether there are differences in the results.

1. Methodology: Graphs showing minimum and maximum values: BEREC identified the minimum/maximum unit costs of all scenarios per country, year and service (see Annex II showing the results for all countries). Using this methodology, a different scenario of the bottom-up cost model for each year/country/service results is used in the cited minimum/maximum unit costs (e.g. for Greece regarding data roaming service in 2019, the minimum unit cost used is from scenario 38, while for Spain the minimum unit cost used is from scenario 50). For each graph included in chapters 3 to 5 showing the

¹⁰ The model calculates unit cost for years 2015-2025. The graphs of the supplementary analysis present the unit costs only from 2017.

¹¹ BEREC has indications that there are no transit costs for roaming SMS services.

¹² For SMS, BEREC does not compare the costs with unbalanced wholesale rates, as there are not enough reliable data available.

unit cost evolution, BEREC only presents the country with the lowest and highest values (separately for the maximum and minimum values) for each service as well as the average of all modelled countries (separately for the maximum and minimum values). The complete list of values per country can be found in the tables in Annex II. BEREC defined the country with the highest and lowest value based on the highest and lowest unit cost in the year 2025.

2. Methodology: Graphs showing minimum and maximum scenarios: In this methodology BEREC identified a set of parameters/methodological approaches (i.e. a scenario) with the maximum/minimum unit costs on average for all countries. In order to do this, BEREC calculated the average unit costs of each roaming service for all countries and for the years 2021-2025 per scenario, and then identified which scenario yields the minimum and maximum average unit cost per service. In contrast to the values of the methodology described above, this methodology used one scenario of the bottom-up model per roaming service for all countries and for the whole period. BEREC presents the country with the lowest and highest values (separately for the maximum and minimum scenarios) for each service as well as the average of all modelled countries (separately for the maximum and minimum scenarios). The results for all countries are provided in Annex II of this document. In addition, a table showing the parameters/methodological approaches under each scenario are presented in Annex II.

BEREC employed both methodologies for this supplementary analysis and notes that the results from both methodologies for all services do not diverge significantly for the years 2021-2025.

3. Roaming voice services

This chapter shows the results of the analysis for voice roaming services. As described above and in more detail in Annex III, the costs shown are the sum of:

- a) the origination costs,
- b) an estimate of EU weighted average of termination rates¹³ and
- c) an estimate of transit charges paid.

Regarding point a) the results of the Axon costs models are used.

Regarding point b), as previously described in the methodology chapter, it is necessary to take into account the termination rate (because in most cases outgoing roaming voice calls are routed by the visited network for efficiency reasons, see service description in Annex I) in addition to the origination costs. A call could either terminate in a mobile or fixed network and the visited network operator needs to pay the termination rate for this service, which it should be able to recover from the wholesale cap. For reasons of simplicity, BEREC uses only estimates for mobile termination rates in its analysis, as fixed termination rates are

¹³ For years 2022-2025 an estimate of the Euro rate is used.

much lower than mobile termination rates: the results are therefore an upper estimate. The mobile termination rates are estimated as follows (for further details, please see Table M in Annex II):

- *Years 2017-2021 (period preceding the applicability of the single European termination rate):* The data used for 2017-2018 are from the biannually published BEREC reports on the termination rates at the European level¹⁴. In the context of the data collection on termination rates, some NRAs also report on forecasted mobile termination rates until mid-2021. BEREC for this purpose calculated the weighted average based on the forecasts. Where forecasts are not available, BEREC worked under the assumptions that the mobile termination rate will not change until the single termination rate becomes applicable (see Table M in Annex II).
- *Years 2022-2025 (period in which the single European termination rate is applicable):* For 2022-2025, BEREC adopted a conservative approach taking into account that cost recovery needs to be ensured for all operators. Therefore, the mobile termination unit cost of the country with the highest unit cost from the Axon model was used. Different estimates were made for the minimum/maximum values-scenarios according to the methodology described above¹⁵.

Regarding point c), BEREC used data collected by the EC from stakeholders regarding transit charges paid. Based on this input, the EC estimated the transit charges paid to range between 0.4 - 0.6 €cent/min¹⁶ for roaming voice services. The EC concluded that a declining trend for transit charges is expected for the coming years, but did not present an estimate of the level of this decline. The calculations therefore followed a conservative approach by adopting an average of the range (0.5 €Cent/min) for all years.

¹⁴ https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/8600-berec-report-on-the-termination-rates-at-the-european-level

¹⁵ Regarding the methodology for the scenarios, the same scenario used for the voice roaming service is used for mobile termination unit cost estimate

¹⁶ In the excel file in which the EC presents the results a value of 0.5 €cent/min is used for voice transit. BEREC uses this in its graphs

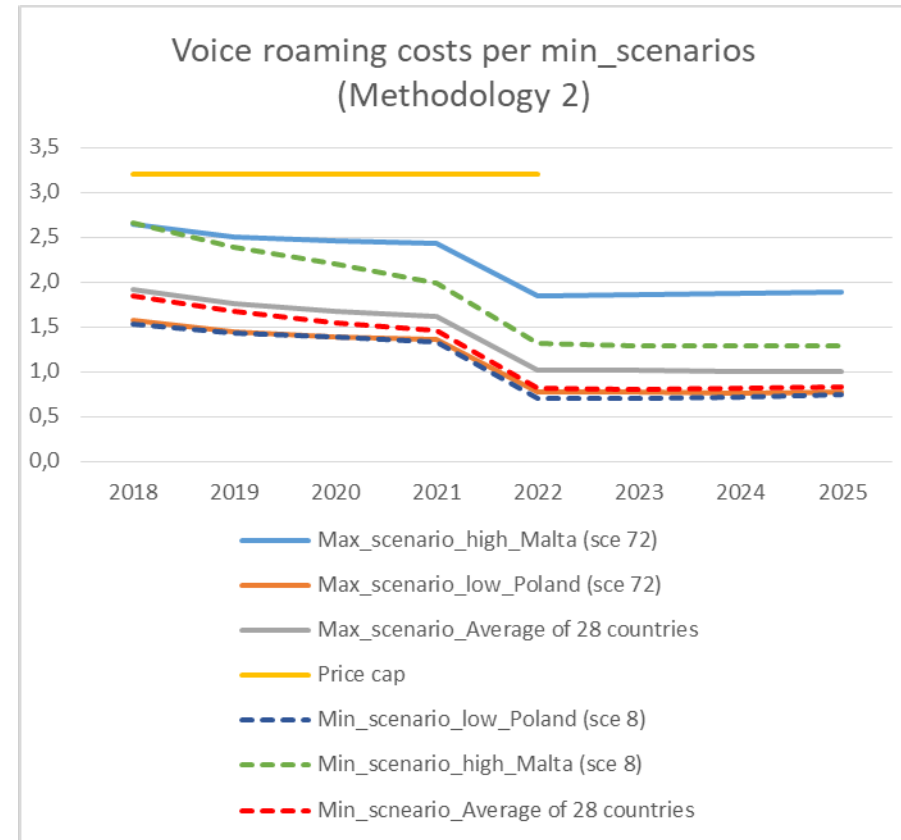
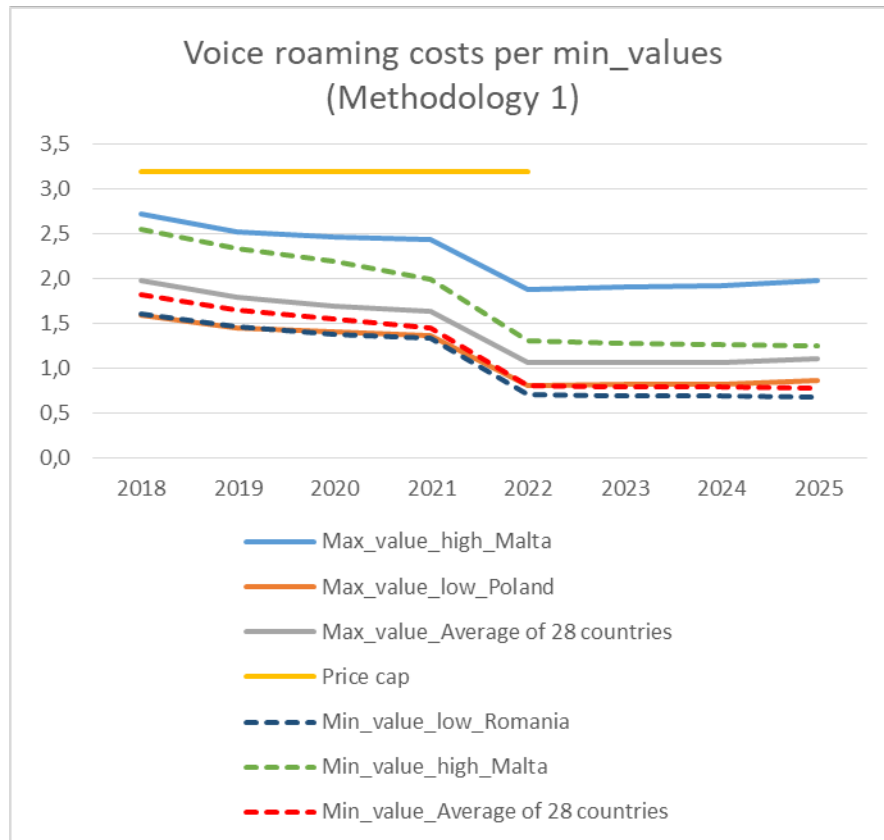


Figure 1 – Unit cost evolution for roaming voice service per min (in €Cent/min). The unit cost consists of: (a) an estimation of wholesale costs according to Axon's cost model, (b) an estimate of transit payments and (c) an estimation of mobile termination rate

Figure 1 presents the cost evolution for roaming voice service based methodology 1 (left graph) and methodology 2 (right graph). Besides the minimum and maximum results for the different methodologies, also the average of the 28 countries and the applicable price cap are shown in the figure. For both methodologies, it can be stated that for the whole period analysed the country with the highest costs are well below the wholesale cap of 3.2 €Cent.

The detailed data for all countries are included in Tables A - D of Annex II.

Figure 2 and Figure 3 show the comparison of unit costs¹⁷ (minimum and maximum with data derived according to Methodology 1), wholesale rates applied (unbalanced and total) and the price cap imposed for roaming voice service for the second half of 2017 and for the full year of 2018, i.e. the RLAH period. In these figures, the average unit cost of the 28 countries¹⁸ is calculated as the simple average of unit costs per country (seperately for minimum and maximum costs).

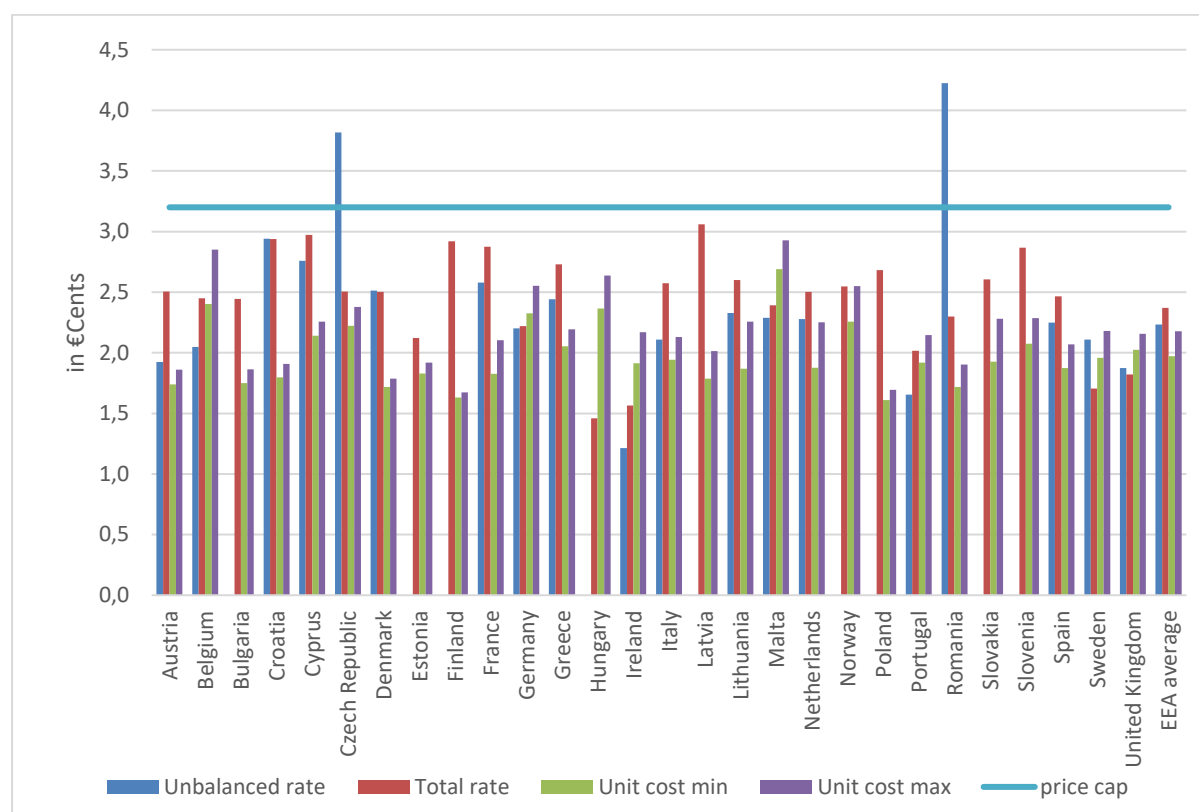


Figure 2 – Roaming voice – comparison for H2 2017 – Methodology 1

¹⁷ The unit cost consists of: (a) an estimation of wholesale costs according to Axon's cost model, (b) an estimate of transit payments and (c) an estimation of mobile termination rate

¹⁸ The countries for which Axon prepared a country specific model are taken into consideration in the average unit cost calculation.

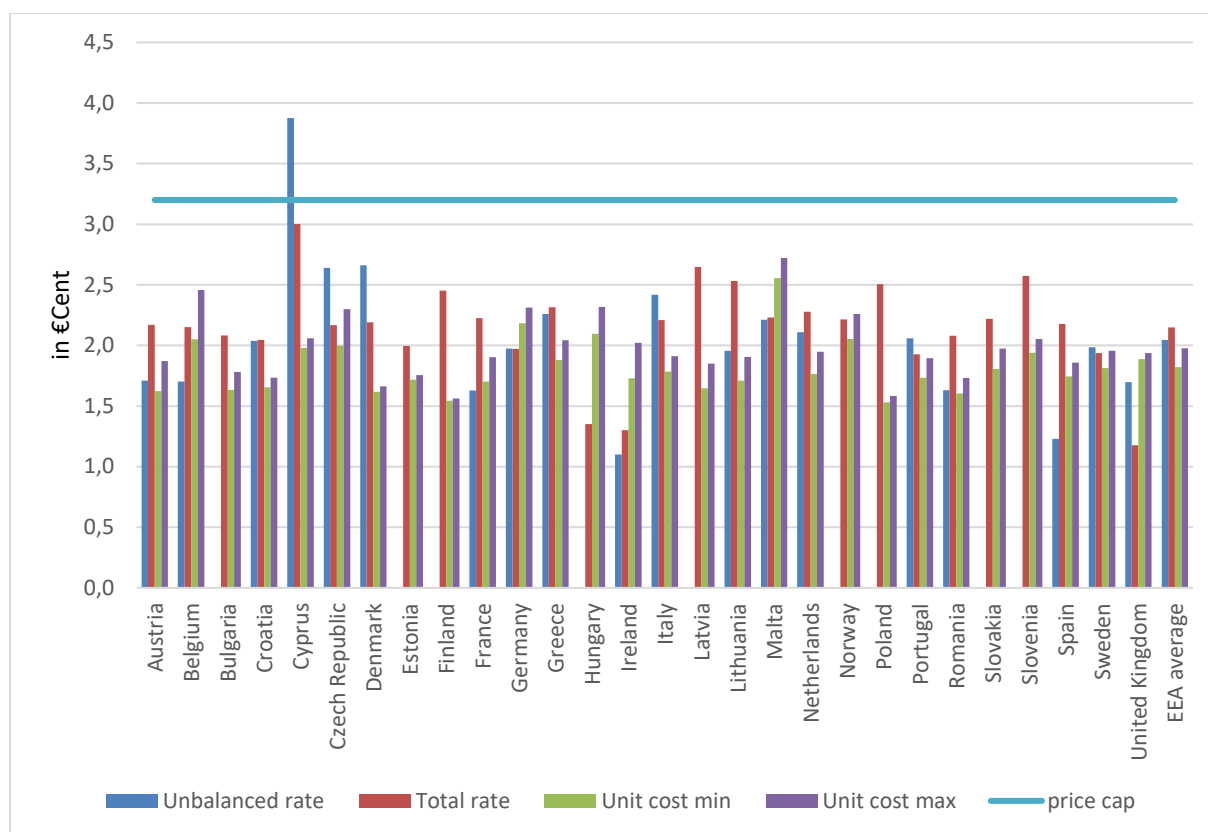


Figure 3 – Roaming voice – comparison for Q1-Q3 2018 – Methodology 1

From the figures above, BEREC concludes that in nearly two thirds of the countries included in the data set, the total wholesale rates applied for Q1-Q3 2018 are higher than the maximum unit costs calculated .

In addition, BEREC's analysis shows that the maximum unit cost calculated for the country with the highest unit cost is 40% lower than the price cap currently imposed for the first half of 2022, while the respective percentage for the minimum unit cost calculated is 60%. For 2021 the respective percentages are 25% and 40%.

For the forecast up to 2025, BEREC notes a slight increase in the unit costs between 2022 and 2025 and even when comparing the maximum costs for the country with the highest costs, the EC/Axon model arrives at costs that are far below the roaming voice price cap applied in the current Roaming Regulation for the first half of 2022.

4. Roaming SMS services

For roaming SMS services, the following costs (see Annex I) need to be taken into account:

- (i) Origination costs, which are the results of the Axon cost models,
- (ii) Costs that allow cost recovery for incoming SMS termination.

Regarding (i) and (ii), in its final estimates the Axon cost model reallocates the costs for wholesale incoming roaming SMS (termination) to the wholesale roaming SMS outgoing service (origination) to ensure the cost recovery according to the current regulatory framework¹⁹ (discussed in further detail in Annex I). Given that incoming roaming SMS are free of charge at retail and wholesale levels, the incremental and non-incremental costs of SMS termination (from incoming SMS) are thereby reallocated to roaming SMS origination service²⁰. Therefore, unit costs for wholesale roaming service from Axon model cover both (i) and (ii).

BEREC applied the same approach to SMS services as for voice services and conducted an analysis for both methodologies, showing a range based on the minimum/maximum values as well as different scenarios.

¹⁹ According to recital 63 of the Roaming Regulation, “the wholesale price limit for regulated roaming SMS should include all costs incurred by the provider of the wholesale service, including, inter alia, origination, transit and the unrecovered cost of termination of roaming SMS messages on the visited network. Wholesale providers of regulated roaming SMS services should therefore be prohibited from introducing a separate charge for the termination of roaming SMS messages on their network, in order to ensure the consistent application of the rules established by this Regulation”.

²⁰ On page 58 of BoR (10) 58, BEREC stated that: “Wholesale costs of incoming SMS services should therefore be accounted for as part of regulated wholesale rates for outgoing roaming SMS services”.

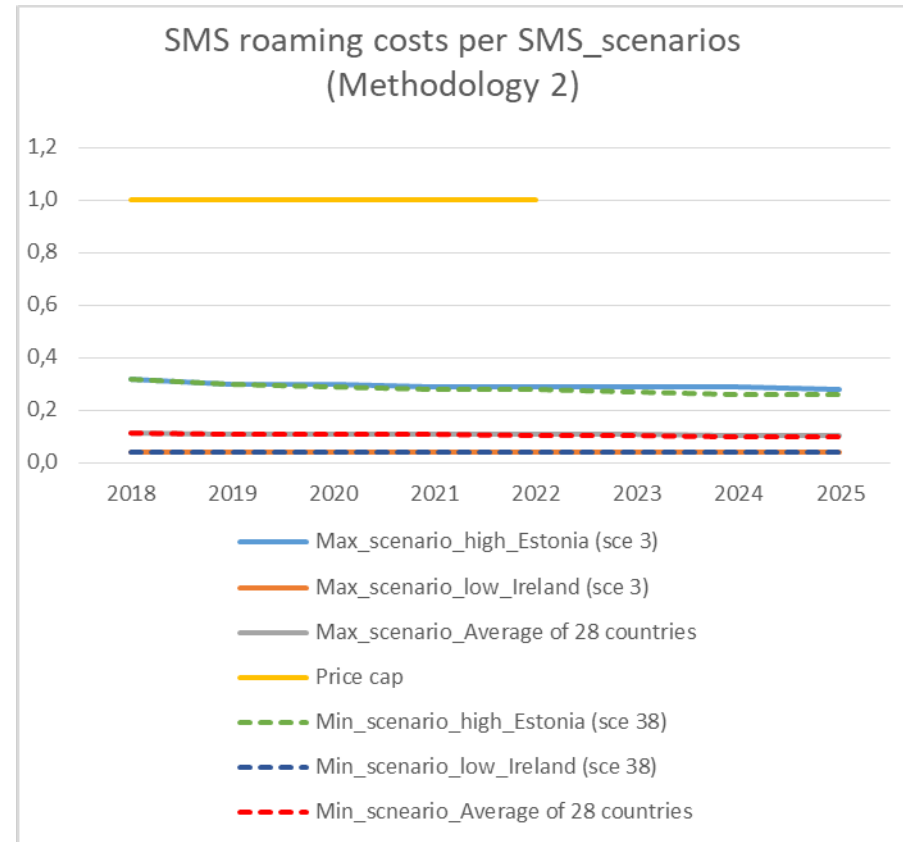
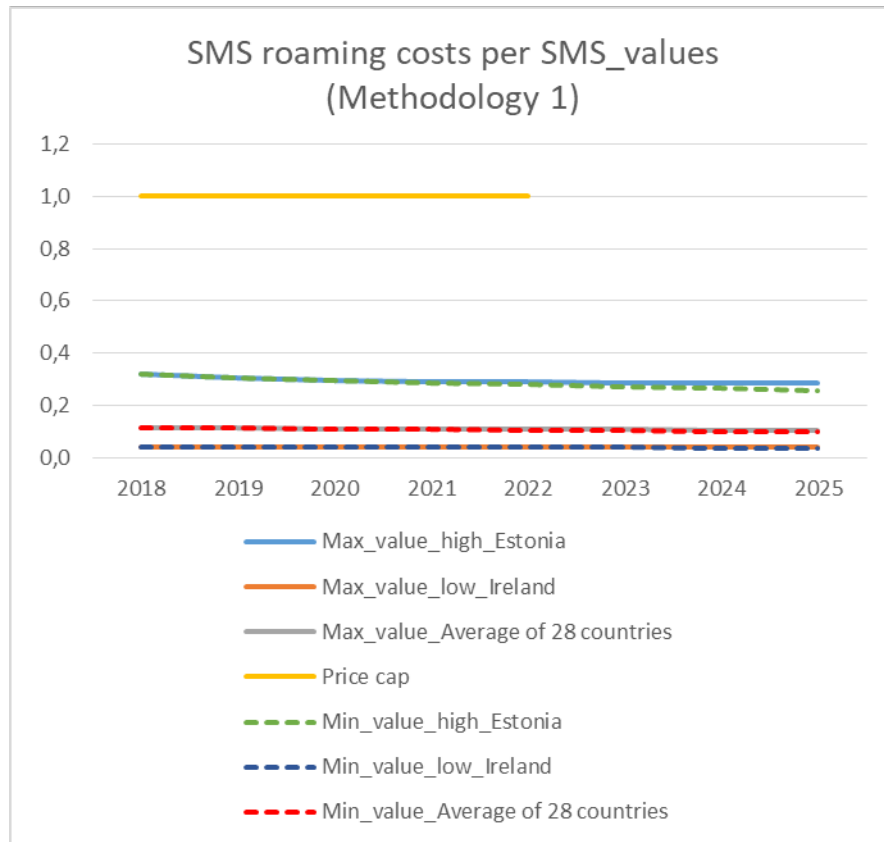


Figure 4 – Unit cost evolution for roaming SMS service (in €Cent per SMS)

Figure 4 presents the unit cost evolution for roaming SMS for both methodologies. The analysis for both methodologies leads to very similar results. Overall, it can be said that the results of the cost estimates for wholesale roaming SMS service are all far below the wholesale cap. The detailed data per country are included in Tables E – H of Annex II.

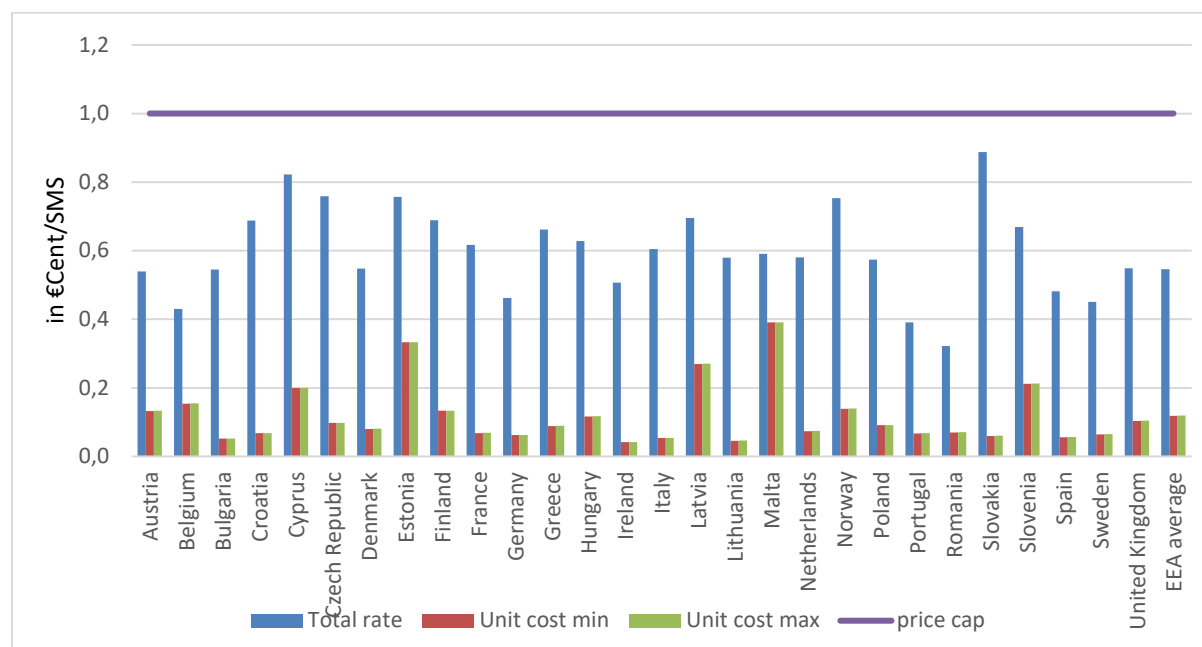


Figure 5 – Roaming SMS – comparison for 2nd half of 2017 – Methodology 1

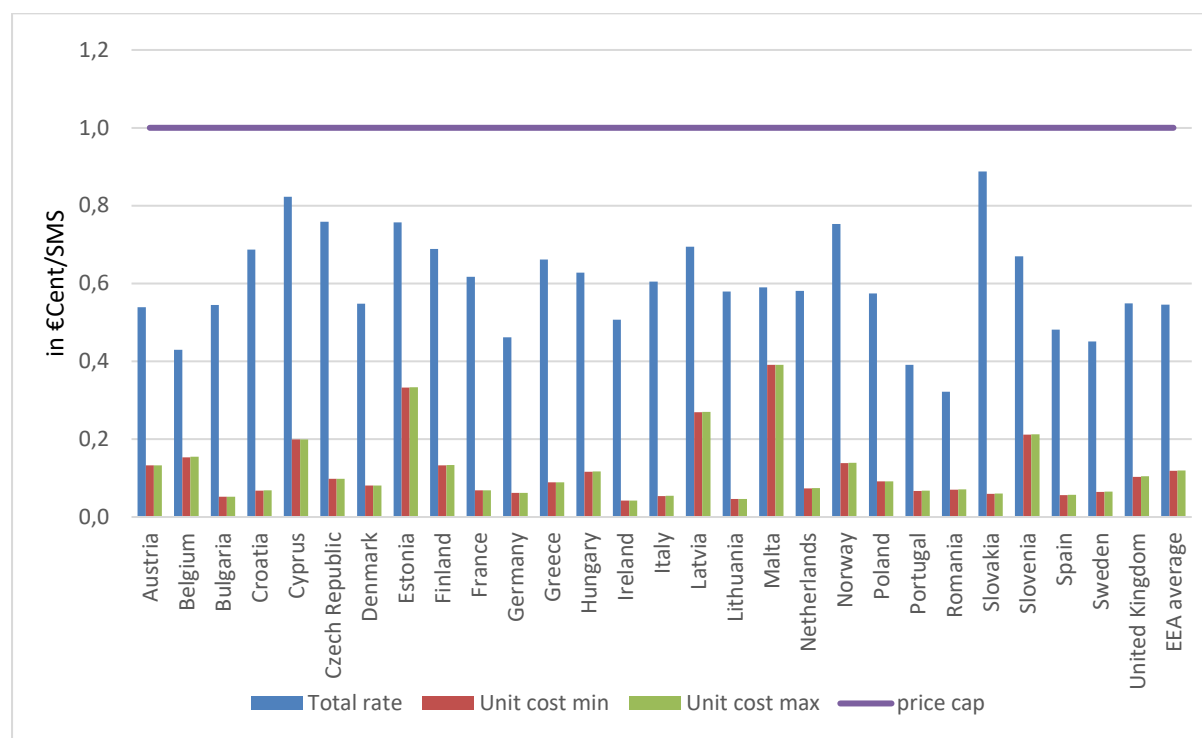


Figure 6 – Roaming SMS – comparison for Q1-Q3 2018 – Methodology 1

Figure 5 and Figure 6 present the comparison of unit cost (minimum and maximum) as calculated with Methodology 1, the wholesale rates applied for the total traffic and the cap imposed for roaming SMS service for the second half of 2017 and the first three quarters of 2018. In these figures, the average unit cost of the 28 countries²¹ is calculated as the simple average of unit costs per country (separately for minimum and maximum).

The above figures lead to the conclusion that in almost all cases, the wholesale rates applied for SMS are significantly above the unit cost calculated and that the price cap imposed for 2021 and 2022 is more than 3 times the maximum unit cost calculated for the country with the highest unit cost and 25 times higher than the maximum unit cost calculated for the country with the lowest unit cost.

5. Roaming data services

For data roaming services, the following costs (see Annex I) are taken into account for the analyses:

- (i) Origination costs
- (ii) Transit costs

With regard to (i), BEREC bases its calculations on the results of the Axon costs models.

With regard to (ii), BEREC draws on the information published by the EC about transit charges paid for data roaming services, which are 0.2 € per GB. The EC forecasts a declining trend for transit charges in the coming years. However, no estimate of the level of this decline is presented. The calculations therefore followed a conservative approach by adopting a unit cost of 0.2 €/GB for the estimable future.

²¹ The countries for which Axon prepared a country specific model are taken into account in the average unit costs.

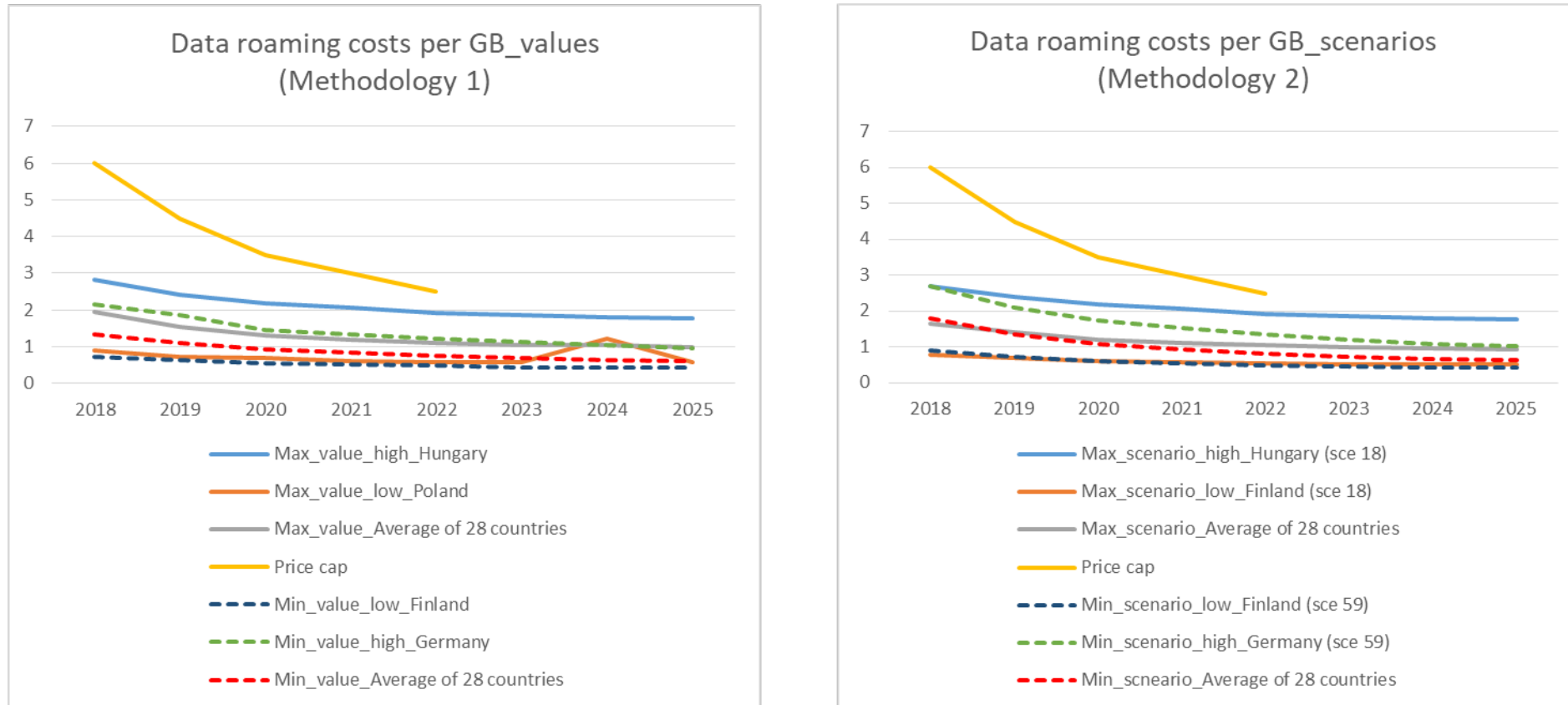


Figure 7 – Unit cost evolution for data roaming services in €/GB – The unit costs include a) origination costs from the Axon cost model and b) transit costs estimation²²

²² The unit cost for Poland calculated according to Methodology 1 exhibits an abnormal fluctuation in 2024. This is due to the fact that this unit cost is calculated taking into account the aggressive scenario for demand forecast. According to Axon cost study the aggressive scenario does not fully reconcile for all EEA countries

Figure 7 presents the unit cost evolution for roaming data service for both methodologies. It can be seen, that for both methodologies for the years until 2022 the wholesale roaming costs for data roaming services are well below the imposed caps. The detailed data for all countries are included in Tables I – L of Annex II.

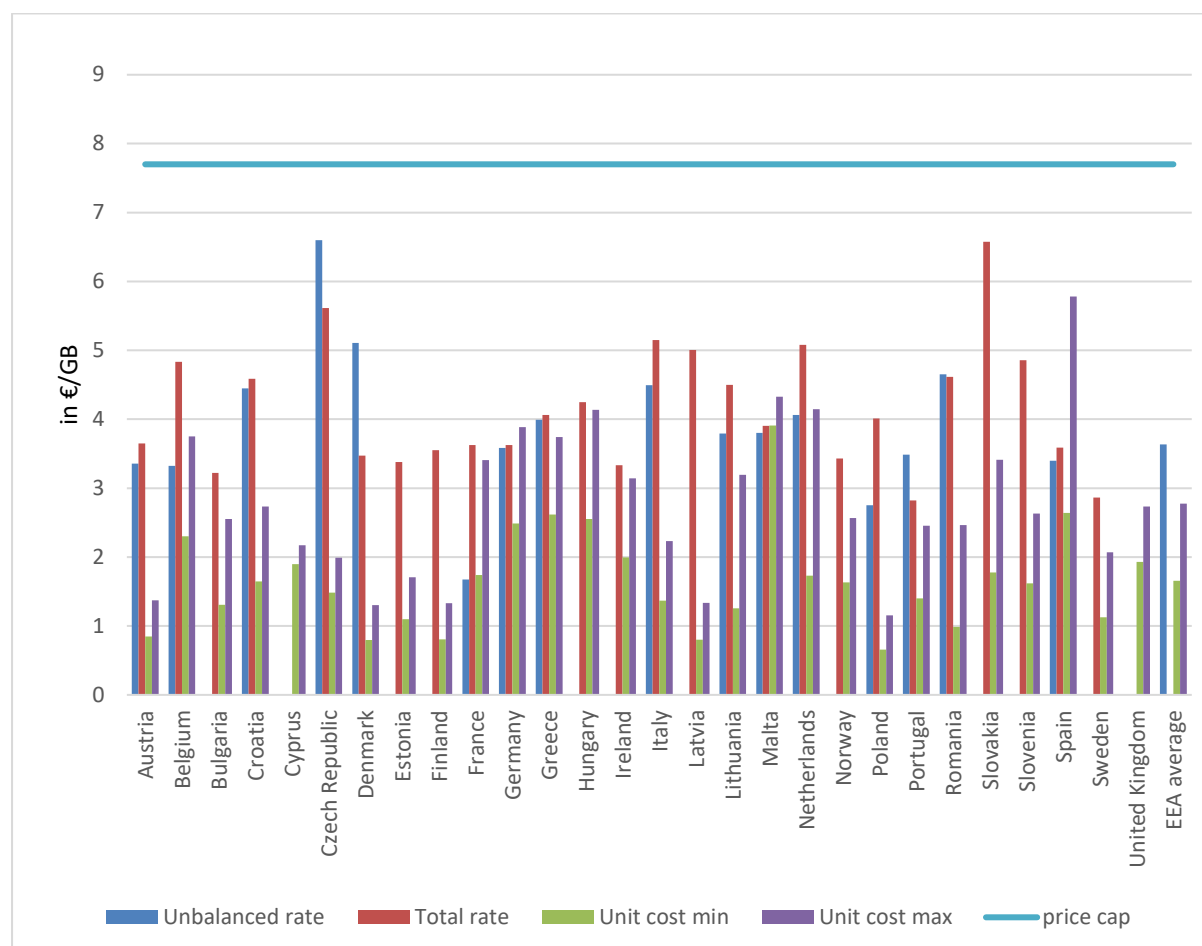


Figure 8 – Roaming data – comparison for the second half of 2017 – Methodology 1

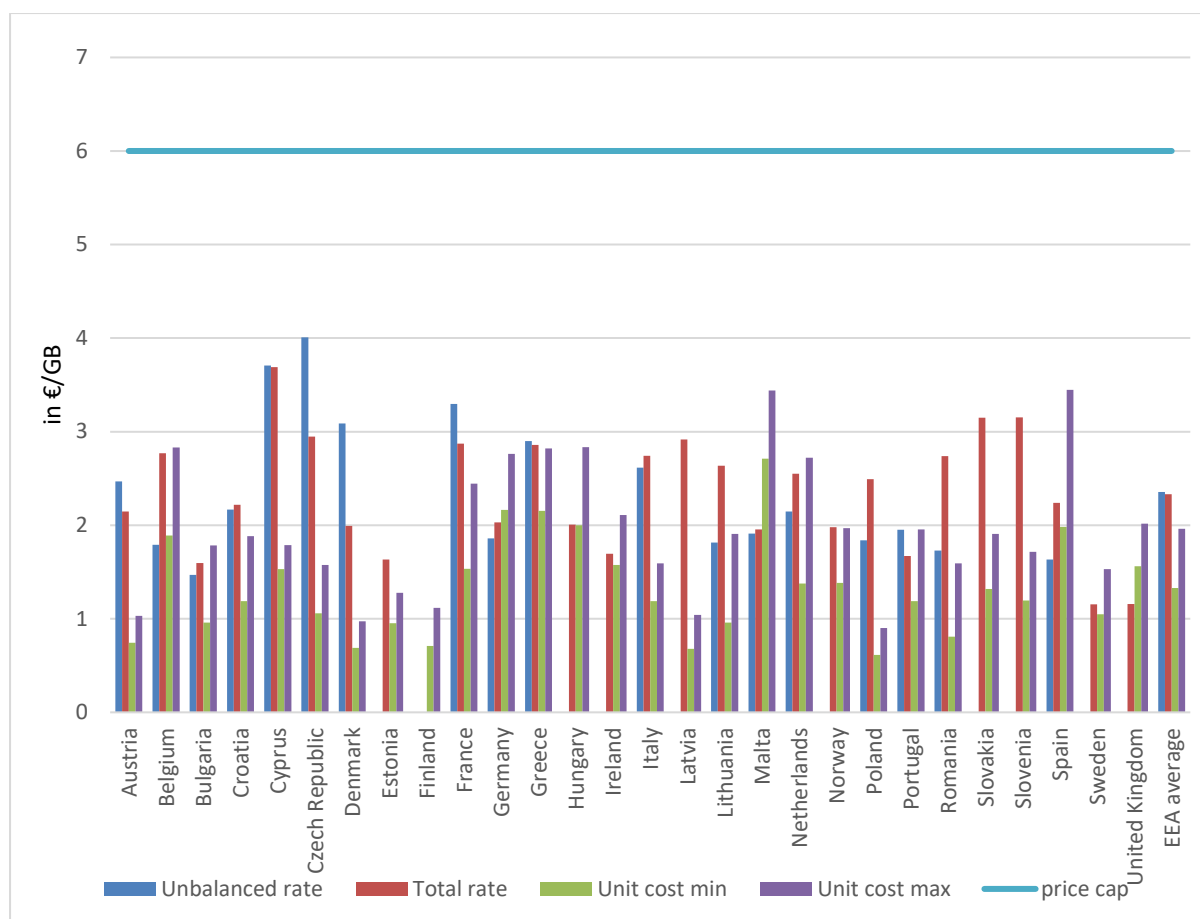


Figure 9 – Roaming data – comparison for 2018 – Methodology 1

Figure 8 and Figure 9 show the unit cost (minimum and maximum) calculated using Methodology 1, the wholesale rates applied (unbalanced and total traffic) and the price cap imposed for data roaming services for the second half of 2017 and for the first three quarters of 2018. In these figures, the average unit cost of the 28 countries²³ is calculated as the simple average of unit costs per country (seperately for minimum and maximum).

The above figures demonstrate that in less than one third of the countries the wholesale rates applied in the first three quarters of 2018 for total traffic do not diverge significantly from the unit cost calculated. For the rest, in twelve countries the total rate applied is higher than the unit costs, while in seven countries the opposite holds true.

BEREC further observes that the maximum unit costs calculated (including a conservative estimate of transit costs) for the country with the highest unit cost is close to 25 % lower than the roaming data price cap currently imposed for the first half of 2022, while the respective percentage for the minimum unit cost calculated is almost 50 %. For 2021 the respective percentages are 30% and 55%. For the forecast up to 2025, BEREC notes a slight increase in the unit costs between 2022 and 2025.

²³ The countries for which Axon prepared a country specific model are taken into account in the average unit cost.

6. Conclusions

BEREC carefully analysed the results of the Axon Cost study for this supplementary analysis and compared these with the current wholesale roaming caps imposed by the Roaming Regulation as well as the currently applied wholesale prices by the operators.

The results of this analysis show that for voice roaming services, the maximum unit costs for voice roaming services are 40 % lower than the price cap imposed and the minimum unit costs are 60 % lower than the cap of the first half of 2022. The analysis also shows that, in nearly two thirds of the countries, the total wholesale rates applied for Q1-Q3 2018 for voice roaming service are higher than the maximum unit costs calculated.

The results for SMS roaming services are even more compelling. The maximum and minimum costs for SMS are 70% lower than the SMS wholesale cap imposed for 2022. In addition, it can be concluded that in almost all cases, the wholesale rates applied for SMS are significantly above the unit cost calculated.

Furthermore, BEREC determines that the maximum unit costs for data roaming services for 2022 are 25% lower than the caps and the minimum unit costs are 50% lower than the caps. Comparing the costs with wholesale rates, it can be concluded that in less than one third of the countries the wholesale rates applied in the first three quarters of 2018 for total traffic do not diverge significantly from the unit cost calculated. In twelve countries the total rate applied is higher than the unit costs, while in seven countries the opposite holds true.

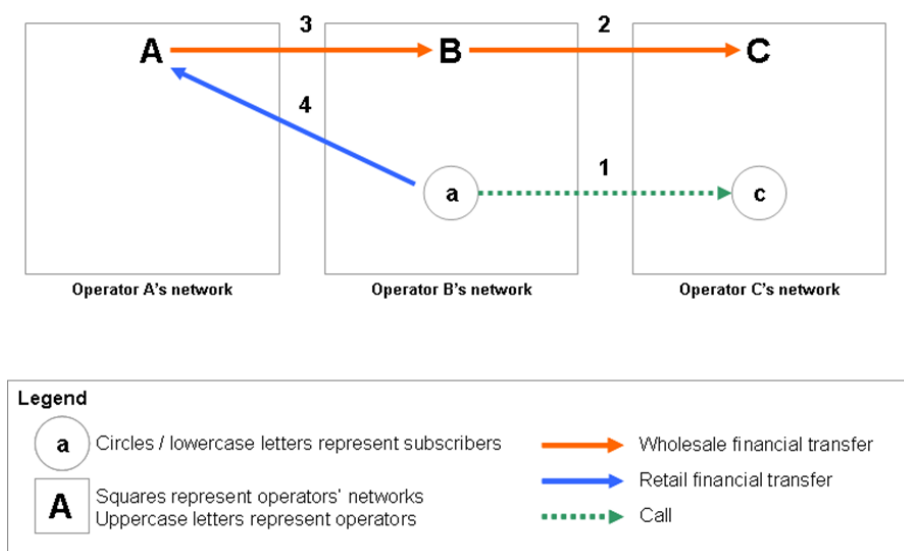
BEREC advises the EC to consider the results of this analysis together with the findings in the BEREC opinion published in June 2019. One of the proposed measures in this opinion was, to further reduce the wholesale caps, in order to increase the competitive strength for MVNOs. The results of this supplementary analysis show that there is some room for further reduction of the wholesale caps, while still guaranteeing that operators are able to recover their efficiently occurred costs for providing wholesale roaming services, and at the same time still leaving room for negotiating prices below the wholesale caps.

Last but not least, BEREC would like to note that there is some uncertainty regarding the wholesale costs for the last period of the estimates in the cost model, as the Axon cost model has not modelled costs for 5G. In addition, as also noted in the BEREC Opinion published in June, it is too early to draw strong conclusions regarding 5G and potential changes required in the regulation, but BEREC suggests closely monitoring the market and follow up this assessment, especially with regard to the question if new regulatory approaches are required and whether different charging mechanisms would better suit the peculiarities of M2M and IoT.

Annex I

A. Outgoing roaming voice calls

The diagram below shows the traffic routing and payments when a roaming customer places an outgoing voice call:



Note: This example relies on the assumption that the visited operator (B) routes outgoing roaming voice calls directly. This situation is the most common for outgoing voice calls within Europe.

The diagram depicts the following process:

- Customer (a) is domestic operator (A)'s customer
- Customer (a) roams on visited operator (B)'s network
- 1 – customer (a) calls customer (c) on (C)'s network
- 2 – visited operator (B) pays a termination fee to called operator (C)
- 3 – domestic operator (A) pays regulated wholesale fee to visited operator (B)
- 4 – customer (a) pays regulated retail fee to domestic operator (A)

The above example intends to represent a generic situation. Operator (C) may be a mobile or a fixed operator in operator (A)'s country, in operator (B)'s country or in another country. In case operator (C) is a fixed operator, payment 2 corresponds to a fixed termination rate, whereas if operator (C) is a mobile operator, payment 2 will correspond to a MTR.

There are a few particular cases to be considered where:

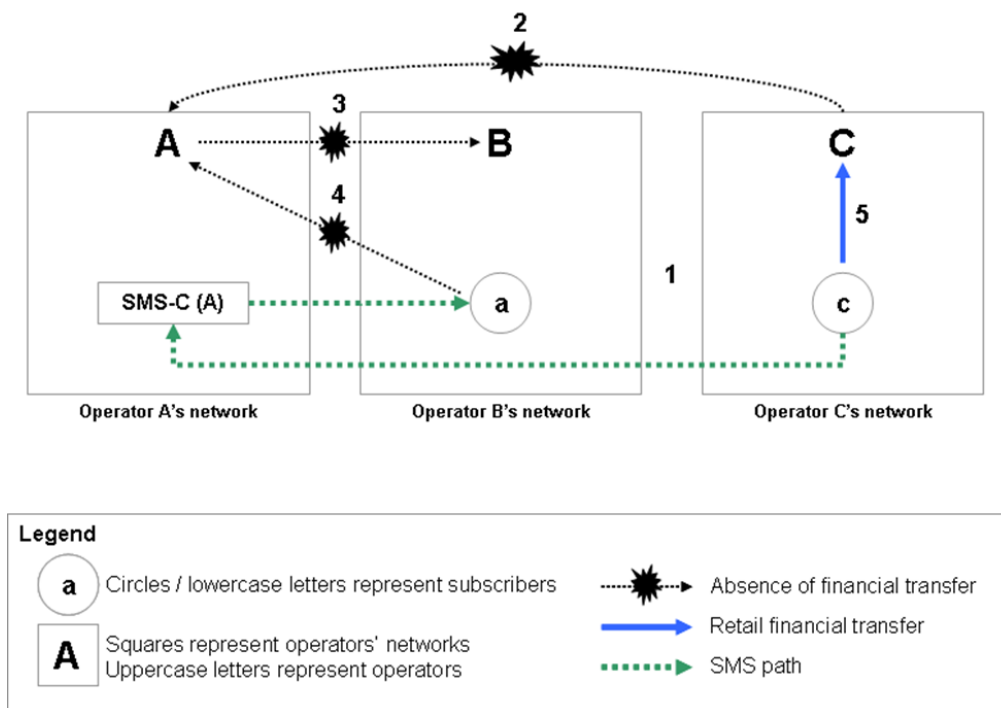
- (C) and (A) are the same operator – in this case, it is likely that there will not be any changes to the above described situation and (B) will pay 2 to (A) while (A) will pay 3 to (B)
- (B) and (C) are the same operator – in this situation, instead of paying 2, (B) incurs the cost of an on-net call (i.e. a call where the calling party and called party are on the same network)

Under those assumptions, payment 3 by domestic operator (A) should allow the visited operator (B):

- to recover origination costs,
- to pay for termination to called operator (C) (or to recover termination cost in the case where (B) and (C) are the same operator) and
- to recover transit costs.

B. Incoming roaming SMS services

The diagram below illustrates the process of traffic routing and payments when a roaming customer receives an incoming SMS. In the case of outgoing SMS services, the visited operator only provides origination, as roaming SMS services are managed by the home operator's SMS-C.



As depicted in the diagram, the following process is the norm:

- Customer (a) is domestic operator (A)'s customer
- Customer (a) roams on visited operator (B)'s network
- Customer (c) is on operator (C)'s network
- 1 – customer (a) receives an SMS from customer (c)
- 2 – calling operator (C) does not pay a termination fee to called operator (A), because customer (a) is roaming on another network
- 3 – domestic operator (A) does not pay anything to visited operator (B)
- 4 – customer (a) is not charged for receiving the SMS
- 5 – customer (c) pays domestic retail fee to operator (C)

Recital 63 of the Roaming Regulation states that:

“The wholesale price limit for regulated roaming SMS should include all costs incurred by the provider of the wholesale service, including, inter alia, origination, transit and the unrecovered cost of termination of roaming SMS messages on the visited network. Wholesale providers of regulated roaming SMS services should therefore be prohibited from introducing a separate charge for the termination of roaming SMS messages on their network, in order to ensure the consistent application of the rules established by this Regulation”.

Wholesale costs of incoming SMS services should therefore be accounted for as part of regulated wholesale rates for outgoing roaming SMS services.

Furthermore, according to the market’s practice and to the Roaming Regulation, incoming SMS services are free of charge for consumers. As stated in the Regulation:

“Roaming customers should not be required to pay any additional charge for receiving a regulated roaming SMS or voicemail message while roaming on a visited network, since such termination costs are already compensated by the retail charge levied for the sending of a roaming SMS or voicemail message.”

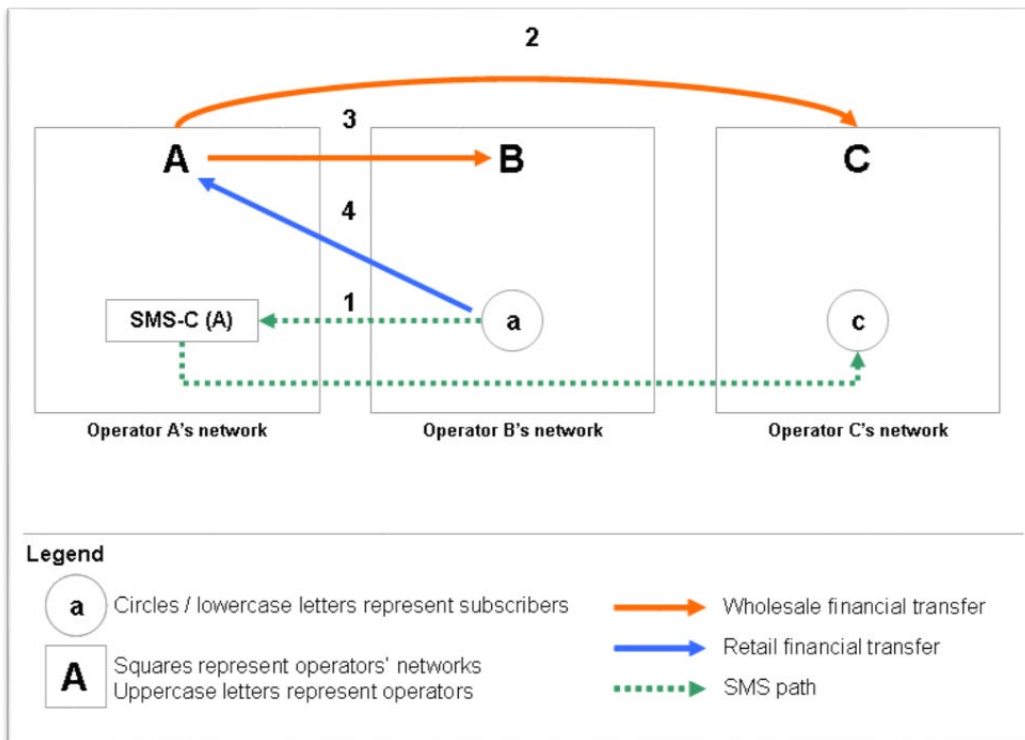
The roaming regulation states that those costs should be recovered as part of the retail charge for outgoing roaming SMS services, assuming a ratio of one SMS received for each SMS sent. Retail costs of incoming roaming SMS services should therefore be accounted for as part of regulated retail rates for outgoing roaming SMS services.

C. Outgoing roaming SMS services

In the case of outgoing SMS services, the visited operator only provides origination, as roaming SMS services are managed by the home operator’s SMS-C.

In general, the following procedure applies to outgoing roaming SMS:

- Customer (a) is domestic operator (A)’s customer
- Customer (a) roams on visited operator (B)’s network
- Customer (c) is on operator (C)’s network
- 1 – customer (a) sends an SMS to customer (c)
- 2 – domestic operator (A) pays a mobile SMS termination fee to called operator (C)
- 3 – domestic operator (A) pays regulated wholesale fee to visited operator (B)
- 4 – customer (a) pays regulated retail fee to domestic operator (A)



There are a few particular cases to be considered where:

- (C) and (A) are the same operator: In this case, payment 2 will not take place because once forwarded by (B) to (A), the SMS will become an on-net SMS on (A)'s network. In this case, operator (A) incurs internal on-net termination costs.
- (B) and (C) are the same operator: It is likely that the above described situation will apply and (A) will pay both 2 and 3 to (B).

The Roaming Regulation states that wholesale cost of incoming SMS services incurred by visited operators for terminating incoming SMS services to roaming customers should be recovered through wholesale charges for outgoing SMS services.

Under those assumptions, wholesale payments by domestic operator (A) should allow the visited operator (B):

- to recover costs incurred for terminating incoming SMS services, assuming a ratio of one SMS received for each SMS sent and
- to recover origination costs.
-

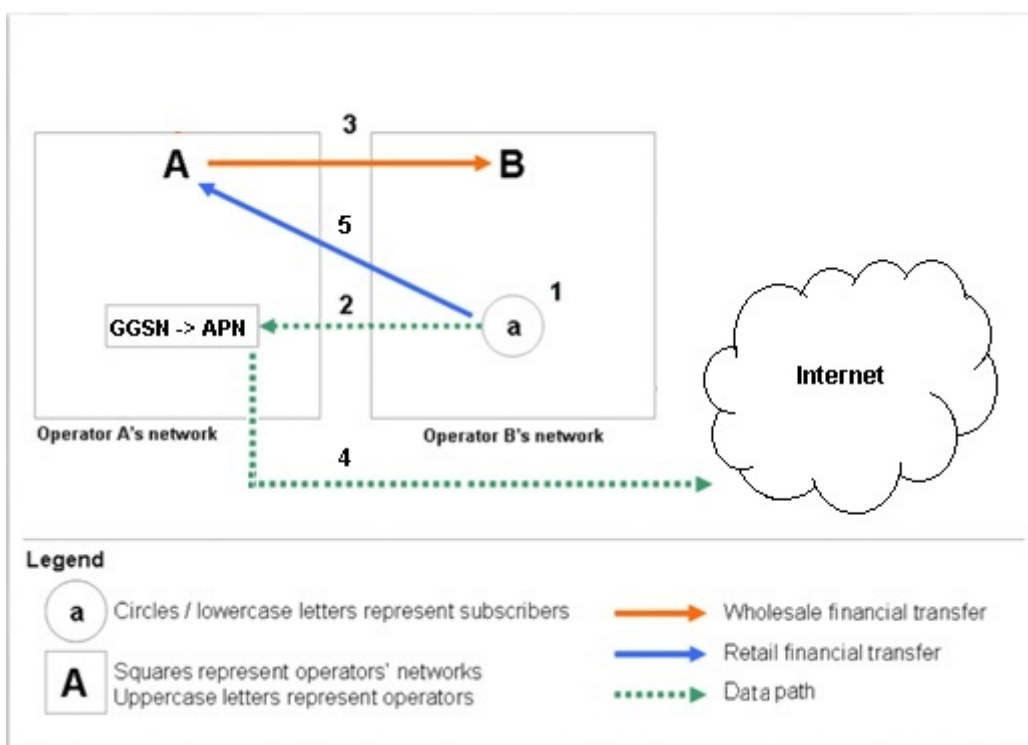
Termination is not to be recovered by visited operator (B) since domestic operator (A) is responsible for paying for termination of the SMS.

D. Data services

In the case of mobile data roaming, the visited operator only provides ACO and the mobile data session is managed by the domestic operator's internet gateways.

The following briefly describes this process:

- Customer (a) is domestic operator (A)'s customer
- Customer (a) roams on visited operator (B)'s network
- 1 – customer (a) initiates a mobile data session while roaming
- 2 – visited operator (B) forwards data session request to domestic operator (A)
- 3 – domestic operator (A) pays regulated wholesale fee to visited operator (B)
- 4 – domestic operator (A) connects to the Internet
- 5 – customer (a) pays the same like at home for data to the domestic operator (A)



Wholesale payments by domestic operator (A) should allow the visited operator (B):

- to recover origination costs
- to recover transit costs

Annex II

A. Minimum unit cost evolution for roaming voice service

	2018	2019	2020	2021	2022	2023	2024	2025
Austria	1.62	1.49	1.42	1.37	0.73	0.72	0.72	0.72
Belgium	2.05	1.81	1.67	1.52	0.83	0.81	0.80	0.79
Bulgaria	1.63	1.50	1.40	1.35	0.71	0.70	0.70	0.70
Croatia	1.66	1.52	1.44	1.38	0.74	0.71	0.71	0.70
Cyprus	1.98	1.79	1.67	1.54	0.88	0.87	0.86	0.85
Czech Republic	2.00	1.77	1.58	1.47	0.80	0.79	0.79	0.78
Denmark	1.62	1.49	1.41	1.37	0.72	0.72	0.72	0.71
Estonia	1.72	1.57	1.49	1.44	0.80	0.79	0.80	0.79
Finland	1.54	1.43	1.37	1.34	0.70	0.70	0.70	0.70
France	1.70	1.57	1.47	1.40	0.75	0.74	0.74	0.73
Germany	2.18	1.96	1.79	1.62	0.94	0.93	0.91	0.90
Greece	1.88	1.65	1.51	1.41	0.74	0.74	0.73	0.72
Hungary	2.10	1.86	1.65	1.51	0.84	0.82	0.82	0.81
Ireland	1.73	1.55	1.42	1.36	0.71	0.71	0.71	0.71
Italy	1.78	1.62	1.51	1.42	0.76	0.75	0.75	0.74
Latvia	1.65	1.52	1.44	1.38	0.74	0.74	0.74	0.74
Lithuania	1.71	1.55	1.47	1.41	0.78	0.77	0.78	0.77
Malta	2.55	2.33	2.19	1.99	1.31	1.28	1.26	1.24
Netherlands	1.77	1.59	1.51	1.46	0.79	0.78	0.77	0.77
Norway	2.05	1.84	1.69	1.51	0.86	0.85	0.84	0.82
Poland	1.53	1.43	1.37	1.33	0.70	0.69	0.69	0.69
Portugal	1.73	1.59	1.47	1.39	0.74	0.74	0.74	0.73
Romania	1.60	1.46	1.38	1.33	0.70	0.69	0.68	0.68
Slovakia	1.80	1.64	1.53	1.44	0.78	0.78	0.77	0.77
Slovenia	1.94	1.75	1.65	1.55	0.90	0.89	0.89	0.88
Spain	1.74	1.59	1.53	1.44	0.78	0.77	0.76	0.76
Sweden	1.81	1.65	1.52	1.44	0.79	0.79	0.79	0.78
United Kingdom	1.89	1.75	1.65	1.52	0.85	0.84	0.84	0.83

B. Minimum scenario unit cost evolution for roaming voice service

	2018	2019	2020	2021	2022	2023	2024	2025
Austria	1.62	1.49	1.43	1.37	0.74	0.74	0.75	0.77
Belgium	2.14	1.87	1.69	1.52	0.85	0.84	0.85	0.86
Bulgaria	1.63	1.50	1.40	1.35	0.72	0.72	0.73	0.76
Croatia	1.65	1.52	1.45	1.38	0.75	0.74	0.76	0.78
Cyprus	2.00	1.80	1.67	1.54	0.89	0.88	0.89	0.90
Czech Republic	2.00	1.83	1.59	1.47	0.82	0.81	0.82	0.83
Denmark	1.63	1.54	1.43	1.37	0.73	0.73	0.74	0.76
Estonia	1.71	1.57	1.49	1.44	0.81	0.80	0.83	0.84
Finland	1.54	1.43	1.38	1.34	0.71	0.71	0.73	0.74
France	1.70	1.57	1.48	1.40	0.76	0.75	0.77	0.79
Germany	2.22	1.98	1.80	1.63	0.95	0.94	0.94	0.95
Greece	1.88	1.66	1.52	1.41	0.76	0.75	0.76	0.77
Hungary	2.14	1.86	1.66	1.52	0.86	0.83	0.84	0.86
Ireland	1.73	1.54	1.42	1.36	0.73	0.72	0.74	0.75
Italy	1.79	1.62	1.53	1.43	0.77	0.76	0.78	0.80
Latvia	1.65	1.52	1.46	1.38	0.76	0.75	0.77	0.79
Lithuania	1.71	1.55	1.47	1.41	0.79	0.78	0.80	0.82
Malta	2.66	2.39	2.20	1.99	1.32	1.29	1.29	1.29
Netherlands	1.78	1.64	1.57	1.46	0.80	0.80	0.81	0.83
Norway	2.09	1.86	1.73	1.56	0.89	0.88	0.89	0.90
Poland	1.53	1.43	1.40	1.33	0.71	0.70	0.72	0.74
Portugal	1.85	1.58	1.47	1.40	0.76	0.75	0.77	0.78
Romania	1.60	1.45	1.38	1.33	0.75	0.71	0.73	0.75
Slovakia	1.89	1.66	1.54	1.44	0.79	0.79	0.80	0.82
Slovenia	1.94	1.76	1.65	1.55	0.91	0.90	0.92	0.93
Spain	1.76	1.61	1.55	1.44	0.80	0.79	0.81	0.82
Sweden	1.83	1.65	1.54	1.45	0.81	0.80	0.82	0.83
United Kingdom	1.90	1.76	1.67	1.53	0.86	0.85	0.86	0.88

C. Maximum unit cost evolution for roaming voice service

	2018	2019	2020	2021	2022	2023	2024	2025
Austria	1.87	1.63	1.60	1.73	1.19	1.24	1.24	1.30
Belgium	2.46	2.14	1.89	1.78	1.16	1.12	1.10	1.13
Bulgaria	1.78	1.62	1.51	1.47	0.91	0.90	0.90	0.94
Croatia	1.73	1.62	1.52	1.46	0.88	0.87	0.87	0.92
Cyprus	2.06	1.85	1.71	1.61	1.03	1.05	1.06	1.11
Czech Republic	2.30	2.10	1.97	1.85	1.28	1.22	1.19	1.21
Denmark	1.66	1.55	1.50	1.49	0.94	0.95	0.95	1.00
Estonia	1.76	1.61	1.52	1.46	0.91	0.93	0.94	1.00
Finland	1.56	1.46	1.39	1.36	0.81	0.83	0.84	0.90
France	1.90	1.74	1.66	1.62	1.03	1.02	1.01	1.04
Germany	2.31	2.12	2.00	1.92	1.33	1.30	1.29	1.33
Greece	2.04	1.78	1.70	1.63	1.04	1.01	1.00	1.03
Hungary	2.32	2.02	1.90	1.82	1.23	1.21	1.20	1.23
Ireland	2.02	1.68	1.55	1.51	0.94	0.93	0.92	0.96
Italy	1.91	1.72	1.60	1.50	0.90	0.92	0.93	0.99
Latvia	1.85	1.71	1.65	1.63	1.08	1.09	1.09	1.15
Lithuania	1.91	1.68	1.56	1.48	0.92	0.93	0.95	1.01
Malta	2.72	2.52	2.46	2.43	1.88	1.90	1.92	1.98
Netherlands	1.95	1.74	1.67	1.55	0.99	0.99	0.99	1.04
Norway	2.26	2.03	1.88	1.65	1.13	1.07	1.10	1.17
Poland	1.58	1.45	1.40	1.36	0.81	0.81	0.81	0.86
Portugal	1.90	1.67	1.59	1.54	0.97	0.99	1.04	1.02
Romania	1.73	1.57	1.49	1.46	0.90	0.90	0.91	0.95
Slovakia	1.97	1.86	1.72	1.65	1.04	0.99	0.95	0.98
Slovenia	2.05	1.80	1.71	1.66	1.13	1.15	1.16	1.22
Spain	1.86	1.71	1.63	1.60	1.06	1.10	1.13	1.20
Sweden	1.96	1.83	1.74	1.67	1.10	1.11	1.12	1.17
United Kingdom	1.94	1.82	1.75	1.70	1.13	1.13	1.12	1.16

D. Maximum scenario unit cost evolution for roaming voice service

	2018	2019	2020	2021	2022	2023	2024	2025
Austria	1.67	1.62	1.60	1.73	1.16	1.19	1.19	1.21
Belgium	2.28	2.00	1.85	1.75	1.12	1.09	1.05	1.04
Bulgaria	1.77	1.62	1.51	1.47	0.87	0.87	0.85	0.85
Croatia	1.72	1.61	1.52	1.46	0.85	0.83	0.81	0.82
Cyprus	1.98	1.80	1.72	1.61	1.00	1.01	1.01	1.02
Czech Republic	2.27	2.08	1.96	1.84	1.21	1.17	1.13	1.12
Denmark	1.65	1.55	1.51	1.49	0.90	0.91	0.90	0.91
Estonia	1.72	1.59	1.52	1.46	0.88	0.89	0.89	0.91
Finland	1.54	1.44	1.39	1.36	0.77	0.79	0.79	0.81
France	1.82	1.70	1.65	1.60	0.99	0.98	0.95	0.94
Germany	2.27	2.08	1.95	1.88	1.27	1.26	1.23	1.24
Greece	2.04	1.78	1.71	1.62	0.99	0.98	0.95	0.94
Hungary	2.25	2.01	1.90	1.82	1.20	1.18	1.15	1.14
Ireland	1.99	1.68	1.56	1.51	0.90	0.89	0.87	0.87
Italy	1.86	1.68	1.58	1.47	0.86	0.88	0.87	0.89
Latvia	1.82	1.70	1.65	1.63	1.04	1.05	1.04	1.05
Lithuania	1.85	1.65	1.55	1.48	0.88	0.90	0.90	0.92
Malta	2.64	2.50	2.47	2.43	1.85	1.86	1.87	1.89
Netherlands	1.87	1.66	1.61	1.55	0.96	0.96	0.94	0.95
Norway	2.21	1.99	1.85	1.57	0.98	0.98	0.97	0.97
Poland	1.57	1.44	1.39	1.36	0.77	0.77	0.76	0.77
Portugal	1.79	1.65	1.58	1.54	0.94	0.94	0.92	0.93
Romania	1.67	1.54	1.49	1.45	0.86	0.87	0.85	0.86
Slovakia	1.90	1.81	1.71	1.64	0.98	0.95	0.90	0.89
Slovenia	2.04	1.77	1.68	1.66	1.09	1.12	1.11	1.13
Spain	1.74	1.59	1.57	1.54	0.96	0.97	0.97	0.98
Sweden	1.89	1.83	1.74	1.67	1.07	1.08	1.07	1.08
United Kingdom	1.94	1.81	1.75	1.70	1.10	1.09	1.07	1.07

E. Minimum unit cost evolution for roaming SMS service

	2018	2019	2020	2021	2022	2023	2024	2025
Austria	0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.12
Belgium	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Bulgaria	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Croatia	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Cyprus	0.18	0.16	0.16	0.15	0.14	0.14	0.13	0.12
Czech Republic	0.10	0.10	0.09	0.09	0.09	0.09	0.09	0.09
Denmark	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.07
Estonia	0.32	0.30	0.29	0.28	0.28	0.27	0.26	0.26
Finland	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
France	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Germany	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Greece	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07
Hungary	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10
Ireland	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Italy	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Latvia	0.27	0.27	0.27	0.27	0.27	0.26	0.26	0.26
Lithuania	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Malta	0.34	0.31	0.29	0.27	0.25	0.23	0.21	0.19
Netherlands	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.06
Norway	0.14	0.13	0.13	0.13	0.12	0.12	0.12	0.12
Poland	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Portugal	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Romania	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Slovakia	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05
Slovenia	0.22	0.20	0.19	0.19	0.19	0.18	0.18	0.18
Spain	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Sweden	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
United Kingdom	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

F. Minimum scenario unit cost evolution for roaming SMS service

	2018	2019	2020	2021	2022	2023	2024	2025
Austria	0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.12
Belgium	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Bulgaria	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Croatia	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Cyprus	0.18	0.16	0.16	0.15	0.14	0.14	0.13	0.12
Czech Republic	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.09
Denmark	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.07
Estonia	0.32	0.30	0.29	0.28	0.28	0.27	0.26	0.26
Finland	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
France	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Germany	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Greece	0.09	0.08	0.08	0.08	0.08	0.07	0.07	0.07
Hungary	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.10
Ireland	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Italy	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Latvia	0.27	0.27	0.27	0.27	0.27	0.26	0.26	0.26
Lithuania	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Malta	0.34	0.31	0.29	0.27	0.25	0.23	0.21	0.19
Netherlands	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.06
Norway	0.14	0.13	0.13	0.13	0.12	0.12	0.12	0.12
Poland	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Portugal	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Romania	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Slovakia	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05
Slovenia	0.22	0.20	0.19	0.19	0.19	0.18	0.18	0.18
Spain	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Sweden	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
United Kingdom	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

G. Maximum unit cost evolution for roaming SMS service

	2018	2019	2020	2021	2022	2023	2024	2025
Austria	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Belgium	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Bulgaria	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Croatia	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.06
Cyprus	0.18	0.16	0.16	0.15	0.15	0.15	0.14	0.14
Czech Republic	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.09
Denmark	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Estonia	0.32	0.30	0.30	0.29	0.29	0.29	0.29	0.28
Finland	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
France	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Germany	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Greece	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Hungary	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Ireland	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Italy	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Latvia	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.26
Lithuania	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Malta	0.35	0.31	0.30	0.29	0.28	0.27	0.26	0.25
Netherlands	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Norway	0.14	0.13	0.13	0.13	0.13	0.13	0.12	0.12
Poland	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Portugal	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Romania	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Slovakia	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05
Slovenia	0.22	0.20	0.19	0.19	0.19	0.19	0.18	0.18
Spain	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Sweden	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
United Kingdom	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

H. Maximum scenario unit cost evolution for roaming SMS service

	2018	2019	2020	2021	2022	2023	2024	2025
Austria	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Belgium	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Bulgaria	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Croatia	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Cyprus	0.18	0.16	0.16	0.15	0.15	0.15	0.14	0.14
Czech Republic	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.09
Denmark	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Estonia	0.32	0.30	0.30	0.29	0.29	0.29	0.29	0.28
Finland	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
France	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Germany	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Greece	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07
Hungary	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Ireland	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Italy	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Latvia	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.26
Lithuania	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Malta	0.35	0.31	0.30	0.29	0.28	0.27	0.26	0.25
Netherlands	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Norway	0.14	0.13	0.13	0.13	0.13	0.13	0.12	0.12
Poland	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Portugal	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Romania	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Slovakia	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05
Slovenia	0.22	0.20	0.19	0.19	0.19	0.19	0.18	0.18
Spain	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Sweden	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
United Kingdom	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

I. Minimum unit cost evolution for roaming data service

	2018	2019	2020	2021	2022	2023	2024	2025
Austria	0.74	0.61	0.55	0.50	0.49	0.47	0.44	0.43
Belgium	1.89	1.53	1.27	1.10	0.98	0.84	0.72	0.65
Bulgaria	0.96	0.85	0.62	0.57	0.53	0.50	0.48	0.46
Croatia	1.19	0.85	0.74	0.65	0.61	0.56	0.53	0.50
Cyprus	1.53	1.30	1.16	1.10	1.01	0.94	0.87	0.80
Czech Republic	1.06	0.90	0.83	0.77	0.74	0.66	0.61	0.57
Denmark	0.69	0.62	0.59	0.57	0.55	0.53	0.52	0.51
Estonia	0.95	0.80	0.67	0.61	0.56	0.50	0.47	0.45
Finland	0.71	0.63	0.55	0.51	0.48	0.45	0.43	0.42
France	1.53	1.30	1.06	0.96	0.88	0.84	0.77	0.73
Germany	2.16	1.85	1.44	1.33	1.21	1.13	1.04	0.96
Greece	2.15	1.74	1.27	1.17	1.00	0.86	0.78	0.72
Hungary	2.00	1.66	1.44	1.27	1.10	0.95	0.87	0.78
Ireland	1.57	1.22	0.89	0.81	0.72	0.64	0.60	0.58
Italy	1.19	1.03	0.89	0.82	0.74	0.66	0.61	0.57
Latvia	0.68	0.61	0.56	0.52	0.51	0.49	0.46	0.44
Lithuania	0.96	0.78	0.67	0.59	0.55	0.50	0.46	0.44
Malta	2.71	2.04	1.65	1.44	1.22	1.06	0.93	0.83
Netherlands	1.38	1.17	1.03	1.00	0.99	0.92	0.87	0.83
Norway	1.38	1.20	1.07	0.99	0.92	0.83	0.74	0.68
Poland	0.61	0.57	0.54	0.51	0.49	0.48	0.46	0.45
Portugal	1.19	0.98	0.80	0.72	0.65	0.60	0.55	0.51
Romania	0.81	0.73	0.60	0.56	0.52	0.49	0.46	0.44
Slovakia	1.32	1.01	0.85	0.76	0.70	0.65	0.61	0.58
Slovenia	1.20	1.00	0.89	0.76	0.71	0.63	0.59	0.54
Spain	1.98	1.55	1.13	0.98	0.92	0.86	0.77	0.72
Sweden	1.05	0.86	0.81	0.78	0.74	0.68	0.64	0.60
United Kingdom	1.56	1.30	1.14	1.03	0.94	0.89	0.83	0.79

J. Minimum scenario unit cost evolution for roaming data service

	2018	2019	2020	2021	2022	2023	2024	2025
Austria	1.03	0.71	0.61	0.53	0.49	0.47	0.44	0.44
Belgium	2.83	2.09	1.61	1.27	1.02	0.86	0.75	0.68
Bulgaria	1.41	1.06	0.83	0.67	0.59	0.52	0.49	0.47
Croatia	1.62	1.08	0.86	0.70	0.66	0.56	0.54	0.50
Cyprus	1.62	1.35	1.24	1.18	1.07	0.96	0.87	0.80
Czech Republic	1.31	1.07	0.92	0.80	0.75	0.66	0.61	0.57
Denmark	0.90	0.72	0.65	0.59	0.63	0.55	0.53	0.52
Estonia	1.20	0.93	0.74	0.64	0.56	0.50	0.55	0.46
Finland	0.90	0.71	0.59	0.53	0.48	0.45	0.43	0.42
France	2.28	1.78	1.48	1.34	1.10	0.97	0.87	0.78
Germany	2.69	2.09	1.73	1.52	1.34	1.19	1.09	1.02
Greece	2.57	2.00	1.37	1.20	1.00	0.86	0.78	0.72
Hungary	2.61	1.94	1.58	1.34	1.13	0.97	0.88	0.81
Ireland	2.03	1.74	1.46	1.23	1.09	0.92	0.82	0.73
Italy	1.59	1.23	1.01	0.86	0.74	0.66	0.62	0.58
Latvia	0.90	0.71	0.63	0.55	0.52	0.49	0.46	0.44
Lithuania	1.40	0.99	0.77	0.64	0.55	0.50	0.46	0.44
Malta	2.97	2.17	1.72	1.45	1.23	1.06	0.93	0.83
Netherlands	2.51	1.80	1.39	1.25	1.15	0.98	0.95	0.92
Norway	1.91	1.51	1.25	1.10	0.94	0.88	0.76	0.69
Poland	0.73	0.60	0.54	0.51	0.49	0.48	0.47	0.48
Portugal	1.96	1.40	1.16	0.96	0.80	0.73	0.65	0.59
Romania	1.50	1.00	0.77	0.64	0.55	0.51	0.55	0.47
Slovakia	1.69	1.23	0.98	0.83	0.76	0.67	0.61	0.60
Slovenia	1.68	1.34	1.20	0.91	0.75	0.66	0.61	0.54
Spain	3.17	2.10	1.51	1.19	1.05	0.96	0.81	0.76
Sweden	1.44	1.05	0.91	0.82	0.74	0.68	0.64	0.60
United Kingdom	1.85	1.51	1.21	1.05	0.95	0.89	0.83	0.79

K. Maximum unit cost evolution for roaming data service

	2018	2019	2020	2021	2022	2023	2024	2025
Austria	1.03	0.79	0.72	0.77	0.64	0.61	0.60	0.60
Belgium	2.83	2.37	2.06	1.93	1.77	1.70	1.65	1.60
Bulgaria	1.78	1.23	0.92	0.81	0.78	0.75	0.73	0.73
Croatia	1.88	1.40	1.13	1.02	0.94	0.88	0.85	0.84
Cyprus	1.79	1.53	1.39	1.37	1.33	1.28	1.25	1.23
Czech Republic	1.57	1.34	1.10	0.96	0.89	0.84	0.81	0.81
Denmark	0.97	0.85	0.75	0.70	0.70	0.69	0.64	0.63
Estonia	1.28	0.97	0.81	0.75	0.69	0.67	0.65	0.64
Finland	1.12	1.11	0.67	0.63	0.61	0.58	0.58	0.57
France	2.44	1.96	1.68	1.63	1.57	1.45	1.39	1.35
Germany	2.76	2.09	1.80	1.60	1.45	1.35	1.28	1.23
Greece	2.82	2.13	1.67	1.42	1.27	1.19	1.14	1.11
Hungary	2.83	2.40	2.18	2.06	1.93	1.85	1.81	1.78
Ireland	2.11	1.80	1.55	1.40	1.28	1.17	1.09	1.03
Italy	1.59	1.31	1.17	1.11	1.05	1.02	1.00	0.98
Latvia	1.04	0.84	0.84	0.73	0.67	0.64	0.64	0.62
Lithuania	1.91	1.23	0.93	0.86	0.81	0.78	0.76	0.74
Malta	3.44	2.72	2.16	2.00	1.82	1.67	1.59	1.53
Netherlands	2.72	1.98	1.69	1.51	1.43	1.33	1.30	1.32
Norway	1.97	1.72	1.66	1.54	1.43	1.36	1.35	1.34
Poland	0.90	0.71	0.69	0.62	0.57	0.56	1.23	0.57
Portugal	1.96	1.40	1.19	1.07	1.00	0.94	0.91	0.87
Romania	1.59	1.13	0.83	0.74	0.71	0.69	0.68	0.68
Slovakia	1.91	1.40	1.14	0.97	0.93	0.81	0.81	0.79
Slovenia	1.71	1.39	1.26	0.98	1.02	0.94	0.83	0.81
Spain	3.45	2.34	1.83	1.72	1.53	1.44	1.37	1.34
Sweden	1.53	1.19	1.15	1.10	1.04	1.02	1.00	0.98
United Kingdom	2.02	1.61	1.38	1.19	1.09	1.03	0.98	0.95

L. Maximum scenario unit cost evolution for roaming data service

	2018	2019	2020	2021	2022	2023	2024	2025
Austria	0.89	0.79	0.72	0.67	0.64	0.61	0.60	0.59
Belgium	2.69	2.32	2.03	1.90	1.76	1.69	1.64	1.60
Bulgaria	1.31	1.07	0.86	0.81	0.77	0.75	0.73	0.73
Croatia	1.55	1.35	1.12	1.02	0.94	0.88	0.85	0.84
Cyprus	1.79	1.53	1.39	1.33	1.26	1.21	1.18	1.16
Czech Republic	1.33	1.18	1.05	0.95	0.88	0.83	0.79	0.77
Denmark	0.80	0.77	0.75	0.70	0.67	0.65	0.64	0.63
Estonia	1.09	0.93	0.81	0.75	0.69	0.67	0.65	0.64
Finland	0.78	0.69	0.60	0.57	0.54	0.52	0.52	0.51
France	1.80	1.54	1.27	1.17	1.08	1.04	1.03	1.02
Germany	2.41	1.96	1.52	1.41	1.29	1.22	1.18	1.15
Greece	2.57	2.05	1.58	1.40	1.27	1.19	1.13	1.11
Hungary	2.70	2.39	2.18	2.06	1.93	1.85	1.81	1.78
Ireland	1.87	1.49	1.12	1.03	0.93	0.87	0.86	0.86
Italy	1.46	1.31	1.17	1.11	1.05	1.02	1.00	0.98
Latvia	0.83	0.78	0.76	0.71	0.66	0.64	0.63	0.62
Lithuania	1.26	1.07	0.92	0.86	0.80	0.77	0.75	0.74
Malta	3.43	2.71	2.12	1.95	1.78	1.66	1.59	1.53
Netherlands	1.82	1.70	1.61	1.49	1.39	1.33	1.30	1.27
Norway	1.81	1.72	1.66	1.54	1.43	1.35	1.31	1.27
Poland	0.66	0.63	0.59	0.56	0.54	0.53	0.53	0.53
Portugal	1.42	1.21	1.03	0.97	0.90	0.87	0.84	0.82
Romania	1.08	0.94	0.79	0.74	0.71	0.69	0.68	0.68
Slovakia	1.59	1.25	0.96	0.88	0.81	0.77	0.75	0.74
Slovenia	1.34	1.12	0.95	0.87	0.81	0.78	0.76	0.74
Spain	2.59	2.12	1.75	1.59	1.46	1.38	1.32	1.28
Sweden	1.23	1.18	1.15	1.10	1.04	1.02	1.00	0.98
United Kingdom	1.69	1.47	1.28	1.17	1.08	1.02	0.98	0.95

M. Termination rates for the years 2019 - 2021 as collected from NRAs²⁴

Country	From 01/01/2019 - 30/6/2019	From 01/07/2019 - 31/12/2019	From 01/01/2020 - 30/6/2020	From 01/07/2020 -31/12/2020	From 01/01/2021 - 30/6/2021
Austria	0.80	0.81	0.81	0.81	0.81
Belgium	0.99	0.99	0.99	0.99	0.99
Bulgaria	0.72	0.72	0.72	0.72	0.72
Croatia	0.63	0.63	0.63	0.63	0.63
Cyprus	0.48	0.48	0.48	0.48	0.48
Czech Republic	0.96	0.96	0.96	0.96	0.96
Denmark	0.52	0.52	0.52	0.52	0.52
Estonia	0.83	0.83	0.83	0.83	0.83
Finland	0.93	0.93	0.89	0.89	0.82
France	0.74	0.74	0.74	0.74	0.74
Germany	0.95	0.95	0.95	0.95	0.95
Greece	0.95	0.95	0.95	0.95	0.95
Hungary	0.53	0.53	0.53	0.53	0.53
Ireland	0.79	0.67	0.55	0.43	0.31
Italy	0.90	0.90	0.76	0.76	0.67
Latvia	0.89	0.89	0.89	0.89	0.89
Lithuania	0.94	0.94	0.94	0.94	0.94
Luxembourg	0.89	0.89	0.89	0.89	0.89
Malta	0.40	0.40	0.40	0.40	0.40
Netherlands	0.58	0.58	0.58	0.58	0.58
Poland	1.00	1.00	1.00	1.00	1.00
Portugal	0.42	0.40	0.40	0.40	0.40
Romania	0.84	0.84	0.76	0.76	0.76
Slovakia	1.23	0.82	0.82	0.82	0.82
Slovenia	1.14	1.14	0.92	0.92	0.92
Spain	0.67	0.67	0.64	0.64	0.64
Sweden	0.57	0.57	0.27	0.21	0.21
UK	0.55	0.54	0.54	0.53	0.53
Weightedaverage	0.80	0.79	0.76	0.75	0.74

²⁴ Background about the data and estimates, please have a look at Chapter 2.1

N. Axon model scenarios

Scenario #	VoLTE Scenario	Traffic split per technology forecasts	Annualisation criteria	Roaming increment	Specific cost allocation	Cell Radii	Threshold to identify seasonality	Demand Forecast
1	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Base Case
2	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Aggressive
3	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Conservative
4	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Base Case
5	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Aggressive
6	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Conservative
7	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Base Case
8	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Aggressive
9	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Conservative
10	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Base Case
11	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Aggressive
12	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Conservative
13	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Base Case
14	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Aggressive

15	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Conservative
16	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Base Case
17	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Aggressive
18	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Conservative
19	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Base Case
20	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Aggressive
21	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Conservative
22	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Base Case
23	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Aggressive
24	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Conservative
25	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Base Case
26	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Aggressive
27	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Conservative
28	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Base Case
29	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Aggressive
30	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Conservative

31	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Base Case
32	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Aggressive
33	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Conservative
34	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Base Case
35	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Aggressive
36	Terminal Adoption	Same percentages across EEA from 2020	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Conservative
37	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Base Case
38	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Aggressive
39	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Conservative
40	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Base Case
41	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Aggressive
42	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Conservative
43	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Base Case
44	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Aggressive
45	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Conservative
46	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Base Case

47	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Aggressive
48	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Conservative
49	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Base Case
50	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Aggressive
51	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Conservative
52	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Base Case
53	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Aggressive
54	Terminal Adoption	Country-specific projections	Economic depreciation based on demand	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Conservative
55	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Base Case
56	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Aggressive
57	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Conservative
58	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Base Case
59	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Aggressive
60	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Conservative
61	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Base Case

62	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Aggressive
63	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Specific roaming increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Conservative
64	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Base Case
65	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Aggressive
66	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	10%	Conservative
67	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Base Case
68	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Aggressive
69	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	30%	Conservative
70	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Base Case
71	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Aggressive
72	Terminal Adoption	Country-specific projections	Economic depreciation based on ARPU	Joint roaming and domestic increment	Allocation based on driver	Mix EEA Average – Country specific figures	50%	Conservative