Office of Utilities Regulation

Determination Notice – Public Version

Cost Model for Fixed Termination Rates – The Decision on Rates

2017 June 07

OFFICE OF UTILITIES REGULATION

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Jamaica

DOCUMENT TITLE AND APPROVAL PAGE

1. DOCUMENT NUMBER: 2017/TEL/004/DET.002

2. DOCUMENT TITLE: Cost Model for Fixed Termination Rates – The Decision on Rates – Public Version

3. PURPOSE OF DOCUMENT

This document contains the main decisions of the Office of Utilities Regulation regarding the Cost Model of Fixed Interconnection Rates and the outputs of that Model.

4. ANTECEDENT PUBLICATIONS

Publication Number	Publication Title	Publication Date
2016/TEL/011/CON.003	Cost Model for Fixed Termination Rates – Draft Model Consultation Document – Public Version	2016 June 22
2016/TEL/010/CON.002	Cost Model for Fixed Termination Rates – Draft Model Consultation Document - Confidential Version	2016 June 22
2015/TEL/006/DET.002	Determination Notice - "Cost Model for Fixed Termination Rates – Principles and Methodology"	2015 July 1
2015/TEL001/CON.001	Cost Model for Fixed Termination Rates – Principles and Methodology Consultation	2015 January 19

5. Approval

This document is approved by the Office of Utilities Regulation and the decisions therein become effective on 2017 June 07.

On behalf of the Office:

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Chairman

Joseph Matalon

2017/06/05

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Date

Abstract

The Telecommunications Act (the "Act"), as amended in 2012 May, requires that all dominant public telecommunications carriers permit interconnection of their public network with the public network of other carriers for telecommunications services, and that the prices at which these services are to be provided shall be set based on the principles outlined in section 33 of the Act. The Act also provides that the Office of Utilities Regulation ("OUR" or "the Office") shall take the principle of cost orientation into account when determining an operator's call termination charges.

The Act stipulates that prices shall be established:

- Based on forward-looking long-run incremental cost[1] ("LRIC") for fixed termination.
- Between the total long-run incremental cost ("TLRIC") and the stand-alone cost ("SAC") in the case of other interconnection services.

This Determination Notice sets out the Office's response to the issues raised by stakeholders who commented on the draft LRIC model. Further, the Determination Notice indicates the resulting fixed termination rates (FTRs) extracted from the cost model and the Office's decision regarding the regulated wholesale tariffs.

[1] Whereby the relevant increment is the wholesale termination service and includes only avoidable costs.

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Chapter 1: Introduction

1.1. On 2015 January 19, the OUR issued a Consultation Document "*Cost Model for Fixed Termination Rates – Principles and Methodology*" Document No. 2015/TEL001/CON.001 to receive stakeholders' views on the methodology to be applied for the determination of costs and associated charges for wholesale fixed interconnection services. Stakeholders' views were analysed and the document "*Determination Notice for Cost Model for Fixed Termination Rates – Principles and Methodology,*" Document No. 2015/TEL/006/DET.002 (hereinafter, the "Methodology"), was published on 2015 July 1.

1.2. On 2016 June 22, the OUR launched a public and private consultation process for the draft LRIC Model for fixed networks. The proprietary information of Cable & Wireless Jamaica Limited ("C&WJ") used in the model, as well as other information which the OUR has classified as confidential in light of the provisions of the Telecommunications Act, were excluded from the public consultation document and the associated attachments. Simultaneously, with the public consultation, the OUR conducted a private consultation with C&WJ, on inputs and information used in the model that were obtained from C&WJ. Stakeholders were given a deadline of 2016 August 3, for submission of comments to facilitate any correction or improvement of the draft model that may arise from these comments. Stakeholders were instructed to submit relevant arguments and also data, analysis, benchmarking studies and any relevant information based on the national situation, or on the experience of other countries, in support of their comments.

1.3. The operators requested an extension of the deadline for submission of responses. The OUR granted the extension, setting a new deadline of 2016 August 11 for the public consultation, and 2016 August 24 as the date for the private consultation.

1.4. C&WJ delivered responses to the public and private consultations on 2016 August 11 and August 24, respectively.

1.5. The Consumer Advisory Committee on Utilities ("CACU") and Digicel Jamaica Limited ("Digicel") delivered responses with their contributions to the public consultation on 2016 August 10.

1.6. Industry players were then given until 2016 August 17 to provide comments on these responses. This deadline was then extended to 2016 August 25.

1.7. On 2016 August 25, C&WJ and Digicel delivered comments on responses to the draft Cost Model for Fixed Termination Rates.

Purpose of this Determination Notice

1.8. This Determination Notice details the Office's views on the responses provided by industry players regarding the draft cost model for fixed termination rates and the comments on responses.

1.9. This Determination Notice also details the changes implemented in the cost model because of the comments and responses received, to produce the final version of the cost model.

1.10. In keeping with the approach adopted during the consultation process, the OUR will issue a public and a confidential version of this Determination Notice. The proprietary information of C&WJ mentioned in the Notice, as well as other information which the OUR has classified as confidential in light of the provisions of the Act, will be excluded from the public version. The confidential version of the Determination Notice will be shared with C&WJ.

Legislative Framework

1.11. The OUR is authorised to determine the prices charged by telecommunications operators for the provision of interconnection services. Under section 4(1) of the Act, part of the overall functions of the OUR is to

regulate specified services and facilities. This is in keeping with its express power to determine the rates that may be charged in respect of the provision of a prescribed utility service under section 4(4) of the Office of Utilities Regulation Act ("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."*

1.12. A "*specified service*" is defined in section 2 of the Act to mean, inter alia, a telecommunications service, 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.

1.13. The legal framework governing interconnection, which is a type of telecommunications service, can be found in Part V (sections 27-37A) of the Act.

1.14. The Act at section 29 (1) states:

> *"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."*

1.15. The Act grants the OUR specific powers regarding the determination of the rates charged for interconnection services. Sections 29 (4)(a), (5) and (6) state:

> *"(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 -

(b) the principles of cost orientation or reciprocity;

(c) local or international benchmarks; or

(d) 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."

1.16. The Act at section 30 requires that dominant public telecommunications carriers provide interconnection in accordance with certain principles specified in the Act. In particular, section 30 (1)(a)(iii) requires that charges for interconnection services "*…shall be cost oriented and guided by the principles specified in section 33.*"

1.17. These principles of cost orientation are stated in section 33 as follows:

"(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 standalone 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 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 to the draft model. These relate to the regulatory process, inputs and results of the model.

Regulatory Process

2.2. C&WJ pointed out that the five-year period from 2016 – 2020, for which the wholesale interconnection rates will be applicable, is consistent with the determination made in the Methodology. However, the proceeding is more than one year behind and the determination of rates will not be made until early 2017. Therefore, the OUR should maintain the duration and the implementation dates, but utilize existing rates for the 2016 period and the pure-LRIC-based rates for 2017-2020.

2.3. As pointed out by C&WJ in its comments on the draft model, the applicable rate of 2016 - 2020 was determined with the expectation that the model would be implemented in 2016. The OUR will not implement the result of the model retroactively. However, the determination on wholesale interconnection rates will apply for a four (4) year period. As such the regulated tariffs are defined from 2017 to 2020, as established in Chapter 15 of this document. This may be adjusted where there is a major change in market conditions.

Determination 1: The Fixed Termination rates are set from 2017 to 2020.

Results of the Model

2.4. Digicel stated that "*in general in jurisdictions where both fixed and mobile termination services have been cost modelled, Fixed Termination Rates (FTRs) are a fraction of Mobile Termination Rates (MTRs).*" It is concerned that the resultant FTRs from the draft model are higher than they should be. However, these FTR's will still be lower than those currently charged.

2.5. Therefore, it suggested that the OUR determines a FTR based on the current model as an interim measure, and then proceed to review the entire model.

2.6. The OUR agrees with Digicel that FTRs smaller than MTRs are common. The primary purpose of sharing the draft model with stakeholders is to use the responses to identify where adjustments may be needed to refine the model. Based on the adjustments made to the draft model, the results (see Appendix A) yielded by the final fixed model are below the current MTR. The Office disagrees with the suggestion to implement interim wholesale interconnection rates.

2.7. The OUR will update the model in due time. Model updates are typically performed when a new tariff is needed (by 2020 in this case). The update may be undertaken earlier if major changes are identified in the market or in the networks which were not considered in the current model.

Determination 2: The fixed interconnection rates presented in this Determination Notice are considered reasonable and they will not be considered interim.

Chapter 3: Market Demand

3.1. This Chapter discusses the comments submitted by the operators concerning voice, broadband and leased-lines traffic and the associated forecasts.

Voice Traffic

3.2. CACU agreed with the general trend of a decline in voice traffic.

3.3. C&WJ pointed out that the incoming and transit traffic are reasonable, but "*the outgoing voice traffic should exhibit the same decline as other voice traffic*" in the forecast period.

3.4. The demand forecasts used in the model were estimated based on information provided by C&WJ. Moreover, the proposed amendment would have a limited impact on the regulated tariffs. In consequence, the OUR does not see a reason to change the voice traffic forecasts.

Determination 3: The Office will keep the voice traffic forecasts used in the draft model.

Broadband Traffic

3.5. CACU agreed with the general trend of an increase in data traffic.

3.6. C&WJ stated that the broadband traffic data is reasonable.

3.7. Digicel indicated that "*the projections for non-voice services are underestimated*" because "*shorter loop lengths increase access speeds on DSL networks*"; and according to Cisco, there will be a 21% CAGR [compound annual growth rate] in internet traffic between 2015 and 2020.

3.8. Digicel noted that a material underestimate in data traffic will increase the cost attribution to voice-based services, resulting in an inflation of the FTRs.

3.9. Digicel also proposed to provide confidential information about its fixed broadband service. The OUR notes that Digicel has not provided any additional information in this regard.

3.10. C&WJ disagreed with Digicel's comment because "*MSAN loop lengths have to be shorter than TDM nodes to deliver any quality of service.*" Additionally, C&WJ affirmed that the growth rate in data services will not be as high as Cisco's estimation, because Jamaica will remain an overwhelmingly mobile-internet nation. It also noted that the CAGR suggested by Cisco is a global estimate. Finally, C&WJ stated: "*There is nothing to suggest that the growth rate will be as high as that in Jamaica or even the Caribbean in general.*"

3.11. The OUR agrees with Digicel that underestimating data traffic could result in higher FTRs.

3.12. The OUR notes that the traffic forecasts considered were based on a CAGR of 17% from 2015 onwards, according to the information previously sent by C&WJ.

3.13. In the OUR's view, it is not clear if Jamaica's market is expected to grow (in relative terms) above or below global estimates published by Cisco.

3.14. Based on the Methodology (paragraph 3.16) determined by the OUR, the Office can rely on international practice information when relevant divergences are found. Even though C&WJ had the opportunity to justify the estimates in its "Comments on responses", it has not provided any supporting information nor evidence supporting its forecasts.

3.15. Therefore, the OUR has decided to update the broadband traffic forecast based on Cisco's international reference CAGR of 21% in the period 2015-2020 as shown in Table 1 below.

Broadband traffic	Unit	2013	2014	2015F	2016F	2017F	2018F	2019F	2020F
Draft Model	Gbps	12.5	17.0	19.9	23.3	27.2	31.9	37.3	43.6
Updated Model	Gbps	12.5	17.0	20.6	24.9	30.1	36.4	44.1	53.4

Table 1: Updated broadband traffic demand [Source: Axon Partners Group Consulting]

Determination 4: The forecast of broadband demand has been updated based on Cisco's estimates (CAGR of 21% from 2015 to 2020) as indicated in Table 1.

Leased Lines Capacity

3.16. C&WJ stated that the leased-line traffic data is reasonable.

3.17. Digicel stated that the peak network load of leased lines does not seem correct, because the enterprise use of dedicated links and virtual private networks (VPNs) is increasing. Also, an increase in the leased-line capacity is expected due to increasing use by LTE sites.

3.18. C&WJ agreed with Digicel that the high-usage mobile LTE cell sites will require more capacity in fibre connections. However, C&WJ disagreed with Digicel and believes that the demand for leased lines for mobile transmission was incorporated in the mobile model.

3.19. The OUR agrees with Digicel and considers that a decrease in leased lines traffic may be excessively conservative due to the potential increase of business using these services. However, there is not sufficient information to forecast businesses' use of leased lines services in order to validate such an assumption.

3.20. On the other hand, even though leased-line demand for mobile transmission was included in the mobile model, the OUR does not see any issue of considering such traffic in both models. While the use of leased lines by mobile operators represents a cost for mobile services provision, it increases the economies of scale of fixed operators' networks. The Office believes that the fixed model should be aligned with the economies of scale enjoyed by the incumbent operator, not only due to consumers and enterprises' traffic but also to the demand generated by other operators (including third parties and C&WJ mobile operations).

3.21. The degree of uncertainty on this matter and the lack of information do not allow the OUR to estimate an accurate forecast. Additionally, as stated by C&WJ, changes in leased-line demand are estimated to have a limited impact in pure LRIC results which will be used for the final rates.

3.22. Based on the above, the OUR has decided to follow a conservative approach and apply a neutral growth (i.e. 0%) for leased-line traffic in the period 2015-2020, as shown in Table 2 and Table 3 below.

Leased lines intra-parish	Unit	2013	2014	2015F	2016F	2017F	2018F	2019F	2020F
Draft Model	Gbps	0.58	0.57	0.57	0.56	0.56	0.55	0.54	0.54
Updated Model	Gbps	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58

Table 2: Updated Leased lines intra-parish demand [Source: Axon Partners Group Consulting]

Leased lines inter-parish	Unit	2013	2014	2015F	2016F	2017F	2018F	2019F	2020F
Draft Model	Gbps	1.50	1.49	1.47	1.46	1.44	1.43	1.41	1.40
Updated Model	Gbps	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50

Table 3: Updated Leased lines inter-parish demand [Source: Axon Partners Group Consulting]

3.23. Digicel stated that due to the merger between Columbus Communications Jamaica Limited ("CCJ") and C&WJ, the incumbent's network is expected to transmit TV and broadband traffic from former FLOW customers. Digicel affirmed that this will not affect the cost modelling for the next 1 to 2 years, but it is one of the reasons why the model should be revisited in the next year.

3.24. C&WJ stated that Digicel's comment is "*an unworkable proposal and contradicts the methodological determination that the OUR has already made on the question of what kind of fixed network to model.*"

3.25. The OUR acknowledges Digicel's and C&WJ's comments. However, there is a high level of uncertainty about the unified network, the technical implications and the associated timing.

3.26. Therefore, the OUR considers that it is not appropriate to consider CCJ clients' traffic in the current model. Nevertheless, the OUR will continue to monitor the situation and revisit the issue when more certainty is provided about the combined network.

<u>Determination 5:</u> The leased-line traffic forecast has been updated based on a CAGR of 0% as indicated in Table 2 and Table 3. The OUR will not consider the possibility of including CCJ's customer traffic until further clarity on the combined network is provided.

Chapter 4: Demand Statistics

4.1. For reasons of confidentiality, C&WJ was the only stakeholder with access to demand statistics information.

4.2. C&WJ agreed that the statistics are reasonable because "*the values proposed for each demand parameter are consistent with what C&WJ has provided to the OUR.*"

4.3. The OUR acknowledges C&WJ's comment.

Determination 6: No changes are required in the demand statistics used in the draft model.

Chapter 5 : Migration Percentage and number of access nodes

5.1. Chapter 5 of this Determination Notice discusses the comments submitted by the operators concerning:

- *Migration Percentage*
- *Migration Factors*
- *Geotypes*
- *Number of Access Nodes*

Migration Percentage

5.2. CACU "*does not disagree with the migration percentages and the final number of nodes*" resulting from the model.

5.3. C&WJ pointed out that "*the OUR is assuming a more accelerated transition than is possible*" and affirmed that in Caribbean markets "*there is a limit on how many legacy sites per year can be realistically transitioned*."

5.4. Based on its historic experience, C&WJ stated that it is more realistic to assume that the migration of 100% will not be achieved until 2021, where the overall transition progress is as follows:

Year	% of TDM access node Transitioned
2015	25%
2016	34%
2017	48%
2018	62.5%
2019	76%
2020	91%
2021	100%

Table 4: Percentage of the total traditional nodes migrated to NGN in each year [Source: C&WJ]

5.5. Digicel disagreed with C&WJ and stated that based on its "*experience of deploying FTTH networks in a number of Caribbean markets, the 2020 date is achievable.*" Also, Digicel stated that "*using a shorter migration timeline provides a proxy for otherwise absent competitive pressures and gives the incumbent economic incentives to deploy NGN equipment in the shortest possible time, thus maximising consumer welfare benefit*".

5.6. The OUR highlights that C&WJ has not provided any evidence suggesting that a full migration by 2020 is not achievable. Moreover, the full migration to an NGN network by 2020 is a requirement defined in the Methodology, which was already subject to consultation. Therefore, this approach will not be changed.

Determination 7: The model will consider a complete migration to NGN nodes by 2020.

Migration Factors

5.7. C&WJ stated that the forecasted number of MSAN is low, mainly because the migration factors are low. Therefore, it has provided alternative migration factors for the Urban Dense, Urban, Suburban Dense, Suburban, Rural and Rural Spread geotypes under confidential cover.

[CONFIDENTIAL]

Geotype	Migration factor
Urban Dense	
Urban	
Suburban Dense	
Suburban	
Rural	
Rural Spread	

Table 5: Migration factors per geotype proposed by C&WJ [Source: C&WJ]

[END CONFIDENTIAL]

5.8. The OUR states that the migration factors considered in the model were estimated based on information provided about access nodes. Additionally, C&WJ has not provided any evidence supporting its proposed values, and therefore it is not possible to assess the reasonableness of C&WJ's proposed information.

5.9. As such, the migration factors used in the draft model will remain.

Determination 8: The migration factors proposed in the draft model will not be changed.

Geotypes

5.10. Digicel stated that "*the most direct and relevant metric is the number of active lines [...] because the number of active lines will depend not just on the population density but on the uptake/penetration levels*". Also, Digicel stated that the geotypes are not "*relevant for costings that exclude the access layer of the network.*"

5.11. C&WJ disagreed with Digicel because "*the geotype is essential for the projection of how many NGN nodes are deployed in the future given the varying density of population.*"

5.12. The OUR agrees with C&WJ and considers that geotypes are essential for the accuracy of the model, allowing a detailed analysis based on the geographical characteristics of the country. Therefore, the Office will not change the defined geotypes.

Determination 9: Geotypes will be used in the model for dimensioning the fixed network elements.

Number of Access Nodes

5.13. Digicel stated that C&WJ "*has no issues with confidentiality regarding the future topology of its network as its projected volumes of NGN nodes in 2020 have been provided. As this represents a forward view of its network and investment plans then it must have reached a view that indicating the volume of node types provides no competitive information to potential competitors. By the same logic, giving a view of the current volume of node types would give no competitive information.*"

5.14. C&WJ disagreed with Digicel and noted that Digicel has not carefully read the methodology document to identify that "*the NGN node projects are produced by the model itself.*"

5.15. The OUR confirms that the forecasted number of NGN access nodes is calculated by the model based on the number of nodes provided by C&WJ and the migration factors estimated by the geographical analysis. As a consequence, the information about NGN nodes in the previous years was omitted from the consultation for reasons of confidentiality.

5.16. Digicel noted that "the definition of geotypes would *indicate that the number of lines connected to rural* geotype nodes should be *less than 20% of the*

overall volume of lines", and that the model should be low sensitive to the volume of rural nodes.

5.17. The OUR confirms that the number of lines connected under rural geotypes is less than 20% of the overall lines.

Determination 10: The OUR considers reasonable the number of access nodes produced by the model.

Chapter 6: Internodal Distances

6.1. Chapter 6 of this Determination Notice discusses the comments submitted by the operators regarding the average distance parameters used in the model.

Calculation of Access Distances

6.2. CACU does not disagree with the average distances calculated.

6.3. C&WJ stated that the methodology for the Minimum Distance Tree calculation appears valid and the number of nodes per ring and per geotype used in the model is reasonable. However, C&WJ stated that it is not clear from the methodology whether all distances are road-based.

6.4. Digicel noted that the distances for the legacy topology are reasonable if they have been calibrated against actual data.

6.5. The OUR confirms that the average distances for connecting access nodes through ring topology consider road-based distances. The OUR agrees that minimum distance tree topology should consider road-based distances as well. Table 6 shows the new values after revisiting the calculations.

	Draft Model		Updated Model	
Geotype	Average distance (km)	Daisy Chain Factor	Average distance (km)	Daisy Chain Factor
Urban Dense	1.83	3.93	1.66	1.08
Urban	1.71	2.63	5.01	1.89
Suburban Dense	7.41	4.92	5.07	2.18
Suburban	7.41	4.92	5.07	2.18
Rural	5.00	3.63	8.20	2.08
Rural Spread	6.41	2.66	7.97	1.86

Table 6: Updated average distance of transmission links for connecting access nodes through Minimum Distance Tree topology [Source: Axon Partners Group Consulting]

<u>Determination 11:</u> The average distances for connecting access nodes through Minimum Distance Tree topology have been updated as indicated in Table 6.

NGN Access Node Distances

6.6. C&WJ declared that the average distances for the MSANs seem shorter than its own estimation based on minimal road distances: "*The overall average inter-MSAN distance for the urban dense, urban, suburban dense and suburban geotypes*" that it has estimated is 3.9 km. However, "*the weighted average of the OUR's distances is only 2.7 km.*"

6.7. C&WJ has not provided its estimation of average distance or provided any evidence that shows that its estimation is more accurate than the one used in the draft model. Therefore, the final model will keep the values used in the draft version.

6.8. Digicel stated that "*any differences in distances thrown up should not materially affect the derived FTR.*"

6.9. The OUR agrees with Digicel that variation in distances is expected to have a negligible impact on pure LRIC results.

6.10. Digicel noted that "*NGN link distances for the rural geotypes are the same as the legacy distances.*" Thus, Digicel infers that "*the number of NGN nodes in these geotypes will be roughly the same as the number of legacy nodes.*"

6.11. C&WJ disagreed with Digicel because the number of MSANs will not be the same in rural geotypes, as indicated in the migration factors.

6.12. The OUR agrees with Digicel that in those areas where the number of legacy nodes is similar to the number of NGN nodes after the migration, the links distance for both technologies should be similar.

6.13. C&WJ stated that legacy node distances should be longer than MSAN distances in all geotypes, because "*more MSANs are necessary to cover a given area than legacy nodes.*" However, C&WJ noted that in the model for the urban geotype the opposite is the case.

6.14. The OUR notes that the average distances have been based, when possible, on the real location of nodes provided by C&WJ. In the case of the urban geotype, there were only a few NGN nodes, which may not be sufficient to characterise the geotype. The Office agrees with C&WJ that NGN distances should be equal to or less than legacy nodes. Therefore, the OUR has revisited the distances in the urban geotype and decided to use the distance observed in legacy access nodes, due to the lack of other information. Table 7 shows the adjustment applied.

	Average distance (km)	
Geotype	**Draft Model**	**Updated Model**
Urban Dense	1.43	1.43
Urban	3.00	2.78
Suburban Dense	3.87	3.87
Suburban	3.87	3.87
Rural	5.36	5.36
Rural Spread	6.67	6.67

Table 7: Updated average distance of transmission links for connecting access nodes through Ring topology [Source: Axon Partners Group Consulting]

<u>Determination 12:</u> The average distances for connecting NGN access nodes through Ring topology have been updated as indicated in Table 7 to reflect the distance observed in legacy access nodes.

Link's Routes

6.15. Digicel stated that the NGN links "*will in general still follow the same routes as the legacy topology (particularly in urban areas). As such, there should be no cost increase in the physical transmission layer.*"

6.16. C&WJ agreed that the legacy routes can be used. However, it disagreed with Digicel that there would be no cost increase in the physical transmission layer, because the intermodal core lengths would be increased while the access lengths would be reduced.

6.17. The OUR emphasizes that, as described in the methodological document, the model is based on a modified scorched-node approach. Therefore, the modelled network should represent an efficient network based on existing node locations. The OUR agrees with Digicel that costs associated with the physical layer are not expected to vary significantly when considering a transition to NGN. However, it is important to mention that, as C&WJ indicated, a migration to NGN would lead to network segments previously considered as access network to become transmission links. Therefore, total costs associated to the transmission are expected to grow when migrating to NGN, while access infrastructure cost is expected to decrease.

Determination 13: No changes will be applied to the link routes considered in the draft model.

Chapter 7: Number of Resources

7.1. Chapter 7 of this Determination Notice discusses the comments submitted by the operators regarding the reasonability of the resources obtained by the model.

7.2. Digicel and CACU stated that not enough information was presented to provide comment on this issue. However, Digicel noted, "*that based on a total projected installed base of some 500 NGN nodes in 2020 the volumes set out […] are unsurprising.*"

7.3. The OUR reaffirms that it was not possible to provide more information to the stakeholders for confidentiality reasons.

Number of nodes and chassis

7.4. C&WJ has stated that "*the number of MSAN chassis appears low relative to the number of NGN access nodes [...] We would have anticipated twice the number of MSAN chassis […] based on the total number of access nodes.*" C&WJ considered that the difference is due to the dimensioning algorithms.

7.5. The number of cabinets calculated depends directly on the migration factors and the number of traditional nodes provided by C&WJ in the data request.

7.6. The number of chassis is calculated based on the chassis capacity and the number of lines connected to each one. Based on the information provided by C&WJ, it is estimated that only one chassis per node is required.

7.7. C&WJ stated that in the description of the BULRIC model "*it is not clear how the number of Edge nodes are determined.*" Also, C&WJ considered that "*the number of Edge nodes for a Jamaican national network would have been over 100. Thus, an Edge chassis count of 55 would not be possible.*"

7.8. C&WJ considered that "*by 2020 the number of Distribution nodes would be over 30. The number of Core nodes should be 6 over the modelled period.*

The number of chassis for each will […] depend on the dimensioning rule. In which case, based on the node count, the chassis figures appear too low."

7.9. The OUR's position is that the nodes represent the locations provided by C&WJ. The number of nodes is not determined by the model, and is an input to the model based on the information provided by C&WJ. The model's algorithms only adapt the capacity of the equipment installed in each location based on the demand, without adjusting the number of nodes. Additionally, C&WJ has not provided any evidence supporting the number of nodes suggested in its response to the Consultation document.

7.10. The number of chassis is calculated based on the router capacity. Based on the information provided by C&WJ, one chassis is estimated to be required per node.

7.11. Based on the above, the Office believes that no changes should be implemented in this regard.

Determination 14: The number of nodes and chassis considered in the draft model will not be changed.

Submarine fibre costs, number of towers and fibre km

7.12. C&WJ disagreed that the number of resources listed in the consultation document is reasonable to satisfy the demand presented. C&WJ provided a list of additional resources necessary to satisfy the demand.

7.13. Also, C&WJ stated that it is not clear whether all the additional costs associated with subsea fibre transmission system have been included, e.g., cable landing stations and far-end network access point charges.

7.14. Digicel noted that the additional cost elements proposed by C&WJ may already be included in the categories listed by the OUR in the consultation

document. Also, Digicel stated that some of the cost element may not affect the FTR. For example, the subsea cable system - "*The point of handover for the purposes of FTRs is on the landward side of these systems and these elements lie beyond the network that requires modelling.*"

7.15. The OUR agrees that the additional cost elements should be included in the model, as well as the list of elements suggested by C&WJ, and confirms that they were not included in the version submitted for consultation.

7.16. The OUR disagrees that the subsea system and the elements related are beyond the required network to be modelled, since they are used for the provision of the services considered in the model.

7.17. The OUR confirms that all the costs associated with submarine transmission should be included in the unitary cost of subsea fibre per kilometre. In this regard, the unitary cost has been revised to ensure all required resources are considered, and the value has been updated, as detailed in Chapter 9.

7.18. C&WJ stated that the fibre kilometres are low, consistently with its argument that the distances are low (see Chapter 6). Additionally, C&WJ considered that "*given the increase in demand for data services and the need to push connectivity to more remote areas, the number of towers in the future would be greater than it is today*" and the number presented in the consultation document indicates otherwise.

7.19. Digicel stated that additional radio sites are not required since there is no increase in the number of nodes. Digicel added that potential capacity upgrades should be considered instead.

7.20. The OUR highlights that C&WJ has not provided any evidence supporting a higher number of towers and kilometres of fibre. Therefore, the OUR does not find any reason to adjust the dimensioning algorithm for these elements.

Determination 15: The number amount of tower and fibre resources obtained in the draft model are considered reasonable.

Nodes in backhaul and nodes connected by MW

7.21. C&WJ stated that there is no information about the methodology used to calculate the number of nodes in backhaul and the number of nodes connected with microwaves.

7.22. Additionally, C&WJ considered that the increase in demand for data services would require an increase in the number of towers.

7.23. The OUR notes that these parameters have been calculated based on the information provided by C&WJ about the existing nodes[2], as described in the technical manual[3] (sections 5.3.1 and 6.4.1). In any case, the OUR has revised the relevant sections in the technical manual to ensure its clarity.

7.24. Regarding the number of towers, an increase of traffic would require additional capacity in the equipment installed in the existing towers, without requiring additional towers, consistent with the scorched node approach.

Determination 16: The OUR has revised the relevant sections of the technical manual to ensure its clarity. No further changes are deemed appropriate regarding this point.

[2] C&WJ provided information about the transmission technology used by each access node (between microwaves and fibre). The percentage of nodes using microwaves has been calculated as the number of odes using microwaves divided by the total number of nodes.
[3] Description of the BULRIC Model for Fixed Networks

Chapter 8: Resources' Useful Lives

8.1. Please note that useful lives are considered confidential and therefore only C&WJ was able to provide comments.

8.2. C&WJ states that "*the useful lives proposed for each resource category appear consistent with what C&WJ has provided to the OUR.*"

8.3. The OUR acknowledges C&WJ's comment.

Chapter 9: Unitary Cost

9.1. Chapter 9 of this Determination Notice discusses the comments received regarding unitary costs.

9.2. CACU did not disagree with the unitary costs used in the model and considers those costs reasonable given that the source is an international benchmark.

9.3. The OUR acknowledges CACU's comment.

9.4. Digicel stated that it was reviewing input on the costs and would provide feedback later. However, the OUR highlights that no further comment has been received from Digicel on this matter.

Unit CapEx

9.5. C&WJ stated that according to previously submitted data to the OUR "*the capex costs associated with sites may be as much as twice what the OUR is presenting in the Consultation Document.*" Additionally, "*Air-conditioning units appear to be absent from the site costs.*"

9.6. The OUR affirms that the CapEx associated with access sites is based on information provided by C&WJ, including the cost of the AC/DC converter and air conditioning unit. However, only the part not associated with access is included, as described in the model (column 'G' in worksheet '1C INP UNITARY COSTS').

9.7. Regarding the CapEx associated with core sites, the OUR reviewed the information provided by C&WJ, and found that it was not aligned with the international benchmark. In light of this, the OUR decided to use the benchmark values in the model.

9.8. C&WJ stated that "*the capex associated with generators appears reasonable for small sites, but not for larger sites. It is possible, for example, that the*

OUR has not adequately scaled or assumed back-up generators for larger, critical sites."

9.9. The OUR confirms that the generator is modelled separately only for the access sites, i.e., cabinets and remotes. CapEx of generators for core sites is included in the unit CapEx of each site, as described in the model (column 'G' in worksheet '1C INP UNITARY COSTS').

9.10. C&WJ stated that "[with] *respect to fibre, the unit capex appears to exceed the cost of the fibre itself, but is nowhere near the figure for fibre plus associated ducts and civil works.*"

9.11. The OUR has revisited and updated the unit CapEx and OpEx associated with the terrestrial fibre cable to ensure that it includes the related civil infrastructure. Table 8 shows the updated values compared to the draft version.

			Draft Model		Updated Model	
Resource	**Cost Type**	**Currency**	**2013**	**2014**	**2013**	**2014**
Terrestrial fibre cable	CAPEX	USD	14,524	14,233	27,176	26,632
Terrestrial fibre cable	OPEX	JMD	858	912	26,397	28,086

Table 8: Updated unit costs for terrestrial fibre cable [Source: Axon Partners Group Consulting]

9.12. The OUR has also revisited and updated the unit CapEx and OpEx associated with the subsea fibre cable based on the comments received in response to the draft model (see Chapter 7). Table 9 shows the updated values compared to the draft version.

			Draft Model		Updated Model	
Resource	**Cost Type**	**Currency**	**2013**	**2014**	**2013**	**2014**
Subsea fibre cable	CAPEX	USD	17,784	17,428	21,903	21,465
Subsea fibre cable	OPEX	JMD	4,470	4,756	50,293	53,512

Table 9: Updated unit costs for subsea fibre cable [Source: Axon Partners Group Consulting]

9.13. C&WJ stated that "*the capex for traditional exchange equipment is at least half of what we had estimated (and submitted to the OUR) on the basis of actual asset purchase prices discounted for cost trends. Furthermore, the input sheet does not provide any information about where the benchmarks, were acquired so we are unable to confirm the appropriateness of those benchmarks.*"

9.14. The OUR affirms that all the information provided by the operators was reviewed and validated against international benchmarks, as described in the Chapter 2 section 'Data Sources' of the methodological document published by the OUR[4]. Where the values provided by the operators were not in alignment with international practice, the values from the benchmark were used. Additionally, C&WJ did not provide information for all the elements requested. The OUR used international benchmarks in these cases[5].

9.15. C&WJ stated that "*the majority of the NGN node and port equipment unit capex is significantly lower than what we had reported to the OUR.*" It provided to the OUR "*specific invoice back-up from a sister business in the Caribbean illustrating MSAN unit capex figures.*"

9.16. The OUR confirms that the CapEx of NGN nodes and NGN ports equipment is based on information provided by C&WJ during the data request. However, some values provided were from previous years and it was necessary to apply the cost trends.

9.17. In the case of cabinets (MSANs) the value used in the model is based on the values provided by C&WJ during the data gathering process, after removing the access-related part (please, see section 6.1.2 in the description manual of the BULRIC model for fixed networks). Table 10 below provides a comparison

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[4] Cost Model for Fixed Termination Rates -Principles and Methodology. 2015 July 1. http://www.our.org.jm/ourweb/sectors/cost-model-fixed-termination-rates-principles-and-methodology-0

[5] The international information used in the model has been based on a thorough review of the prices offered by main international equipment manufacturers which serve operators in several countries such as Cayman Islands, Argentina, UK, Norway, France, Greece, among others.

between the new information provided by C&WJ and the values used in the model.

[CONFIDENTIAL]

Resource	Cost Type	Currency	C&WJ "Back-Up" Value	Values in Model	
				2013	2014
Cabinet site	CAPEX	USD			
MSAN chassis	CAPEX	USD			
Gigabit port	CAPEX	USD			

Table 10: Comparison of unit costs for the NGN access nodes proposed by C&WJ vs the current values used in the model [Source: Axon Partners Group Consulting]

Note: Values for Cabinet site in the model are in JMD. The values in the model for Cabinet site and MSAN chassis are reduced by the percentage associate to the access.

[END CONFIDENTIAL]

9.18. C&WJ stated that "*much of the core switching software capex is priced close to zero with no explanation. We understand that the capex is expressed in units of BHCA, but it still appears small.*" It provided the OUR with "*specific invoice back-ups (softswitch and core voice router) that provide more realistic pricing and in particular demonstrate the significance of the software component from sister businesses in the Caribbean.*"

9.19. The OUR confirms that the CapEx associated with core-switching software is based on the capacity. Notably, since C&WJ did not provide information regarding its core equipment capacity, international benchmark information has been used.

9.20. The OUR acknowledges the reception of invoices regarding softswitch and core voice routers. However, no information has been provided about equipment specifications, making it impossible to determine whether it is representative of the capacity requirements in Jamaica. Therefore, it has not been possible to compare this information with the values used in the model.

<u>Determination 17:</u> The unit CapEx and OpEx for the terrestrial and subsea fibre cable have been updated as indicated in Table 8 and Table 9 based on the comments received in response to the draft model.

Unit OpEx

9.21. C&WJ pointed out that "*OpEx as a percentage of CapEx for NGN equipment is generally lower than what international benchmarks suggest.*" Also, C&WJ stated that the "*OpEx as a percentage of CapEx associated with TDM equipment is inexplicitly lower than the OpEx as a percentage of CapEx of NGN equipment.*"

9.22. The OUR highlights that C&WJ has not provided any evidence supporting its affirmation that OpEx as a percentage of CapEx for NGN equipment should be lower than what is used in international benchmarks.

9.23. Additionally, it is observed that a higher percentage of OpEx over CapEx for NGN, compared to equivalent legacy equipment, is common in the international practice. For instance, according to the model published by the Norwegian regulator (the Norwegian Communications Authority, previously called Norwegian Post and Telecommunications Authority), the ratio OpEx/CapEx for a legacy remote node is 4 times lower than for a NGN MSAN.

9.24. However, the Office has re-examined the OpEx unit values in the draft model and found some inconsistencies which have been updated based on the international practice, as follows:

Resource	Draft Model		Updated Model	
	2013	2014	2013	2014
Local exchange chassis	1.25%	1.27%	4.21%	4.27%
Local exchange CPU	1.25%	1.27%	4.21%	4.27%
Tandem exchange chassis	1.25%	1.27%	4.21%	4.27%
Tandem exchange CPU	1.25%	1.27%	4.21%	4.27%
Edge router chassis	10.47%	10.81%	7.62%	7.86%
Distribution router chassis	43.17%	44.55%	8.01%	8.27%
Core router chassis	191.24%	197.39%	16.08%	16.60%

Table 11: Updated OpEx over CapEx percentage for core chassis equipment [Source: Axon Partners Group Consulting]

9.25. CACU identified an abnormal trend in the unit OpEx considered for cabinet sites. The OUR has revisited these values and confirms an issue in the unit cost for 2014, which has been updated as follows:

Resource	Cost Type	Currency	Draft Model		Updated Model	
			2013	2014	2013	2014
Cabinet site	OPEX	JMD	12,451	186	12,451	13,248

Table 12: Updated unit OpEx for cabinet sites (values without considering the cost associated to the access) [Source: Axon Partners Group Consulting]

<u>Determination 18:</u> The unit OpEx associated to core chassis equipment and cabinet sites has been updated as indicated in Table 11 and Table 12.

Services Specific Costs

9.26. In its responses to the public and the private consultation documents C&WJ stated that "*interconnection costs and interconnection-specific costs have not been introduced at all.*" The company then provided, within its response to the private consultation, additional information about the following four types of interconnection-specific costs which it indicated should be included in the model:

(1) Interconnection Specific Staff OpEx;

(2) Regulatory and Legal Interconnection-Specific Activity;

(3) Interconnection-Specific Regulatory Fees (revenue-based and per minute); and

(4) Wholesale Billing System Cost.

9.27. Digicel commented on C&WJ's statement regarding interconnection-specific costs and noted that the cost of additional specific network elements for external supply of termination services should be recovered by the entirety of the termination increment demand, including on-net self-supply of termination.

9.28. The OUR notes that the model was prepared to incorporate interconnection specific costs. However, the required information was not provided by C&WJ during the data collection process and, therefore, the relevant inputs in the draft model were set to 0. The new information provided by C&WJ during the consultation process has been considered in the final model.

9.29. The OUR acknowledges Digicel's comment and remarks that sharing between retail and wholesale services is taken into account when it is applicable.

9.30. C&WJ pointed out in its response to the private consultation that the mobile model included interconnection-specific staff OpEx as a flat value over the time modelled, and suggested that an equivalent concept be included in the fixed model. C&WJ has provided estimations of the staff-related costs associated with interconnection, differentiating between the following categories:

(1) Carrier Services Management;

(2) Carrier Services International Interconnect;

(3) Carrier Services Tech & Operations; and

(4) Carrier Services National Business.

9.31. The OUR notes that Carrier Services-related costs were included within retail costs mark-up. The Office agrees with C&WJ that considering them as specific resources in the model instead of being part of retail costs mark-up would improve the causality of the allocation. The 2013 and 2014 values for the following resources have been included in the final model:

- Staff-Related Costs National Ix
- Staff-Related Costs International Ix
- Staff-Related Costs General Ix.

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			Values in Model	
Resource	**Cost Type**	**Currency**	**2013**	**2014**
Staff-Related Costs National Ix	OPEX	JMD		
Staff-Related Costs International Ix	OPEX	JMD		
Staff-Related Costs General Ix	OPEX	JMD		

Table 13: Staff-related costs associated to interconnection [Source: Axon Partners Group Consulting]

[END CONFIDENTIAL]

9.32. In light of the comments received, the overheads for Retail costs (percentage over Network OpEx, Depreciation and Amortisation) and G&A (percentage over Network OpEx, Depreciation, Amortisation and Retail costs) have been updated in the model (see Table 14).

[CONFIDENTIAL]

Description	Units	Draft Model	Updated Model
Network OpEx Working Capital (percentage over network OpEx)	%		
Retail Costs (percentage over Network OpEx, Depreciation and Amortisation)	**%**		
G&A (percentage over Network OpEx, Depreciation, Amortisation and Retail costs)	%		

Table 14: Updated percentages for overhead costs calculation [Source: Axon Partners Group Consulting]

[END CONFIDENTIAL]

9.33. C&WJ stated in its response to the private consultation that "*Legal and Regulatory staff spend a significant amount of time on interconnection-specific activity*." Accordingly, C&WJ has estimated the staff cost amount that should be included as an interconnection-specific cost to fixed-network interconnection services associated with legal and regulatory activity.

9.34. In its response to the private consultation, C&WJ also stated that it "*pays a share of its net revenues to the OUR to cover the latter's budget*." Then, it affirmed that these interconnection-specific regulatory fees should be included in the model and allocated to interconnection services, since "*interconnection revenues are included in the calculation of this levy.*"

9.35. The OUR remarks that the regulatory fee described above and all the costs associated with legal and regulatory activity for the fixed operation have been included within G&A costs in the draft model, and accordingly, G&A costs are allocated to all wholesale and retail services. The OUR therefore does not consider it necessary to disaggregate these types of costs in the final model.

9.36. C&WJ also pointed out in its response to the private consultation that it "*pays US 3 cents per min on international incoming traffic terminating on the fixed network*" and that "*C&WJ collects this fee and pays over to the government.*"

9.37. The OUR' notes that the USD 3 cents levy charged on international incoming traffic cannot be considered a cost for providing international termination services, since it is a pass-through to international carriers. C&WJ collects the levy on behalf of the Government, independently from the provision costs. The OUR believes that the termination rates to be included in the reference offer should be based on provision costs, consistent with rates approved in previous reference offers. Any service specific levy charged on behalf of the Government should be added on top of the termination rate set by the OUR.

9.38. With respect to wholesale billing system cost, C&WJ provided invoices of "*a recent quote for an outsourced billing function provided to another C&WJ subsidiary*" where the following components of the pricing structure can be identified:

(1) One-off fees - Setup fee;

(2) Per-minute fees; and

(3) Ad hoc support fees.

9.39. The OUR agrees with C&WJ that wholesale billing system costs should be included in the model and it was updated based on the evidence provided by C&WJ. The 2013, 2014 and 2015 values for the following resources have been included in the model:

- Wholesale billing hardware
- Wholesale billing software (per minute).

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			Values in Model		
Resource	Cost Type	Currency	2013	2014	2015
Wholesale billing hardware	CAPEX	USD			
Wholesale billing software (per minute)	OPEX	USD			

Table 15: Wholesale billing system costs included in the model [Source: Axon Partners Group Consulting]

[END CONFIDENTIAL]

9.40. With regards to the specific costs associated to the DQ and Emergency services (i.e. call centre related costs), C&WJ provided information during the data collection phase which was not supported with any evidence and, therefore, no related costs were included in the model under consultation. After the consultation document was issued, C&WJ provided detailed information about the costs associated with the call centre.

9.41. The OUR agrees with C&WJ that call centre costs should be included. The resources listed in Table 16 have been included in the model based on the evidence provided by C&WJ. These resources are shared between retail and wholesale DQ and Emergency services.

[CONFIDENTIAL]

			Values in Model			
Resource	Cost Type	Currency	2013	2014	2015	2016
Call Centre - Fixed Cost	CAPEX	USD				
Call Centre - Fixed Cost	OPEX	USD				
Call Centre - Variable Cost (per minute)	CAPEX	USD				
Call Centre - Variable Cost (per minute)	OPEX	USD				
Call Centre - Additional Capacity	OPEX	USD				

Table 16: Call centre costs included in the model [Source: Axon Partners Group Consulting]

[END CONFIDENTIAL]

<u>Determination 19:</u> Interconnection-specific staff OpEx, wholesale billing system and call centre costs have been included in the model as described above.

Chapter 10: Cost Trends

10.1. Chapter 10 of this Determination Notice discusses the comments received regarding cost trends.

CapEx and OpEx Cost Trends

10.2. CACU stated that it "*does not disagree with the cost trends given the source of the information.*"

10.3. The OUR acknowledges the comment from CACU.

10.4. C&WJ pointed out that the OpEx cost trends are reasonable, but the "*unit CapEx decline appears to be exaggerated in some cases.*" C&WJ stated that the maximum cost reduction should be -5% to -6% annually, which "*would be more consistent with international benchmarks, including relevant equipment capex found in the 2012 Jamaican mobile model.*"

10.5. The OUR remarks that the CapEx cost trends used in the model are obtained from international benchmarks and C&WJ did not provide any evidence to support its comments. Therefore, the cost reductions applied in the model are considered appropriate and the OUR does not see a reason to adjust them.

Determination 20: The OUR will not adjust the CapEx cost trends included in the draft model.

Use of Costs Trends

10.6. Digicel noted that "*only a trend between 2013 and 2014 has been provided*", and affirms that "*the use of additional data points would give a more robust trend estimate, especially as the model proposes to project forward until 2020.*"

10.7. C&WJ understood that "*the cost trends provided will be used for each year of the model.*" But, due to Digicel's comment, C&WJ encouraged the OUR to clarify the approach implemented in the model.

10.8. The OUR confirms that the cost trends provided are used for each year in the model, as detailed in the description manual of the BULRIC model for fixed networks (section 7.1).

<u>Determination 21:</u> OUR confirms that the cost trends are applied to each year.

Chapter 11: Cost Structure

11.1. Chapter 11 of this Determination Notice discusses the comments submitted by the operators regarding the resulting cost structure.

Increase of OpEx

11.2. CACU stated that it "*does not disagree with the cost structure presented.*"

11.3. C&WJ commented that the cost structure presented "*does not appear unreasonable.*"

11.4. The OUR acknowledges the comments from CACU and C&WJ.

11.5. Digicel disagreed with the cost structure presented because "*the trends show an increase in the longer term of the Network OpEx cost.*" Digicel also stated that "*shorter loop lengths due to NGN, improved equipment reliability, improved network management capability and straightforward operational efficiency improvements over time should all improve operational performance and reduce costs.*"

11.6. C&WJ disagreed with Digicel and said that "*the OUR has already reduced the OpEx associated with NGN components beyond what is realistic.*"

11.7. Digicel stated that due to the increase in the number of nodes and the deployment of modern equipment, the incremental cost of repairing the voice elements should be zero "*as that cost will have been necessarily incurred by the other services.*"

11.8. The OUR disagrees with Digicel's statement about a forecasted OpEx reduction. The NGN migration may improve operational performance, but it does not necessarily mean that a cost reduction is possible, because a larger number of network elements will be in operation. Additionally, the OpEx trend is linked to inflation, resulting in a general increase of network OpEx.

11.9. The OUR considers that incremental OpEx associated with voice should not be zero, since the number of network elements may change due to the

capacity required for voice services; as a consequence, the OpEx associated with those elements would also change.

Determination 22: The OUR has not adjusted the network OpEx calculation already implemented in the draft model.

Depreciation of Voice Switching

11.10. Digicel indicated that given the IP nature of a NGN core network, "*the depreciation attributed to voice switching should decline over time.*" However, in the model, "*the depreciation levels for the combined legacy and NGN switching category are higher in every year after 2014 than the initial combination in 2013.*"

11.11. The OUR remarks that the legacy and NGN-switching categories include switching equipment associated with both voice and non-voice services.

11.12. The OUR confirms that the depreciation attributed to voice switching is declining over time.

Determination 23: The OUR has not adjusted the depreciation calculation and attribution implemented in the draft model.

Chapter 12: Routing Factors

12.1. Chapter 12 of this Determination Notice discusses the comments received regarding routing factors.

12.2. CACU "*does not disagree with the routing factors used.*"

12.3. The OUR acknowledges the comment from CACU.

Use of Transmission and Switching Facilities

12.4. C&WJ disagreed with the routing factors and claimed that "*there must be an error as the traffic services appear not to use any transmission or switching facilities.*"

12.5. The OUR confirms that voice routing factors associated with transmission and switching costs are greater than zero and, therefore, these costs are allocated to voice services. This Office understands that C&WJ has not properly reviewed the routing factors provided.

Determination 24: The OUR has not adjusted the routing factors implemented in the draft model.

Facilities Shared with Mobile Businesses

12.6. Digicel stated that "*in general, the categories appear to be appropriate,*" but claimed that due to the fact that the incumbent is also a mobile network operator, "*many of the facilities such as sites, towers and generators will be shared between its fixed and mobile businesses.*"

12.7. C&WJ disagreed with Digicel and stated "*what is modelled is a self-standing national fixed network, just as what was modelled for the mobile sector was a self-standing mobile network.*" Thus, mobile traffic does not need to be taken into consideration.

12.8. The OUR agrees with Digicel, and affirms that it is true that some facilities may be shared between mobile and fixed operations and, therefore, it is important not to overestimate the costs related to the sites. To consider the facilities required to hold only the fixed network equipment, the OUR has revisited and adjusted costs associated with core sites based on the area occupied by the fixed network elements and the space required to access the equipment. Table 17 shows the updated values:

			Draft Model		Updated Model	
Resource	**Cost Type**	**Currency**	**2013**	**2014**	**2013**	**2014**
Local site	OPEX	JMD	1,213,651	1,291,324	615,584	654,981
Tandem site	OPEX	JMD	2,704,794	2,877,900	2,219,676	2,361,736
Edge site	OPEX	JMD	1,213,651	1,291,324	607,899	646,805
Distribution site	OPEX	JMD	2,704,794	2,877,900	2,155,514	2,293,467
Core site	OPEX	JMD	2,704,794	2,877,900	2,229,501	2,372,190

Table 17: Updated unit OpEx for core sites [Source: Axon Partners Group Consulting]

Determination 25: The OUR has revisited and adjusted the unit OpEx for core sites as indicated in Table 17.

Attribution of Cost of Power

12.9. Digicel stated that "*a routing factor should not be applied to power*" because the cost of power is not incremental to fixed termination. Then, "*an approach of applying a routing factor will in all cases give rise to an incremental cost and overstate the cost of the Fixed Termination Service.*"

12.10. The OUR remarks that the use of routing factors is necessary to attribute all costs to services, no matter what scenario is calculated. If no incremental cost is identified when removing the termination traffic, no energy cost would be attributed to services.

Determination 26: The routing factors used in the draft model have not been changed.

Chapter 13: Services Costs

13.1. Chapter 13 of this Determination Notice discusses the comments submitted by the operators regarding services' unit costs.

Fixed Termination Rates Derived

13.2. Digicel stated that "*the costs appear to be within a reasonable range from an order of magnitude perspective relative to the mobile termination rates.*"

13.3. C&WJ stated that the services' unit costs are not reasonable and there were several cost items missing from the model, mainly the interconnection specific costs discussed in Chapter 9.

13.4. Additionally, C&WJ pointed out that "*the fixed termination rates derived on the basis of pure LRIC models in Europe are generally higher than that derived in the OUR's cost model, which is counterintuitive given the larger size of the European networks.*"

13.5. Digicel disagreed with C&WJ and said that the "*comparison to networks in Europe is misguided. These networks are characterised by higher population densities, higher levels of fixed line penetration and much higher aggregate call volumes*", resulting in a much higher cost increment for termination services.

13.6. The OUR notes that a comparison with European networks is not straightforward. The FTR depends on various factors considered in the modelling process, such as penetration, coverage and population density, among other specific characteristics in each country. For instance, European operators face significantly higher operational costs due to higher salaries. The combinations of all these factors may lead to higher or lower rates compared to Jamaica's figures, between 0.06 JMD and 0.18 JMD. Thus, the Office does not see enough evidence to support a higher termination rate.

Forecast increase in the FTRs

13.7. CACU "*does not disagree with the services' unit costs,*" but CACU pointed out that "*the Emergency and Weather Warning Services have an upward trend in their costs,*" which could be abnormal.

13.8. Digicel also noted that "*a number of the services show steady increases in cost over the entire modelling period.*"

13.9. Digicel stated that the incremental cost of fixed termination should decline over time; instead "*the model is yielding cost increases from 2018 onwards.*"

13.10. C&WJ agreed with Digicel and pointed out that the "*results by service category change direction in a few of the model years,*" mostly due to the "*pure LRIC nature of the results, and the fact that the model is not fully populated with costs.*"

13.11. The OUR remarks that the cost of the core resources decreases about 2.5% annually and the traffic of termination services decreases more than 3% annually. As a consequence, there is an increase of the core cost per minute over the entire modelling period for all termination services. This is the result of the expected decrease in economies of scale for voice-specific resources, which is not fully compensated by the economies of scale in transmission costs associated with the broadband traffic increase.

13.12. This effect is more noticeable in termination to Emergency, Weather warning and Own Freephone services since their costs are mostly formed by core network resources.

Determination 27: The OUR has not adjusted the services cost calculation in the draft model.

Chapter 14: WACC

14.1. On 2016 November 15, the OUR published the Determination Notice "*Estimate of the Weighted Average Cost of Capital for Telecommunications Carriers*" Document No.2016/TEL/016/DET.002.

14.2. In the Determination Notice, the OUR determined that "*the estimated nominal pre-tax WACC for fixed line carriers in J$ terms is 19.25%. The estimated nominal pre-tax WACC for mobile carriers in J$ terms is 20.93%.*"

14.3. The OUR also determined that "*The WACC will be updated every five (5) years from the effective date of this Determination Notice.*"

Determination 28: The nominal pre-tax WACC value has been updated from 24.39% to 19.25% in the fixed cost model.

Chapter 15: Determination of wholesale rates

15.1. Chapter 15 of this Determination Notice presents the results of the model after all the updates discussed in the previous sections and establishes the new wholesale interconnection rates.

Cost of services

15.2. One of the objectives of this Determination Notice is to present the resulting fixed termination rates (FTRs) extracted from the cost model and the Office's decision regarding the regulated wholesale tariffs. As mandated by the Act, interconnection rates shall be cost oriented; specifically, termination rates shall be based on the avoidable cost (i.e., pure LRIC cost) and other interconnection rates shall be between the TLRIC and SAC. Table 18, Table 19 and Table 20 below show the results of the model for these standards.

Services	Units	2017	2018	2019	2020
PSTN Terminating Access Service – Local level	JMDcent / min	9.22	9.25	9.45	9.65
PSTN Terminating Access Service – National level	JMDcent / min	9.56	9.29	9.82	9.65
Incoming International Call Termination Service on PSTN	JMDcent / min	10.62	9.82	10.06	9.65
Terminating on Emergency Services[6]	JMDcent / min	8.44	8.79	9.57	9.65
Terminating on Weather Warning Service	JMDcent / min	17.31	18.10	19.30	19.79
Terminating on National DQ Service[6]	JMDcent / min	9.50	9.32	9.81	9.65
Terminating on International DQ Service[6]	JMDcent / min	9.50	9.32	9.81	9.65
Terminating on National Freephone Service	JMDcent / min	9.56	9.29	9.82	9.65
Terminating on 1-888-Call CWJ Service	JMDcent / min	8.44	8.79	9.57	9.65
Terminating on International Freephone Service	JMDcent / min	9.50	9.32	9.81	9.65
Terminating on Home Country Direct Collect Service	JMDcent / min	8.25	7.14	7.19	6.57

Table 18: Cost of services under Pure LRIC standard [Source: Axon Partners Group Consulting]

[6] This service only includes the termination costs. The costs associated to the call centre are included within the service "Use of call centre for DQ and Emergency Services" below.

Services	Units	2017	2018	2019	2020
PSTN Transit Service	JMD / min	0.43	0.52	0.57	0.43
International Transit to Third Party Fixed Network	JMD / min	0.65	0.64	0.62	0.43
Use of call centre for DQ and Emergency Services	JMD / min	11.14	11.90	12.63	13.07

Table 19: Cost of services under TLRIC standard [Source: Axon Partners Group Consulting]

Services	Units	2017	2018	2019	2020
PSTN Transit Service	JMD / min	1.97	2.07	2.17	1.95
International Transit to Third Party Fixed Network	JMD / min	2.81	2.96	3.11	2.83
Use of call centre for DQ and Emergency Services	JMD / min	11.14	11.90	12.63	13.07

Table 20: Cost of services under SAC standard [Source: Axon Partners Group Consulting]

Fixed Termination Rates

15.3. In the Methodology published on 2015 July 1, the OUR stated that if an existing termination rate is above the TLRIC rate estimated by the model, this would mean that operators would have reaped significant benefits from having a termination which is above cost. The OUR indicated that should such a scenario occur, the termination rate will be immediately adjusted to its TLRIC level. The OUR also established that glide paths will be allowed from TLRIC rate to the Pure LRIC rate only where there is a significant difference in the rates in dollar terms. While the OUR established that the maximum time period for a glide path should be two (2) years, it indicated that it will only decide on the final glide paths, detailing exact lengths and the adjustment steps, after the model is developed and the fixed termination rate is calculated The OUR did not however, indicate the approach to be taken in the scenario where the current termination rates are lower than the TLRIC level.

15.4. After comparing the model's results with the tariffs in the existing reference interconnection offer, the OUR observes that current termination rates are much lower than the TLRIC model results. This means that the current rates already accord with the principle of cost-orientation and as such C&WJ would not have been benefitting from supernormal profits. It was also observed that

there were significant differences between current termination rates and the rates resulting from the new methodology (Pure LRIC). Table 21 shows the comparison of current termination rates against the average of the LRIC model results for 2017-2020.

Services	Units	Average RIO[7]	Average 2017-2020	Difference
PSTN Terminating Access Service – Local level	JMDcent / min	41.33	9.39	-77%
PSTN Terminating Access Service – National level	JMDcent / min	115.16	9.58	-92%
Incoming International Call Termination Service on PSTN[8]	JMDcent / min	144.70	10.04	-93%

Table 21: Comparison of fixed termination rates with estimated cost of services in the period under analysis [Source: Axon Partners Group Consulting]

15.5. In its deliberations regarding the implementation of a glide path, the OUR took note of the significant differences found between the current rates and the Pure LRIC rates and the impact that the immediate reduction of the rates to the Pure LRIC level would have on C&WJ revenues. The fact that the current rates were also not above TLRIC was also taken into account. Based on these considerations, the OUR decided, in keeping with its statutory mandate to balance short term welfare gains of immediate price reductions with the long term interests of protection of efficient investment incentives, to implement a two-step glide-path.

15.6. The first step of the glide-path for fixed termination rates becomes effective on 2017 July 1 and remains in effect until 2017 December 31. The second step will become effective on 2018 January 1.

15.7. Additionally, the OUR observes that the differences in the resulting service costs in the modelled period are small, with a slight increase in some values (see Chapter 13, section Forecast increase in the FTRs). Therefore, the OUR

[7] Values were estimated based on the Tariff Schedule of the LIME – Reference Interconnect Offer. September 13, 2013. http://www.our.org.jm/ourweb/sites/default/files/documents/sector_documents/lime_rio_6_tariff_schedule.pdf

[8] The fee associated to the service "Incoming International Call Termination Service on PSTN" does not include any additional tax collected by the operator on behalf the government.

considers that in order to simplify the fee schedule, a unique value for each service in the period 2017-2020 would be preferable. The glide-path final value would be calculated as the average of the results for the period 2017-2020.

15.8. Based on the above, the OUR determines that the FTRs applicable from 2017 to 2020 are those listed in Table 22:

Services	Units	2017	2018-2020
PSTN Terminating Access Service – Local level	JMDcent / min	25.36	9.39
PSTN Terminating Access Service – National level	JMDcent / min	62.37	9.58
Incoming International Call Termination Service on PSTN	JMDcent / min	77.37	10.04

Table 22: Fixed termination rates applicable from 2017 to 2020 [Source: Axon Partners Group Consulting]

Determination 29: The charges for fixed termination shall be those listed in Table 22. The FTRs shall be charged on a per-second basis. These rates shall remain in effect for a period of four (4) years unless they are reviewed earlier.

Special Services Rates

15.9. In addition to the services associated to terminating traffic to C&WJ's customers, there are a number of services which are related to terminating calls on special services. Table 23 compares current RIO rates for those services with the results obtained from the model:

Services		Units	Average RIO[9]	Average 2017-2020	Difference
Terminating on Weather Warning Service		JMDcent / min	102.13	18.62	-82%
Terminating on National Freephone Service		JMDcent / min	74.38	9.58	-87%
Terminating on 1-888-Call CWJ Service		JMDcent / min	69.32	9.11	-87%
Terminating on International Freephone Service		JMDcent / min	146.09	9.57	-93%
Terminating on Home Country Direct Collect Service		JMDcent / min	116.05	7.29	-94%
Terminating on Emergency Services	Call Termination	JMD / min	2.29	0.09	436%
	Call Centre			12.18	
Terminating on National DQ Service	Call Termination	JMD / min	36.35	0.10	-66%
	Call Centre			12.18	
Terminating on International DQ Service	Call Termination	JMD / min	70.24	0.10	-83%
	Call Centre			12.18	

Table 23: Comparison of rates for termination on special services with estimated cost in the analysed period [Source: Axon Partners Group Consulting]

15.10. Equivalently to what was observed in the fixed termination services, there are significant differences between current RIO rates and the rates resulting from the model. Therefore, bearing in mind the considerations in relation to the fixed termination services, the OUR has decided to implement a two-step glide-path.

15.11. The first step of the glide-path for special services rates shall become effective on 2017 July 1 and remain in effect until 2017 December 31. The second step will become effective on 2018 January 1. Based on the above, the OUR determines that the rates for termination on special services applicable from 2017 to 2020 are those listed in Table 24:

[9] Values were estimated based on the Tariff Schedule of the LIME – Reference Interconnect Offer. September 13, 2013. http://www.our.org.jm/ourweb/sites/default/files/documents/sector_documents/lime_rio_6_tariff_schedule.pdf

Services	Units	2017	2018-2020
Terminating on Weather Warning Service	JMDcent / min	60.38	18.62
Terminating on National Freephone Service	JMDcent / min	41.98	9.58
Terminating on 1-888-Call CWJ Service	JMDcent / min	39.22	9.11
Terminating on International Freephone Service	JMDcent / min	77.83	9.57
Terminating on Home Country Direct Collect Service	JMDcent / min	61.67	7.29
Terminating on Emergency Services (termination component)[10]	JMD / min	1.19	0.09
Terminating on National DQ Service (termination component)[10]	JMD / min	18.23	0.10
Terminating on International DQ Service (termination component)[10]	JMD / min	35.17	0.10

Table 24: Rates for termination to special services applicable from 2017 to 2020 [Source: Axon Partners Group Consulting]

15.12. Additionally, in the case that C&WJ's call centre is used for the provision of Emergency, National DQ or International DQ services, the fee set out in Table 25 should be added on top of the termination component:

Services	Units	2017	2018-2020
Use of C&WJ's call centre	JMD / min	12.18	12.18

Table 25: Rates for using C&WJ's call centre applicable from 2017 to 2020 [Source: Axon Partners Group Consulting]

<u>Determination 30:</u> The charges for terminating traffic in special services shall be those listed in Table 24 and Table 25. The fees shall be charged on a per-second basis. These rates shall remain in effect for a period of four (4) years unless they are reviewed earlier.

Transit Rates

15.13. As mandated by the Act, interconnection rates other than termination rates shall be between the TLRIC and SAC, which is the case of the transit rates.

[10] In the case that the call is ended in C&WJ's call centre, an additional fee should be paid for the use of such facilities, as described in this section.

15.14. After comparing the model's results with the existing reference interconnection offer, the OUR observes that current transit rates are already between the TLRIC and SAC model results. Table 26 shows the comparison of current transit rates against the TLRIC and SAC model results for the period under analysis (2017-2020).

Services	Units	Average RIO[11]	TLRIC	SAC
PSTN Transit Service	JMD / min	0.76	0.49	2.04
International Transit to Third Party Fixed Network	JMD / min	0.80	0.59	2.93

Table 26: Comparison of fixed transit rates with estimated cost of services in the period under analysis (2017-2020) [Source: Axon Partners Group Consulting]

15.15. As shown in Table 26 above, current transit rates are already between TLRIC and SAC values. Therefore, the OUR has decided to leave the transit rates unchanged, as shown in Table 27:

Services	Units	2017-2020
PSTN Transit Service	JMD / min	0.76
International Transit to Third Party Fixed Network	JMD / min	0.80

Table 27: Fixed transit rates applicable from 2017 to 2020 [Source: Axon Partners Group Consulting]

<u>Determination 31:</u> The charges for transit shall remain unchanged at the level previously approved in the RIO 6 Tariff schedule as indicated in Table 27. The transit rates shall be charged on a per-second basis. These rates shall remain in effect for a period of four (4) years unless they are reviewed earlier.

[11] Values were estimated based on the Tariff Schedule of the LIME – Reference Interconnect Offer. September 13, 2013. http://www.our.org.jm/ourweb/sites/default/files/documents/sector_documents/lime_rio_6_tariff_schedule.pdf

Determination 32: **In instances where the interconnecting operator is a licensed domestic carrier with customers on its network, once there are no technical reasons on the part of the interconnecting operator preventing it from obtaining direct interconnection with C&WJ's mobile switch, C&WJ is obligated to offer direct interconnection to its mobile switch. In such cases, there shall be no transit or other costs of connection for the interconnecting operator other than the tariffs listed in the approved Tariff Schedule for mobile termination rates or as separately determined by the Office. Where the interconnecting operator is not a licensed domestic carrier, C&WJ is not obligated to offer direct interconnection to its mobile switch pending the agreement of commercial terms with the interconnecting operator, regardless of whether or not there is agreement on technical terms. In any event, disputes regarding commercial issues relating to interconnection to C&WJ's mobile switch should be referred to the Office for resolution.**

Determination 33: **C&WJ will have ten (10) working days from the effective date of this Determination Notice within which to submit a revised RIO 6 Tariff schedule reflecting the rates established in this Determination Notice to the Office.**

Determination 34: **The Office will begin the process of data collection to update the model one (1) year in advance of when a rate review becomes due. In the case of a four (4) year review, if the Office is unable to complete its review by 2020 December 31, the interconnection rates existing in the market at the time will remain in force until the review is completed.**

Annex A: List of Determinations

Determination 1: The Fixed Termination rates are set from 2017 to 2020.

Determination 2: The fixed interconnection rates presented in this Determination Notice are considered reasonable and they will not be considered interim.

Determination 3: The Office will keep the voice traffic forecasts used in the draft model.

Determination 4: The forecast of broadband demand has been updated based on Cisco's estimates (CAGR of 21% from 2015 to 2020) as indicated in Table 1.

Determination 5: The leased-line traffic forecast has been updated based on a CAGR of 0% as indicated in Table 2 and Table 3. The OUR will not consider the possibility of including CCJ's customer traffic until further clarity on the combined network is provided.

Determination 6: No changes are required in the demand statistics used in the draft model.

Determination 7: The model will consider a complete migration to NGN nodes by 2020.

Determination 8: The migration factors proposed in the draft model will not be changed.

Determination 9: Geotypes will be used in the model for dimensioning the fixed network elements.

Determination 10: The OUR considers reasonable the number of access nodes produced by the model.

Determination 11: The average distances for connecting access nodes through Minimum Distance Tree topology have been updated as indicated in Table 6.

Determination 12: The average distances for connecting NGN access nodes through Ring topology have been updated as indicated in Table 7 to reflect the distance observed in legacy access nodes.

Determination 13: No changes will be applied to the link routes considered in the draft model.

Determination 14: The number of nodes and chassis considered in the draft model will not be changed.

Determination 15: The number amount of tower and fibre resources obtained in the draft model are considered reasonable.

Determination 16: The OUR has revised the relevant sections of the technical manual to ensure its clarity. No further changes are deemed appropriate regarding this point.

Determination 17: The unit CapEx and OpEx for the terrestrial and subsea fibre cable have been updated as indicated in Table 8 and Table 9 based on the comments received in response to the draft model.

Determination 18: The unit OpEx associated to core chassis equipment and cabinet sites has been updated as indicated in Table 11 and Table 12.

Determination 19: Interconnection-specific staff OpEx, wholesale billing system and call centre costs have been included in the model as described above.

Determination 20: The OUR will not adjust the CapEx cost trends included in the draft model.

Determination 21: OUR confirms that the cost trends are applied to each year.

Determination 22: The OUR has not adjusted the network OpEx calculation already implemented in the draft model.

Determination 23: The OUR has not adjusted the depreciation calculation and attribution implemented in the draft model.

Determination 24: The OUR has not adjusted the routing factors implemented in the draft model.

Determination 25: The OUR has revisited and adjusted the unit OpEx for core sites as indicated in Table 17.

Determination 26: The routing factors used in the draft model have not been changed.

Determination 27: The OUR has not adjusted the services cost calculation in the draft model.

Determination 28: The nominal pre-tax WACC value has been updated from 24.39% to 19.25% in the fixed cost model.

Determination 29: The charges for fixed termination shall be those listed in Table 22. The FTRs shall be charged on a per-second basis. These rates shall remain in effect for a period of four (4) years unless they are reviewed earlier.

Determination 30: The charges for terminating traffic in special services shall be those listed in Table 24 and Table 25. The fees shall be charged on a per-second basis. These rates shall remain in effect for a period of four (4) years unless they are reviewed earlier.

Determination 31: The charges for transit shall remain unchanged at the level previously approved in the RIO 6 Tariff schedule as indicated in Table 27. The transit rates shall be charged on a per-second basis. These rates shall remain in effect for a period of four (4) years unless they are reviewed earlier.

Determination 32: In instances where the interconnecting operator is a licensed domestic carrier with customers on its network, once there are no technical reasons on the part of the interconnecting operator preventing it from obtaining direct interconnection with C&WJ's mobile switch, C&WJ is obligated to offer direct interconnection to its mobile switch. In such cases, there shall be no transit or other costs of connection for the interconnecting operator other than the tariffs listed in the approved Tariff Schedule for mobile termination rates or as separately

determined by the Office. Where the interconnecting operator is not a licensed domestic carrier, C&WJ is not obligated to offer direct interconnection to its mobile switch pending the agreement of commercial terms with the interconnecting operator, regardless of whether or not there is agreement on technical terms. In any event, disputes regarding commercial issues relating to interconnection to C&WJ's mobile switch should be referred to the Office for resolution.

Determination 33: C&WJ will have ten (10) working days from the effective date of this Determination Notice within which to submit a revised RIO 6 Tariff schedule reflecting the rates established in this Determination Notice to the Office.

Determination 34: The Office will begin the process of data collection to update the model one (1) year in advance of when a rate review becomes due. In the case of a four (4) year review, if the Office is unable to complete its review by 2020 December 31, the interconnection rates existing in the market at the time will remain in force until the review is completed.

Annex B: Summary of changes in the Draft Model

Changes	Chapter	Section
Broadband demand forecast has been updated based on Cisco's estimates (CAGR of 21% from 2015 to 2020).	Chapter 3	Broadband Traffic
Leased-line traffic forecast has been updated based on a CAGR of 0%.	2.1	Leased Lines Capacity
The average distances for connecting access nodes through Minimum Distance Tree topology have been updated to consider road distances.	Chapter 6	Calculation of Access Distances
Average distances for connecting NGN access nodes through Ring topology have been updated.	Chapter 6	15.16. NGN Access Node Distances
Different unit capex and OpEx of resources have been updated.	Chapter 9	Unit CapEx / Unit OpEx
Wholesale billing-related costs (CapEx and OpEx) have been included in the model based on C&WJ information.	Chapter 9	Services Specific Costs
Interconnection-related staff costs have been moved from the G&A markup to be included as an interconnection- specific cost.	Chapter 9	Services Specific Costs
Call centre costs for handling DQ and Emergency services have been included in the model based on C&WJ information.	Chapter 9	Services Specific Costs
Costs associated with core sites have been adjusted based on the area occupied by the fixed network elements and the space required to access the equipment.	Chapter 12	Facilities Shared with Mobile Businesses
The WACC value has been updated from 24.39% to 19.25% according to OUR's recent determination notice about 'Estimate of the Weighted Average Cost of Capital for Telecommunications Carriers'.	Chapter 14	: WACC

Table 28: Summary of changes included in the draft model [Source: Axon Partners Group Consulting]

Annex C: Glossary

BULRIC	Bottom-up Long Run Incremental Costing model model
CapEx	Capital Expenditure
CCA	Current Cost Accounting
DSLAM	Digital Subscriber Line Access Multiplexer
EC	European Commission
EPMU	Equi-Proportional MarkUp
EU	European Union
G&A	General and Administrative
Line Card	Printed circuit board that interfaces with a telecommunications access network
LRIC	Long-Run Incremental Cost
MEA	Modern Equivalent Asset
MSAN	Multi-Service Access Node
NGN	New Generation Network

OpEx	Operational Expenditure
SAC	Stand-Alone Cost
SDH	Synchronous Digital Hierarchy
TDM	Time-division multiplexing
TLRIC	Total Long-Run Incremental Cost
WDM	Wavelength Division Multiplexing