Office of Utilities Regulation

Cost Model for Mobile Termination Rates – The Decision on Rates

Determination Notice

OUR

OFFICE OF UTILITIES REGULATION

Publication Date: May 30, 2013

Abstract

The Telecommunications Act, as amended May 2012 (the "Act"), requires that all dominant public telecommunications carriers shall permit interconnection of its public network with the public network of another carrier for the purpose of telecommunications services, and that the prices at which these services are to be provided shall be grounded by the principles set out in Section 33 of the Act. The Act also provides that the Office shall have regard to the principle of cost orientation when making a determination of an operator's call termination charges.

This Determination Notice sets out the Offices response to the issues raised by stakeholders who commented on the draft LRIC model. Further, the Determination Notice indicates the resulting mobile termination rate (MTR) from the cost model. The Office's decision with regard to a glide path for operators to adjust their MTR to the cost oriented rate calculated by the model is also discussed.

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DOCUMENT TITLE AND APPROVAL PAGE

DOCUMENT NUMBER: TEL2013001_DET001

1. DOCUMENT TITLE: Determination Notice for Cost Model for Mobile Termination Rates – The Decision on Rates.

2. PURPOSE OF DOCUMENT

This document contains the main decisions of the Office of Utilities Regulation regarding the cost model for mobile termination rates and the output of that model.

ANTECEDENT DOCUMENTS

Document Number	Description	Date
TEL 2008/10 : Con/03	Consultation Document on Principles of Long-run Incremental Cost Model for the Jamaican Telecommunications Market.	July 30, 2008
TEL2012001_CON001	Consultation Document on Cost Model for Mobile Termination Rates.	February 21, 2012
TEL2012001_CON002	Second Consultation Document on Cost Model for Mobile Termination Rates.	June 15, 2012
TEL2012001_DET001	Determination Notice on Cost Model for Mobile Termination Rates.	July 24, 2012

3. APPROVAL

This document is approved by the Office of Utilities Regulation and the decisions therein become effective July 1, 2013.

On behalf of the Office:

………………….……………………………...
Maurice Charvis
Director General

May 30, 2013

Chapter 1:   Introduction

1.1   In October 2012, the Office presented a draft mobile cost model to industry players for review and comment. A deadline of January 25, 2013 was established for submission of comments to facilitate any correction or improvement of the draft model that may arise from these comments.

1.2   Both mobile operators - Cable and Wireless Jamaica Limited ("**LIME**") and Digicel (Jamaica) Limited ("**DIGICEL**"), submitted comments.

1.3   Industry players were then given until February 25, 2013 to respond to the comments received.

1.4   Both operators - LIME and DIGICEL - submitted responses.

Purpose of this Determination Notice

1.5   This Determination Notice details the Office's views on and responses to the comments submitted by industry players regarding the draft mobile cost model and the responses received from industry players on the submitted comments.

1.6   This Determination Notice also details the changes that have been made to the draft cost model as a result of the comments and responses received, to produce the final version of the mobile cost model.

Legislative Framework

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

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;"*

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".*

1.8   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 telecommunications services.

1.9   The legal framework governing interconnection, which is a type of telecommunications service, is set out in sections 27 – 37 inclusive of the Act. Section 29 of the Act requires that all carriers permit other carriers to interconnect with its public network. 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".*

1.10   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) of the Act provide as follows:

> *"(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."*

1.11 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 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(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."

1.12 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, a 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) …; and

(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; ..."

"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 2:   General Comments

2.1   Chapter 2 of this Determination Notice discusses the general comments submitted by the operators. These relate to the consultation process and international calls.

Consultation Process

2.2   DIGICEL suggested that another round of consultations be held on the model given the number and nature of the changes that it had proposed.

2.3   LIME disagreed with DIGICEL. LIME agreed that some changes to the model were needed, but believed the overall structure was correct. It therefore stated that no further consultation was needed.

2.4   The Office agrees with LIME in this regard and does not see the need for any further consultation at this point as no new issues have been raised. Stakeholders had ample opportunity to suggest corrections and improvements which they think needed to be made to the draft mobile cost model. The Office has reviewed and considered all comments and responses received regarding the model and has either accepted or rejected suggested changes. In either case, the Office has indicated in this Determination the reason for its decision.

2.5   It is also of note that during the presentation of the draft mobile cost model, the Office requested additional data from each of the mobile operators to address inconsistencies and oversights found during the initial data collection phase. The additional data requested included, among other things, data about the operating expenditure ("**opex**"), un-attributable costs and the routing matrix of the operators. The provision of this additional information represented yet another opportunity to the operators to provide valuable inputs that would influence the final outcomes in the draft model.

2.6   Furthermore, the Office notes that the structure of the model has not been criticised, and that the main comments received related to the inputs to the model. Therefore, a further consultation would not bring any further benefit to the tariff determination process; rather it would only serve to postpone the implementation of the mobile cost model and the implementation of fair and reasonable mobile termination rates ("**MTRs**") in Jamaica.

2.7   LIME stated that the MTR computed in the draft mobile cost model could only be used for domestic mobile termination rates.

2.8   DIGICEL agreed with this statement.

2.9   The Office disagrees with both parties. The Office reaffirms that the MTR calculated by the model is for the termination of both domestic and international calls. This is consistent with the Office's position in the Determination Notice titled "Cost Model for Mobile Termination Rates" Document No: TEL2012001_DET001 published on July 24, 2012.

2.10   The draft model does not include cost related to equipment for the international media gateway. The Office's position is that this cost element relates to the international switch and should be included in a carrier's international settlement rate, not its termination rate. The current regime for incoming international calls is that any operator with an International Carrier licence is allowed to carry international traffic destined for a Jamaican subscriber via its international switch. The payment construct for these calls is that the operator with the International Carrier licence charges the foreign operator with whom the call originates, a settlement rate for the service. The operator with the International Carrier licence then terminates the call to the local subscriber for whom the call is destined if that subscriber is on its network or sends it to another operator for termination if the subscriber is on a different network. In the case where the sucbscriber is on a different network, the operator that brings in the incoming international call (that is, the operator with the International Carrier licence) would then pay the operator on whose network the subscriber resides, a termination rate. It is this termination rate that is being determined by the model and not the international settlement rate. If the cost of the international media gateway is included in the model, operators with both a domestic network and an International Carrier licence would be able to unfairly compete with operators who only have an International Carrier licence.

Determination 1

The Office reaffirms that the model shall be used to set the MTR which is independent of the origin of the call.

Chapter 3:   Market and Traffic Forecasts

3.1   Chapter 3 of this Determination discusses the comments submitted by the mobile operators concerning actual market and demand traffic data and the associated forecasts.

Actual Demand and Forecasts

3.2   DIGICEL disagreed with the forecasts proposed by the Office in its draft mobile cost model that the average number of subscriptions held by each subscriber will fall slightly from a figure of 1.47 SIMs per user in 2011 to 1.45 in 2020. Based on a report from Wireless Intelligence, DIGICEL stated that the multi-SIM ratio was 1.7 in 2011. DIGICEL then claimed that the number of SIMs per user was affected by several factors:

- A market comprised mainly of prepaid contracts;
- More than one operator with significant market share;
- Multiple devices and lines ownership;
- On-net/off-net pricing differential.

These factors led DIGICEL to believe the multi-SIM ratio will increase to 1.85 in 2020.

3.3   DIGICEL further opined that the SIM penetration rate would reach 135% in 2020 relative to the 116% forecasted in the draft mobile cost model.

3.4   LIME disagreed with DIGICEL's comments stating that DIGICEL's actual data and forecasts were mostly based on a report from Wireless Intelligence and there was no possibility to check the accuracy of this data and the way the forecasts have been computed.

3.5   The Office also does not accept DIGICEL's numbers concerning the multi-SIM ratio and the SIM penetration rate. The Office agrees with the factors used by DIGICEL to explain the reasons why multiple SIM ownership exists. However, the Office does not agree with DIGICEL's conclusions on the multiple sim ratio.

3.6   DIGICEL's forecast of the multiple SIM ratio growing from 1.7 to 1.85 is based on an estimate from Wireless Intelligence with no supporting data provided to justify the accuracy of the estimate. The Office's

estimate was arrived at using actual data where available. In this regard, the actual SIM penetration rate was 114%[1] in 2011 and the subscriber penetration rate for the corresponding period was estimated to be 78%[2] (number of subscribers as a percentage of population over 14). The multiple SIM ratio is then calculated by dividing the SIM penetration rate by the subscriber penetration rate. The Office prefers to take a conservative view regarding the growth in SIM penetration rate and as such has forecasted that it will rise to 116% in 2020. DIGICEL has not submitted any data to support why it believes that this ratio will grow to 135% in 2020.

3.7   The Office believes, as a very conservative approach, that the multiple SIM ratio will most likely stagnate for upcoming years due to:

- Increasing market concentration (two operators are remaining each with a 50% market share - model assumption);

- Increasing number of post-paid contracts reaching 8.3% in 2020 (these forecasts have not been challenged by any operator);

- Decreasing MTR due to the use of the pure LRIC approach.

3.8   The last factor mentioned above is perhaps the most important as customers have multiple SIM cards because of the high price differential between off-net and on-net services. The setting of the MTR based on the pure LRIC approach, as required by the Act, will likely result in the pricing differential between on-net and off-net services becoming marginal. As a result, the share of customers having two SIM cards may decrease. The Office therefore believes a more likely outcome would be a decline of the multiple SIM ratio.

3.9   Furthermore, the SIM penetration rate computed by DIGICEL is only the result of the subscriber penetration rate (total number of subscribers divided by the population) multiplied by the multiple SIM ratio. If the assumed multiple SIM ratio is overstated, then DIGICEL's SIM penetration rate will also be overstated. As the Office rejects DIGICEL's forecasts on multiple SIM ratio, the Office cannot agree with DIGICEL on the SIM penetration rate forecasts.

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[1] Value used for calculation is 114.19%, rounded to 114% in this document
[2] Value used for calculation is 77.56%, rounded to 78% in this document

Actual Voice Traffic and Forecasts

3.10 DIGICEL did not agree with the Office's forecast concerning the balance between on-net and off-net traffic. It has stated that a generic operator with a 50% market share should have balanced traffic between on-net and off-net.

3.11 LIME stated that off-net traffic would increase but reach a plateau below 50%.

3.12 The Office agrees with DIGICEL that the traffic should be balanced between on-net and off-net services, that is, 50% of the traffic should be on-net traffic and 50% of the traffic should be off-net traffic. As a consequence, the incoming traffic from other mobile operators has been updated in the mobile cost model. With a 50% market share and two operators, the incoming traffic of one operator should be the outgoing traffic from the other operator.

3.13 The Office has therefore added a parameter in order to control the share of on-net traffic among total outgoing traffic towards mobile networks and has set it to 50%.

3.14 The Office has also updated the call duration for on-net, off-net and incoming off-net services. With a low MTR and a balanced market share, the use of these services by customers should be the same. Based on traffic statistics provided by the operators for 2012, the Office has computed the number of calls and deduced the new average call durations.

Table 1 – Updated Average Call Durations

	Draft model	Updated model
Outgoing calls		
To mobile on-net	1.43	1.31
To mobile off-net	0.68	1.31
Incoming calls		
From other mobiles	0.72	1.31

Source: TERA Consultants

Determination 3

The mobile cost model has been updated in order to have a balanced traffic between on-net and off-net mobile services. The incoming traffic from other mobile operators has also been updated so that, for a 50% market share, it is equal to the outgoing traffic to other mobile operators. Finally, the call duration of on-net, off-net and incoming calls from other mobile operators' services has been updated so that they are equal.

Actual SMS Traffic

3.15 LIME disagreed with the SMS volume figures provided by the Office in the worksheet named "1.0 Market".

3.16 The Office agrees with LIME that there is a discrepency between the data provided by the operators and the Office's data. The Office has not used the SMS volume figures of the spreadsheet "1.0 Market" and has chosen to use the operators' data, therefore this discrepancy has no impact on the modelling.

Determination 4

The Office has used the mobile operators' data regarding SMS volume figures in the mobile cost model.

Chapter 4:   Network Modelling and Dimensioning

4.1 Chapter 4 of this Determination Notice discusses the comments submitted by the mobile operators concerning how the mobile network is modeled and dimensioned.

Geotypes

4.2 DIGICEL stated that simplifying the modelling with the use of only two geotypes could be an effective way to balance accuracy and modelling pragmatism, but it also created risks of averaging and therefore increased the potential for inaccuracies.

4.3 LIME stated that the Office should determine the number of geotypes based on local geo-marketing data. LIME outlined that although it had proposed the use of three geotypes, Urban, Suburban and Rural, benchmarking could not be relied on as the characteristics of other markets may be very different from the Jamaican market.

4.4 The Office agrees that defining geotypes is always a difficult exercise. As LIME suggested, benchmark data cannot readily be substituted as each country has its own particular characteristics. The Office has therefore relied on mobile operators' inputs in order to define the geotypes. The aim has been to reconcile the inputs in the model with the operators' inputs as much as possible.

4.5 Although both DIGICEL's and LIME's inputs suggest the use of three geotypes, the geotypes proposed by each operator were not congruent. DIGICEL used Urban, Seaside, and Rural geotypes, while LIME used Urban, Suburban, and Rural geotypes.

4.6 Given the number of Digicel sites tagged as "Seaside" (less than 1% of the total number of Digicel sites), these geotypes have been recoded as "Urban". This geotype makes up a very small proportion of the overall number of Digicel sites and is unlikely to have any material impact on the model.

4.7 In order to make use of the data submitted by both networks, the Office decided to use – Urban and Rural - in the model. The Office reconciled LIME's three geotypes with the two geotypes used in the model by allocating LIME's Suburban sites to one of the two geotypes used (Urban and Rural). That is, LIME's Suburban sites have been set as

Urban if they were located in the area identified by DIGICEL as Urban, and the remaining sites were set as Rural.

Determination 5

Only two geotypes are used in the model – Urban and Rural.

Coverage versus Capacity

4.8 DIGICEL did not agree with the cell radii used in the model, nor with the value of the scorched node factor. DIGICEL stated that the cell radii should be 2.5 km and 6.7 km for the urban and the rural geotypes, respectively, with a 100% scorched node factor. Further, DIGICEL stated that it expected a 50% market share operator would have at least 50% of sites deployed for capacity purposes. In order to support its arguments, DIGICEL shared the following analysis:

- A "timing advance" analysis of all cells in its mobile network which can provide an estimate of cell radii. The "timing advance" analysis provides the measurement of the time needed for the signal to reach the base station from a mobile phone. The radius can then be deduced by multiplying this measure by the speed of light. This method nonetheless has some limits. For example, the choice of the availability percentage as explained by DIGICEL will impact the cell radius but also the choice of the mobile phone will impact the "timing advance" analysis.

- A historical analysis: DIGICEL claimed its geographic coverage of 95% was reached in 2008, so any site rolled out since then could only be deployed for capacity purposes. The absolute maximum number of sites required for geographic coverage could only be the number of sites rolled out by DIGICEL up to 2008.

- Finally, DIGICEL provided maps showing that even in 2008, the company already had some densification sites.

4.9 LIME agreed with DIGICEL that some sites were deployed for capacity purposes but disagreed with DIGICEL that the cell radii should be 2.5 km and 6.7 km for urban and rural geotypes, respectively. Based on an analysis of the distance inter-site, LIME argued that the cell radii could not exceed 4 km in the rural geotype and was half of what DIGICEL proposed for the urban geotype.

4.10 In the draft mobile cost model, the Office used a cell radii of 1.2 km and 4.0 km for the urban and rural geotypes, respectively with a scorched node factor of 0.7. Using these cell radii and scorched node factor, the draft model resulted in no site deployed for capacity purposes.

4.11 Considering new data provided by DIGICEL, the Office agrees with DIGICEL's analysis that some sites should be deployed for capacity purposes. The Office therefore updated the model.

4.12 Digicel's statements about the "effective" cell radii are correct. In the draft model, coverage calculations were based on "effective" cell radii, equal to the cell radii multiplied by the scorched node factor. A simpler approach, relying solely on the "effective" cell radii has been implemented in the final model, which is strictly equivalent to setting the scorched node factor value to 100%.

4.13 The comparison of new cell radii values presented by the operators show large discrepancies. Hence, it is not possible for the Office to rely on the data submitted by the operators for this parameter. The cell radii are updated to 1.875 km and 5.350 km for the urban and the rural geotypes, respectively, in the 900 MHz. These cell radii have been determined by the Office so that the model results in a satisfactory proportion of 2G sites roll out for capacity purposes.

4.14 The Office notes that with the updated parameters (cell radii, traffic, usage rate), the proportion of 2G sites rolled out for capacity purposes is around 75% of the total 2G sites, which is more than any value of the benchmark provided by DIGICEL.

4.15 The Office further notes that the cell radii used in the final model falls within the interval defined by the cell radii submitted by the operators.

4.16 Finally, the Office notes that with parameters consistent with DIGICEL's characteristics in 2011, that is, a market share of 75%, a 98% share of on-net traffic, and no 3G, the total number of minutes calculated by the model is consistent with DIGICEL's data. In such a configuration the model assumes 884 2G sites, which is more than the amount in Digicel's network.

Determination 6

The cell radii have been updated to 1.875 km and 5.350 km for the rural and urban geotypes, respectively. The scorched node factor has been removed from the computation.

Minimum Number of TRXs per Sector

4.17 DIGICEL stated that each sector had at least two TRXs due to technical requirements. Additional TRXs were deployed for capacity purposes.

4.18 LIME disagreed with DIGICEL and stated that using two TRXs per sector in some areas, especially in urban areas, may not allow for adequate coverage of these areas.

4.19 The Office points out that the number of TRXs per sector computed in the draft mobile cost model is solely based on capacity requirements. The Office agrees with DIGICEL that a minimum of two TRXs per sector should be implemented. However, the Office notes that the number of TRXs per sector is always at least equal to two, therefore this update has no impact on the results of the model.

Determination 7

The number of TRXs per sector is a minimum of two.

1,800 MHz BTS deployment

4.20 DIGICEL stated that the 1,800 MHz BTS were deployed only for capacity purposes and therefore should be modeled only as traffic sensitive.

4.21 LIME disagreed with DIGICEL's statement as LIME indicated that it often rolled out the two frequency bands simultaneously. LIME therefore stated that the 1,800 MHz BTS should be deployed at the same time as the 900 MHz BTS and not considered as solely traffic sensitive.

4.22 The Office agrees with DIGICEL and disagrees with LIME as it is common practice to deploy 1,800 MHz BTS for densification and 900 MHz BTS for coverage. Even if LIME rolls out 900 MHz BTS and 1,800 MHz BTS at the same time, both frequency bands are not used for coverage. Only the 900 MHz is used for coverage because it covers more.

4.23 The Office points out nonetheless that the 1,800 Mhz BTS are already modeled in the draft model as traffic sensitive and are not deployed as a complete overlay of the 900 MHz BTS.

Utilization Factor

4.24 DIGICEL stated that the utilization factor of the BTS had been overestimated in the draft mobile cost model. DIGICEL is of the view that the 900 MHz TRX should be used at most 60% of its full capacity and when 900 MHz and 1,800 MHz TRX are used at the same time, this utilization factor should be 55% in urban areas and 51% in rural areas.

4.25 LIME agreed with DIGICEL that the utilization factor for TRX should be reviewed in the mobile cost model. However, LIME did not agree with DIGICEL's numbers which were calculated from averaging benchmarked values.

4.26 The draft mobile cost model includes two parameters in order to compute the utilization factor:

- A *"BH spare capacity mark-up"*;
- An *"equipment utilization factor"*.

The utilization factor is directly deduced from these two values by the following formula:

$$Utilization\ factor = \frac{equipment\ utilization\ factor}{1 + BH\ spare\ capacity\ markup}$$

4.27 Information regarding these two parameters were requested from both operators during the data request phase and the Office has used the submitted values.

4.28 The values used for the "*BH spare capacity mark-up*" in the draft model were:

Table 2 – Draft model utilization factor

Equipment	BH spare capacity	Equipment utilization factor	Utilization factor
BTS	18%	100%	84.75%
Node B	18%	100%	84.75%
BSC	30%	70%	53.85%
RNC	30%	70%	53.85%
MGW	23%	80%	65.04%
MSC	23%	80%	65.04%
HLR	23%	80%	65.04%
VLR	23%	100%	81.30%
STP	45%	100%	68.97%
VMS	13%	100%	88.50%
SMSC	25%	80%	64%
MNP	25%	100%	80%
MMSC	20%	80%	66.67%
GGSN	20%	80%	66.67%
SGSN	20%	80%	66.67%
IN	22%	80%	65.57
NMS	22%	100%	81.97%

Source: TERA Consultants

4.29 However, as both operators stated that the utilization factor should be updated, the Office agrees to update the value of the utilization factor. The Office has set the new values:

- taking into account the operators comments; and
- in order to calibrate the model against reality and in particular the evolution of the number of BTS.

Table 3 – Updated utilization factor

Equipment	BH spare capacity	Equipment utilization factor	Utilization factor
BTS	30%	85%	65.38%
Node B	30%	85%	65.38%
BSC	30%	85%	65.38%
RNC	30%	85%	65.38%
MGW	25%	80%	64%
MSC	22.50%	100%	81.63%
HLR	23.33%	80%	64.87%
VLR	22.50%	80%	65.31%
STP	N/A	N/A	N/A
VMS	12.50%	100%	88.89%
SMSC	25%	80%	64%
MNP	25%	100%	80%
MMSC	20%	80%	66.67%
GGSN	20%	80%	66.67%
SGSN	20%	80%	66.67%
IN	21.67%	80%	65.75%
NMS	25%	100%	80%

Source: TERA Consultants

These updated factors are in line with DIGICEL's proposed figures and ensures that the the determination of the number of BTS is consistent with reality.

Determination 8

The model has been updated with the new utilization factors outlined in Table 6 above.

Overlapping Reduction Parameter

4.30 DIGICEL stated that the overlapping reduction parameter had no theoretical ground as voice and data were carried separately in 2G and 3G layers.

4.31 LIME stated that its busy hour for voice and its busy hour for data occurred nearly at the same time. LIME expected to have a much lower reduction (that is, an overlapping reduction parameter closer to 100%).

4.32 The draft model used the busy hour traffic in order to dimension the required number of equipment. Other requirements may apply for specific equipment especially for core equipment. It is therefore important to correctly assess the busy hour traffic.

4.33 Both voice 2G traffic and data 2G traffic at the site level are handled by the TRX. The number of TRXs is therefore derived directly from the 2G traffic regardless of whether this traffic consists of pure voice traffic, or of pure data traffic, or both voice and data traffic. Since the voice busy hour and the data busy hour do not occur at the exact same time, the busy hour traffic cannot be estimated by the sum of the data traffic at data busy hour and the voice traffic at voice busy hour. This sum has to be corrected which is the purpose of this factor.

4.34 In the same manner, the capacity of a 3G site is directly derived from the number of channel elements available. The pool of channel elements is then allocated to the different bearers used to handle the voice traffic and the data traffic depending on the needs and according to engineering rules that are described in the model and its documentation. As no operator has mentioned a dedicated carrier for data or for voice, this pool of channel elements is shared between all bearers, that is, it is shared between voice and data traffic. It is therefore necessary to assess the busy hour traffic including voice and data traffic. As for the 2G network, the 3G busy hour traffic cannot be estimated by the sum of the data traffic at data busy hour and the voice traffic at voice busy hour. This sum has to be corrected and the overlapping reduction parameter is used for this purpose.

4.35 The value of this overlapping reduction parameter has been derived directly from the traffic data provided by the operators:

- Data and voice traffic at voice busy hour;
- Data and voice traffic at data busy hour.

The overlapping reduction parameter is the maximum between the data traffic at voice busy hour on the data traffic at data busy hour and the voice traffic at data busy hour on the voice traffic at voice busy hour.

- DIGICEL believed this factor should be set to 100%;
- LIME stated that the voice busy hour and data busy hour occur nearly at the same time.

4.36 The Office accepts the arguments provided by the operators and as a consequence, has updated the overlapping reduction parameter to 100%.

Determination 9

The "overlapping reduction parameter" has been updated and set to 100% according to the values submitted by both operators. As it is strictly equivalent to removing it, it has been removed.

Routing Matrix

4.37 LIME disagreed with the routing matrix used in the draft model. In particular, LIME disagreed with the share of intra-MSC traffic versus inter-MSC traffic. LIME stated that the intra-MSC represents 70% of the traffic versus 30% for the inter-MSC.

4.38 The Office reminds the operators that they were asked to provide new routing matrices as the data provided during the data collection phase were inconsistent and the Office had to use a benchmarked routing matrix.

4.39 Only LIME has provided new inputs for the routing matrix. Therefore, the Office has used this to update the routing matrix.

Chapter 5:   Economic Parameters and Expenditures

5.1   Chapter 5 of this Determination Notice discusses the comments submitted by the operators in relation to the economic parameters and the expenditure inputs.

Operating Expenditures and Un-attributable Costs

5.2   DIGICEL disagreed with the value of the opex obtained in the draft model. DIGICEL however agreed with the methodology used, that is, using a mark-up on the capital expenditure ("**capex**") in order to obtain the opex, but disagreed with the value of this mark-up. DIGICEL stated that instead of using a 5% mark-up, the Office should use an average value of 19% based on the benchmark it provided.

5.3   LIME agreed with DIGICEL that the value of the mark-up used to compute the opex was too low but did not agree with the value provided by DIGICEL. LIME provided the value based on its network operation.

5.4   It should be noted that during the draft model presentation to the operators, the Office pointed out that the mark-up used for the draft model was likely to be inaccurate due to incorrect or missing data submitted by the operators and would be updated when new data was provided. Both DIGICEL and LIME have since submitted new data in order to compute the opex based on the capex value.

5.5   The Office has used the new data to compute the mark-up. The Office has computed the average between the values submitted by DIGICEL and LIME. The Office has used all the values provided in the benchmark by DIGICEL, except for values that seem to be inconsistent with the other values provided (e.g. opex associated with sites in Antilles-Guyane is 71% compared to 5% to 18% in the remaining countries of the benchmark) and the values provided by LIME.

5.6   The following table shows the values that have been kept for calculating the opex mark-up for network equipment and the final value.

Table 4 – Benchmark and Final Value of Opex Mark-Up for Network Equipment

Ntw Equip. unit cots	unit	Denmark	France	Antilles-Guyane	Réunion-Mayotte	Portugal	Sweden	UK	LIME	VALUE
BTS 900 MHz	%	3%	17%	26%	17%	13%	10%	10%	15%	13.88%
BTS 1800 MHz	%	3%	17%	26%	17%	13%	10%	10%	15%	13.88%
Node B	%	3%	10%	18%	10%	13%	10%	10%	15%	11.13%
2G IBS	%									14.00%
3G IBS	%									11.00%
2G TRX	%	3%	17%	26%	17%	13%	10%	10%	15%	13.88%
3G Transceivers	%	3%	10%	18%	10%	13%	10%	10%	15%	11.13%
Aggregators	%	3%	17%	26%	17%	13%	10%	10%	15%	13.88%
BSC	%	7%	24%	26%		0%	30%	12%	20%	17.00%
RNC	%	7%	24%	16%		0%	30%	12%	20%	15.57%
MGW	%	6%	27%		27%	42%	40%	14%		25.83%
MSC-S	%	6%	27%		27%	42%	40%	14%	20%	25.00%
SGSN	%	6%	27%		27%	42%	40%	14%		25.83%
GGSN	%	6%	27%		27%	42%	40%	14%		25.83%
SMSC	%	6%	27%		27%	42%	40%	14%		25.83%
MMSC	%	6%	27%		27%	42%	40%	14%		25.83%
HLR	%	6%	27%		27%	42%	40%	14%	10%	23.57%
VMS	%	6%	27%		27%	42%	40%	14%	20%	25.00%
VLR	%	6%	27%		27%	42%	40%	14%	10%	23.57%
IN	%	6%	27%		27%	42%	40%	14%		25.83%
NMS	%	6%	27%		27%	42%	40%	14%		25.83%
Portability Platform	%	6%	27%		27%	42%	40%	14%		25.83%
Signalling transfer platform	%	6%	27%		27%	42%	40%	14%		25.83%
Billing Platform	%	6%	27%		27%	42%	40%	14%		25.83%

Source: TERA Consultants, DIGICEL, LIME

5.7 The following table shows the values that have been kept for calculating the opex mark-up for network sites and the final value.

Table 5 – Benchmark and Final Value of Opex Mark-Up for Network Sites

Ntw Sites unit cost	unit	Denmark	France	Antilles-Guyane	Réunion-Mayotte	Portugal	Sweden	UK	LIME	AVERAGE
BTS site	%	7%	10%			5%	10%	18%	10%	10.00%
Node B site	%	7%	10%			5%	10%	18%	10%	10.00%
Colocated BTS/Node B site	%	7%	10%			5%	10%	18%	10%	10.00%
2G IBS site	%	7%	10%			5%	10%	18%	10%	10.00%
3G IBS site	%	7%	10%			5%	10%	18%	10%	10.00%
2G/3G IBS site	%	7%	10%			5%	10%	18%	10%	10.00%
BSC site	%	7%	10%			5%	10%	18%	10%	10.00%
RNC site	%	7%	10%			5%	10%	18%	10%	10.00%
Colocated BSC / RNC / MGW site	%	7%	10%			5%	10%	18%	10%	10.00%
Core sites (MSC, MGW, others)	%	7%	10%			5%	10%	18%	10%	10.00%

Source: TERA Consultants, DIGICEL, LIME

5.8 The following table shows the values that have been kept for calculating the opex mark-up for network transmission equipment and the final value.

Table 6 – Benchmark and Final Value of Opex Mark-Up for Network Transmission Equipment

Transmission unit cost	unit	Denmark	France	Antilles-Guyane	Réunion-Mayotte	Portugal	Sweden	UK	LIME	AVERAGE
Wireline										
T1	%	3%				9%	10%		10%	8.00%
STM1	%	3%				9%	10%		10%	8.00%
STM4	%	3%				9%	10%		10%	8.00%
STM16	%	3%				9%	10%		10%	8.00%
MW Links										
7 Mhz	%	3%	17%	7%	6%	9%	10%	21%	10%	10.19%
14 Mhz	%	3%	17%	7%	6%	9%	10%	21%	10%	10.19%
28 Mhz	%	3%	17%	7%	6%	9%	10%	21%	10%	10.19%

Source: TERA Consultants, DIGICEL, LIME

5.9 DIGICEL commented as well that the value of the mark-up used to compute un-attributable cost was too high, and that a mark-up of around 3.5% should be used instead of 25%.

5.10 LIME agreed with DIGICEL that the Office should review the mark-up used for un-attributable costs.

5.11 As for the mark-up used for opex, the Office had specifically asked both parties to provide new values for the mark-up used to compute the un-attributable costs as the values provided during the data request phase were clearly inaccurate or missing.

5.12 The Office has therefore updated the value of the mark-up for un-attributable costs using the value submitted by DIGICEL, that is, 3.5%.

Determination 10

The mark-up used to compute the opex is updated in order to take into account the values submitted by the operators. The mark-up used to compute the un-attributable costs is decreased from 25% to 3.5%.

Capital Expenditures

5.13 LIME disagreed with some benchmark values provided in the draft mobile cost model concerning capital expenditures:

- Cost of the 2G TRX;
- Cost of the 3G Microcell or IBS;
- Cost of the number portability platform;
- Cost of the signalling transfer platform;
- Cost of node sites.

5.14 LIME stated that the values provided for the previous list of elements were not consistent with LIME's values. LIME therefore provided new inputs in order to update the model.

5.15 DIGICEL stated that the draft model was underestimating the Gross Replacement Cost ("**GRC**") of the network assets because direct installation, indirect assets, and necessary upgrades had not necessarily been taken into account and those assets that would be forgotten were not listed. DIGICEL indicated that it expected an increase of 42% on radio/software assets and an increase of 203% on switching assets.

5.16 The Office disagrees with DIGICEL's analysis concerning the GRC because the scope used for the comparison is not the same. DIGICEL's market share in terms of number of subscribers is approximately 67% without CLARO and 84% with CLARO compared to the 50% market share of the generic operator (considering the market share in traffic would give much higher values). This difference leads to different requirements in terms of number of equipment needed to handle the demand (for example, the number of BTS would be different, especially with the changes DIGICEL is requesting concerning the cell radii in urban and rural geotypes).

5.17 An analysis of the 2012 GRC (in USD with 1 JMD = 0.010334 USD) calculated with different market shares obtained with the final model shows that the results are consistent with the GRC provided by DIGICEL. DIGICEL should have carried out the comparison with similar levels of traffic as that of the generic operator.

Inflation

5.18 LIME stated that the inflation rate proposed in the model was exceptionally low, and even if it was in line with the Jamaican Central Bank, LIME expected it to raise for the 2013-2020 period. LIME indicated also that the site rental price trend should be influenced by inflation. This was not the case in draft model.

5.19 DIGICEL supported LIME's comments on inflation and on the site rental price trend and expected both to be higher.

5.20 The Office has calculated the site rental price trend by computing the average between the operators' submissions. When submitting their price trends, the operators had already included the effect of inflation. Therefore, the Office is rejecting the mobile operators' comments.

5.21 The Office agrees with the operators that the inflation rate used in the draft model needs to be revised. As such, the Office averaged the forecasted inflation rate from the Bank of Jamaica over the period FY2013/2014 to FY2017/2018 as shown in Table 7. This resulted in an inflation rate of 9.04%. However, the Office notes that the inflation rate differential is only used to compute the equipment price trend. It should be noted that DIGICEL seemed to recognise in its comments on the draft model that the price trends have been correctly set:

> *"TERA recognises (correctly) that many of the underlying cost trends in Jamaican currency are flat […]."*

Table 7 – Selected Medium Term Macroeconomic Indicators

Selected Medium Term Macroeconomic Indicators						
	FY2012/13	FY2013/14	FY2014/15	FY2015/16	FY2016/17	FY2017/18
Real GDP (% chg.)	-0.5	0.8	1.4	1.8	2.2	2.5
Inflation (Annual pt. to pt.)	9.1	10.5	9.4	8.8	8.5	8.0
Public Sector Deficit / GDP	-4.0	-0.4	0.1	0.7	1.4	1.7
Primary balance / GDP	5.3	7.5	7.5	7.5	7.5	7.0
Current Account / GDP	-11.6	-10.8	-9.6	-7.6	-6.5	-6.0
Gross Reserves (weeks of imports)	11.5	13.0	13.0	15.0	16.0	16.0

Source: Bank of Jamaica Quarterly Monetary Policy Report January – March 2013, Volume 13 No.4 Draft

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Determination 11

The inflation rate used in the model will be 9.04%.

Weighted Average Cost of Capital (WACC)

5.22 DIGICEL stated that the pre-tax nominal WACC should be used and the value of this pre-tax nominal WACC should be maintained up-to-date with the most recent values that can be obtained, particularly on inflation.

5.23 LIME agreed that the pre-tax nominal WACC should be used in the mobile cost model but disagreed that this value should be updated. LIME also disagreed with the idea that another consultation on the WACC should be undertaken.

5.24 The Office agrees with both parties that the pre-tax nominal WACC should be used. However the Office disagrees with DIGICEL that the WACC value should be updated. The WACC has been set by the Determination Notice "Estimate of the Weighted Average Cost of Capital for Telecommunications Carriers" Document No. TEL2009005_DET001 published on December 9, 2010. It is clearly stated that the WACC value has been calculated to be an input of the cost model:

> *"The estimated cost of capital will be used by the Office as an input into the next Price-Cap for LIME, the determination of interconnection charges between carriers, and any other tariffs that may need to be established by the Office."*

Determination 12

The WACC used in the model has been changed to the pre-Tax WACC of 27.95%.

Working Capital

5.25 DIGICEL stated that the working capital for purchased equipment should be included in the cost model. DIGICEL relied on benchmark information in this regard of periods considered in different countries.

5.26 LIME agreed with DIGICEL that the working capital should be included in the mobile cost model.

5.27 The Office agrees that the working capital should be included in the model. The tilted annuity formula used in the draft model already includes a 6 month offset between the time that the assets are purchased and the time that they start to generate outputs. However, the Office will include a 9 month period instead of a 6 month period in order to be consistent with the benchmark data provided by DIGICEL.

5.28 Also for consistency, the Office has included the same period in the pure LRIC with adjusted tilted annuities calculation.

Determination 13

The Office has updated the tilted annuity and adjusted tilted annuity formula in order to include a 9 month period so that working capital is taken into account.

Chapter 6:   Services Costing

6.1   Chapter 6 of this Determination Notice discusses the comments submitted by the mobile operators concerning services costing, in particular, the pure LRIC calculation and the Shapley-Shubik allocation.

Pure LRIC Calculation

6.2   DIGICEL stated that the incremental economic cost computed in the draft model was incorrect due to:

- double-discounting of the economic cost;
- considering a flat economic cost although the cost of production is rising.

6.3   The incremental economic cost computed in the draft model was averaged over the period of computation. The Office agrees that this approach was a simplification and therefore has updated the computation of the pure LRIC with adjusted tilted annuities. The new implementation can be seen in the worksheet named "8.3 Pure LRIC Eco Depr". The new approach is as follows: 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.

6.4   DIGICEL also pointed out an erratic behavior of the pure LRIC results with tilted annuities, this it contended was the consequence of the yearly approach adopted in the draft model.

6.5   LIME disagreed with DIGICEL's criticism of the results validity due to the erratic behavior observed. LIME stated that the erratic behavior is a result of the yearly approach which is a requirement of the methodology set by the Office.

6.6   The yearly approach adopted in the draft model is a requirement defined in the Determination Notice titled "Cost Model for Mobile Termination Rates" Document No: TEL2012001_DET001 published July 24, 2012. Therefore this approach will not be changed. Furthermore, the yearly approach has no impact on the behavior of the pure LRIC results except if the number of assets were decreasing,

which is not the case. The erratic behavior observed by DIGICEL results from the threshold effects inherent to cost modelling. However, MTRs are set following the pure LRIC with adjusted tilted annuities method, which evolves in a smoother way.

Figure 1: Evolution of the MTR based on pure LRIC with adjusted tilted annuities
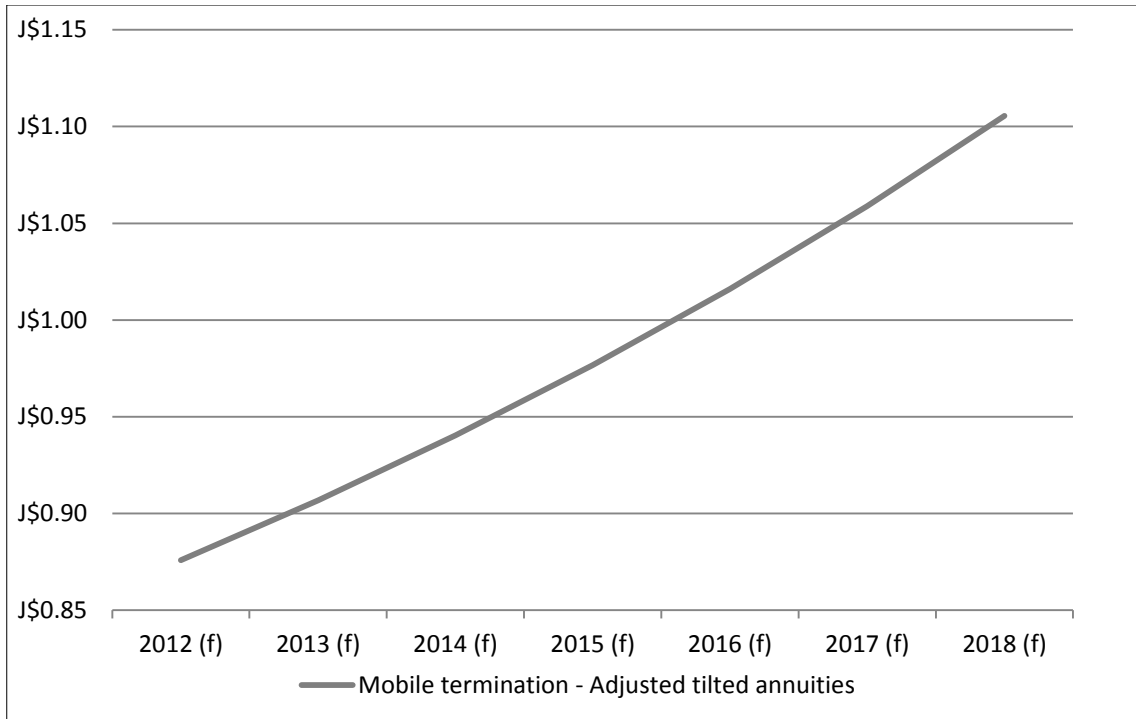
Source: TERA Consultants analysis

6.7 Furthermore, DIGICEL argued that the results for any given year are:

- sensitive to thresholds due to the avoidable traffic load when computing the pure LRIC; and

- very sensitive to forecast assumptions.

DIGICEL therefore suggested that a set of results should be computed with a set of different assumptions.

6.8 LIME did not disagree with DIGICEL on computing a range of results with a range of assumptions to set the pure LRIC cost.

6.9 The Office is not amenable to the option of computing a range of results by varying the inputs, in particular the traffic forecasts. The operators have been granted the opportunity to provide information to

be included in the model and to challenge the inputs of the model, including the forecasts, as well as model structure.

6.10 However, for illustrative purposes only, the Office presents the following sensitivity analysis that have been carried out by changing the multi-SIM ratio and the penetration rate, all else being equal. The following table is showing the sensitivity analysis carried out by changing the multi-SIM ratio from 1.51, the value used in the model, to up to 2, which is the number of operators remaining in Jamaica.

Table 8 – Sensitivity Analysis Changing the Multi-SIM Ratio (in JMD per min, 2013 values)

Multi-SIM ratio	1.51	1.6	1.7	1.8	1.9	2
LRAIC+ - Shapley-Shubik	0.943	0.941	0.940	0.935	0.934	0.938
Pure LRIC with adjusted tilted annuity	0.907	0.903	0.895	0.894	0.896	0.900

Source: TERA Consultants, final version of the mobile cost model

The following table is showing the sensitivity analysis carried out by changing the penetration rate from 80%, the value used in the model, to 100%.

Table 9 – Sensitivity Analysis Changing the subscriber penetration rate (in JMD per min, 2013 values)

Subscriber penetration rate	80%	85%	90%	95%	100%
LRAIC+ - Shapley-Shubik	0.943	0.941	0.935	0.934	0.939
Pure LRIC with adjusted tilted annuity	0.907	0.892	0.895	0.893	0.897

Source: TERA Consultants, final version of the mobile cost model

6.11 LIME believed the service "Incoming from outbound roaming" should be added to the list of services removed for the pure LRIC calculation as it is part of the incoming traffic. LIME stated as well that the "Other costs", that is, licence cost and the interconnection staff costs should be included in the pure LRIC computation. LIME stated also that NMS, signalling transfer platform and number portability platform should be included in the pure LRIC computation

6.12 The Office observes that contrary to LIME's statement, the NMS, the signalling transfer platform, and the number portability platform are already included in the pure LRIC computation of the draft model. However, the cost associated with these elements was shown in the draft model as zero because neither of the operators had provided any inputs concerning these three elements during the data collection phase. The Office susbsequently asked the operators to provide these inputs especially concerning the number portability platform. Only LIME has provided new inputs concerning these nodes. The model has therefore been updated to take the submitted information into account.

6.13 The Office agrees with LIME that the service called "Incoming outbound roaming call" should be added to the list of services part of the increment used for the pure LRIC calculation. The aim of the model is to set the mobile termination rate regardless of call origin. Thus all the incoming traffic should be part of the increment. The model has therefore been updated by including in the pure LRIC increment the service "Incoming outbound roaming call".

6.14 The Office finally points out that the "Other Costs" are already considered in the pure LRIC calculation in the draft model:

- Half of the annual interconnection staff cost is included.

- License fees are part of common cost and therefore are not part of the pure LRIC costs of MTRs.

Determination 14

The incremental economic cost in the model has been updated in order to take into account a rising cost of production and to avoid a double-discounting effect. The Office has included new inputs to update the number of NMS, signalling transfer platform, and number portability platform to be used. The Office has included the service named "Incoming outbound call" in the list of services considered as part of the increment for the pure LRIC calculation.

Shapley-Shubik

6.15 DIGICEL indicated that whilst it previously favoured the Shapley-Shubik method, it no longer agreed with the use of the method for several reasons including:

- Most mobile cost models built do not use the Shapley-Shubik approach.

- The standalone cost of a network with a standalone SMS service would be something like a 2-way paging network.

- The Shapley-Shubik approach assumes the mobile services can be produced in any different order although this has no real basis. First, consumers do not choose indifferently between mobile services as the usage of these services is very different. Second, historical data shows that mobile networks have been rolled out first for voice service. SMS and data services should be considered as value added services. Standalone SMS networks do not exist anymore (or the equivalent 2-way paging network) and data-only networks are almost non-existent.

6.16 Furthermore, DIGICEL stated that the Shapley-Shubik approach implemented in the draft model is opaque and fails to fully recover the costs of interconnection. DIGICEL concluded that the Office should use the LRAIC+ with EPMU approach instead of the Shapley-Shubik approach as the Shapley-Shubik approach provided biased results with SMS and data services unit costs being 30 to 40 times higher than the unit cost of the resources consumed to produce these services and vice versa the cost of voice services being underestimated.

6.17 LIME disagreed with DIGICEL and stated that the Office should not change its approach by using the LRAIC+ with EPMU approach instead of the Shapley-Shubik as already determined by the Office in the July 24, 2012 Determination Notice.

6.18 The Office intends to strictly follow the approach defined in the Determination Notice "Cost Model for Mobile Termination Rates" Document No: TEL2012001_DET001 published in July 2012. Finally, the MTR will be set at the pure LRIC value (computed with adjusted tilted annuities). The Shapley-Shubik approach is only the starting point of the glide path.

6.19 The Office rejects DIGICEL's comments that the cost of a network providing only SMS services should be the same as the cost of a 2-way paging network. The networks modelled should remain a 2G and a 3G network, even if the SMS services are the only services provided. Therefore, the model should include all the 2G and 3G elements required to deliver these services. The list of elements would include:

- Enough BTS (for the 2G network) and enough Node B (for the 3G network) to provide the required coverage rate.

- Enough BTS and Node B for the densification (that is, enough BTS and Node B to be able to support the traffic generated by the SMS services).

- Enough TRXs (for the 2G network) and enough RRUs (for the 3G network) to handle the traffic generated by the SMS services.

- All the core equipment used by the SMS services (MSC, SMS-C, HLR, VLR, IN, NMS and billing platform) and the appropriate transmission links (backhaul and backbone).

This is exactly what the Office has modeled in the draft model. Therefore, the structure of the Shapley-Shubik approach does not need to be changed.

6.20 Furthermore, the Shapley-Shubik approach was extensively described in the Consultation Document titled "Cost Model for Mobile Termination Rates" Document No. TEL2012001_CON001 published on February 21, 2012. It was clearly explained that although voice services had been developed first, followed by SMS, then by Internet services, this order of development was immaterial from the perspective of the current market as all three services exist together. The chronology of development was also immaterial from the perspective of a new entrant who would implement all three services from the start.

6.21 The Office points out that DIGICEL did not disagree with this description of the Shapley-Shubik approach and even suggested that it be used in the mobile cost model. The Office is of the opinion that DIGICEL has misunderstood the use of the Shapley-Shubik approach. First of all, DIGICEL opposed LRAIC+ and Shapley-Shubik but Shapley-Shubik is part of the LRAIC+ approach where shared costs are not allocated on the basis of capacity. Shapley-Shubik should be compared to the required capacity allocation approach not LRAIC+. Also, when DIGICEL stated that Shapley-Shubik calculates costs that are higher than the resources consumed to provide some services, DIGICEL incorrectly assumed that the costs calculated on the basis of the required capacity approach are the only valid ones.

6.22 The Office agrees with DIGICEL that the implementation of the Shapley-Shubik approach in the draft model did not allow for the full recovery of costs (the model was under-recovering the costs by 6.7% due to cost allocation of colocated sites between different network

elements). The Office has therefore updated the model in order to make sure all the costs are fully recovered.

Determination 15

The Office has updated the Shapley-Shubik calculation in order to allow costs to be fully recovered.

Chapter 7:   Technical Comments

7.1   Chapter 7 of this this Determination Notice discusses the comments submitted by the mobile operators in relation to some technical issues encountered in the model.

Worksheet "0. Control"

7.2   LIME did not agree with the values provided in the "Transmission parameters" table. LIME stated that 100% of the sites were aggregated.

7.3   LIME stated that the share of pylon sites in urban areas and the cost reduction due to site colocation should be corrected according to the new data LIME submitted subsequent to the data request made during the draft model presentation.

7.4   DIGICEL did not agree with LIME on the values provided concerning the share of pylons sites in urban areas and the cost reduction due to colocation. DIGICEL has therefore submitted a new value concerning its share of tower sites in urban areas. Digicel has also stated that the cost reduction due to colocation was zero as colocation implies decommissionning of existing non-colocated sites and re-installing equipment.

7.5   The Office has updated the number of aggregated sites to the value submitted by LIME as it is the only operator who has provided a new value. The number of sites that are aggregated is henceforth 100%. The Office has updated the share of pylons to the average of the amount submitted by LIME and DIGICEL. That is, 68% in urban areas.

7.6   The cost reduction due to colocation should be estimated as the long term cost reduction, therefore DIGICEL's arguments for setting the cost reduction to 0% cannot be accepted. On the other hand, even in colocated sites, some equipment cannot be shared between operators. Therefore, the cost reduction is necessarily below 50%. The Office is therefore maintaining unchanged the cost reduction due to site colocation at 30%.

> **Determination 16**
>
> The Office has updated the share of sites that are aggregated to 100% and the share of pylons among urban sites to 68%. However, the Office is maintaining the cost reduction due to site colocation at 30%.

Worksheet "2.0 Market"

7.7 DIGICEL stated that the data in the "Key market statistics" table did not match with the values contained in the worksheet "1.0 Market", and so the source of the data was therefore not clear. DIGICEL furthermore points that the forecasts are hard-coded and the assumptions used are not clear.

7.8 LIME stated that MMS, inbound and outbound roaming services had not been populated in the draft model.

7.9 The data contained in the "Key market statistics" table did not match with the values contained in the worksheet "1.0 Market" because the source of these data is different (data from the operators in "Key market statistics" versus data from the Office in "1.0 Market") and the scope is also different. In the "Key market statistics" table, only the data concerning DIGICEL and LIME are used, that is, Claro's data is not included.

7.10 The Office has provided hard-coded forecasts as agreed with the operators during the draft model presentation in order to not disclose the other party's data. However, the forecasts have been built according to the following rules:

- For some inputs, a target value for 2020 has been defined in the "0. Control" worksheet. E.g. the 3G subscriber penetration rate. For in-between yearly value, a linear extrapolation has been computed.

- For other inputs, a trend has been computed based on past values and has been applied to compute the forecasted values.

7.11 MMS, inbound roaming services and outbound roaming services have not been populated in the draft model because no input concerning these services were provided by the operators during the data collection phase. Furthermore, the traffic attributable to these services

is very low compared to the traffic attributable to remaining voice services, SMS services, and data services.

Worksheet "3.0 Generic Operator"

7.12 DIGICEL stated that the number of channel elements for the High-Speed Down Link Packet Access ("**HSDPA**") was incorrect. DIGICEL also stated that the subscriber capacity of the MSC was incorrect as it was based on BHCA ("busy hour call attempts") multiplied by a percentage.

7.13 The Office used the operators' data for the number of channel elements per bearer. The inputs used are therefore consistent with DIGICEL's submission.

7.14 The model uses only the number of subscribers to dimension the number of MSC required and not the BHCA. This number of subscribers is multiplied by a usage factor in order to have some amount of spare capacity.

Worksheet "4.0 Design Params"

7.15 DIGICEL stated that the data traffic rate was not sourced and the conversion tables were not explained. DIGICEL also stated that the formula in cell K75 was incorrect as it used 36000 instead of 3600. DIGICEL indicated that the 3G data traffic split per bearer was incorrect as HSDPA had a non-zero value for "Uplink". DIGICEL also pointed out that there was no downlink traffic in the "3G services CE" table link to the HSPA row.

7.16 The data traffic rates come from TERA Consultants' expertise that has been acquired working for several regulatory authorities and operators in different countries. The conversion tables are used to simplify the calculation in further worksheets. The table "Yearly traffic to BH Erlangs - Access" provides the number of Erlangs at the busy hour in the access part of the network for:

- 1 minute of yearly traffic;
- 1 SMS;
- 1 MMS;
- 1 MB of data.

7.17 The Office agrees with DIGICEL concerning the mistake in cell K75 and has updated the model accordingly. However, the Office points out that this comment has no impact on the model as there is no MMS traffic.

7.18 The Office used the operators' submission in order to fill in the 3G data traffic split per bearer. However, the Office agrees with DIGICEL that HSDPA should have no uplink. The Office has therefore updated the draft model with only the consistent values.

7.19 The "3G services CE" table is computed based on the "3G data traffic split per bearer" table (located in the "4.0 Design Params" worksheet) and the "3G RAN dimensioning" table (located in the "3. Generic operator" worksheet). The "3G RAN dimensioning" table is consistent with DIGICEL's submission and does not include any channel element for the downlink traffic on HSDPA bearers. Furthermore, having no channel element for the HSPA traffic is consistent with international best practices.

Worksheet "4.3 Nwk Design 3G Access"

7.20 DIGICEL stated that the calculation of the number of channel elements for the peak uplink and downlink video call traffic was wrong. DIGICEL did not understand the difference between "# UL CE for av. Traffic of CS" and "# DL CE for av. Traffic". DIGICEL also did not understand why the factor "(1- blocking probability)" was used.

7.21 The Office agrees with DIGICEL that the number of channel elements calculation is wrong for video call traffic. The Office has therefore corrected the model. However, the Office points out that this comment has no impact on the model as there is no video call traffic.

7.22 As explained in the model documentation and during the draft model presentation, the number of channel elements required is the result of two constraints:

- The required number of channel elements to handle the peak voice traffic.

- The required number of channel elements to handle the average voice traffic and the data traffic.

These two constraints are applied to both the uplink traffic and the downlink traffic as both are dimensioned differently and do not have the same number of channel elements attributed.

7.23 The Office used the factor "(1-blocking probability)" because the voice traffic needs to be correctly dimensioned by taking into account even the average traffic that is blocked.

Worksheet "4.4 Nwk Design Core"

7.24 DIGICEL stated that the number of BH call attempts should change when computing the pure LRIC. DIGICEL indicated that the number of SGSN should be dimensioned using the number of data subscribers instead of the total number of subscribers.

7.25 The Office agrees with DIGICEL and has updated the model so that the number of BHCA is changing when computing the pure LRIC. The pure LRIC is indeed computed in two steps:

- First step, the entire traffic is considered, so here the BHCA should not change.

- Second step, incoming traffic is removed, so the BHCA should decrease.

7.26 The Office points out that the number of SGSN is already dimensioned using the number of data subscribers.

Determination 17

The Office has updated the draft model so that the number of busy hour call attempts is changing when computing the pure LRIC.

Chapter 8: Rates and Glide Path

Mobile Termination Rates

8.1 The aim of the consultative process has been to determine cost oriented termination rates for the mobile sector as mandated by the Act. This should facilitate vibrant competition amongst the companies in the sector. Lower MTRs will intensify competition as smaller operators will pay lower termination charges to larger operators and thus be able to reduce retail prices and encourage a higher level of mobile service consumption.

8.2 The LRIC model developed by the Office calculated two sets of MTRs - a total long run incremental cost (TLRIC) MTR and a pure LRIC (avoidable cost) MTR. Table 10 and 11 show the two sets of rates calculated by the model.

Table 10 – TLRIC MTR

TLRIC - Shapley-Shubik unit cost	unit	2013	2014	2015	2016	2017	2018
Mobile termination - Shapley-Shubik	JMD/min.	0.943	0.982	1.027	1.075	1.123	1.173

Source: TERA Consultants, final version of the mobile cost model

Table 11 – Pure LRIC MTR

pure LRIC unit cost	unit	2013	2014	2015	2016	2017	2018
Mobile termination - Adjusted tilted annuity	JMD/min.	0.907	0.940	0.977	1.016	1.059	1.106

Source: TERA Consultants, final version of the mobile cost model

8.3 The Office indicated in the July 24, 2012 Determination Notice that the MTR would be set for a period of five years. At the time, the Determination Notice was written, this covered the period 2012 -2017. However, given that the rates are being implemented in 2013, the relevant period is 2013 – 2018.

Glide Path

8.4 The Act mandates that wholesale termination rates should be based on forward looking LRIC cost whereby the relevant increment is the wholesale termination service and includes only avoidable cost. This is generally refered to as pure LRIC. In the July 24, 2012 Determination

Notice, the Office indicated that it would immediately adjust rates to TLRIC cost and allow a glide path for the MTR to adjust to pure LRIC cost over a period not exceeding three (3) years. The length of the period for the glide path is dependent on the size of the difference between TLRIC rates which is the starting point of the glide path and pure LRIC rate which is the end point. The larger the difference, the longer the adjustent period that will be allowed.

8.5   If the Office is to implement a glide path, the starting point would be the TLRIC rate applicable for 2013 which is $0.943 per minute. The MTR would then be adjusted to the pure LRIC rate in a future period. However, as can be seen in Tables 10 and 11, the difference between the 2013 TLRIC rate and 2014 pure LRIC rates is not significant. The pure LRIC rates for the period 2015 - 2017[3] are above the initial TLRIC rate. In this regard, the Office does not think it is necessary to implement a glide path as the difference between the 2013 TLRIC rate and future period pure LRIC rate is small.

8.6   Although the model produced a MTR that is increasing in each period, the Office is of the view that it would be simpler to have a single MTR over the review period. The calculated pure LRIC rate for 2017, which is the last reset period for the MTR, is $1.059 per minute. The Office therefore determines that the MTR for the applicable five year period is $1.10 per minute. This rate is higher than the calculated pure LRIC rates and allows for some amount of fluctuation in costs relative to those used in the model.

8.7   This MTR of $1.10 becomes effective July 1, 2013 and will last until June 30, 2018 unless adjusted sooner on the basis of Section 33(3) of the Act. The MTR is to be charged on a per second basis. The Office will begin the process of data collection to update the model one year in advance of when a new rate becomes due. If the Office is unable to complete the rate review by July 1, 2018 in the case of a five-year review, the MTR existing in the market at the time will remain in force until the review is completed.

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[3] Although the MTR is being set for the period 2013 – 2018, the last reset period for the MTR would be 2017.

Determination 18

Effective July 1, 2013, operators shall reduce their MTR from the current $5.00 per minute to $1.10 per minute. The MTR shall be charged on a per second basis. This rate shall remain in effect for a period of five years unless reviewed earlier having regard to Section 33(3) of the Act.

Determination 19

The Office will begin the process of data collection to update the model one year in advance of when a rate review becomes due. In the case of a five year review, if the Office is unable to complete its review by July 1, 2018, the MTR existing in the market at the time will remain in force until the review is completed.

Appendix – List of Determinations

Determination 1
The Office reaffirms that the model shall be used to set the MTR which is independent of the origin of the call.

Determination 2
The Office will use a market forecast of 1.47 SIMs per user in 2011 and 1.45 in 2020.

Determination 3
The mobile cost model has been updated in order to have a balanced traffic between on-net and off-net mobile services. The incoming traffic from other mobile operators has also been updated so that, for a 50% market share, it is equal to the outgoing traffic to other mobile operators. Finally, the call duration of on-net, off-net and incoming calls from other mobile operators' services has been updated so that they are equal.

Determination 4
The Office has used the mobile operators' data regarding SMS volume figures in the mobile cost model.

Determination 5
Only two geotypes are used in the model – Urban and Rural.

Determination 6
The cell radii have been updated to 1.875 km and 5.350 km for the rural and urban geotypes, respectively. The scorched node factor has been removed from the computation.

Determination 7
The number of TRXs per sector is a minimum of two.

Determination 8
The model has been updated with the new utilization factors outlined in Table 6 above.

Determination 9
The "overlapping reduction parameter" has been updated and set to 100% according to the values submitted by both operators. As it is strictly equivalent to removing it, it has been removed.

Determination 10
The mark-up used to compute the opex is updated in order to take into account the values submitted by the operators. The mark-up used to compute the un-attributable costs is decreased from 25% to 3.5%.

Determination 11
The inflation rate used in the model will be 9.04%.

Determination 12
The WACC used in the model has been changed to the pre-Tax WACC of 27.95%.

Determination 13
The Office has updated the tilted annuity and adjusted tilted annuity formula in order to include a 9 month period so that working capital is taken into account.

Determination 14
The incremental economic cost in the model has been updated in order to take into account a rising cost of production and to avoid a double-discounting effect. The Office has included new inputs to update the number of NMS, signalling transfer platform, and number portability platform to be used. The Office has included the service named "Incoming outbound call" in the list of services considered as part of the increment for the pure LRIC calculation.

Determination 15
The Office has updated the Shapley-Shubik calculation in order to allow costs to be fully recovered.

Determination 16
The Office has updated the share of sites that are aggregated to 100% and the share of pylons among urban sites to 68%. However, the Office is maintaining the cost reduction due to site colocation at 30%.

Determination 17
The Office has updated the draft model so that the number of busy hour call attempts is changing when computing the pure LRIC.

Determination 18
Effective July 1, 2013, operators shall reduce their MTR from the current $5.00 per minute to $1.10 per minute. The MTR shall be charged on a per second basis. This rate shall remain in effect for a period of five years unless reviewed earlier having regard to Section 33(3) of the Act.

Determination 19

The Office will begin the process of data collection to update the model one year in advance of when a rate review becomes due. In the case of a five year review, if the Office is unable to complete its review by July 1, 2018, the MTR existing in the market at the time will remain in force until the review is completed.