

CONSULTATION DOCUMENT

Recommendation of the Eastern Caribbean Telecommunications Authority ("ECTEL")

To the National Telecommunications Regulatory Commission to consult

on

Draft Cost Models for Fixed and Mobile Interconnection Rates

1. The National Telecommunications Regulatory Commission is in receipt of a submission from ECTEL containing ECTEL's recommendation for **Draft Cost Models for Fixed and Mobile Interconnection Rates and supporting documents** for its Member States as follows:
 - i) Consultation Paper on Draft Cost Models for Fixed and Mobile Interconnection Rates
 - ii) Introduction to Bottom-Up Long Run Incremental Cost (BULRIC) Models Consultation
 - iii) Description of the BULRIC Model for Fixed Networks
 - iv) Fixed BULRIC Model User Manual
 - v) BULRIC Fixed Model
 - vi) Description of the BULRIC Model for Mobile Networks
 - vii) Mobile BULRIC Model for Mobile Networks User Manual
 - viii) BULRIC Mobile Model
2. The initial comments period will run from **30 May 2017 to 28 June 2017**.
3. Once the respondents have read this document and the models' supporting documentation they may ask for a videoconference to clarify questions they may have about the process, this document or how to operate the models.
4. Those respondents who desire to participate in such a videoconference should make a request to ECTEL within 5 working days (**by 7 June 2017**) of the publication of this consultation document.

5. The Comment on Comments period will run from **3 July 2017 to 21 July 2017**.
6. The comments provided to this consultation should be accompanied with the supporting rationale and evidences. ECTEL may reject comments without evidences.
7. Following the Reply Comments period, ECTEL’s Directorate will revise and make a final determination on the Cost Models for Fixed and Mobile Interconnection Rates in the ECTEL Member States.
8. All responses to this Consultative Document should be written and sent by post, fax or e-mail to:

Managing Director
ECTEL
P.O. Box 1886
5th Floor Conway Business Centre
Waterfront
CASTRIES
Saint. Lucia
Fax: 1-758-458-1698
Email: consultation@ectel.int

Disclaimer

This consultative document does not constitute legal, commercial or technical advice. The consultation is without prejudice to the legal position of ECTEL's duties to provide advice and recommendations to the Ministers with responsibility for telecommunications and the National Telecommunications Regulatory Commissions.

Recommendations for new interconnection rates for the ECTEL Member States

*Consultation paper on Draft Cost Models for
Fixed and Mobile Interconnection Rates*

29 May 2017



AXON 

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1. Introduction

On May 4, 2000, the Eastern Caribbean Telecommunications Authority (hereinafter referred to as 'ECTEL' or 'the Authority') was established. This Authority came into being by way of a treaty signed between the five (5) contracting Eastern Caribbean States - Dominica, Grenada, St. Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines. ECTEL regulatory framework has a two-tiered arrangement:

- ▶ At the national level, there is the National Telecommunications Regulatory Commission (NTRC)
- ▶ At the regional level there is the ECTEL Directorate as an advisory body. Each Member State cedes some of its "sovereignty" to a regional body. The NTRC must liaise and consult with the ECTEL Directorate and the commission must act independently on all regulatory matters placed before the commission.

The Authority is able to determine the framework regarding regulatory matters that affect the five (5) entities pertaining to interconnection and pricing. In particular **Article 4 (e) of the Treaty** provides that one of the major purposes of ECTEL is to promote fair pricing and the use of cost-based pricing methods by telecoms providers in the Contracting States. Also, **Article 5(m)** indicates that one of the functions of ECTEL is to recommend a regional cost-based pricing regime for implementation by each Contracting States. Each country has its separate 'National Telecommunications Regulatory Commission' in place that works alongside with ECTEL, based in Saint Lucia, to carry out the latter's mandate.

In 2009, the Council of Ministers that govern ECTEL approved the implementation of the Long Run Incremental Cost Models ('LRIC') for setting interconnection rates (hereinafter the 'Existing Models'). As it relates to the mobile termination rates, the implementation of the LRIC model was to result in an up to 40 per cent reduction in the wholesale rate for mobile termination in the first year and up to 60 per cent reduction over the three-year period.

In 2009, the Regulations were passed in Dominica, St. Lucia and Grenada, meanwhile, St. Vincent and the Grenadines and St. Kitts and Nevis saw the passage of the legislation in 2008.

ECTEL issued a public consultation on the principles, methodologies and guidelines to be applied to determine the cost oriented rate for interconnection services. The consultation took place between July and September 2016.

After addressing feedback provided by stakeholders, ECTEL published the “*Final Principles Methodologies Guidelines*”.¹

Axon Partners Group Consulting S.L.U. (Axon Consulting) has developed, on behalf of ECTEL, two Draft BULRIC Models (one for fixed and one mobile networks) aligned with the Methodology.

ECTEL is of the opinion that the operators are in a good position to contribute to the development of the models. Therefore, ECTEL invites and encourages the operators to support all comments on the Draft Models with relevant arguments and also data, analysis, benchmarking studies and information based on the national situation, or on the experience of other countries (if relevant) to support its comments. ECTEL is likely to give greater weight to comments supported by relevant, appropriate arguments and evidence.

Please note that the Methodology was already subject to consultation. Comments provided regarding the methodology were duly noted and taken into account in the determination. Therefore, respondents should comment only on the models and not on the methodological decisions taken in previous determination.

After the conclusion of this consultation process, ECTEL will address the contributions provided by the operators and industry stakeholders and a final version of the BULRIC Models for fixed and mobile networks will be developed.

In order to provide the maximum transparency possible to the industry, ECTEL has decided to share the Microsoft Excel models together with its supporting documentation. This means that the industry has access to the algorithms, formulas and information used to calculate interconnection services cost.

The following files can be found attached:

► Model for mobile networks:

- ❖ **Draft BULRIC Model for mobile networks** (file: “20170524 - Axon Consulting - BULRIC Mobile Model v3.8 PUBLIC.xlsm”): This document contains the calculations of the BULRIC model itself, its inputs and outputs (results).
- ❖ **Description of the BULRIC Model** (file: “20170525 - Axon Consulting - Description of the BULRIC Model for Mobile Networks v1.4.pdf”): This

¹ <https://www.ectel.int/principles-methodologies-and-guidelines-for-the-determination-of-new-interconnection-rates/>

document describes how the model works and the algorithms used for modelling the network and calculating services' costs.

- ❖ **User manual** (file: "20170525 - Axon Consulting -BULRIC Model for Mobile Networks user manual v1.4.pdf"): This document explains how to use the model and run the calculations.
- ▶ Model for fixed networks:
- ❖ **Draft BULRIC Model for fixed networks** (file: "20170524 - Axon Consulting - BULRIC Fixed Model ECTEL v4.1 PUBLIC.xlsm"): This document contains the calculations of the BULRIC model itself, its inputs and outputs (results).
 - ❖ **Description of the BULRIC Model** (file: "20170525 - Axon Consulting - Description of the BULRIC Model for Fixed Networks v3.4_PUBLIC VERSION"): This document describes how the model works and the algorithms used for modelling the network and calculating services' costs.
 - ❖ **User manual** (file: "20170525 - Axon Consulting - BULRIC Model for fixed network user manual v1.5.pdf"): This document explains how to use the model and run the calculations.

Please note that, due to confidentiality of part of the information considered in the models, some figures have been anonymised in the attached files. To ensure the industry can provide valuable comments, the published figures may have been calculated as a random variation within a defined range (as stated in each section below). In particular, the following inputs have been anonymised:

▶ **Model for mobile networks:**

- ❖ Demand Statistics
- ❖ WACC
- ❖ Coverage
- ❖ Overheads

▶ **Model for fixed networks:**

- ❖ Market demand
- ❖ Demand Statistics
- ❖ WACC
- ❖ Overheads

The amount of time allowed for responding to this consultation is aligned with the international practice in costing models' consultation processes and is sufficient for a thorough revision of the models and supporting documentation. Moreover, the remainder of this document has been designed to focus the efforts on those aspects of greater relevance in which the industry can provide higher value. Therefore, we

strongly suggest following this document and providing the comments within the relevant questions outlined below, to ensure the efficiency of the process.

Once the respondents have read this document and the models' supporting documentation they may ask for a videoconference to clarify questions they may have about the process, this document or how to operate the models. Please note that the videoconference should not be used for providing comments (which should be provided in written form).

Those respondents who desire to participate in such a videoconference should make a request to ECTEL within 5 working days of the publication of this consultation document.

This document is structured into 2 main chapters as set out below:

- ▶ Topics that are considered of special relevance for the model for mobile networks
- ▶ Topics that are considered of special relevance for the model for fixed networks

2. Topics that are considered of special relevance for the model for mobile networks

ECTEL welcomes all comments on the model, especially those that address the topics of highest relevance and with highest impact on the outcome of the model. ECTEL will dedicate special attention to those comments on topics of special relevance and which have greater impact on the results of the model. Therefore, ECTEL would appreciate comments from the operators especially on the following aspects of the Model:

- ▶ Market demand considered in the model
- ▶ Demand Statistics
- ▶ WACC Calculation
- ▶ Population coverage of the modelled operator
- ▶ Spectrum allocation per technology
- ▶ Modelled Backbone Network
- ▶ Resulting network elements
- ▶ Useful lives applied for annualisation
- ▶ Costs
- ▶ Cost allocation to services

2.1. Market demand considered in the model

Demand is one of the main inputs of a BULRIC model. The historic and forecast traffic used is based on the data provided by the operators in each Member State, and can be found in worksheet 1A INP DEMAND.

In the following subsections, we present an overview of demand’s main characteristics, namely:

- ▶ Overall market historic demand
- ▶ Disaggregation by technology
- ▶ Traffic forecast
- ▶ Market share

2.1.1. Overall market historic demand

The following exhibit shows total voice traffic consumption for each of the Member States considered in the model² for 2015:

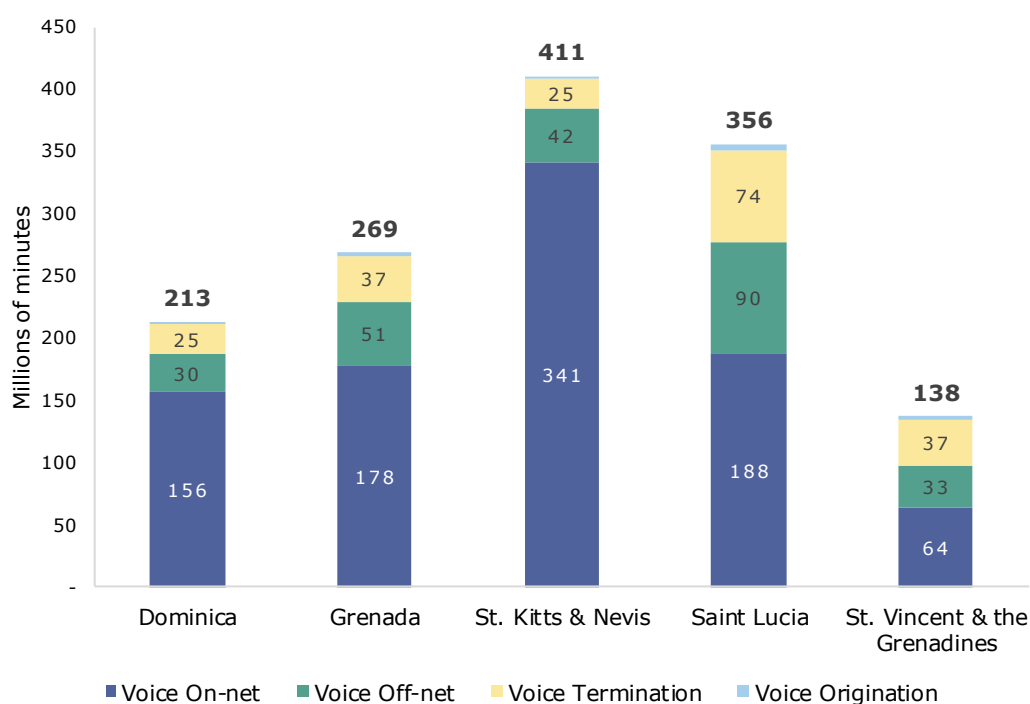


Exhibit 2.1: Total market voice traffic in 2015. [Source: Axon Consulting]

² Please note that the figures below represent the total traffic in each market. The reference operator would satisfy certain market share, as described later on.

The following exhibit presents total data traffic consumption for each of the Member States considered in the model for 2015:

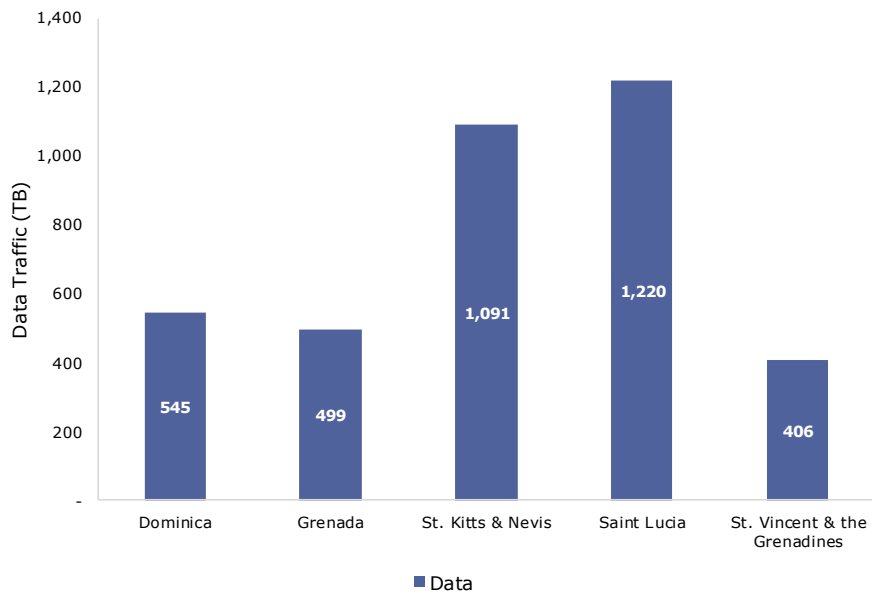


Exhibit 2.2: Total market data traffic³ in 2015. [Source: Axon Consulting]

The following exhibit shows messages traffic for each of the Member States considered in the model for 2015:

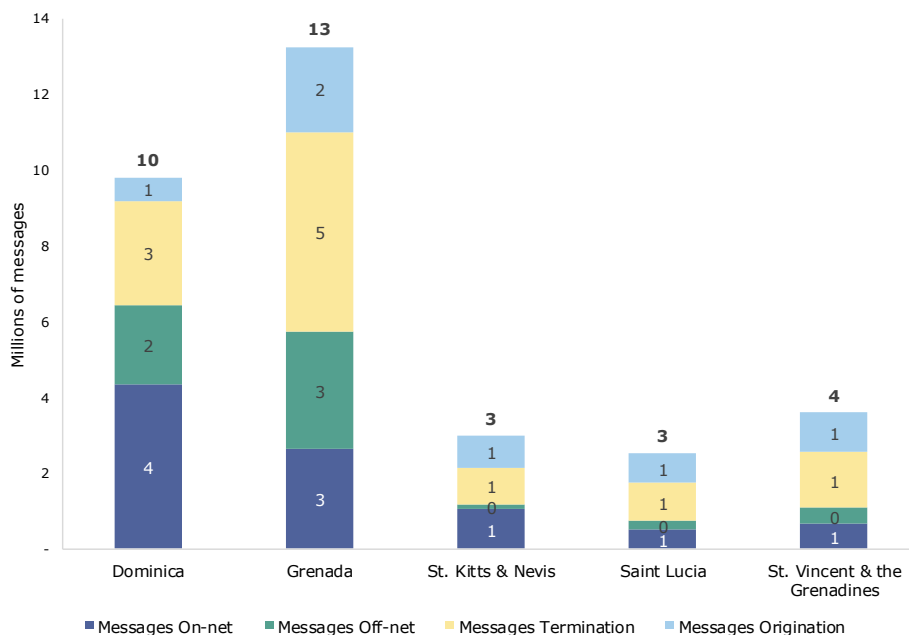


Exhibit 2.3: Total market messages traffic⁴ in 2015. [Source: Axon Consulting]

³ Figures include roaming in traffic.

⁴ Including SMSs and MMSs.

Question 1: Do you agree that the demand presented above accurately represents Member States’ mobile market? Please explain your views and support any comment with information.

2.1.2. Demand disaggregation per technology

Even though the disaggregation of traffic by technology was requested from the operators, no information has been provided to ECTEL. The following disaggregation has been considered:

Service Category	Technology	2015	2016	2017	2018	2019	2020
Voice, SMS and MMS	GSM	99.0%	97.2%	95.4%	93.6%	91.8%	90.0%
Voice, SMS and MMS	UMTS	1.0%	2.8%	4.6%	6.4%	8.2%	10.0%
Voice, SMS and MMS	LTE	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 2.1: Demand Disaggregation per technology for voice, SMS and MMS services. [Source: Axon Consulting]

Service Category	Technology	2015	2016	2017	2018	2019	2020
Data	GSM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Data	UMTS	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Data	LTE	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 2.2: Demand Disaggregation per technology for data services. [Source: Axon Consulting]

Question 2: Do you agree that the demand disaggregation per technology presented above accurately represents Member States’ mobile market? Please explain your views and provide measurements in your network to support your arguments.

2.1.3. Traffic forecast

The following table presents demand growth rates considered in the model:

Service Category	2016	2017	2018	2019	2020
Voice	0.0%	0.0%	0.0%	0.0%	0.0%
SMS and MMS	13.0%	12.0%	11.0%	10.0%	10.0%
Data	45.0%	35.0%	25.0%	15.0%	15.0%

Table 2.3: Demand growth rates. [Source: Axon Consulting]

Question 3: Do you agree that the growth rates presented above accurately represent Member States' mobile market? Please explain your views and provide measurements in your network to support your arguments.

2.1.4. Market Share

As described in the Methodology, the modelled reference operator will be required to satisfy a demand representing between 33% and a 50% of the overall demand. Following sections of the document present results for both 33% and 50% market shares to show the industry the impact of this parameter and gather feedback.

2.2. Demand Statistics

Apart from the overall demand described in previous section, a number of indicators are required in the model. The information considered in the model (worksheet 1B INP NW STATISTICS) has been based on the information provided by the operators and on the international practice. The following table presents a summary of main parameters considered. Note that these parameters have been modified within a range of $\pm 30\%$, due to confidentiality reasons:

Parameter	Value
Percentage of uncompleted calls because the recipient is busy or not available over total call attempts	22%
Percentage of uncompleted calls because the call is not taken (and the recipient is available and not busy) over total call attempts	22%
Average minutes per call - Voice On-net	4.60
Average minutes per call - Voice Outgoing	3.20
Average minutes per call - Voice Incoming	1.80
Average minutes per call - Video On-net	4.60
Average minutes per call - Video Outgoing	3.20
Average minutes per call - Video Incoming	1.80
Average ringing time in minutes	0.20
Download percentage for 2G data traffic	75%
Download percentage for 3G data traffic	75%
Download percentage for 4G data traffic	80%

Table 2.4: Summary of main demand statistics [Source: Axon Consulting]

Question 4: Do you agree that the statistics presented above are reasonable and accurately represent the demand in the Member States market? Please explain your views and provide own measurements to support your arguments.

2.3. WACC Calculation

The following formula has been used for the calculation of the Weighted Average Cost of Capital percentage for the mobile model:

$$WACC = W_d \times K_d + \frac{(1 - W_d) \times K_e}{1 - Tax}$$

Where:

- ▶ W_d represents gearing
- ▶ K_d represents cost of debt
- ▶ K_e represents return on equity
- ▶ Tax represents the average corporate tax

Cost of debt (K_d) has been obtained through the following formula:

$$K_d = r_f + CRP + D_p$$

Where:

- ▶ r_f represents risk free rate
- ▶ CRP represents the country risk premium
- ▶ D_p represents the debt premium

Return on equity (K_e) has been obtained through the following formula:

$$K_e = r_f + \beta \times (MRP + CRP)$$

Where:

- ▶ r_f represents risk free rate
- ▶ β represents the equity beta
- ▶ MRP represents market risk premium
- ▶ CRP represents country risk premium

Question 5: Do you agree with the formulas used for the calculation of WACC? Please explain your views.

The following table presents the average parameters used for the calculation of the WACC, based on the information provided by the operators:

Parameter	Value
Risk free rate (r_f)	2.71%
Country risk premium (CRP)	10.21%
Debt premium (D_p)	1.25%
Cost of debt (K_d)	14.16%
Equity Beta (β)	62.46%
Market risk premium (MRP)	5.55%
Return on equity (K_e)	12.55%
Gearing (W_d)	40.00% ⁵
Tax	27.62% ⁶

Table 2.5: Parameters used for the calculation of the Mobile Network WACC [Source: Axon Consulting]

Question 6: Do you agree that the parameters above are reasonable for the Member States? Please explain your views and provide information that supports your arguments.

The above formulas and parameters result in an average WACC for mobile operations in Member States of 16.07%⁷.

Question 7: Do you agree that WACC presented above is reasonable for mobile operations in Member States? Please explain your views and provide information that supports your arguments.

2.4. Population coverage of the modelled operator

Population coverage has a significant impact on the access network. The coverage figures considered in the model are input in the worksheet 1C INP COVERAGE. The following exhibit summarises the historic coverage considered in the model (2015):

⁵ Note that *Gearing* has been modified within a range of ± 10 p.p. due to confidentiality reasons

⁶ Based on information from World Bank.

⁷ Please note that this value is the result of using the anonymised *Gearing* presented above and that final WACC may vary slightly.

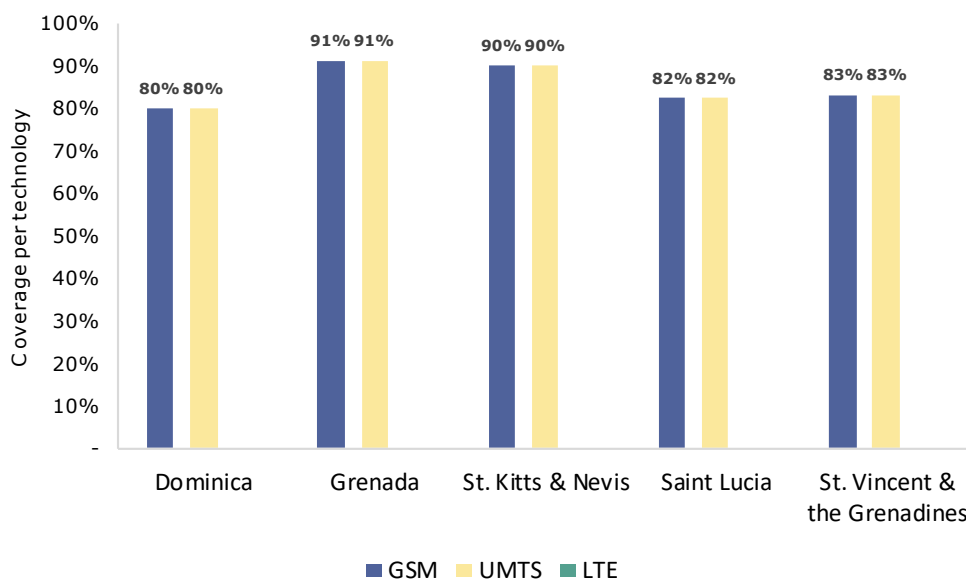


Exhibit 2.4: Historic coverage per technology (2015) [Source: Axon Consulting]

The information shown in the previous exhibit has been modified within a range of ± 10 p.p. due to confidentiality reasons.

Question 8: Do you agree that the coverage presented above is reasonable and accurately represents the coverage in the Member States?

Even though information about forecast coverage was requested from the operators, no information was provided to ECTEL. Due to the lack of information provided historic coverage (2015) has been considered for the entire period under analysis (2015-2020).

Question 9: Do you think that 2015 coverage is representative of the period 2015-2020? If not, please provide your best estimates, explaining your rationale behind, providing any supporting information and detailing the sources of such information.

2.5. Spectrum allocation per technology

Available spectrum and its allocation to each technology have a significant impact on the access network. The following exhibit presents the spectrum available in each

market⁸ and the allocation to each technology based on the information provided by the operators (worksheet 1D INP SPECTRUM):

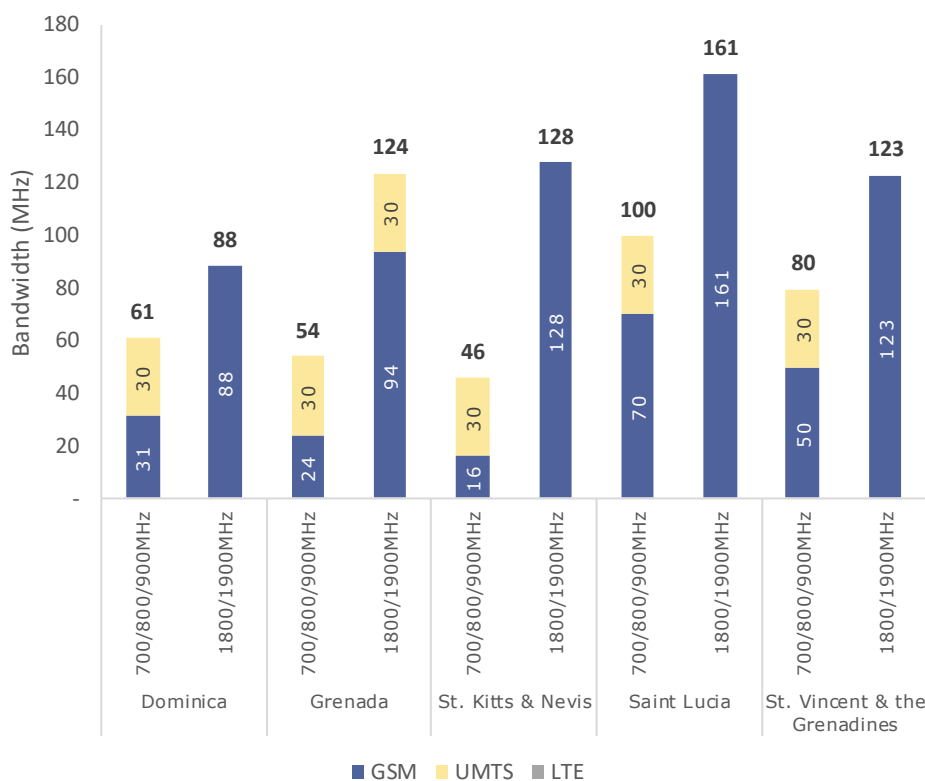


Exhibit 2.5: Bandwidth (uplink plus downlink) available for operators in each market and allocation to technologies. [Source: Axon Consulting]

Question 10: Do you agree that the spectrum above represents accurately the total spectrum available in the market? Please, explain your views.

Question 11: Do you agree that the spectrum allocation to technologies is reasonable? Please, explain your views.

The operators have not provided information to ECTEL about their plans (if any) to reallocate spectrum in the future. Therefore, the draft models are considering the spectrum allocation above for the entire period (2015-2020).

Question 12: Do you think it is reasonable to apply the spectrum allocation above to the entire period 2015-2020? If not, please explain your spectrum allocation plans and the rationale behind.

⁸ The reference operator will have access to an amount of spectrum consistent with its market share.

2.6. Modelled Backbone Network

Due to the lack of information on operators' backbone network⁹, a theoretical backbone network has been considered. Additionally, no information was made available to ECTEL regarding the transmission technologies used in the backbone. Therefore, it is assumed that backbone network is built based on leased lines¹⁰.

The following exhibits present the topology of the mobile core network considered for each of the Member States¹¹:



Exhibit 2.6: Topology of the mobile core network for Dominica. [Source: Axon Consulting]

⁹ Backbone represents the transmission network that aggregates traffic of access nodes in a number of backbone nodes, and convey it to the core node (where MGW and controllers are located).

¹⁰ Based on information from the fixed model, outlined in chapter 3.5 below.

¹¹ Please note that links distances are calculated based on road distances. They are shown as straight lines in the diagrams for simplicity purposes.



Exhibit 2.7: Topology of the mobile core network for Grenada. [Source: Axon Consulting]

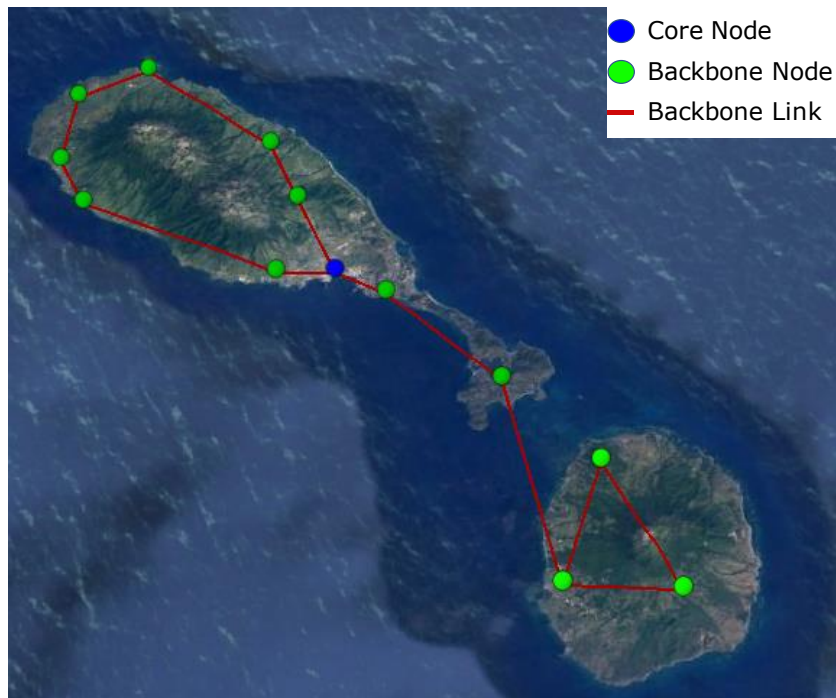


Exhibit 2.8: Topology of the mobile core network for St Kitts & Nevis. [Source: Axon Consulting]

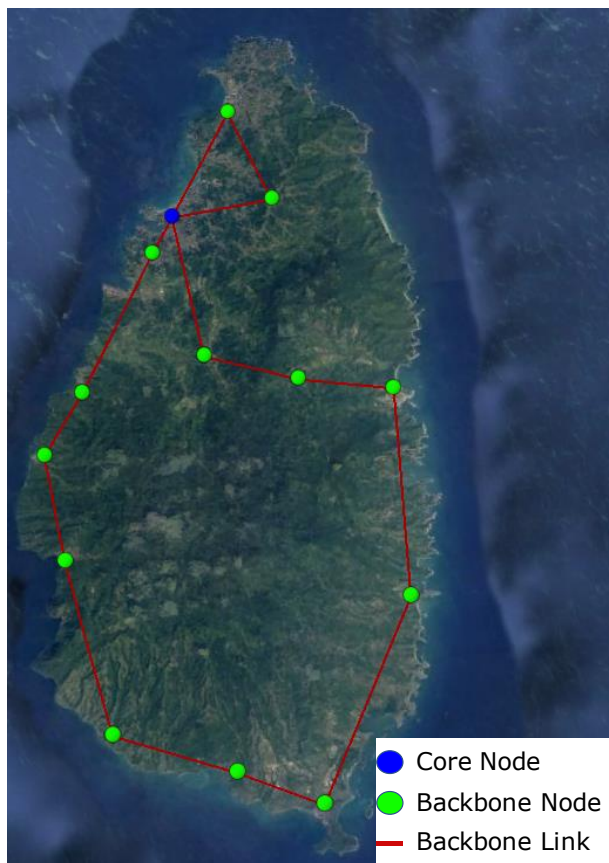


Exhibit 2.9. Topology of the mobile core network for Saint Lucia. [Source: Axon Consulting]

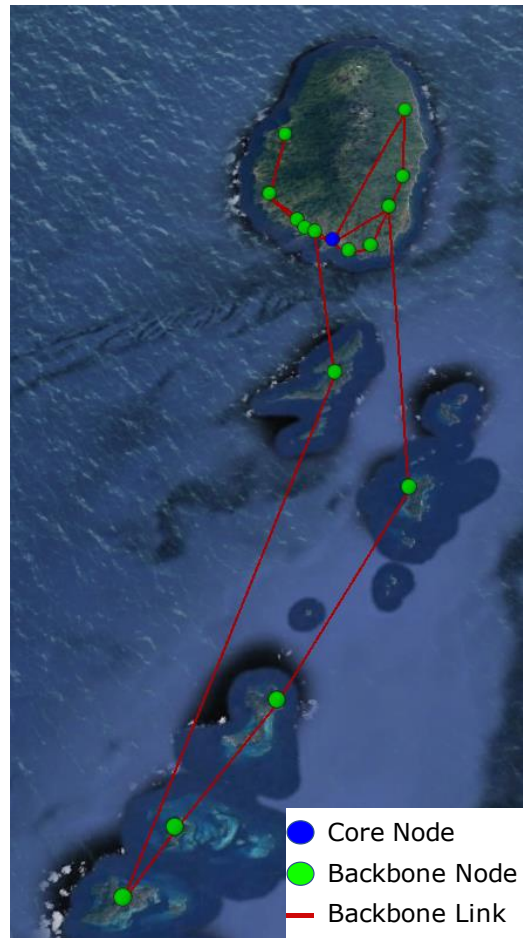


Exhibit 2.10: Topology of the mobile core network for St Vincent & the Grenadines. [Source: Axon Consulting]

Question 13: Do you agree that the backbone network considered for each Member State is reasonable? Please explain your views and provide information about your backbone network to support your comments.

2.7. Resulting network elements

The following table summarises the network resulting from the inputs described above¹² for each of the market share scenarios (33% and 50%):

Resource	Dominica		Grenada		St Kitts & Nevis		Saint Lucia		St Vincent & the G.	
	Market Share		Market Share		Market Share		Market Share		Market Share	
	33%	50%	33%	50%	33%	50%	33%	50%	33%	50%
Access										
Radio sites	43	51	26	31	49	61	49	57	47	49
BTS	31	34	20	24	27	35	18	21	17	19
TRX	298	338	220	278	308	405	192	255	176	201
NodesB	42	50	25	30	49	61	49	57	47	49
3G Cell Carriers	122	147	80	106	142	180	144	168	140	146
eNodesB	-	-	-	-	-	-	-	-	-	-
4G Cell Carriers	-	-	-	-	-	-	-	-	-	-
Controllers										
BSC	1	1	1	1	1	1	1	1	1	1
RNC	1	1	1	1	1	1	1	1	1	1
Transmission										
MW Links	2	2	3	3	2	2	1	1	4	4
Leased Lines Backhaul (Mbps)	-	-	-	-	-	-	-	-	-	-
Backhaul fibre (km)	109	119	52	67	52	62	99	115	74	78
Leased Lines Backbone (Mbps)	140	208	128	191	249	371	367	546	192	285
Backbone fibre (km)	-	-	-	-	-	-	-	-	-	-
Core										
MGW ¹³	1	1	1	1	1	1	1	1	1	1

Table 2.6: Summary of resources obtained for 2015 depending on operator market share¹⁴
[Source: BULRIC Model for Mobile networks]

Question 14: Do you agree that the resources obtained are reasonable to satisfy the demand and coverage of the Member States? Please explain your views and provide any information that supports your views.

¹² As well as other relevant inputs, such as those included in worksheet '2A INP NW'.

¹³ Please note that other core elements (such as MSCS, HLR, etc.) are shared among Member States. Therefore, they are modelled based on the capacity needed for each country (for example in BHCA).

¹⁴ Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

Additionally, based on the demand forecast considered (Section 2.1)¹⁵, the model results in the following network evolution:

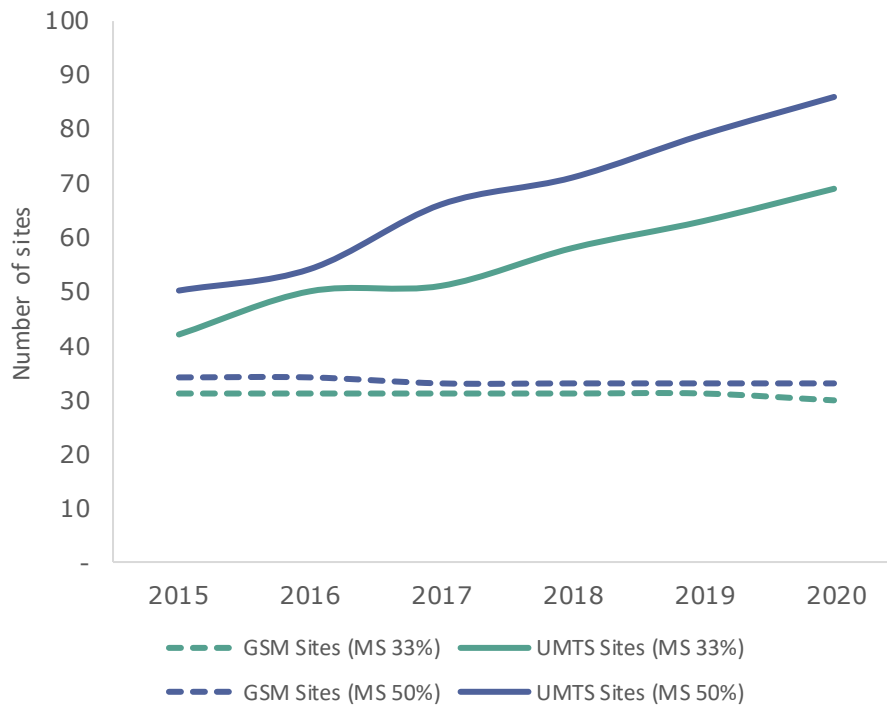


Exhibit 2.11: Evolution of GSM and UMTS sites for the reference operator (MS 33% and 50%) for Dominica.¹⁶ [Source: BULRIC Model for Mobile networks]

¹⁵ Please note that coverage has been considered constant due to the lack of information from operators (see section 2.4).

¹⁶ Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

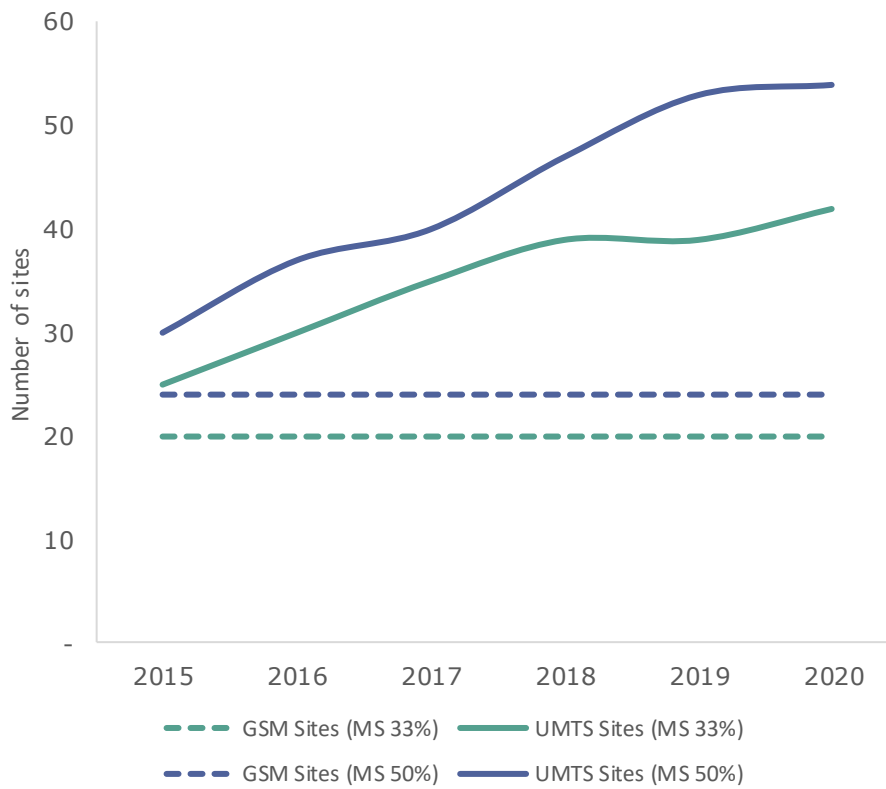


Exhibit 2.12: Evolution of GSM and UMTS sites for the reference operator (MS 33% and 50%) for Grenada. ¹⁷ [Source: BULRIC Model for Mobile networks]

¹⁷ Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

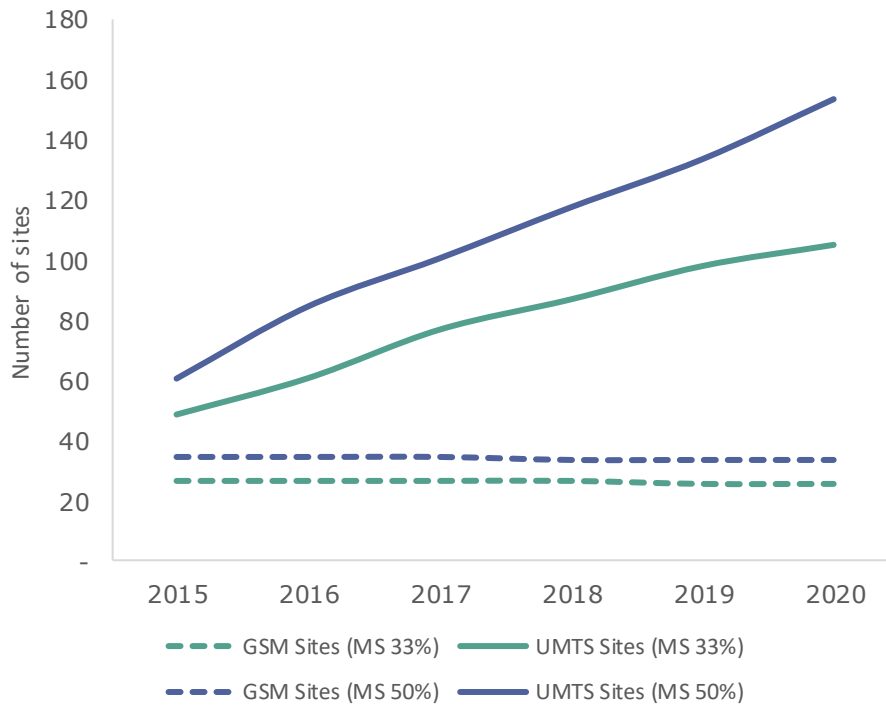


Exhibit 2.13: Evolution of GSM and UMTS sites for the reference operator (MS 33% and 50%) for St Kitts & Nevis.¹⁸ [Source: BULRIC Model for Mobile networks]

¹⁸ Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

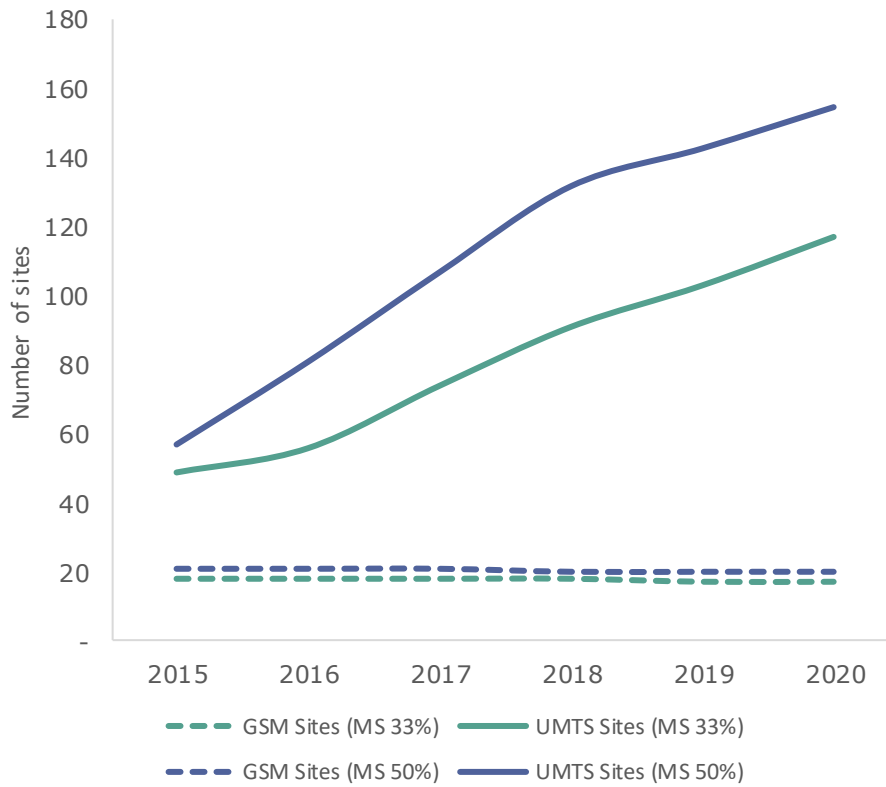


Exhibit 2.14: Evolution of GSM and UMTS sites for the reference operator (MS 33% and 50%) for Saint Lucia. ¹⁹ [Source: BULRIC Model for Mobile networks]

¹⁹ Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

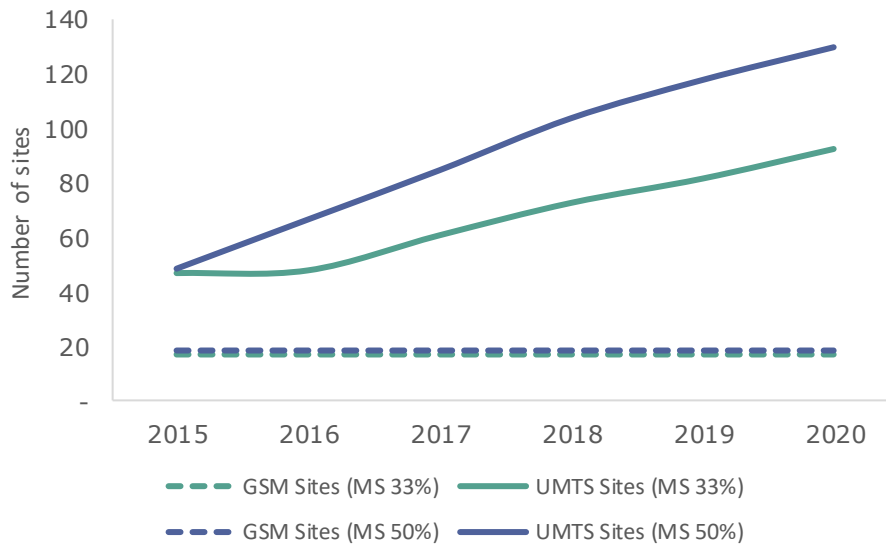


Exhibit 2.15: Evolution of GSM and UMTS sites for the reference operator (MS 33% and 50%) for St Vincent & the Grenadines.²⁰ [Source: BULRIC Model for Mobile networks]

Question 15: Do you agree that the sites evolution is reasonable and aligned with the demand requirements? Please explain your views and provide any information that supports your views.

²⁰ Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

2.8. Useful lives applied for annualisation

The useful lives used for the annualisation of the assets are based on the information provided by the operators. The following table presents a summary of the useful lives considered in the model:

Resource Category	Useful life
Access sites	17
RAN Hardware	8
RAN Software	5
Controllers Hardware	8
Controllers Software	5
Transmission equipment	8
Core equipment Hardware	8
Core equipment Software	5

Table 2.7: Summary of useful lives [Source: Axon Consulting]

**Question 16: Do you agree that the useful lives employed are appropriate?
Please explain your views.**

2.9. Costs

The costs are based on the following inputs:

- ▶ Unitary cost of the resources (worksheet '1E INP UNITARY COSTS')
- ▶ Resources' cost trends (worksheet '1F INP COST TRENDS')
- ▶ Overheads (worksheet '1I INP COST OVERHEADS')²¹

Based on these inputs, the model obtains the following costs for the reference operator for each of the Member States.

²¹ Please note that Overheads have been modified within a range of ± 0.5 p.p. due to confidentiality reasons.

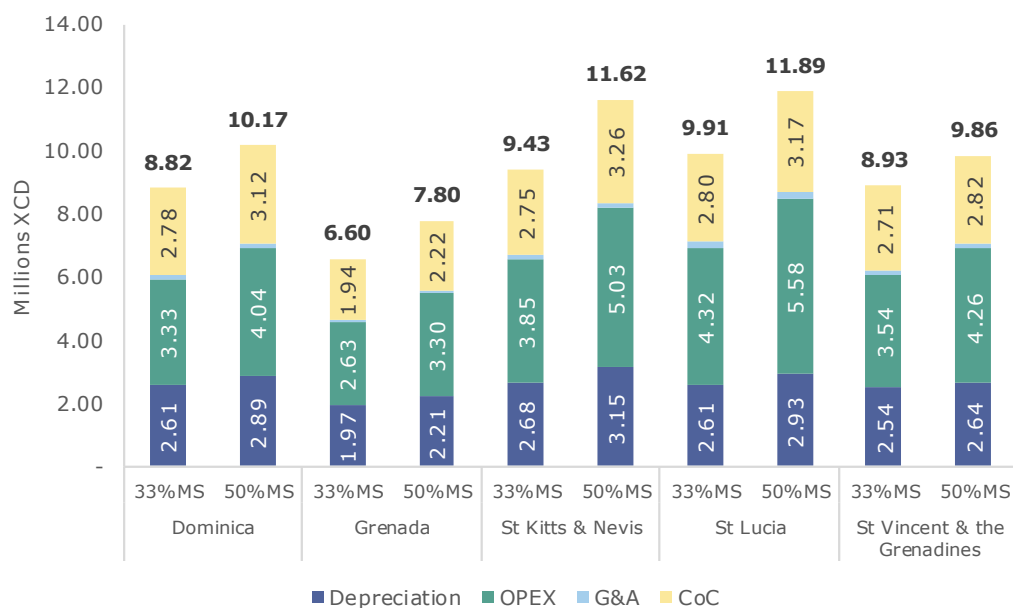


Exhibit 2.16: Total costs for reference operator (2015)²². [Source: BULRIC Model for Mobile networks]

Question 17: Do you agree that the costs obtained are reasonable for an operator with the demand, resources, etc. described above? Please explain your views and provide information supporting your arguments.

2.10. Cost allocation to services

Costs are allocated to the services based on routing factors. These routing factors represent the relative use that each service makes of a resource. The routing factors are introduced in the worksheet '3B MAP ROUTING FACTORS'. Resulting unit costs are presented in worksheet '13A OUT SERVICES LRIC+ UNIT COST'. The following exhibits present the resulting mobile termination costs:

²² Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

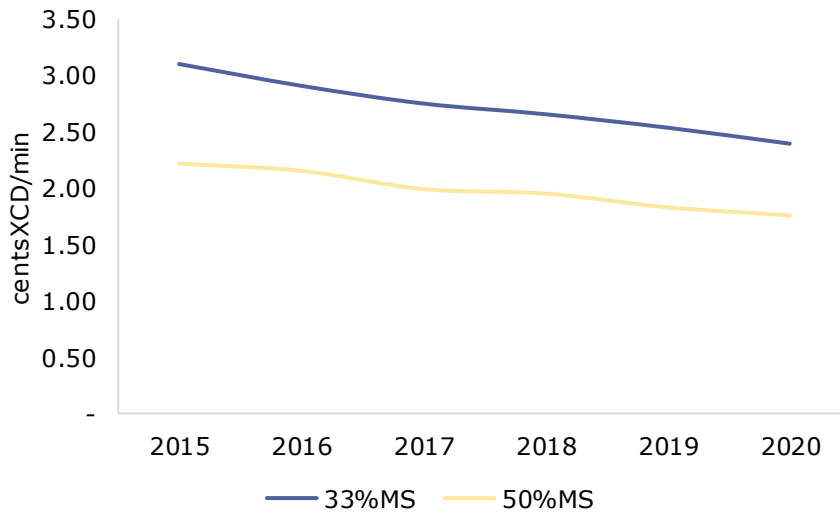


Exhibit 2.17: Mobile termination costs for Dominica.²³ [Source: BULRIC Model for Mobile networks]

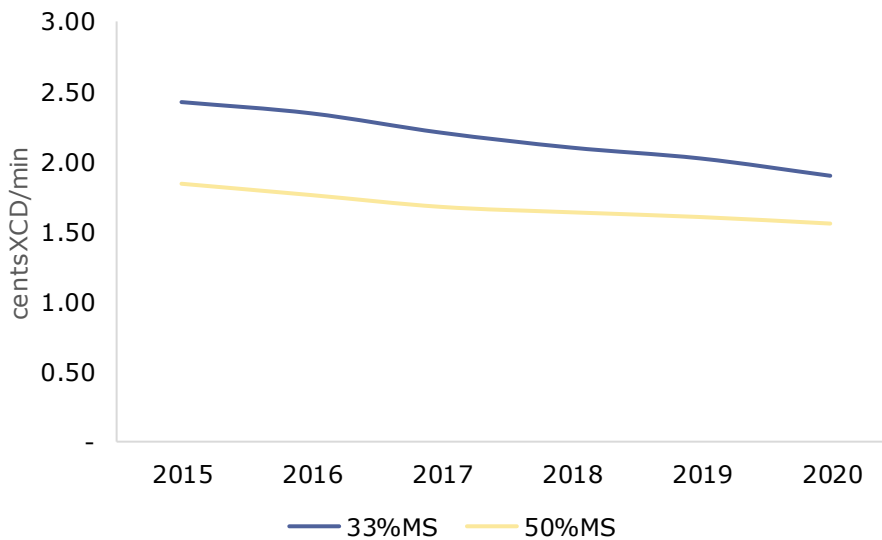


Exhibit 2.18: Mobile termination costs for Grenada.²⁴ [Source: BULRIC Model for Mobile networks]

²³ Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

²⁴ Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

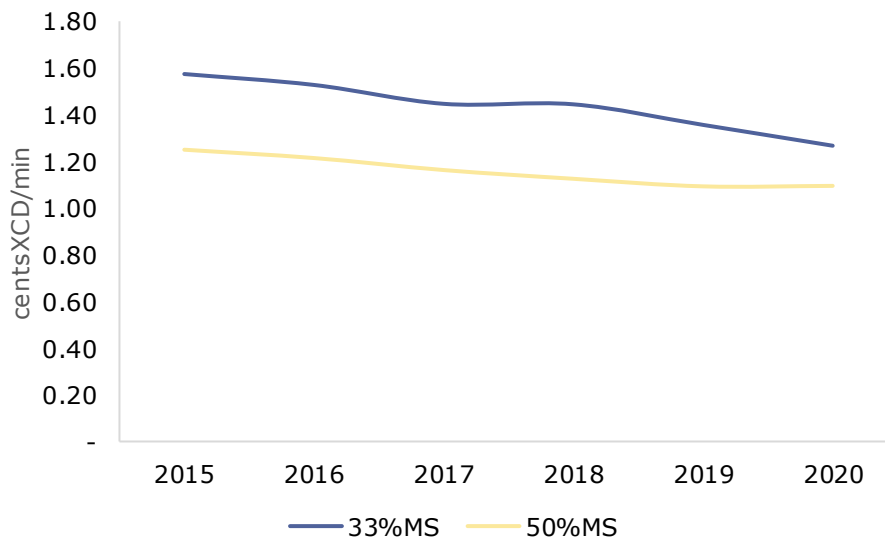


Exhibit 2.19: Mobile termination costs for St Kitts & Nevis. ²⁵ [Source: BULRIC Model for Mobile networks]

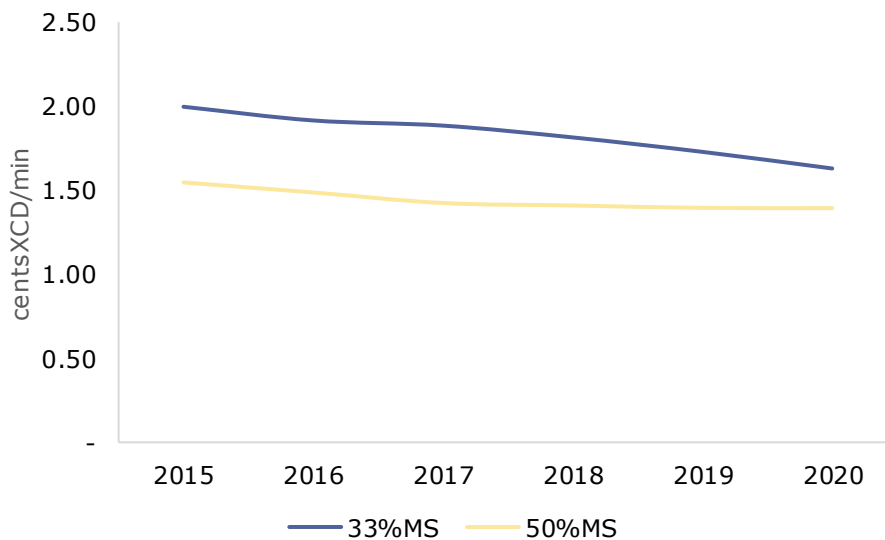


Exhibit 2.20: Mobile termination costs for Saint Lucia. ²⁶ [Source: BULRIC Model for Mobile networks]

²⁵ Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

²⁶ Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

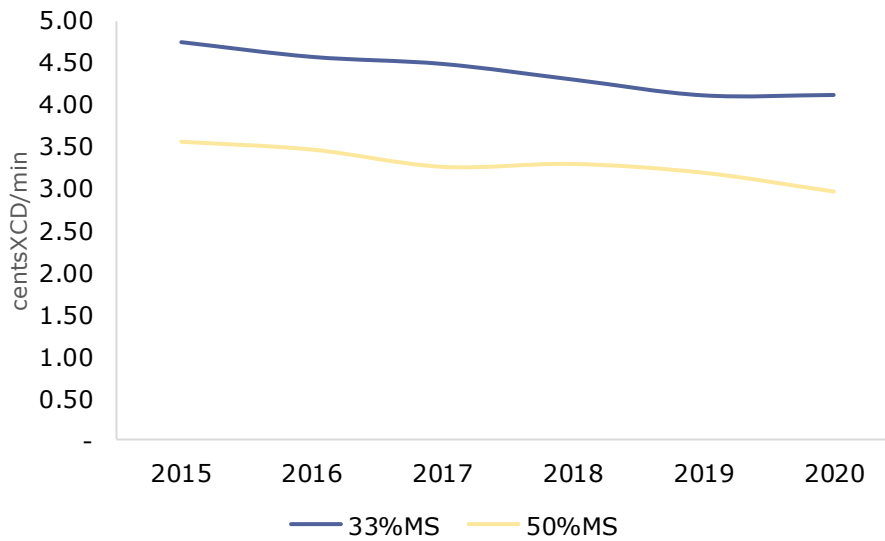


Exhibit 2.21: Mobile termination costs for St Vincent & the Grenadines. ²⁷ [Source: BULRIC Model for Mobile networks]

Question 18: Do you agree that the services' unit costs obtained, reasonably represent the costs in Member States? Please explain your views and provide information supporting your views.

Question 19: Based on the results presented in this and previous sections, what market share do you think should be used for each Member State? Please, explain your views and provide any supporting information required.

²⁷ Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

3. Topics that are considered of special relevance for the model for fixed networks

ECTEL welcomes all comments on the model, especially those that address the topics of highest relevance and with highest impact on the outcome of the model. ECTEL will dedicate special attention to those comments on topics of special relevance and which have greater impact on the results of the model. Therefore, ECTEL would appreciate comments from the operators especially on the following aspects of the Model:

- ▶ Market demand considered in the model
- ▶ Demand Statistics
- ▶ WACC Calculation
- ▶ Access network links' distance
- ▶ Resulting network elements
- ▶ Useful lives applied for annualisation
- ▶ Costs
- ▶ Cost allocation to services

3.1. Market demand considered in the model

Demand is one of the main inputs of a BULRIC model. The historic and forecast traffic used is based on the data provided by the operators in each Member State, and can be found in worksheet '1A INP DEMAND'.

In the following subsections, we present an overview of demand's main characteristics, namely:

- ▶ Overall market historic demand
- ▶ Traffic forecast

3.1.1. Overall market historic demand

As stated in the Methodology: *"ECTEL proposed to model an operator that will have similar characteristics to the national incumbent operator that combines existing copper and HFC networks. Therefore, the reference operator will be presumed to*

have the demand and coverage of both the copper and HFC incumbent’s networks.”

28

Based on the above, the information provided by the incumbent operators and the statistics available at ECTEL, the model is considering the demand for the reference operator as shown in following exhibits.

The following exhibit presents total voice traffic considered in the model for 2015. Note that voice distribution among categories has been modified within a range of $\pm 30\%$, due to confidentiality reasons:

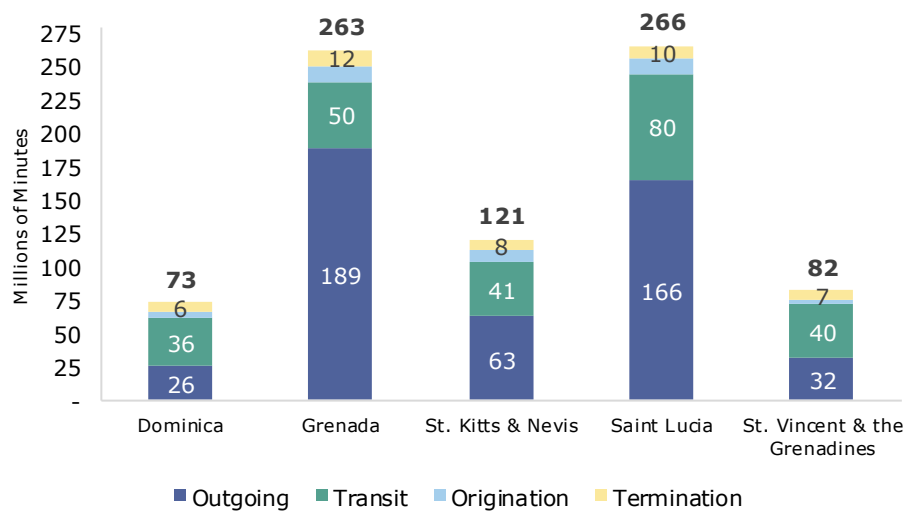


Exhibit 3.1: Reference operator voice traffic in 2015 [Source: Axon Consulting]

The following exhibit displays total data traffic considered in the model for 2015. Note that data traffic and its distribution among services has been modified within a range of $\pm 30\%$ due to confidentiality reasons:

²⁸ <https://www.ectel.int/principles-methodologies-and-guidelines-for-the-determination-of-new-interconnection-rates/>

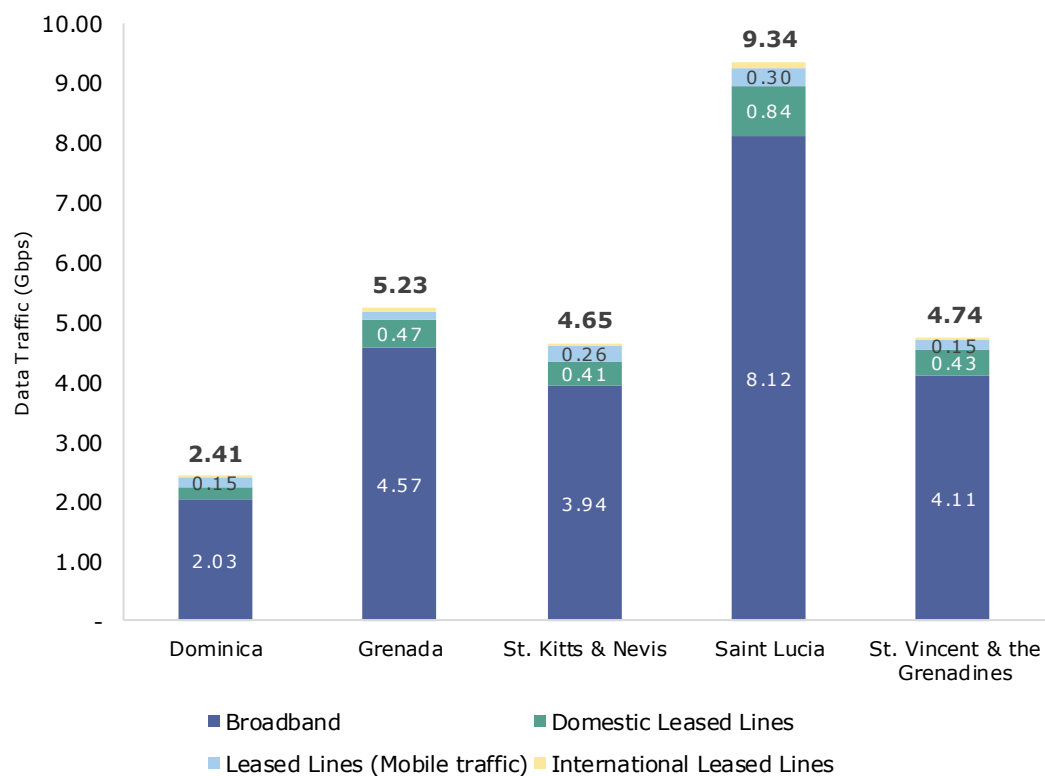


Exhibit 3.2: Reference operator data traffic in 2015 [Source: Axon Consulting]

The following table shows the number of TV channels considered in the model²⁹:

Member States	SD TV Channels	HD TV Channels
Dominica	-	-
Grenada	127	6
St Kitts & Nevis	-	-
Saint Lucia	67	49
St Vincent & the Grenadines	109	75

Table 3.1: Number of TV Channels considered in the model. [Source: Axon Consulting]

Question 20: Do you agree that the demand presented above accurately represents Member States' fixed market? Please explain your views.

²⁹ The bitrate considered for Standard Definition (SD) channels is 3.3 Mbps and for High Definition (HD) channels is 8.3 Mbps.

3.1.2. Traffic forecast

The following table presents the growth rate considered in the model:

Service Category	2016	2017	2018	2019	2020
Voice Outgoing (on-net and off-net)	-8.00%	-8.00%	-8.00%	-8.00%	-8.00%
Voice Termination from National	-3.00%	-3.00%	-3.00%	-3.00%	-3.00%
Voice Termination from International	-8.40%	-8.40%	-8.40%	-8.40%	-8.40%
Retail Broadband	17.00%	17.00%	17.00%	17.00%	17.00%

Table 3.2: Demand trends for the Member States for the services category defines in the Draft Model [Source: Axon Consulting]

Question 21: Do you agree that the demand trends presented above accurately represents Member States' fixed market? Please explain your views and provide measurements in your network to support your arguments.

3.2. Demand Statistics

Apart from the overall demand described in previous section, a number of demand indicators are required in the model. The information considered in the model (worksheet '1B INP NW STATISTICS') has been based on the information provided by the operators and on the international practice. The following table presents a summary of main parameters considered. Note that these parameters have been modified within a range of $\pm 30\%$ due to confidentiality reasons:

Parameter	Value
Percentage of uncompleted calls because the recipient is busy or not available over total call attempts	14.0%
Percentage of uncompleted calls because the call is not taken (and the recipient is available and not busy) over total call attempts	14.0%
Average minutes per call - Voice On-net	3.50
Average minutes per call - Voice Off-net	1.45
Average minutes per call - Off-net to international	5.30
Average minutes per call - Incoming from national (termination)	1.25
Average minutes per call - Incoming from international (termination)	4.70
Average minutes per call - Calls to emergency services	0.80
Average minutes per call - Calls to national DQ service	1.50
Average minutes per call - Calls to international DQ service	1.50
Average minutes per call - Domestic Transit	2.70
Average minutes per call - Terminating to emergency services	0.82
Average minutes per call - Terminating to national DQ	1.25
Average minutes per call - Terminating to international DQ	1.25
Average ringing time in minutes	0.25

Table 3.3: Summary of demand statistics [Source: Axon Consulting]

Question 22: Do you agree that the statistics presented above are reasonable and accurately represent the demand in Member States? Please explain your views and provide own measurements to support your arguments.

3.3. WACC Calculation

The following formula has been used for the calculation of the Weighted Average Cost of Capital percentage for the fixed model:

$$WACC = W_d \times K_d + \frac{(1 - W_d) \times K_e}{1 - Tax}$$

Where:

- ▶ W_d represents gearing
- ▶ K_d represents cost of debt
- ▶ K_e represents return on equity
- ▶ Tax represents the average corporate tax

Cost of debt (K_d) has been obtained through the following formula:

$$K_d = r_f + CRP + D_p$$

Where:

- ▶ r_f represents risk free rate
- ▶ CRP represents the country risk premium

- ▶ D_p represents the debt premium

Return on equity (K_e) has been obtained through the following formula:

$$K_e = r_f + \beta \times (MRP + CRP)$$

Where:

- ▶ r_f represents risk free rate
- ▶ β represents the equity beta
- ▶ MRP represents market risk premium
- ▶ CRP represents country risk premium

Question 23: Do you agree with the formulas used for the calculation of WACC? Please explain your views.

The following table presents the average parameters used for the calculation of the WACC, based on the information provided by the operators:

Parameter	Value
Risk free rate (r_f)	2.71%
Country risk premium (CRP)	10.21%
Debt premium (D_p)	1.75%
Cost of debt (K_d)	14.66%
Equity Beta (β)	56.00%
Market risk premium (MRP)	5.55%
Return on equity (K_e)	11.53%
Gearing (W_d)	40.00% ³⁰
Tax	27.62% ³¹

Table 3.4: Parameters used for the calculation of the Fixed Network WACC [Source: Axon Consulting]

Question 24: Do you agree that the parameters above are reasonable for the Member States? Please explain your views and provide information that supports your arguments.

The above formulas and parameters result in an average WACC for fixed operations in Member States of 15.42%³².

³⁰ Note that *Gearing* has been modified within a range of ± 10 p.p. due to confidentiality reasons

³¹ Based on information from World Bank.

³² Please note that this value is the result of using the anonymised *Gearing* presented above and that final WACC may vary slightly.

Question 25: Do you agree that WACC presented above is reasonable for fixed operations in Member States? Please explain your views and provide information that supports your arguments.

3.4. Access network links' distance

In order to properly characterise the average access transmission networks (between access nodes and Edge nodes), a geographical analysis has been performed to calculate the road distances based on real nodes' location.

Two topologies have been modelled for the backhaul connections, Ring Topology for urban areas and rural areas and Minimum Distance Tree Topology for Suburban and Rural areas³³, as shown in the following tables.

Geotype	Dominica	Grenada	St Kitts & Nevis	Saint Lucia	St Vincent & Grenadines
URBAN_DENSE	2.55	0.99	1.28	2.63	1.91
URBAN	2.46	2.00	1.28	2.18	1.88
SUBURBAN_DENSE	N/A ³⁴	N/A	N/A	N/A	N/A
SUBURBAN	N/A	N/A	N/A	N/A	N/A
RURAL	N/A	N/A	N/A	N/A	N/A
RURAL_SPREAD	N/A	N/A	N/A	N/A	N/A

Table 3.5: Average distance (km) of transmission links for connecting access nodes through ring topology for the Member States (km) [Source: Axon Consulting]

Geotype	Dominica	Grenada	St Kitts & Nevis	Saint Lucia	St Vincent & Grenadines
URBAN_DENSE	N/A	N/A	N/A	N/A	N/A
URBAN	N/A	N/A	N/A	N/A	N/A
SUBURBAN_DENSE	1.95	0.96	3.67	1.18	6.02
SUBURBAN	1.95	2.16	2.25	5.80	6.02
RURAL	5.67	5.50	1.89	5.80	3.63
RURAL_SPREAD	5.67	3.16	3.55	7.39	4.21

Table 3.6: Average distance (km) of transmission links per geotype through Minimum Distance Tree topology for the Member States [Source: Axon Consulting]

³³ Further detail on these topologies can be found in the Description of the BULRIC Model.

³⁴ N/A Represents the cases in which the topology is not used.

Question 26: Do you agree that the average distance extracted from the geographical analysis performed, reasonably represents the prevailing average length of the backhaul network in the geography of the Member States? Please explain your views and provide any information that supports your views.

3.5. Resulting network elements

The following table summarises the network resulting from the inputs described above³⁵. Please note that the geographical information included in the published models have been modified due to confidentiality reasons.

Resource	Dominica	Grenada	St Kitts & Nevis	Saint Lucia	St Vincent & G.
NGN nodes					
Access Sites	87	87	87	87	87
Edge Sites	9	9	9	9	9
Distribution Sites	4	4	4	4	4
Core Sites	1	1	1	1	1
Ethernet ports	20	23	22	21	22
Transmission					
Fibre (km)	391	243	229	477	246
Ethernet Chassis	89	81	90	90	74
Ethernet ports	195	185	208	179	179
DWDM Chassis	-	-	-	-	-
Lambdas	-	-	-	-	-
MW hops	-	6	8	-	9
MW Towers	-	6	7	-	9

Table 3.7: Summary of resources obtained for 2015.³⁶ [Source: BULRIC Model for Fixed networks]

Question 27: Do you agree that the resources obtained are reasonable to satisfy the demand of the Member States? Please explain your views and provide any information that supports your views.

³⁵ As well as other relevant inputs, such as those included in worksheet '2A INP NW'.

³⁶ Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

3.6. Useful lives applied for annualisation

The useful lives used for the annualisation of the assets are based on the information provided by the operators. The following table presents a summary of the useful lives considered in the model:

Resource Category	Useful life
Network sites	40
NGN chassis	5
Ethernet ports	5
Core equipment Hardware	8
Core equipment Software	5
Converters	8
International Exchange	5
MW hops	7
MW Towers	11
Fibre Cable	20
Transmission Ethernet chassis	5
Transmission Ethernet ports	5

Table 3.8: Summary of useful lives [Source: International benchmark information has been used]

Question 28: Do you agree that the useful lives employed are appropriate? Please explain your views.

3.7. Costs

The costs are based on the following inputs:

- ▶ Unitary cost of the resources (worksheet '1C INP UNITARY COSTS')
- ▶ Resources' cost trends (worksheet '1D INP COST TRENDS')
- ▶ Overheads (worksheet '1I INP COST OVERHEADS')³⁷

Based on these inputs, the model obtains the following costs for the reference operator:

³⁷ Please note that Overheads have been modified within a range of ±0.5 p.p. due to confidentiality reasons.

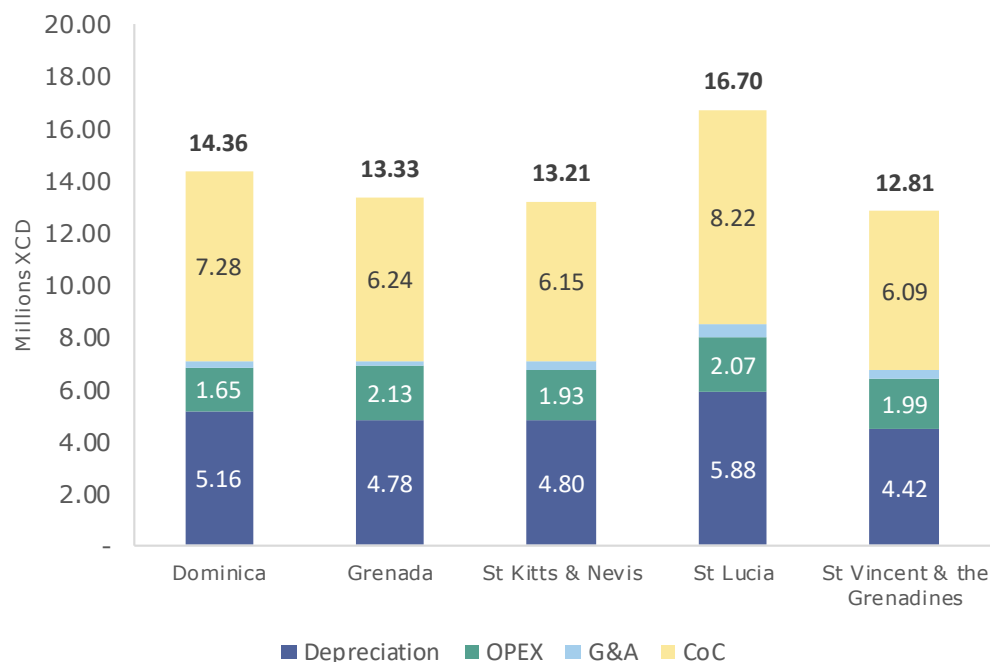


Exhibit 3.3: Total costs for the reference operator.³⁸ [Source: BULRIC Model for fixed networks]

Question 29: Do you agree that the costs obtained are reasonable for an operator with the demand, resources, etc. described above? Please explain your views and provide information supporting your arguments.

3.8. Cost allocation to services

Costs are allocated to the services based on routing factors. These routing factors represent the relative use that each service makes of a resource. The routing factors are introduced in the worksheet '3B MAP ROUTING FACTORS'. Resulting unit costs are presented in worksheet '10A OUT SERV LRIC+ UNIT COST'.

The following exhibits present the evolution of interconnection unit costs:

³⁸ Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

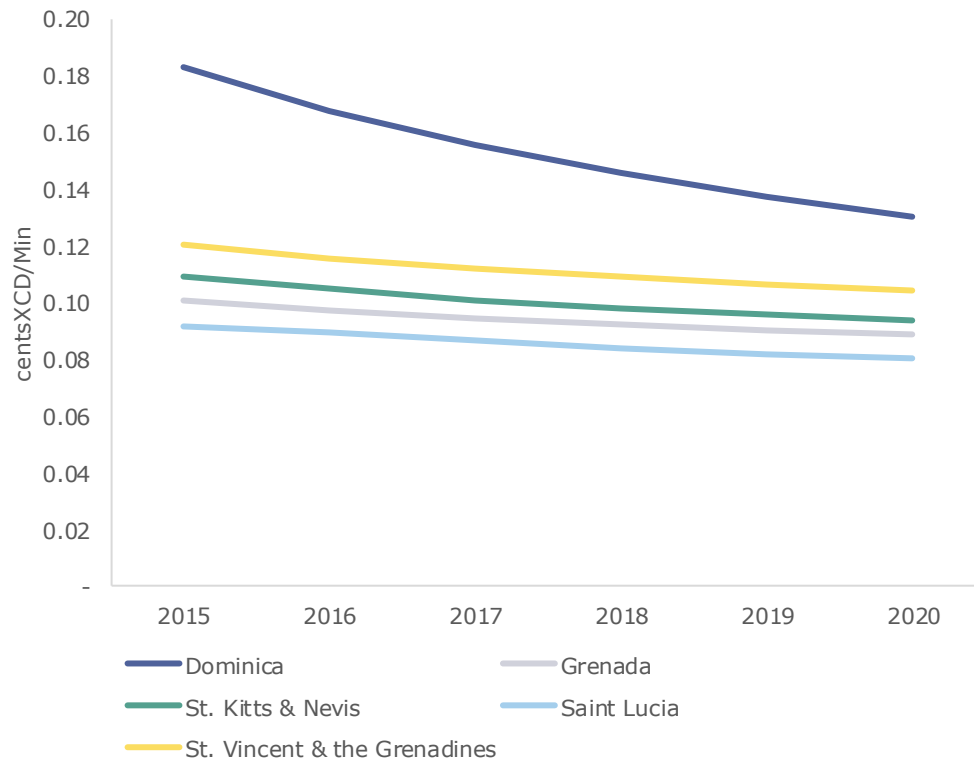


Exhibit 3.4: Domestic Transit costs.³⁹ [Source: BULRIC Model for Fixed networks]

³⁹ Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

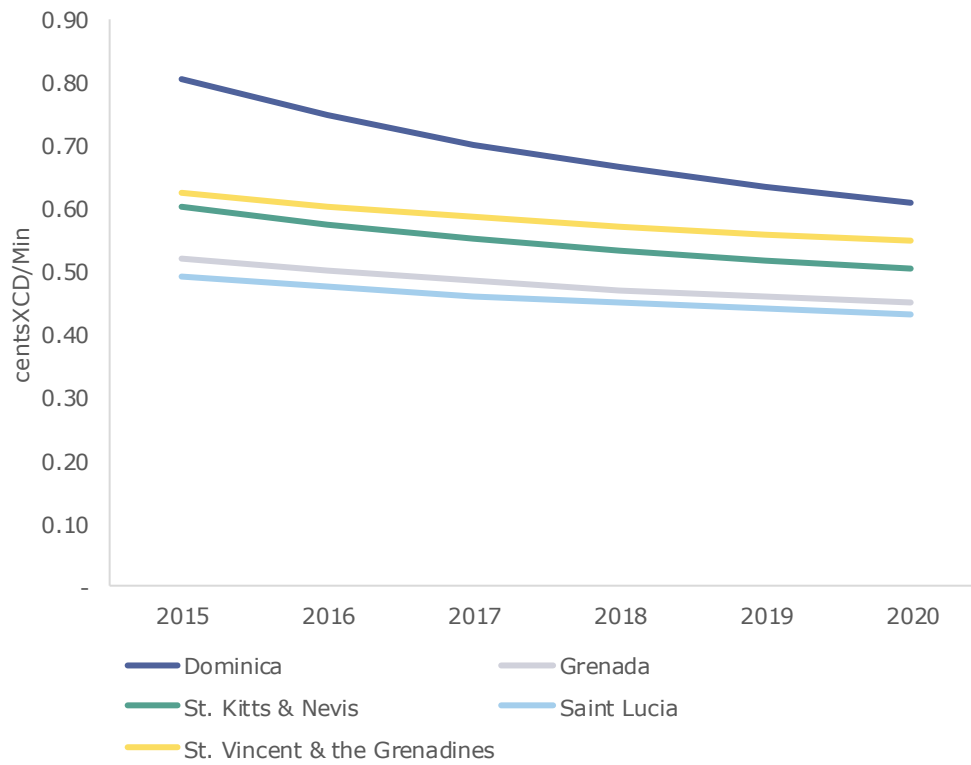


Exhibit 3.5: National termination costs.⁴⁰ [Source: BULRIC Model for Fixed networks]

⁴⁰ Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

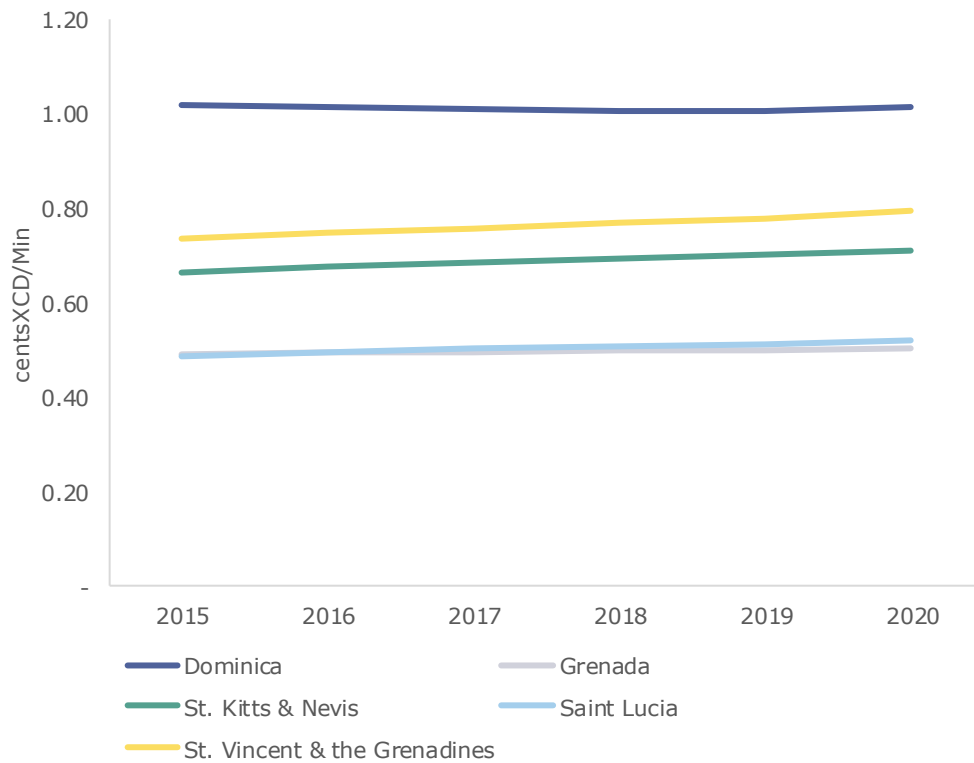


Exhibit 3.6: International termination costs.⁴¹ [Source: BULRIC Model for Fixed networks]

⁴¹ Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

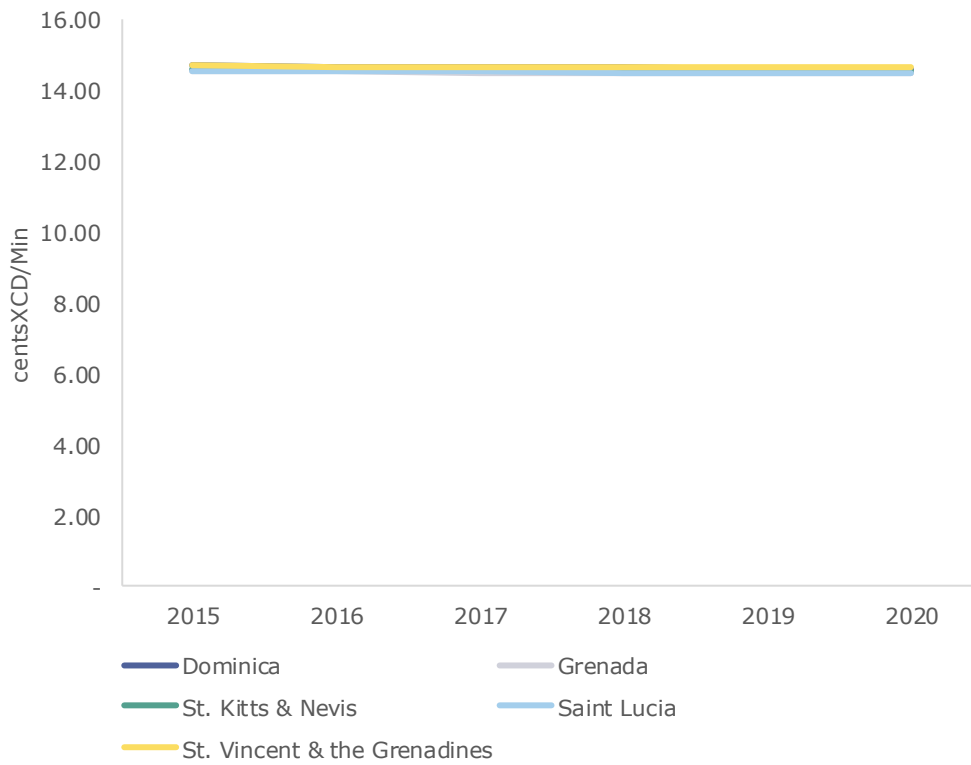


Exhibit 3.7: Emergency services termination costs.⁴² [Source: BULRIC Model for Fixed networks]

⁴² Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

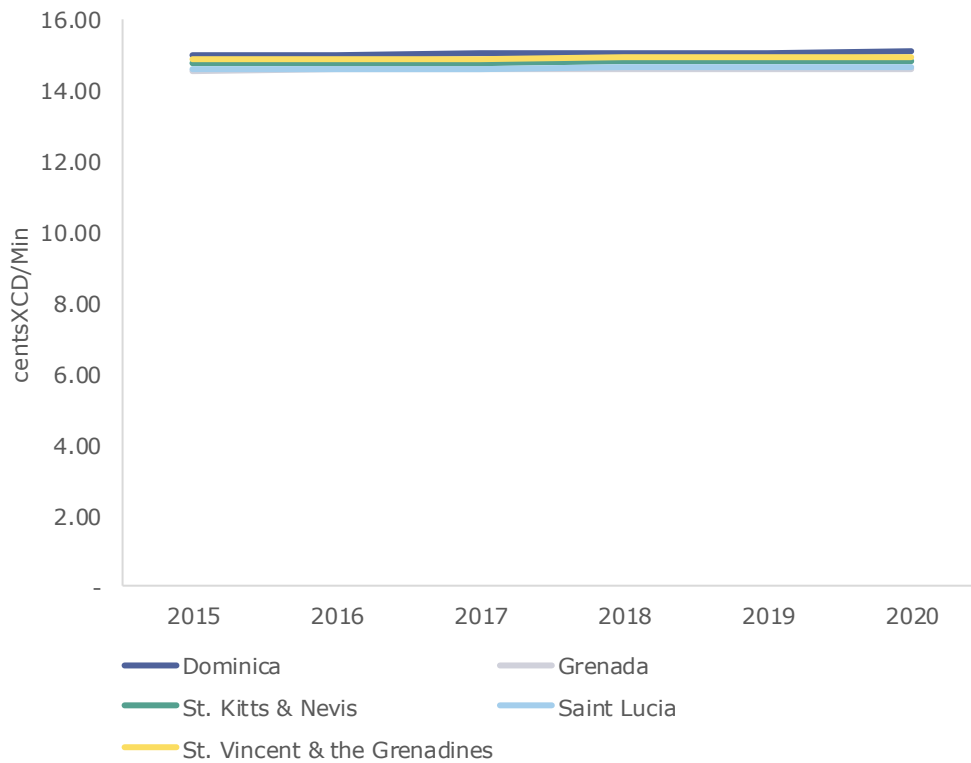


Exhibit 3.8: DQ services termination costs. ⁴³ [Source: BULRIC Model for Fixed networks]

Question 30: Do you agree that the services' unit costs obtained, reasonably represent the costs in the Member States market? Please explain your views.

⁴³ Please note that these results have been obtained based on the anonymised information described in this document and that the final values may vary.

Annex A. Summary of Questions

Question 1: Do you agree that the demand presented above accurately represents Member States' mobile market? Please explain your views and support any comment with information.	7
Question 2: Do you agree that the demand disaggregation per technology presented above accurately represents Member States' mobile market? Please explain your views and provide measurements in your network to support your arguments.	7
Question 3: Do you agree that the growth rates presented above accurately represent Member States' mobile market? Please explain your views and provide measurements in your network to support your arguments.....	8
Question 4: Do you agree that the statistics presented above are reasonable and accurately represent the demand in the Member States market? Please explain your views and provide own measurements to support your arguments.....	9
Question 5: Do you agree with the formulas used for the calculation of WACC? Please explain your views.	9
Question 6: Do you agree that the parameters above are reasonable for the Member States? Please explain your views and provide information that supports your arguments.....	10
Question 7: Do you agree that WACC presented above is reasonable for mobile operations in Member States? Please explain your views and provide information that supports your arguments.....	10
Question 8: Do you agree that the coverage presented above is reasonable and accurately represents the coverage in the Member States?	11
Question 9: Do you think that 2015 coverage is representative of the period 2015-2020? If not, please provide your best estimates, explaining your rationale behind, providing any supporting information and detailing the sources of such information.	11
Question 10: Do you agree that the spectrum above represents accurately the total spectrum available in the market? Please, explain your views.	12
Question 11: Do you agree that the spectrum allocation to technologies is reasonable? Please, explain your views.	12
Question 12: Do you think it is reasonable to apply the spectrum allocation above to the entire period 2015-2020? If not, please explain your spectrum allocation plans and the rationale behind.....	12
Question 13: Do you agree that the backbone network considered for each Member State is reasonable? Please explain your views and provide information about your backbone network to support your comments.	16

Question 14: Do you agree that the resources obtained are reasonable to satisfy the demand and coverage of the Member States? Please explain your views and provide any information that supports your views.	17
Question 15: Do you agree that the sites evolution is reasonable and aligned with the demand requirements? Please explain your views and provide any information that supports your views.....	22
Question 16: Do you agree that the useful lives employed are appropriate? Please explain your views.	23
Question 17: Do you agree that the costs obtained are reasonable for an operator with the demand, resources, etc. described above? Please explain your views and provide information supporting your arguments.	24
Question 18: Do you agree that the services' unit costs obtained, reasonably represent the costs in Member States? Please explain your views and provide information supporting your views.	27
Question 19: Based on the results presented in this and previous sections, what market share do you think should be used for each Member State? Please, explain your views and provide any supporting information required.	27
Question 20: Do you agree that the demand presented above accurately represents Member States' fixed market? Please explain your views.	30
Question 21: Do you agree that the demand trends presented above accurately represents Member States' fixed market? Please explain your views and provide measurements in your network to support your arguments.....	31
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Question 23: Do you agree with the formulas used for the calculation of WACC? Please explain your views.	33
Question 24: Do you agree that the parameters above are reasonable for the Member States? Please explain your views and provide information that supports your arguments.	33
Question 25: Do you agree that WACC presented above is reasonable for fixed operations in Member States? Please explain your views and provide information that supports your arguments.....	34
Question 26: Do you agree that the average distance extracted from the geographical analysis performed, reasonably represents the prevailing average length of the backhaul network in the geography of the Member States? Please explain your views and provide any information that supports your views.	35
Question 27: Do you agree that the resources obtained are reasonable to satisfy the demand of the Member States? Please explain your views and provide any information that supports your views.	35

Question 28: Do you agree that the useful lives employed are appropriate? Please explain your views.36

Question 29: Do you agree that the costs obtained are reasonable for an operator with the demand, resources, etc. described above? Please explain your views and provide information supporting your arguments.37

Question 30: Do you agree that the services' unit costs obtained, reasonably represent the costs in the Member States market? Please explain your views.....42

Annex B. Glossary

2G	Second generation mobile telecommunications technology (GSM)
3G	Third generation of mobile telecommunications technology (UMTS and HSPA)
4G	Fourth generation of mobile telecommunications technology (LTE)
BSC	Base Station Controller.
BTS	Base Transceiver Station: establishes the radio-connection between the user termination (mobile phone) and the mobile network according to the GSM Standard
BULRIC model	Bottom-up Long Run Incremental Cost model
EDGE	Enhanced Data Rates for GSM Evolution
eNode B	Establishes the radio-connection between the user termination (mobile phone) and the mobile network according to the LTE Standard
GSM	Global System for Mobile Communications
HSPA	High-Speed Packet Access
LRIC	Long Run Incremental Cost
LTE	Long Term Evolution
MGW	Media Gateway
NGN	New Generation Network

Node B	Establishes the radio-connection between the user termination (mobile phone) and the mobile network according to the UMTS Standard
OpEx	Operational Expenditure
RNC	Radio Network Controller
SMS	Short Message Service
UMTS	Universal Mobile Telecommunications System