Office of Utilities Regulation

Update of the Mobile Cost Model

Consultation Document

OFFICE OF UTILITIES REGULATION

2020 June 02

Abstract

This document has been prepared to facilitate discussion and consultation in relation to the update of the Bottom-Up Long Run Incremental Cost (BULRIC) Model carried out by the Office of Utilities Regulation (OUR), with the support of MARPIJ Consulting firm.

An updated Draft Model has been prepared for consultation. The updated Model is informed by the principles and methodology defined in the "Cost Model for Mobile Termination Rates – The Determination Notice" Document No: TEL2012001_DET001 published on 2012 July 24 and stakeholders' feedback on the Data Request which was issued on 2019 January 04.

Consultation Process

COMMENTS FROM INTERESTED PARTIES

Persons who wish to express opinions on this Consultation Document are invited to submit their comments in writing to the Office of Utilities Regulation ("OUR") by post, delivery, facsimile or e-mail addressed to:

Office of Utilities Regulation
P.O. Box 593,
36 Trafalgar Road,
Kingston 10

Attention: Nakesha Allen
Fax: (876) 929-3635
E-mail: MobileLRICConsultation@our.org.jm

Responses are requested by 2020 June 30.

Any confidential information should be submitted separately and clearly identified as such. The submission of confidential information should be accompanied by a detailed justification in keeping with section 7(6) of the Telecommunications Act.

Responses that are not confidential, pursuant to sections 7(6) and 7A of the Telecommunications Act, will be posted to the OUR's website (http://www.our.org.jm/). Respondents are therefore requested, where possible, to supply their responses in electronic form to facilitate such postings.

COMMENTS ON RESPONSES

There will be a specific period for respondents to view other responses (non-confidential) and to make comments on them. The comments may take the form of either correcting a factual error or putting forward counterarguments and/or providing data relating to the project. As in the case of the responses, comments which are not confidential pursuant to the Telecommunications Act will be posted to the OUR's website.

Comments on responses are requested by 2020 July 14.

ARRANGEMENTS FOR VIEWING RESPONSES

This Consultation Document and responses and comments received by the OUR will also be made available to the public through the OUR's Information Centre ("OURIC"). Persons who wish to view the Consultation Document, responses and comments should make an appointment by contacting:

Ms. Colleen Mignott
Coordinator OURIC/Information Officer
Telephone: (876) 968-6053
Fax: (876) 929-3635
Email: colleen.mignott@our.org.jm

Individuals with appointments should visit the OUR's offices at:

3rd Floor, PCJ Resource Centre,
36 Trafalgar Road,
Kingston 10

Photocopies of selected responses and comments may be provided on request at a price which reflects the cost to the OUR.

CONSULTATIVE TIMETABLE

The timetable for the consultation is summarized in the table below:

Event	Date
Publish Consultation Document	2020 June 02
Response to the Consultation Document	By 2020 June 30
Comments on Responses	By 2020 July 14
Issue Determination Notice	By 2020 December 21

Abbreviations

AUPU	Average Usage Per User
CAGR	Compound Annual Growth Rate
CAPEX	Capital Expenditure
CE	Channel Elements
C&WJ	Cable and Wireless Jamaica Limited
EC	European Commission
ECTEL	The Eastern Caribbean Telecommunications Authority
EPMU	Equi-Proportional Mark-Up
FB	Fibre-Based
HSPA	High Speed Packet Access
IMS	IP Multimedia Subsystem
LRIC	Long Run Incremental Cost
LTE	Long Term Evolution
LTE-A	Long Term Evolution Advanced
MNO	Mobile Network Operator
MTR	Mobile Termination Rate
MW	Micro-Wave
NRA	National Regulatory Authority
OPEX	Operational Expenditure
OUR/Office	Office of Utilities Regulation
PE Router	Provider Edge Router
PSTN	Public Switched Telephone Network
SBC	Session Border Controller

TAS	Telephone Application Server
VoLTE	Voice Over LTE
WACC	Weighted Average Cost of Capital

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Chapter 1: Introduction

Background

1.1 There are two mobile telecommunications operators in Jamaica: Cable and Wireless Jamaica Limited (C&WJ) and Digicel Jamaica Limited ("Digicel"). In the mobile sector, C&WJ is the incumbent operator and Digicel is the market leader based on subscription and traffic. As at the end of 2018, there were approximately 2,964,974 mobile voice subscribers for a penetration rate of 109%. Prepaid subscribers accounted for approximately 93% of all mobile voice subscribers. Approximately one-half of mobile voice subscribers are mobile Internet users (55%). Both C&WJ and Digicel have been declared dominant in the provision of mobile call termination service on their own networks.

1.2 On 2012 July 24, the Office of Utilities Regulation ("OUR" or "Office") published "Cost Model for Mobile Termination Rates - The Determination Notice" Document No: TEL2012001_DET001 (hereinafter, "the Methodology"), which outlined the methodology to be followed in the development of a mobile cost Model. The Determination Notice "*Cost Model for Mobile Termination Rates – The Decision on Rates*" Document No: TEL2013001_DET001 (hereinafter "the Notice") and the existing Cost Model were issued on 2013 May 30. The Notice established a mobile termination rate for all mobile operators.

1.3 The methodological aspects followed in the development of the current version of the Model, are as follows:

- It is a bottom-up LRIC Model based on the operations of a generic reference mobile operator. The traffic of the efficient generic operator is set at 50% of the total market traffic.
- The Model estimates symmetrical termination rates for the generic operator based on three cost methodologies: stand alone cost; total LRIC; and pure (avoidable) LRIC of providing the services. In line with the Telecommunications Act ("the Act"), the termination rate was set at the level of the pure LRIC rate estimated by the Model.
- The Model uses a scorched node topology based on the location of nodes in the network of the existing operators. The Model uses an average of the number of base stations of both operators.
- The Model is based on the radio technology of the existing operators and so it uses a combination of both 2G and 3G technologies. The amount of 3G equipment in the network increases over time with the 3G penetration rate also increasing.
- The backhaul and the core network use a combination of microwave links and fibre transmission based on the usage of Digicel and C&WJ.

- Equipment costs was based on the average of recent prices paid by Digicel and C&WJ, where the information was available and reliable. Otherwise, benchmark data from cost models in other jurisdictions was used.
- The Model assumes that all interconnected operators are directly connected to the mobile switch rather than transited through the fixed network of the operators.
- A yearly approach is used to dimension the network with depreciation calculated based on the adjusted tilted annuity approach: "For each year, the traffic increment is computed. Then the economic incremental cost with and without the traffic increment is computed. The difference between these two costs is the avoided cost. The pure LRIC with the adjusted tilted annuities is then the result of the avoided cost discounted by the WACC and divided by the traffic increment"[1].
- Common costs and overhead costs are allocated in the Model using the Shapley-Shubik approach and Equi-Proportional Mark-Up (EPMU), respectively.
- The Model runs on Excel.

1.4 In keeping with its express statutory powers to determine the charges for interconnection services, the OUR has initiated this consultation process to allow stakeholders to provide feedback on the updated Model. After the conclusion of this consultation process, the OUR will address the contributions provided by stakeholders and a final version of the Model will be developed.

1.5 Due to confidentiality issues for some of the data considered in the Model, the figures have been anonymised in the Consultation document as well as the public version of the Model. To ensure the industry can provide valuable comments, the published figures may have been calculated as a random variation within a defined range. In particular, the following inputs have been anonymised:

- Demand Statistics
- Technical design parameters of the "Generic Operator" modelled, such as:
    - Key traffic parameters, as well as Busy hour traffic parameters and 3G data traffic split per bearer.
    - Main engineering, Network and equipment dimensioning parameters.
    - Transmission parameters including share of technology for transmission (backhaul), transmission cost and other dimensioning parameters.

[1] Source: "Cost Model for Mobile Termination Rates – The decision on Rates" – Publication date: May 30,2013

- Unit cost items and interconnection staff cost.
- Overheads

Structure of the Document

1.6 The remainder of this document is structured as follows:

- **Chapter 2** outlines the Legal Framework that underscores the remit of the OUR in regard to regulation of interconnection rates.
- **Chapter 3** discusses market and technological developments.
- **Chapter 4** details topics that are considered of special relevance, including the estimated mobile termination rate following the model updates.
- **ANNEX 1** provides a summary of all questions from the consultation document.
- **ANNEX 2** outlines the main specifications of network equipment used as design parameters and considered in the model.
- **ANNEX 3** provides a list of the major updates made to the Excel model.

Chapter 2: Legal and Regulatory Framework

2.1 In accordance with its overall function to regulate specified services and facilities under section 4(1) of the Telecommunications Act ("the Act"), and in keeping with its express power to determine the rates which may be charged in respect of the provisions of a prescribed utility service pursuant to section 4(4) of the Office of Utilities Regulation Act ("the OUR Act"), the OUR is authorised to determine the prices charged by telecommunications operators for the provision of interconnection services.

2.2 Section 4(1)(a) of the Act states:

> *"(1) The Office shall regulate telecommunications in accordance with this Act and for that purpose the Office shall -*
>
> *(a) regulate specified services and facilities;"*

2.3 Section 4(4) of the OUR Act states:

> *"(4) The Office shall have power to determine, in accordance with the provisions of this Act, the rates or fares which may be charged in respect of the provisions of a prescribed utility service".*

2.4 A "*specified service*" is defined in section 2 of the Act to mean, "*a telecommunications service, or such other service as may be prescribed*" while a "*prescribed utility service*" is defined in section 2 and the First Schedule of the OUR Act to include the provision of telecommunication services.

2.5 The Legal framework governing interconnection, which is a type of telecommunications service, is set out in sections 27 – 37A inclusive of the Act. Section 29 of the Act requires that all carriers permit other carriers, upon request, to interconnect with their public networks. Subsection (1) of that section provides as follows:

> *"Each carrier shall, upon request in accordance with this Part, permit interconnection of its public network with the public network of any other carrier for the provisions of telecommunications services".*

2.6 The Office is empowered under the Act to make a determination as to the permissible terms and conditions, including charges, for these interconnection arrangements. Sections 29(4)(a) and 29(5), (6) and (7)of the Act provide respectively in part :

"(4) The Office may-

(a) on its own initiative, in assessing an interconnection agreement, make a determination of the terms and conditions, including charges".

"(5) When making a determination of an operator's interconnection charges, the Office shall have regard to -

(a) the principles of cost orientation or reciprocity;;,
(b) local or international benchmarks; or
(c) any other approach that is relevant to the determination of interconnection charges.

(6) Any determination of the Office made pursuant to subsection (4) shall be binding on the operator.

(7) For the purpose of subsections (4) and (5)-
…
"reciprocity" means basing a carrier's interconnection charges on the interconnection charges of another carrier"

2.7 The Act further grants specific powers to the Office to assess and approve the terms and conditions of interconnection, including charges, offered by public telecommunications carriers which are determined by the Office to be dominant. These terms and conditions are required under the Act to be embodied in a reference interconnection offer ("RIO"). Some of the relevant sections of the Act in this regard are set out below:

"28-(1) Subject to subsection (2), the Office shall determine which public telecommunications carriers are to be classified as dominant public telecommunications carriers for the purposes of this Act."

"32(1) Every dominant carrier shall, and any other carrier may, lodge with the Office a proposed reference interconnection offer setting out the terms and conditions upon which other carriers may interconnect with the public network of that dominant or other carrier for the provision of telecommunications services."

"32(2) Each dominant public telecommunications carrier who is required under this Part to provide interconnection in relation to telecommunications services shall submit a reference interconnection offer to the Office-

(a) within ninety days after the date of determination of dominance pursuant to section 28; or

(b) at least ninety days before the date of expiry of an existing reference interconnection offer..."

"32(3) A reference interconnection offer shall contain such particulars as may be specified by the Office and shall remain in force for a period not exceeding five years or such shorter period as the Office considers necessary having regard to technological and market developments."

"32(4) A reference interconnection offer or any part thereof shall take effect upon approval by the Office and all existing interconnection agreements executed by the filing carrier shall be amended in accordance with the approved reference interconnection offer and until actually amended are deemed to be so amended."

2.8 Sections 30(1) and 33 of the Act further stipulate the principles upon which interconnection charges payable to a dominant carrier should be based. Some of the relevant provisions of these sections are set out below:

"30. – (1) Without prejudice to section 29, dominant public telecommunications carrier shall provide interconnection in relation to a public network in accordance with the following principles –

(a) the terms and conditions under which it is provided shall be -
(i) on a non-discriminatory basis;
(ii) …
(iii) charges shall be cost oriented and guided by the principles specified in section 33;

(b) no unfair arrangements for cross subsidies shall be made;

(c) where technically and economically reasonable, interconnection services shall be so diversified as to render it unnecessary for an interconnection seeker to pay unreasonably for network components or facilities that it does not require."

"33. - (1) Where the Office is required to determine the charges for the provision of interconnection by a dominant carrier, it shall, in making that determination, be guided by the following principles –

(a) costs shall be borne by the carrier whose activities cause those costs to be incurred;

(b) non-recurring costs shall be recovered through non-recurring charges and recurring costs shall be recovered through recurring charges;

(c) costs that do not vary with usage shall be recovered through flat charges and costs that vary with usage shall be recovered through charges that are based on usage;

(d) costs shall include attributable operating expenditure and depreciation and an amount estimated to achieve a reasonable rate of return;

(e) with the exception of interconnection charges for wholesale termination services, interconnection charges shall be established between the total long run incremental cost of providing the service and the stand alone cost of providing the service, so, however, that the prices shall be so calculated as to avoid placing a disproportionate burden of recovery of common costs on interconnection services;

(f) where appropriate, interconnection costs shall include provision for a supplementary charge, being a contribution towards the access deficit of the interconnection provider;

(g) in the case of charges for wholesale termination services, charges shall be calculated on the basis of a forward looking long run incremental cost, whereby the relevant increment is the wholesale termination service and which includes only avoidable costs.

(2) Where the Office has been unable to obtain cost information that it is reasonably satisfied is relevant and reliable it may take into account local and international benchmarks, reciprocity and any other approach that in the opinion of the Office is relevant.

(3) In this section-

(a) "access deficit" means the amount by which a carrier's revenue from connection and line rental charges falls short of the cost of providing access lines due to regulatory constraints on those charges;

(b) "avoidable costs" means the difference between-

(i) the identified total long run costs of a carrier providing its full range of telecommunications services, and

(ii) the identified total long run costs of the carrier providing its full range of telecommunications services, except for the wholesale termination service supplied to any third party (which costs exclude non-traffic-related costs)."

Chapter 3: Market and Technological Developments Considered

Introduction

3.1 The mobile cost model has been updated in order to reflect changes in market conditions and/or accepted international practices in estimating forward looking long run costs of an efficient operator. In addition, network technology or combinations of technologies have been considered, with an aim to reflect the decisions that would be taken by an average efficient mobile provider. The relevance of the following were reviewed and analysed:

1. Changes in the demand forecast for voice and data services and the increasing share of 3G technology in the network of the generic operator over the period modelled.
2. Whether LTE/LTE-A ("4G") and Voice over LTE (VoLTE) should be included in the modelled network.
3. Main technological evolutions implemented by operators between 2012 and 2018 or planned for the period 2018-2025 (HSPA+, IP Interconnection, 2G switch-off).

Demand

3.2 Demand is one of the key inputs of the cost model. However, as illustrated in the figure below, the forecasts for 2018 used in the 2011 model for the number of active subscribers and voice traffic were 8% and 74% higher, respectively, than the observed figures in 2018[2]. In addition, the forecast for data traffic used in the 2011 model was 59% lower than the actual data consumption of mobile subscribers in 2018. Subscriber and traffic forecasts for the modelling period have been updated, based on data provided by the OUR and operators, as well as observed trends in Jamaica and expected market evolutions for the period 2018-2025, namely:

- The Jamaican population remaining generally stable during the period.
- A larger penetration of mobile Internet service among Jamaican mobile subscribers.
- Share of mobile off-net traffic to outgoing traffic continuing to increase to the detriment of on-net traffic.
- Improved accessibility, for Jamaican customers, to smartphones with LTE and LTE-Advanced (LTE-A) capabilities.

[2] Source: OUR Data Repository

- Declining prices for both mobile on-net and off-net calls.
- Mobile Internet offers and plans are more affordable, with declining average gigabyte price and/or bundles offering higher capacity.
- Continued decline in calls to and from fixed lines.

The forecasts for demand data were therefore made by relying mainly on OUR's internal data. OUR's data were completed with information collected from operators, when consistent and available.

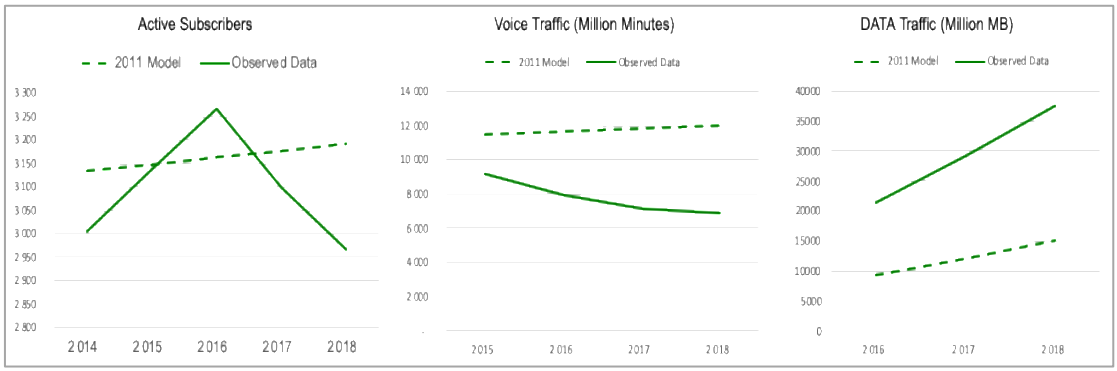

Figure 1: Comparison between Market demand used in previous model and observed data

Technological Developments

3.3 When deciding which technologies to model, consideration was given to the efficient technologies available in the timeframe considered by the Model. This approach is also utilized in jurisdictions such as the European Union[3] and Australia[4]. The updated Mobile Cost Model therefore considers the technological developments presented below:

- LTE/VoLTE modelling
- Evolution of 2G and 3G networks
- IP interconnection

[3] https://eur-lex.europa.eu/legal-content/ET/TXT/?uri=uriserv%3AOJ.L_.2009.124.01.0067.01.ENG
[4] https://www.accc.gov.au/system/files/MTAS%20pricing%20principles%20determination%202009-11.pdf

VoLTE/LTE

3.4 Both operators in Jamaica have extensively deployed LTE networks. As such there needs to be consideration of how this technological development will be treated in the updated model.

VoLTE

3.5 Local mobile network operators (MNOs) have expressed conflicting views on the timeline for deployment of VoLTE in Jamaica. The introduction of VoLTE requires the deployment of an IP multimedia subsystem (IMS) in the core network. The main component in an IMS core is the call server, which contains several voice service functions. Session border controllers (SBCs) and telephony application servers must also be deployed to manage voice services (in particular, the telephone application system (TAS) manages call forwarding, waiting and transferring). The VoLTE platform must also communicate with the 4G data platform, and so upgrades are required for certain existing network elements.

3.6 Given the fact that inter-network VoLTE calls require both calling and called parties to be on networks supporting VoLTE call termination with VoLTE compatible devices, it can be fairly assumed that VoLTE as a share of total voice traffic will remain insignificant, compared to 2G and 3G combined. In light of the likely insignificant VoLTE traffic, the level of complexity at the initial stage of LTE/LTE-A deployment, the associated incremental investment cost for deploying this service and the uncertainty of achieving the required returns on investment, VoLTE is not included in the updated model.

3.7 The approach taken by the OUR is in line with that taken by the national regulatory authorities (NRAs) in countries such as Belgium, France and Ireland. In a statement on 2017 May 26, the Belgian NRA expressed that *"[w]hile it is plausible that 4G voice services (VoLTE) will be introduced within the regulatory period, it is highly unlikely that VoLTE terminated calls will make for a significant part of the overall termination volume."*[5] In France, while LTE services were available starting from mid-2012, the 2014 mobile cost model did not include VoLTE, because it was assumed that VoLTE would have a limited impact on the calculated MTR[6]. In Ireland, the cost model currently in

[5] Decision of the BIPT Council on Market 2 analysis: termination of voice call on individual mobile networks, 26 May 2017, section A.4.4 4G Modelling

[6] Public consultation on the Mobile cost model (Page 23) published by ARCEP

use does not include VoLTE[7]. At the time of updating the model, it was felt that given the lack of VoLTE deployments to date as well as the lack of certainty in modelling the cost for the Irish market it was reasonable to assume that the VoLTE platform would not be deployed during the regulatory period. VoLTE was also excluded by the NRAs in Denmark and Norway when updating their cost models in 2018 and 2017, respectively[8].

3.8 It should be noted that in cases where regulators have included VoLTE in the determination of MTRs, it did not have a significant impact on the MTRs. This was the case in Mexico, where the Federal Telecommunications Institute of Mexico assumed VoLTE deployment in 2018 in the latest update of the cost model used to calculate its MTR[9]. As illustrated in the graph below, the inclusion of VoLTE did not significantly impact the level of MTR in Mexico.

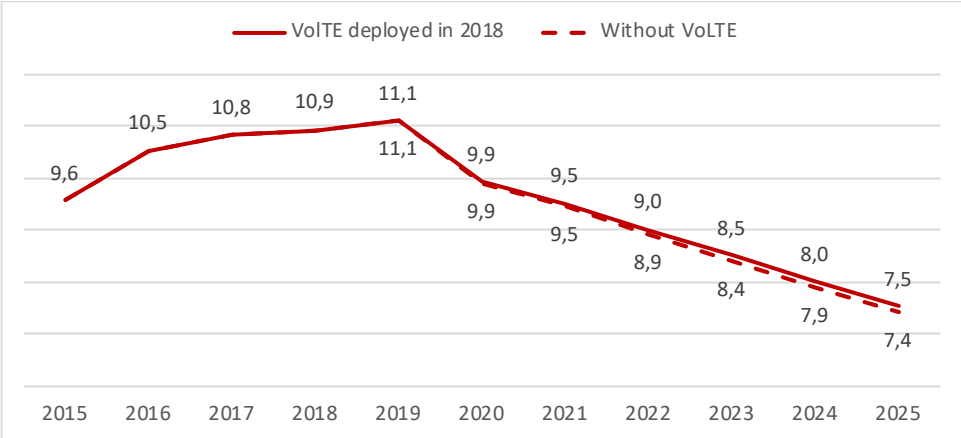

Figure 2: Comparison of calculated MTR rate in Mexico with and without VoLTE (in MXN cents)

OFCOM, the NRA in the United Kingdom, also included VoLTE in the 2015-2018 update of its mobile cost model. It was assumed that the weight of VoLTE traffic among total voice traffic, would remain at approximately 8% for 5 years following the implementation of VoLTE[10]. The inclusion of VoLTE however, had a limited impact on the calculated MTR (around 2%), as shown in Figure 3 below[11].

[7] Report for ComReg "Specification for the proposed new MTR model v1.0D", 6 March 2018 – Section 3.2.1 page 12-12

[8] "Approach to benchmarking the cost of providing MTAS in Australia" - Methodology report for the ACCC published on December 13, 2019 – Section 2.1 - Page 2

[9] Available at: http://www.ift.org.mx/politica-regulatoria/modelos-de-costos/condiciones_tecnicas_minimas_y_modelos_de_costo_2020

[10] Report published by OFCOM on February 6,2015 "Mobile Call Termination Market Review 2015-2018 – Annexes 7-13"

[11] Report published by OFCOM on February 6,2015 "Mobile Call Termination Market Review 2015-2018 – Annexes 7-13" – Figure A12.10

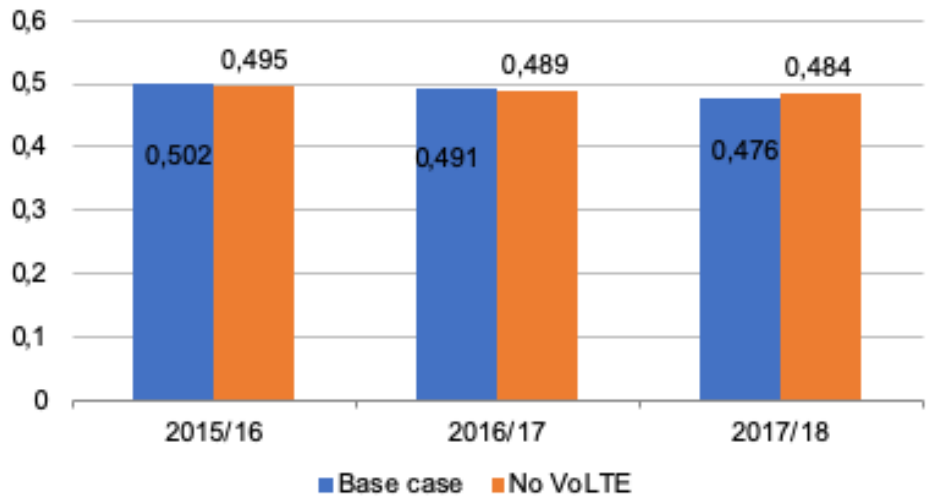

Figure 3: Sensitivity analysis of excluding VoLTE on the blended LRIC (in ppm)

LTE

3.9 Regarding the treatment of LTE in the updated model, two options are worth considering:

1. Modelling an entire LTE/LTE-A network, with corresponding traffic, assets, engineering rules and unit costs.
2. Modelling only LTE/LTE-A traffic demand (with an increasing share of LTE/LTE-A among data traffic over the modelling period), in order to assess its impact on the 3G and 2G Network.

Given that the "Generic Operator" is assumed to have no VoLTE deployment over the modelled period, it is reasonable that the second approach be employed in the updated model. It should be noted that the use of this approach will not result in an underestimation of unit costs. As highlighted by the Belgian NRA "*[w]hile it is true that the cost model developed by BIPT does not model 4G or VoLTE assets, 4G is not totally abstracted from modelling, since data traffic evolution is assumed for 4G networks. Indeed, taking into account forecasts of data traffic volumes carried by a (not modelled) 4G network reduces the volume of data traffic on 2G and 3G networks on which*

investments are to be recovered. Therefore, it would be wrong to consider that the cost model underestimates unit costs"[12].

3.10 Moreover, in cases where countries chose to model the entire 4G (LTE/LTE-A) network it was found that this did not significantly affect MTRs. In the case of the UK, the deviations were within [-1%;+3%] as shown in the graph below.[13]

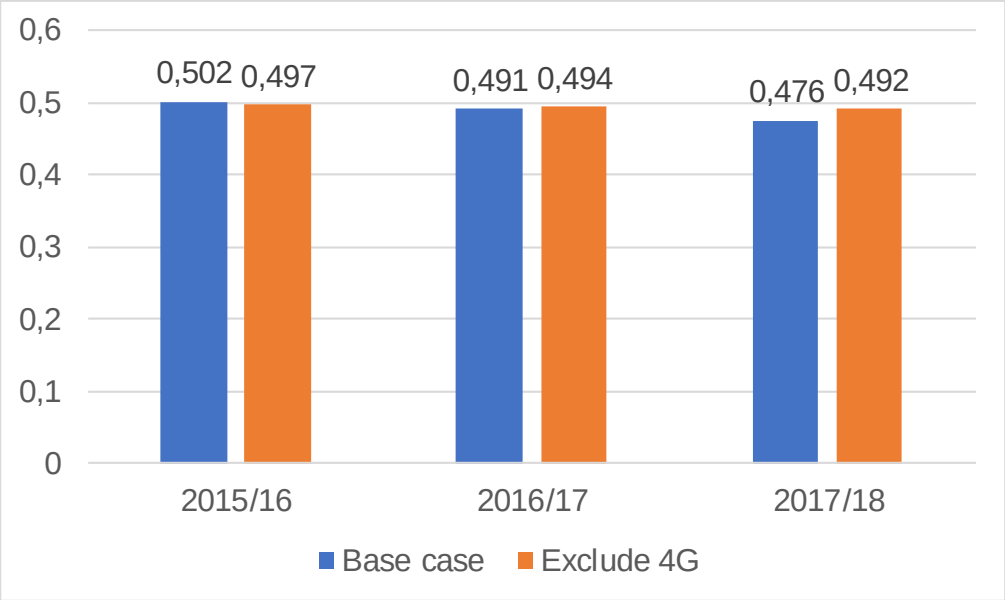

Figure 4: Sensitivity analysis of excluding 4G on the blended LRIC

2G and 3G Network

3.11 MNOs provided conflicting views on the potential evolution of their 2G networks over the period modelled. In order to represent the market, the Model assumes a significant decline in the market share of 2G traffic for the "Generic Operator", with a progressive migration of voice traffic from the 2G network to the 3G network.

[12] Decision of the BIPT Council on Market 2 analysis: termination of voice call on individual mobile networks, 26 May 2017, section A.4.4 4G Modelling

[13] Report published by OFCOM on February 6,2015 "Mobile Call Termination Market Review 2015-2018 – Annexes 7-13" – Figure A12.9

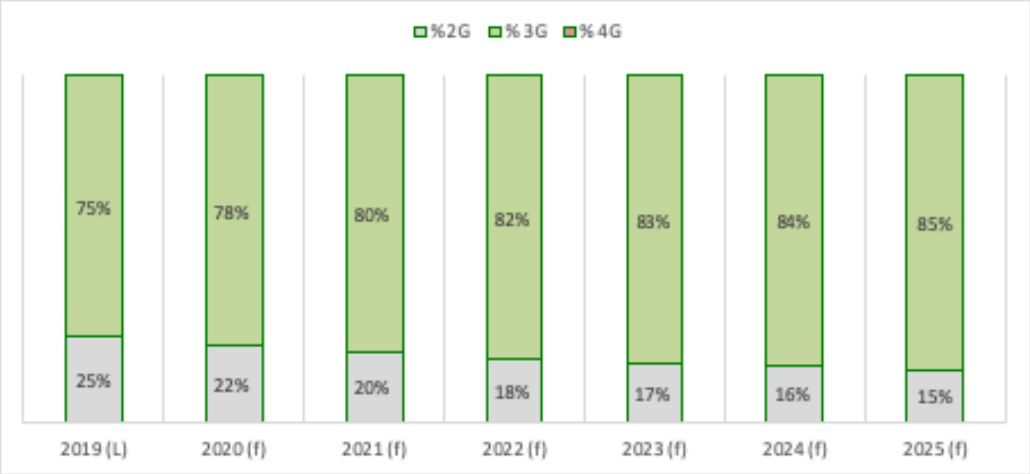

Figure 5: Split of voice traffic per technology

3.12 The Model also assumes that data traffic for the "Generic Operator" will be carried mainly over the 3G and LTE/LTE-A networks. In addition, the "Generic Operator" is assumed to have HSPA+ technologies available, over its 3G network, to improve throughputs and increase efficiency.

IP Interconnection

3.13 Regardless of the network used (either 2G or 3G), it is assumed that the "Generic Operator" relies on IP interconnection for the termination of local incoming traffic (from fixed and from mobile off-net), to increase efficiency. Its local outgoing traffic (to fixed and to mobile off-net) should also be terminated via IP interconnections. This is made possible by the generalization of NGN networks. To achieve IP interconnection, the "Generic Operator" is assumed to introduce two additional equipment:

- Provider Edge Router (PE Router) acting as a transit Router to the core network.
- Session Border Controller (SBC) to control and redirect traffic, either to the media gateway (TDM traffic) or to the PE-Router (IP interconnected traffic).

The cost of these additional equipment is included in the calculation of the mobile termination rate.

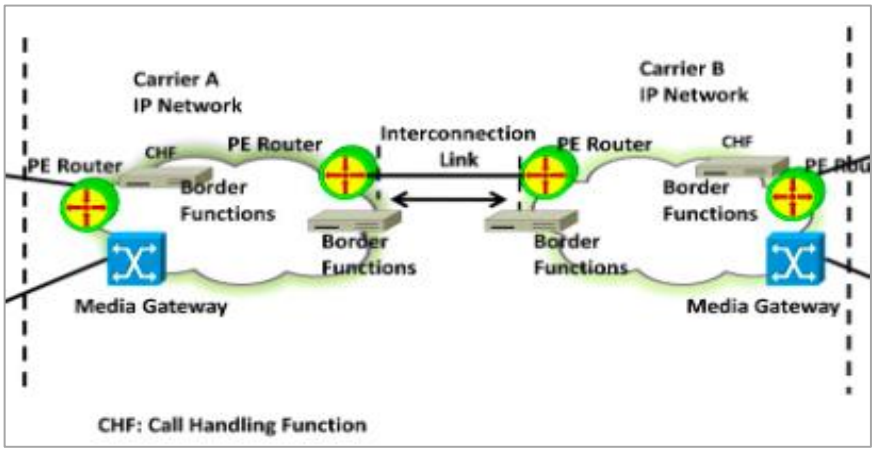

Figure 6: IP interconnection scheme considered in the model

Other Financial and Technical Considerations

3.14 Other financial and technical parameters were also adjusted. These included the following[14]:

- Urban share of voice and data traffic during Busy Hours updated to 54% and 50% respectively.
- Weighted Average Cost of Capital (WACC) updated to 20.93% [15].
- Percentage of un-attributable costs for the defined operator set at 25% based on the data submitted by operators.
- Based on the operators' data, the share of co-located sites and the cost reduction due to site collocation was updated to 45% and 40%, respectively compared to 34% and 30%, respectively in the previous model.

In addition, several engineering and cost calculation rules were simplified or corrected.

3.15 The OUR welcomes all comments on the updated Model, especially those that address the topics of highest relevance and with highest impact on the outcome of the model. Therefore, the OUR would appreciate comments from stakeholders, especially on the following aspects that are considered of high relevance:

1. Market demand

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

[15] Determination Notice: "Estimate of the Weighted Average Cost of Capital for Telecommunications Carriers", published on November 15, 2016. Consultation is ongoing for a new WACC for the mobile sector. This parameter will be updated when a Determination Notice is issued.

2. Evolution of main statistics related to voice and data usage
3. 3G coverage extension and introduction of HSPA+ technology
4. IP interconnection between operators
5. Update of transmission links
6. Unit cost and price trends

Question 1 :
Do you agree with the perspectives described above for the modelling process? Please provide details in support of your views.

Chapter 4: Topics of special relevance

Market Demand

4.1 The forecasts for market demand presented in the document were calculated based on historical and benchmark data in instances where data was missing or inconsistent.[16] The data received from the OUR indicated that in the first quarter of 2019, there were 24,000 new mobile subscribers. Considering that the decline in the mobile base was significantly slower in 2018, it is assumed that the mobile market should be back to growth in 2019. Overall, approximately 90,000 new mobile subscribers are assumed for 2019, yielding a mobile penetration rate of 113%.

4.2 The evolution of the mobile penetration rate was then estimated, by assuming a logarithmic evolution of the penetration rate over the period (coefficient R^2 = 92%). As illustrated in ***Figure 7: Evolution of mobile subscribers (million Subs.) and penetration rate (in %)***, mobile penetration in Jamaica should reach 118% in 2025. This is still below the actual level in 2016.[17] Based on this and assuming a stable population for the period, the total number of mobile subscribers should be around 3.2 million by 2025, remaining relatively stable since 2018 (3.0 million subscribers).

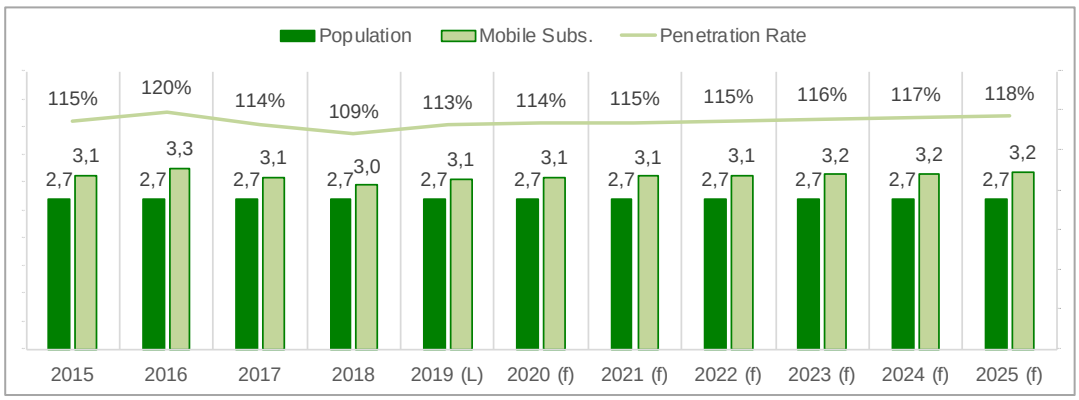

Figure 7: Evolution of mobile subscribers (million Subs.) and penetration rate (in %)

4.3 Similar to mobile penetration, historical data was used to build a mathematical model (combination between linear evolution and "power function" evolutions), to estimate the penetration of Internet services among mobile subscribers. The linear case is assumed to represent quick uptake of Internet services, when the power function should reflect a more moderate uptake of Internet service. Based on this, out of the 3.2 million subscribers, 69% are likely to be subscribed to Internet services on their mobile devices by the end of 2025, compared to 46% and 55% in 2016 and 2018, respectively.

[16] Note that the resulting demand parameters have been modified within a range of ±25%, due to confidentiality issues.

[17] The lower figures could be due to the implementation of number portability.

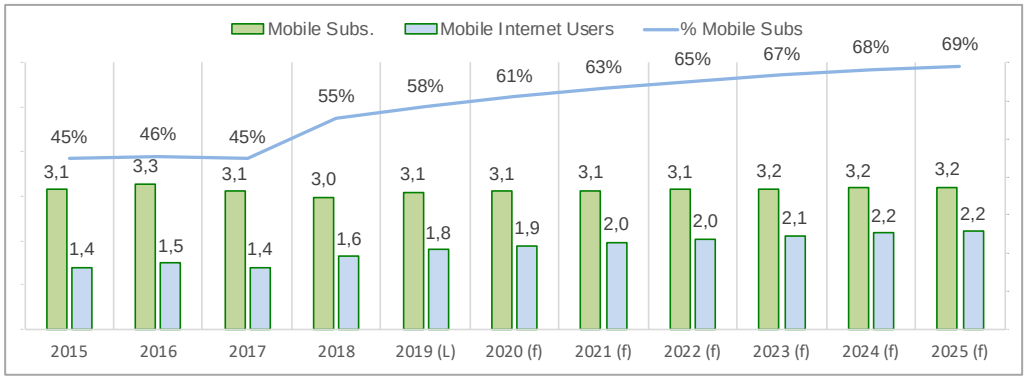

Figure 8: Evolution of mobile Internet users (million users)

Question 2 :
Do you agree that the number of mobile subscribers and mobile Internet users shown above reasonably represent the Jamaican mobile market? Please provide details in support of your view.

Demand Usage Statistics

4.4 Similar to the previous section, the forecasts for market usage statistics were built based on the historical data collected. This was due to the lack of some information required, as well as some inconsistencies observed among collected data.

4.5 Based on historical data, outgoing Average Usage Per User (AUPU) is projected to decline from 152 minutes per month in 2019 down to 127 minutes per month in 2025. As shown in **Figure 9**, this is expected to be driven mainly by the decrease in on-net calls (77 minutes per month in 2025 vs. 98 minutes in 2019). International outgoing AUPU is forecasted to continue to decline, decreasing from 20 minutes in 2019 to 10 minutes per month in 2025.

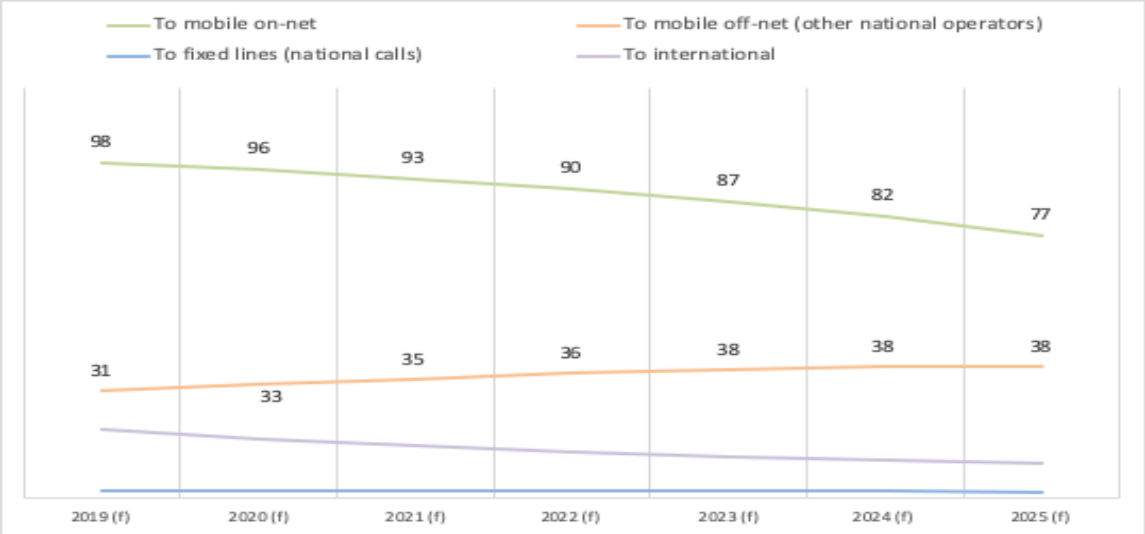

Figure 9: Evolution of outgoing AUPU per destination (minutes per month)[18]

4.6 Between 2019 and 2025 and based on the forecast built using historical data, the average monthly call duration for mobile off-net users is anticipated to increase by 4% compound annual growth rate (CAGR), ending at 38 minutes in 2025. This assumes operators will maintain the current declining trend for mobile off-net prices.

4.7 Based on the estimated number of potential mobile subscribers, as well as their estimated outgoing AUPU per month and destination, total outgoing traffic per destination (excluding calls to own voice message) is calculated and presented in **Figure 10**. Total outgoing traffic is expected to be around 4.9 billion minutes in 2025, decreasing yearly by 3% on average from its 2019 level (5.6 billion minutes). On-net share of local outgoing calls is expected to decrease to 66% in 2025, compared to 33% for mobile off-net share of local outgoing traffic.

[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.

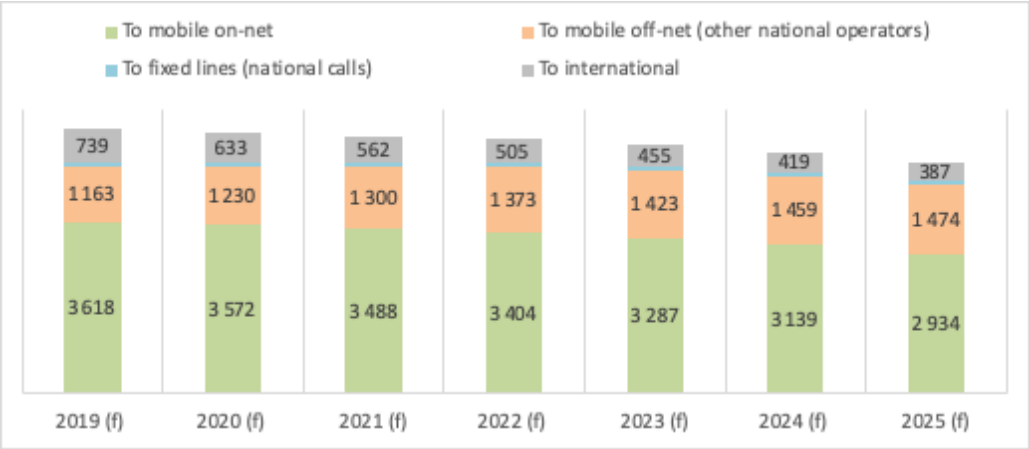

Figure 10: Evolution of the outgoing traffic per destination (Million minutes)

4.8 Total incoming traffic should reach 1.6 billion minutes in 2025 (with 92% of that traffic attributable to mobile off-net calls), compared to 1.3 billion minutes in 2019.

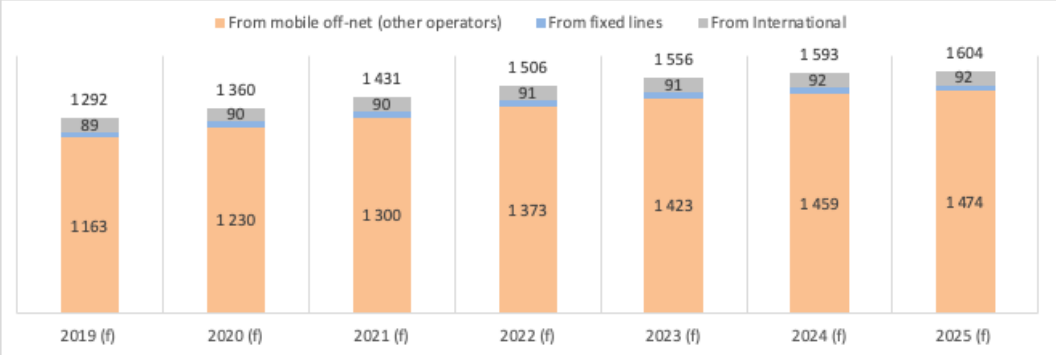

Figure 11: Evolution of incoming traffic per destination (Million minutes)

4.9 Average call duration per destination used in the model was also updated. The table below presents the average call duration for each destination.

Destination		Duration (min)
Outgoing	To mobile on-net	1.45
	To mobile off-net	1.25
	To fixed lines - national calls	1.30
	To international	1.65
	To caller's own voice messaging	2.00
	Inbound roaming	2.40
	Outbound roaming	3.40
Incoming	From other mobiles	1.20
	From fixed lines	1.70
	From international	2.50
	Inbound roaming	2.90
	Outbound roaming	4.50

Table 1: Average call duration per destination (min)

4.10 As shown in **Figure 12**, average data consumption per mobile Internet user is expected to grow from 1.9 Gbytes per month in 2018 to 2.9 Gbytes per month in 2025 (+8% average annual increase between 2018 and 2025). This increase should be driven by the larger adoption and development of LTE/LTE-A technology, as well as increased throughputs facilitated by 3G technology (refer to section on 3G coverage extension).

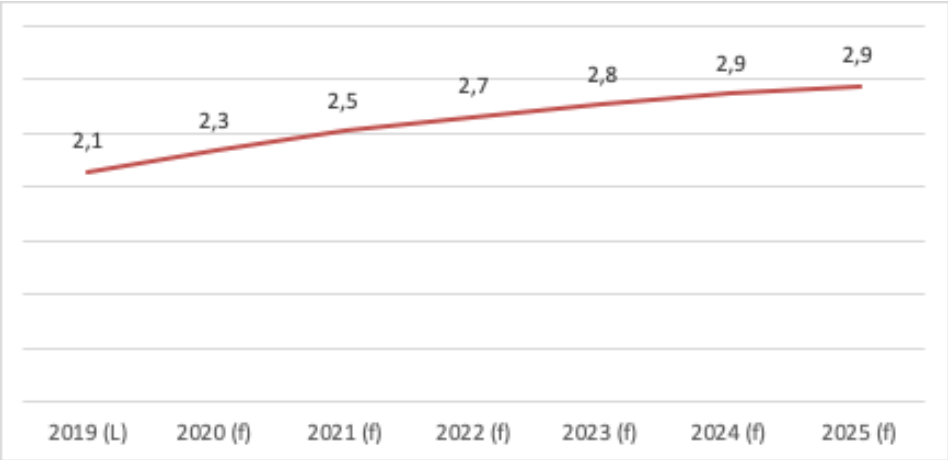

Figure 12: Evolution of monthly data consumption per mobile Internet user (in Gbytes)

4.11 Data traffic between 2018 and 2025 is then based on the expected evolution of the number of mobile Internet users, as well as their average monthly data consumption. As shown in the figure below, data traffic should reach 80 billion Mbytes in 2025 (compared to 54 billion Mbytes in 2019).

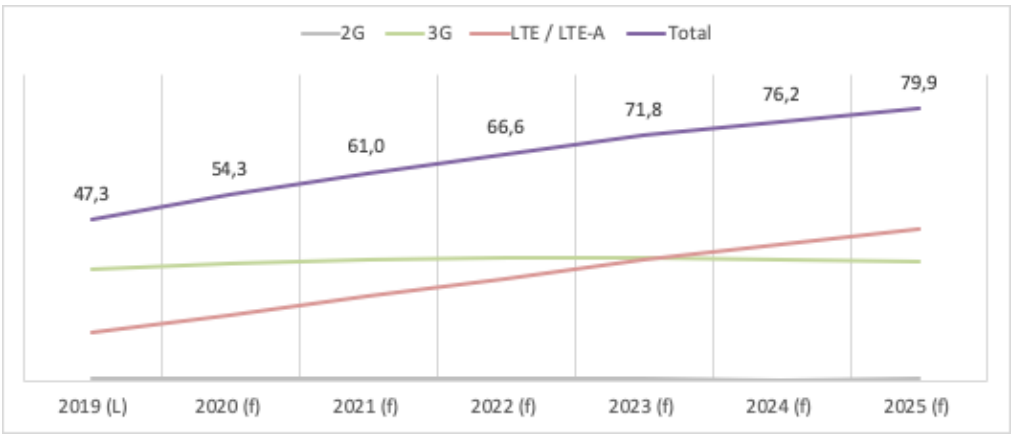

Figure 13: Evolution of Data traffic (Billion Mbytes)

4.12 The share of LTE/LTE-A traffic to total data traffic is estimated to be 56% by the end of 2025, compared to 44% for 3G technology[19]. Only estimated 2G and 3G data traffic is used to model the 2G /3G infrastructure.

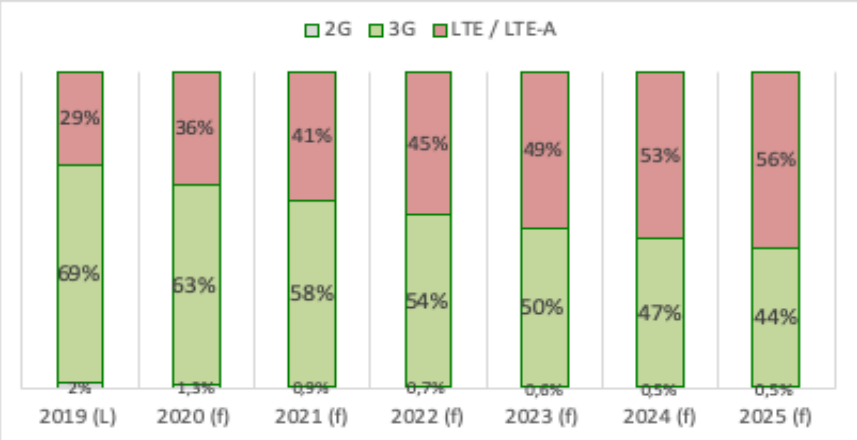

Figure 14: Share of Data traffic per technology (in %)

Question 3 :
Do you agree that voice and data traffic figures shown above reasonably represent the Jamaican mobile market? Please provide details in support of your view.

3G Coverage Extension and Introduction of HSPA+ Technology

4.13 Regarding the coverage per technology for the "Generic Operator", the main adjustment compared to the previous model, is the extension of the 3G territory coverage. The model assumes that 3G territory coverage should reach 98% by the end of 2025, compared to 89% in 2018. Related assumptions considered in the model are presented in the **Table 2**. Urban areas should be fully covered by 2G and 3G in 2018.[20]

Technology	2018	2019 (f)	2020 (f)	2021 (f)	2022 (f)	2023 (f)	2024 (f)	2025 (f)
2G	**98%**	**98%**	**98%**	**98%**	**98%**	**98%**	**98%**	**98%**
3G	89%	95%	98%	98%	98%	98%	98%	98%

Table 2: 2G and 3G territory coverage

[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.
[20] The final values for 3G coverage may vary as the information for each MNO has been modified within a range of due to confidentiality issues.

4.14 In addition to this coverage extension, the "Generic Operator" is assumed to rely on HSPA+ (3GPP Release 7), to offer better throughputs to its mobile Internet users. The following technical and design parameters were updated accordingly:

1. The number of "Channel Elements" (CE) per bearer for both the uplink and downlink (see **Table 3**).

Bearer		Unit	Uplink	Downlink
R99	PS 16	#	1	1
	PS 64	#	4	2
	PS 128	#	8	4
	PS 384	#	16	8
HSPA+	Downlink	#	-	16
HSPA+	Uplink	#	24	-
		#	48	-

Table 3: Number of CE per bearer considered in the model

2. Traffic per connection @ Busy Hour[21] per bearer (refer to **Table 4** below).

Bearer		Unit	Uplink	Downlink
R99	PS 16	Kbps	8	8
	PS 64	Kbps	32	32
	PS 128	Kbps	32	64
	PS 384	Kbps	32	192
HSPA+	Downlink	Kbps	-	9 000
HSPA+	Uplink	Kbps	2 880	-
		Kbps	5 775	-

Table 4: Traffic per connection at busy hours considered in the model[22]

3. The split of 3G data traffic per bearer, where It is assumed that R99 will complement HSPA+ to cover rural low density areas (see **Table 5** below)

Bearer		Unit	Uplink	Downlink
R99	PS 16	%	0%	0%
	PS 64	%	0%	0%
	PS 128	%	0%	0%
	PS 384	%	25%	15%
HSPA+	Downlink	%	-	85%
	Uplink	%	75%	-

Table 5: Split of 3G data traffic per bearer considered in the model

[21] Considered as half of theoretical/Maximum throughput per bearer.

[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.

Question 4 :
Do you agree with the coverage evolution, as well as 3G technical and design parameters shown above? Please provide details in support of your view.

IP Interconnection

4.15 The model assumes the availability of IP interconnection between operators, starting in 2021, when 70% of the total outgoing and incoming traffic between Jamaican operators should transit via specific routers (rather than the media gateway). This percentage should jump to 100%, in 2022, as shown in the table below:

Traffic		2019	2020	2021	2022	2023	2024	2025
Outgoing	To Fixed	0%	0%	70%	100%	100%	100%	100%
	To mobile	0%	0%	70%	100%	100%	100%	100%
	Other destinations	0%	0%	0%	0%	0%	0%	0%
Incoming	From Fixed	0%	0%	70%	100%	100%	100%	100%
	From other mobile	0%	0%	70%	100%	100%	100%	100%
	Other destinations	0%	0%	0%	0%	0%	0%	0%

Table 6: Share of IP interconnected traffic per destination

Question 5 :
Do you agree with the proposed date for introduction of IP interconnection, as well as the proposed scheme to implement it? Please provide details in support of your view.

Update of the Transmission Links Used

4.16 The backhaul of the "Generic Operator" still relies on a mix of Fibre-Based (FB) and Micro-Wave (MW) links to handle traffic between the components of the access network. With the increased growth in traffic to mobile sites and based on data collected from operators, it is assumed that the share of FB links will grow from 28% in the previous model to 60%, as presented in **Table 7** below. Similar to the previous model, the backbone of the "Generic Operator" uses only Fibre-Based links.

Technology	Share (in %)
MW	40%
LL	-
FB	60%

Table 7: Share per technology at the backhaul (in %)

4.17 As detailed in **Table 8**, wired links used in the model include STM-1, STM-4 and STM-16 links, with STM-1 links replacing the T1-link previously used. The capacity of the MW-based links was upgraded to the equivalent of ADM STM1 and ADM STM4. This update occurred due to the following:

- The need for increased capacity, mainly at the backhaul side.
- Recent technical evolutions of MW solutions.
- Price drop (since 2012) of both fibre and MW based solutions.

Technology	Previous Model		Updated Model	
	Link	**Capacity (Mbps)**	**Link**	**Capacity (Mbps)**
Wireline	**T1 link**	**1.54**	**STM1**	**155.52**
	STM1	155.52	STM1	155.52
	STM4	622.08	STM4	622.08
	STM16	2 488.32	STM16	2 488.32
MW Links	**7 MHz Link**	**6.18**	**ADM STM1**	**155.52**
	14 MHz Link	**24.70**	**ADM STM4**	**622.08**
	28 MHz Link	43.23		

Table 8: Comparison between transmission links used in previous and updated model

4.18 The number of the backhaul and backbone links, as calculated by the model, is provided in the table below:

Transmission links		2019	2020	2021	2022	2023	2024	2025
Backhaul								
Wireline	STM1	344	306	274	250	226	204	182
	STM4	-	-	-	-	-	-	-
	STM16	77	73	60	52	52	44	40
MW Links	ADM STM1	-	-	-	-	-	-	-
	ADM STM4	226	202	182	164	150	134	120

Transmission links		2019	2020	2021	2022	2023	2024	2025
Backbone								
Wireline	STM1	26	32	14	10	14	14	12
	STM4	6	-	4	4	-	-	-
	STM16	16	16	22	24	24	24	24
MW Links	ADM STM1	-	-	-	-	-	-	-
	ADM STM4	-	-	-	-	-	-	-

Table 9: Number of Transmission links calculated in the model[23]

Question 6 :
Do you agree that the transmission links presented above are reasonable to satisfy demand? Please provide details in support of your view.

Unit Cost and Price Trends

4.19 Unit cost related to network equipment, network sites and transmission links were derived by combining information received from operators with available benchmarks used in similar models, such us the cost model developed for the Eastern Caribbean Telecommunications Authority (ECTEL)[24].

4.20 Unit costs per network equipment are in line with main specifications used for design parameters (Listed in ANNEX 2) and considered in the model, as detailed in **Table 10**. Unit CAPEX per network equipment is assumed to decrease by 3% per year.

Equipment	2018 Unit CAPEX (JMD)	Mark-up for OPEX calculation
BTS 900	2 220 000	18%
BTS 1800	2 220 000	18%
Node B	2 950 000	10%
2G IBS	63 000	18%
3G IBS	300 000	10%
2G TRX	380 000	10%
3G Transceivers	380 000	10%

[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] Available at https://www.ectel.int/draft-cost-models-for-fixed-and-mobile-interconnection-rates/

Equipment	2018 Unit CAPEX (JMD)	Mark-up for OPEX calculation
Aggregators	26 000 000	12%
BSC	52 760 000	17%
RNC	93 100 000	12%
MGW	15 500 000	15%
PE-Router	7 750 000	15%
SBC	5 400 000	15%
MSC-S	209 500 000	25%
SGSN	250 500 000	25%
GGSN	34 000 000	25%
SMSC	168 700 000	25%
MMSC	135 000 000	25%
HLR	78 500 000	25%
VMS	128 500 000	25%
VLR	60 800 000	25%
IN	668 000 000	25%
NMS	126 850 000	25%
Portability Platform	222 660 000	25%
Signalling transfer platform	212 000 000	25%
Billing Platform	432 000 000	25%
International Media Gateway	88 000 000	15%

Table 10: Network equipment unit cost considered in the model

Question 7 :
Do you agree with the unit cost per equipment item and the associated price trend, considering the main design parameters used? Please provide details in support of your view.

4.21 **Table 11** details the considered unit cost per network site category, as well as the expected yearly price trend for the period 2018-2025.

Site	Unit	2018 Unit CAPEX	Yearly Price trend for site acquisition	2018 Unit OPEX	Yearly Price trend
BTS site	JMD	10 192 820	6%	737 452	10%
Node-B site	JMD	10 192 820	6%	737 452	10%
Co-located BTS / Node B site	JMD	10 192 820	6%	737 452	10%
2G IBS site	JMD	5 532 704	6%	300 000	10%
3G IBS site	JMD	5 532 704	6%	300 000	10%
2G/3G IBS site	JMD	5 532 704	6%	300 000	10%
BSC site	JMD	16 400 000	6%	1 400 000	10%
RNC site	JMD	16 400 000	6%	1 400 000	10%
Co-located BSC / RNC / MGW site	JMD	16 400 000	6%	1 400 000	10%
Core sites (MSC, MGW, others)	JMD	49 200 000	6%	4 200 000	10%

Table 11: Network site unit cost considered in the model

Question 8 :
Do you agree with the unit cost per network site category and the associated price trends? Please provide details in support of your view.

4.22 Unit costs used in the model to calculate transmission CAPEX and OPEX, for the period 2016-2025, are presented in **Table 12**. The values presented are based on benchmark data.

Transmission link		Unit	2018 Unit CAPEX	Yearly Price trend	2018 Unit OPEX	Yearly Price trend
Wireline	STM1	JMD	2 650 000	-3%	212 000	10%
	STM4	JMD	2 950 000	-3%	236 000	10%
	STM16	JMD	9 200 000	-3%	736 000	10%
Micro-Wave	ADM STM1	JMD	1 450 000	-3%	147 755	10%
	ADM STM4	JMD	1 550 000	-3%	157 945	10%

Table 12: Transmission unitary cost considered in the model

Question 9 :
Do you agree with the transmission unit cost and associated price trends? Please provide details in support of your view.

Estimated Mobile Termination Rate

4.23 Based on the parameters considered in the model, the Pure LRIC mobile termination rate is estimated to be around 0.68 JMD in 2025 compared to 0.86 JMD in 2019.[25] The evolution of the estimated MTR is shown in **Figure 15**.

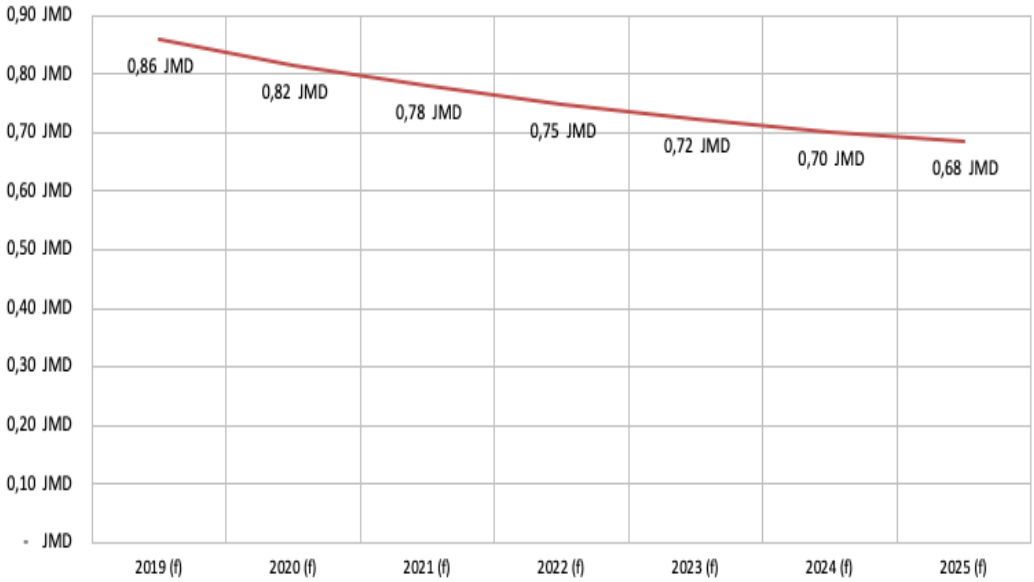

Figure 15: Estimated MTR (in JMD) with the PURE LRIC standard.

[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.

ANNEX 1 Summary of Questions

Question 1: Do you agree with the perspectives described above for the modelling process? Please provide details in support of your view.

Question 2: Do you agree that the number of mobile subscribers and mobile Internet users shown above reasonably represent the Jamaican mobile market? Please provide details in support of your view.

Question 3: Do you agree that voice and data traffic figures shown above reasonably represent the Jamaican mobile market? Please provide details in support of your view.

Question 4: Do you agree with the coverage evolution, as well as 3G technical and design parameters shown above? Please provide details in support of your view.

Question 5: Do you agree with the proposed date for introduction of IP interconnection, as well as the proposed scheme to implement it? Please provide details in support of your view.

Question 6: Do you agree that the transmission links presented above are reasonable to satisfy demand? Please provide details in support of your view.

Question 7: Do you agree with the unit cost per equipment item and the associated price trend, considering the main design parameters used? Please provide details in support of your view.

Question 8: Do you agree with the unit cost per network site category and the associated price trends? Please provide details in support of your view.

Question 9: Do you agree with the transmission unit cost and associated price trends? Please provide details in support of your view.

ANNEX 2 Main Specifications of Network Equipment

Equipment	*Main design parameters considered*									
BTS 900	*Usage*	*85%*								
BTS 1800	*Usage*	*85%*								
Node B	*Usage*	*85%*								
2G IBS										
3G IBS										
2G TRX										
3G Transceivers										
Aggregators										
BSC	*Usage*	*85%*	*TRX*	*1 950*						
RNC	*Usage*	*85%*	*Erl*	*80 000*	*Mbps*	*20 000*	*luB (Mbps)*	*10 000*	*Cells*	*20 000*
MGW	*Usage*	*80%*	*Erl*	*7 500*	*BH call attempts*	*125 000*				
PE-Router	*Usage*	*80%*	*Mbps*	*100 000*						
SBC	*Usage*	*80%*	*Mbps*	*4 000*						
MSC-S	*Usage*	*100%*	*Subs*	*1 250 000*	*BH call attempts*	*1 500 000*				
SGSN	*Usage*	*80%*	*Data Subs*	*2 000 000*						
GGSN	*Usage*	*80%*	*Mbps*	*18 800*						
SMSC	*Usage*	*80%*	*BH SMS*	*1 420 000*						
MMSC	*Usage*	*80%*	*MMS*	*48 600*						

HLR	*Usage*	*80%*	*Subs*	*1 250 000*	*Terminating calls*	*300 000*	
VMS	*Usage*	*85%*					
VLR	*Usage*	*85%*					
IN	*Usage*	*80%*	*Subs*	*3 000 000*	*Traffic per Sub (Erl)*	*0,04*	
NMS	*Usage*	*85%*					
Portability Platform	*Usage*	*85%*					
STP	*Usage*	*85%*					
Billing Platform			*Subs*	*3 000 000*			
International MGW	*Usage*	*85%*					

ANNEX 3 Main Modifications Compared To Previous Model

Global
Period of calculation updated
Transmission supports selected updated
IP Interconnection added
All links with old sheets (2.1-2.2-1.1-1.2) removed
Macro calculating "PURE LRIC - Tilted annuities depreciation" updated following changes in sheet "6. Network Costs"
Macro calculating "Shapley-Shublik" termination cost updated following changes in sheet "6. Network Costs" and "8.1 Economic costs"
Links to operator's Data removed in sheet 3.0
Links to operator's Data removed in sheet 4.0
Sensitivity analysis added at sheet "0.1 Sensitivity Analysis"
Control
Lines 9->12 not used: Hidden
Update to consider the use of UMTS 1800 Mhz
Year of IP interconnection introduction added as parameter
Macros added for the simulation without IP Interconnection
Graph added to compare "LRAIC + Shapley-Shubik" calculated rates with and without IP Interconnection
Inputs for the Model
Insertion of new inputs related to Demand & Traffic evolution between 2016 and 2018
Insertion of a new DGC Topological Data
Insertion of a new CWC Topological Data
Duplication between DGC & CWC sites removed
Topological Data updated
OPEX as % of Site CAPEX added in Benchmark
Insertion of a new sheet with equipment unitary cost and some design parameters
Calculations

Insertion of new sheets used for Demand and Traffic forecast

2.0 Market

Subs, Market penetration and population: updated

Outgoing & Incoming traffic (excluding Roaming) updated

Outgoing inbound roaming call: estimated based on DGC inputs

Incoming inbound roaming In call: estimated based on historical trend Vs. International incoming call

Estimation of the number of calls (Calculation method updated)

Outgoing SMS: updated

Share of 3G traffic: Data updated

3.0 Generic Operator

Traffic Statistics updated + Source

Update of country areas (as %) covered by 2G and 3G, as well as calculation method for 3G (same as 2G)

Cell Radii updated

BH Spare Capacity updated

Traffic per connection @BH speed updated for HSDPA

2G/3G IBS count: calculation method changed

% sites equipped with BSC / RNC updated

Share of co-located site updated

Nodes Equipment Costs updated based on sheet 3.0.1

2G/3G sites cost updated

Price Trends updated

Nodes Equipment Dimensioning parameters updated partially based on proposed unitary costs

Share of technology for transmission updated

Transmission dimensioning table updated

Interconnection staff cost estimated, based on CWC 2019 figures and historical Data

Un-attributable cost updated (Operator's data)

Update of the economic life table

2G RAN Dimensioning: Links with 2011 sheets removed

3G RAN Dimensioning param

eters updated & R99-PS144/256 set to 0

Number of CE updated, considering HSPA+ use in the Uplink and downlink sides

"Site conf --> output #T1" table changed to "Site conf --> output #STM1"

Update of the MW transmission supports used & their cost

Update of the Wireline transmission supports used & their cost

Spectrum allocation table updated

Minimum number of elements for core network updated

All links with old sheets (2.1-2.2-1.1-1.2) removed

MGW replaced by "Point of Interconnection / MGW" (PoI) including: MGW, PE-Router and SBC

Price Trend table updated

Specific IP equipment added when needed in cost and design params tables

CAPEX and OPEX per site updated

OPEX Mark-Up updated

Creation of a new sheet describing the Routing Matrix where MGW is replaced by MGW/PoI

Dimensioning

4.0 Design Params

Traffic parameters updated

3G data traffic split per bearer updated

Traffic rate @ BH updated + one formula corrected (HSPA+ traffic rate)

Update of the "MW links correspondence" table

Update of the "Links Capacity" table

Creation of a new sheet "4.0.1 IP Params" with main IP Interconnection specific design parameters

Creation of new sheets 4.1.1 and 4.1.2 with the split of the interconnection traffic between MGW and IP equipment and the number of BH call attempts via MGW

4.1 Traffic

Rules for the calculation of Core Equipment Traffic (in MB and Erlang) for both 2G and 3G updated, based on new sheets 4.1.1 and 4.1.2

4.4 Nwk Design Core

Rules for the calculation of the number of MGW updated

Dimensioning of IP equipment added

Dimensioning table of remaining equipment updated

4.5 Network Design Transmission

Rules for the calculation of the links per MGW updated based on the calculated BH Traffic per MGW

Calculations of the number of links per the new IP equipment added

Total number of Backbone links updated accordingly

Number of Output links from MSC to MSC recalculated

MTR calculation

5. Unit CAPEX OPEX

MGW replaced by "PoI" or "Point of Interconnection / MGW" when needed

IP equipment added

6. Network Costs

Table "Ntw Equip. Count": IP equipment added

MGW replaced by "Point of Interconnection / MGW" when needed

Calculation of CAPEX and OPEX related to the "Point of Interconnection / MGW" added

"Node B / 3G IBS" CAPEX corrected

BSC, RNC and Core equipment Site CAPEX and OPEX calculation adjusted

7.1 Service Costing

Table "Coverage Cost": formula updated to take into account the eventuality of having 0 new BTS (same logic as 3G coverage)

MGW replaced by Point of Interconnection / MGW

7.2 Other costs

Annual staff cost increase set to 4%

License fees table updated

8.1 Economic Cost

IP Equipment added when needed: PE-Router & SBC

CAPEX & OPEX costs updated accordingly

Formula used for CAPEX & OPEX calculation corrected, as well as the starting number of sites (same as in sheet "6. Network cost")

8.3 Pure LRIC Eco Depr.

Calculation of avoided CAPEX and OPEX updated

Update of the formula used to calculate the economic depreciation of available CAPEX and OPEX

Update of the formula used to calculate the interconnection staff cost contribution (same as PURE LRIC)