Office of Utilities Regulation

Cost Model for Fixed Termination Rates – Principles and Methodology

Determination Notice

OUR

OFFICE OF UTILITIES REGULATION

Publication Date: July 1, 2015

DOCUMENT TITLE AND APPROVAL PAGE

DOCUMENT NUMBER: 2015/TEL/006/DET.002

1. DOCUMENT TITLE: Determination Notice for Cost Model for Fixed Termination Rates – Principles and Methodology.

2. PURPOSE OF DOCUMENT

This document contains the main decisions of the Office of Utilities Regulation regarding the cost model for fixed termination rates.

ANTECEDENT DOCUMENTS

Document Number	Description	Date
2015/TEL001/CON.001	Consultation Document on Cost Model for Fixed Termination Rates – Principles and Methodology	January 19, 2015

3. APPROVAL

This document is approved by the Office of Utilities Regulation and the decisions therein become effective July 1, 2015

On behalf of the Office:

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Albert Gordon
Director General

July 1, 2015

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Abstract

The Telecommunications Act, as amended in May 2012 (the "Act"), requires that all dominant public telecommunications carriers permit interconnection of their public network with the public network of other carriers for the purpose of the provision of telecommunications services, and that the charges at which this interconnection is provided shall be guided by the principles set out in Section 33 of the Act. The Act also provides that the Office of Utilities Regulation ("OUR" or "the Office") shall have regard to the principle of cost orientation when making a determination of an operator's interconnection charges.

This Determination Notice sets out the approach that the OUR plans to take to develop a cost model to calculate the cost of wholesale fixed interconnection services in accordance with the requirements of the Act.

The Act stipulates that charges shall be established:

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

This Determination Notice also sets out the OUR's responses to issues raised by stakeholders who commented on the Consultation Document dated January 19, 2015, and entitled "Cost Model for Fixed Termination Rates - Principles and Methodology" (Document No:2015/TEL001/CON.001), laying out the main decisions on the development of the cost model for fixed termination rates.

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

Chapter 1: Introduction

1.1. Prior to the issue of this Determination Notice, the Consultation Document titled "Cost Model for Fixed Termination Rates – Principles and Methodology" (Document No: 2015/TEL001/CON.001) was published on January 19, 2015 (the "Consultation Document"), for industry stakeholders to review and comment. A deadline of February 17, 2015 was established for the submission of comments.

1.2. Responses to the Consultation Document were received from:

- Cable & Wireless Jamaica Limited ("LIME").
- Columbus Communications Jamaica Limited ("Flow").

1.3. Industry stakeholders were then given until March 3, 2015 to comment on the responses received.

1.4. LIME submitted comments in this phase.

Purpose of this Determination Notice

1.5. This Determination Notice details the Office's responses to the comments submitted by industry stakeholders regarding the Consultation Document and the responses received from industry stakeholders on the submitted comments.

1.6. This Determination Notice also sets out the approach that the OUR plans to take to develop a cost model to calculate the cost of wholesale fixed interconnection services in accordance with the requirements of the Act. Therefore, this Determination Notice addresses issues such as:

- Chapter 2: General Characteristics of the Model, including:
  - Whether a top-down or a bottom-up model should be used;

- What period of time will be modelled; and
- Which sources of information will be used to populate the model.

- Chapter 3: Costs Treatment, including:
  - How costs will be allocated to services;
  - How common costs will be allocated to services;
  - Which costs should be included;
  - How operating expenditures will be calculated; and
  - How capital expenditures will be calculated and annualised.
- Chapter 4: Definition of the Reference Operator, including which operator will be modelled.
- Chapter 5: Network Details, including:
  - What should be the main characteristics of the network modelled;
  - What services will be offered by the modelled operator; and
  - How the increments will be defined.
- Chapter 6: Glide Paths, Price Gradients and Charging Basis, including:
  - Whether different prices should be set for peak and off-peak times;
  - Whether the change in prices should be introduced *through* a glide path; and

- What should be the charging basis for the fixed termination rate.

1.7. Nineteen (19) questions were asked in the Consultation Document, to which LIME and Flow provided responses. In addition, LIME provided further comments to ten (10) of Flow's responses. The Office responds to these issues in chapters 2 to 6.

1.8. Annex A includes a glossary of terms and abbreviations used throughout this document to assist in its reading. Annex B includes a list of all determinations made in the Determination Notice.

1.9. Additionally, Annex C includes a document titled "Cost Model for Fixed Termination Rates – Principles and Methodology" that updates the contents from the Consultation Document as a result of the methodological changes made after considering the contributions made by the operators. Such changes were made according to the twenty-one (21) determinations set out in this Document.

Legislative Framework

1.10. As part of its overall functions to regulate specified services and facilities under section 4(1) of the Act, and in keeping with its express power to determine the rates which 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"), the OUR is authorised to determine the prices charged by telecommunications operators for the provision of interconnection services.

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."*

1.11. 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.

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

1.13. 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 provision of telecommunications services".*

1.14. The Act grants the OUR specific powers with regard to the determination of tariffs charged for interconnection services. Sections 29 (4)(a) and (5) 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."

1.15. 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".*

1.16. 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 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; and

(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)."

1.17. In keeping with its express statutory powers to determine the charges for interconnection services as mentioned above, the Office has initiated a consultative process to set out the approach to develop a cost model to calculate the cost of wholesale fixed interconnection services, issuing the Consultation Document titled "Cost Model for Fixed Termination Rates – Principles and Methodology" (Document No: 2015/TEL001/CON.001) on January 19, 2015.

Chapter 2: General Characteristics of the Model

Main Modelling Approach

2.1. Chapter 3 of the Consultation Document analysed different approaches for cost modelling and proposed to develop a single bottom-up model. This decision puts forward the main benefits of a bottom-up model, in terms of amenability to sensitivity analysis and greater transparency offered. The use of bottom-up models is consistent with the European Commission's ("EC") Recommendation and represents industry best practice when being built by a regulator.

2.2. LIME considered that the Office "*has not adequately highlighted the weaknesses of bottom-up modelling and therewith neglected to discuss or propose measures to mitigate the risks associated with the approach*". According to LIME, a more relevant view of the EC on the interconnection costing should be derived from its recommendation on the Regulatory Treatment of Fixed and Mobile Termination Rates in the European Union (May 7, 2009).

2.3. Omission and distortion of costs are further outlined by LIME as the most probable risks associated with a bottom-up approach, taking into account the current Jamaican situation. Moreover, LIME noted a "*tendency towards omission*" regarding certain types of costs, which is overstated in the Consultation Document, and suggests that an additional effort has to be made by the Office to ensure that costs, such as spectrum and way fees, are not overlooked.

2.4. Flow outlined the appropriateness of a bottom-up model approach for the purpose of calculating interconnection rates, highlighting its flexibility "*to accommodate realistic costs faced by providers of fixed wholesale interconnect services*".

2.5. LIME challenged Flow's statement regarding the flexibility of a bottom-up approach, by proposing a number of changes to the model, which are further discussed in the next sections of this document and include:

- Additional efforts to ensure that costs are not omitted
- Introduction of a mechanism to model the migration from a hybrid of legacy and NGN fixed network to one fully NGN network by 2020.
- Deployment of an appropriate number of NGN nodes, over the course of the modelling period, which should not simply reflect the number and location of nodes current deployed in LIME's network.

2.6. Regarding LIME's comment on appropriate stressing of the weaknesses of bottom-up modelling, the Office acknowledges such limitations. In order to mitigate the risks associated with the bottom-up approach, the Office will properly calibrate the model to ensure that it appropriately represents the telecommunications operations in Jamaica and that relevant costs are not overlooked. Further, the Office has included in the Methodological Document (Annex C) detail on the potential weaknesses of bottom-up modelling and how they will be addressed to minimise their effect.

2.7. Additionally, the model will be consulted on with the operators. During said consultation process, the Office expects that the operators will indicate specific areas where they think relevant costs have been omitted. This consultation process on the model will help to ensure that the results of the model are accurate.

2.8. The Office acknowledges the importance of taking into account the specific circumstances of Jamaica when assuming insignificant or inefficient costs. During the following phases of development of the model, the Office will ask for more detailed information regarding spectrum fees, way fees, and other costs which the operators argue should be included, in order to evaluate their relevance for the model. However, the Office is of the opinion that diverting

efforts in modelling costs that represent a negligible part of services' cost would be inefficient and that efforts should be focused on modelling elements with the biggest impact on services' costs. In any case, during the calibration of the model, the OUR will ensure that even negligible cost items which may not have been specifically modelled are reflected in overall costs. This will be done by including a mark-up calculated as the percentage of the costs associated with not-modelled cost items over the total costs of the company.

2.9. The Office agrees with Flow's comment on the flexibility of bottom-up modelling, acknowledging it as one of its main advantages compared to other approaches, and expects to cover all the aspects raised by LIME, which are addressed in the corresponding sections of this document, i.e., Chapter 3 and Chapter 5.

Period of Time Modelled

2.10. Both LIME and Flow agreed with the proposal to model the period 2013-2020 and set the wholesale interconnection rates for 2016-2020.

2.11. The Office acknowledges LIME's and Flow's agreement.

Determination 1: The Office will model the period 2013-2020 and set interconnection rates for 2016-2020.

Data Sources

2.12. LIME stressed the importance of appropriately selecting the information received from operators for certain aspects of the model. This is generally aligned with the proposed process of data gathering, which includes international benchmarks as an alternative source only if sufficient and reliable data are not available from operators. In addition, LIME also proposes that:

- "*Stakeholders should be able to supply data throughout the modelling process as data needs are identified and sources become available*"

- "*Stakeholders must be able to vet any international benchmarks proposed*"

2.13. The Office would like to reaffirm its position that data provided by the operators is the preferred source of data for the model as stressed in paragraph 3.10 of the Consultation Document. However, data provided by the operators will only be used when the numbers are deemed reasonable, consistent with the methodology and well supported by evidence. Exhibit 3.1 of the Consultation Document illustrates the data validation process.

2.14. Regarding the possibility for operators to supply data throughout the modelling process, the Office notes that operators will be able to comment on the data inputted into the model, during the consultation on the model itself. Moreover, the Office expects this to be a dynamic interactive process between operators, as it proposes to "*engage with the operators to facilitate the exchange of information*" (paragraph 3.10 in Consultation Document).

2.15. The Office does not recognise any legal/regulatory bases regarding LIME's proposal for stakeholders to be able to vet international benchmarks, and therefore reserves the right for a final decision on the use of alternative data. In any case, and as mentioned in the above paragraphs, the stakeholders will have the opportunity to provide comments and ask for additions to or adjustments in the data throughout the process. The request for adjustments to the data used in the draft model to be shared with operators should be provided with arguments to convince the Office of the need for the revision.

2.16. Flow noted that international benchmarks, when used, should be "*based on markets similar to Jamaica in key market characteristics, such as size, population and status of market development*".

2.17. LIME agreed with Flow's comments, however, added a note regarding the likely difficulty of finding benchmarks for the kinds of data that the OUR requires based on markets similar to Jamaica.

2.18. The Office acknowledges Flow's concern regarding international benchmarks' appropriateness to Jamaican circumstances, and agrees that these data should be carefully analysed and selected and, if necessary, adapted to the conditions in Jamaica. However, as noted by LIME, the availability of relevant international benchmark data may be limited, due to the various specificities that characterise the Jamaican market. For this reason, in terms of the data provided by the operators, the Office expects "*swift and close co-operation by all operators concerned to ensure the completeness and accuracy of the data gathered*".

Determination 2: The Office will use the information provided by operators as the primary source of data, and international benchmarks' information, deemed appropriate for the Jamaican reality, as the preferred alternative source of data.

Chapter 3: Costs Treatment

Cost Standard

3.1. LIME believes that it is desirable to build a model that is able to capture the Pure LRIC, TLRIC and SAC cost standards. However, note that to be able to obtain the SAC for termination services, as proposed by the OUR in the Consultation Document, the model would need to include the access network, given that "*without the access network, calls could not be terminated*". In any case, LIME does not consider this to be a major issue due to the fact that the Act does not establish any obligation regarding the inclusion of the SAC standard. LIME further acknowledged that "*the OUR has little choice but to apply Pure LRIC*", despite the absence of anti-competitive price distortion in Jamaican fixed market, and agreed with the proposed allocations of joint and common costs for the TLRIC standard.

3.2. The Office disagrees with LIME's affirmation that the model would need to include the access network to correctly represent the SAC for termination services. The SAC standard represents the cost of providing a sub-set of services of the reference operator. The perimeter of the reference operator defined includes only core assets and, therefore, the access network is not included in such perimeter. In the Office's view, the SAC costs should not include assets out of the reference operators' perimeter.

3.3. Flow agreed with the use of the various proposed cost standards in the model.

3.4. The Office acknowledges Flow's agreement.

<u>Determination 3</u>: The Office will capture the three proposed costs standards - Pure LRIC, TLRIC and SAC - in the model, without including the access network in these calculations. Network joint and common costs will be allocated using the Shapley-Shubik approach and the non-network common costs will be allocated using the EPMU.

Costs Elements to be Considered

3.5. LIME is generally in agreement with the cost elements proposed to be included in the model, more specifically, Network Capital Expenditure (CapEx), Network Operational Expenditure (OpEx), and General and Administrative (G&A) Costs, as well as licence fees costs. LIME also noted that the Office should confirm the inclusion of all capitalised costs associated with the installation and operationalisation of investments into Network Capex. Additionally, LIME believes that spectrum and way fees should not be disregarded as they relate to transmission and core costs in the network.

3.6. According to paragraphs 4.19 and 4.20 in the Consultation Document, the Office proposes to include all costs associated with CapEx investments in the network. These costs should refer to all the planning, installation and operationalisation costs associated with the listed Network Capex elements.

3.7. Regarding LIME's comments on the inclusion of spectrum and way fees costs, the Office reaffirms its intention to not specifically model the cost elements that are negligible to avoid diverting efforts that should be focused on more relevant elements. Based on this, and taking into account the concerns demonstrated by LIME regarding the possibility of not including some costs associated with spectrum and way fees, the Office will ask for more detailed information from operators and further evaluate spectrum and way fees' materiality for fixed operations in Jamaica. In the case that these categories are demonstrated to be relevant for the core network, they will be included in the model.

3.8. An additional comment was made by LIME regarding the fact that retail services involving both an access and a traffic component are often provided along a cost structure that differs from the revenue structure. For that reason, the use of percentages of traffic revenues to estimate retail costs for traffic services is not recommended by LIME and should be avoided, unless a more accurate alternative is not found.

3.9. The Office recognises the limitations of estimating retail costs for traffic services based on the percentages of traffic revenues. However, as also stated by LIME, it is still unclear that this approach would cause distortion in the results. In any case, the Office will further investigate other alternatives and, in the case that a more accurate method is found during the model implementation, it will be proposed and consulted on with the operators.

3.10. Flow stressed the importance of adding further discussions on the detailed elements to be included in the cost base for interconnection services. In particular, Flow mentioned billing and invoicing activities that should be included in the model as they are relevant for the wholesale/interconnection services.

3.11. The Office agrees that it is important to have further discussions on the cost elements to be included in the model, which was stressed by Flow. In particular, the Office agrees with the clarification of billing and invoicing activities, as long as information is available and can be provided by Operators.

Determination 4: The Office will include all planning, installation and operationalisation costs associated with CapEx investments in the network. Additional information regarding spectrum and way fees will be sought from operators to evaluate relevance for the model. Alternative methods for calculating retail costs will be further investigated.

Treatment of OpEx

3.12. LIME outlined the importance of clarifying the bottom-up calculation of Network OpEx costs proposed by the OUR, further suggesting that the results of such calculation should be cross-checked with benchmark expense factors. Additionally, LIME showed similar concerns relating to the calculation of G&A costs based on revenues, as in the calculation of retail costs (paragraph 3.8).

3.13. As stated in the Consultation Document, the Office proposes to implement bottom-up calculations for obtaining Network OpEx costs only when such calculations are "*feasible and adequate data is available*". The algorithms to be used are still to be defined and will be subject to consultation as soon as the model is developed. Additionally, the Office's intention is to calibrate the model to ensure that operative costs incurred by the operators in Jamaica are accurately represented. It is also the intention of the Office to look into any activity-based costing system that operators may have available in order to rely on that information for the calibration of the operative costs in the model.

3.14. LIME's concerns regarding the calculation of G&A costs will be addressed based on the same methodology described in the Office's response in paragraph 3.9. This means that the Office will further investigate alternative methods for calculating G&A costs and, in the event that a more accurate method is found during the model implementation, it will be proposed and consulted on with the stakeholders.

3.15. Flow suggested using the information available to the OUR on ratios of OpEx as a percentage of CapEx as a way of checking and balancing bottom-up calculations of OpEx costs, according to the OUR's proposed approach.

3.16. The Office accepts Flow's suggestion as a complementary method for evaluating the appropriateness of bottom-up calculations for Network OpEx costs results. In any case, the Office notes that operators should be able to provide enough cost accounting information that will allow cross-checking with modelled Network OpEx results.

3.17. Commenting on Flow's response, LIME raised doubts regarding the possibility of determining relevant network OpEx as a percentage of CapEx, given the limited disaggregation available in cost accounting. Nevertheless, and since none of the discussed methods for generating Network OpEx estimates represent a perfect solution, including the use of benchmarks as

described in paragraph 3.12, LIME suggests that a combination of the different mechanisms should be used.

3.18. The Office disagrees with LIME's statement regarding the impossibility to determine relevant network OpEx as a percentage of CapEx. Additionally, in the case that the information provided by the operators is not sufficient to calculate a required parameter, information from international benchmarks will be used and the model will be properly calibrated to ensure the accuracy of the results, as described in Chapter 2.

Determination 5: The Office will ask for available cost accounting information from the operators to provide reasonable visibility of the Network OpEx and support calculations in the model. Alternative methods for calculating G&A costs will be further investigated.

Assets Valuation Method

3.19. Both LIME and Flow agreed that the static Current Cost Accounting (CCA) approach is an appropriate choice for valuating assets. Flow also noted its alignment with international best practices for forward-looking calculation of interconnection costs.

3.20. The Office acknowledges LIME's and Flow's agreement.

Determination 6: The Office will implement asset valuation using the static CCA approach.

Consideration of Modern Equivalent Assets

3.21. Despite being generally in agreement with the use of the Modern Equivalent Assets (MEAs) in the model, LIME considers that, with respect to New Generation Network (NGN) technology and transmission, a hybrid approach should be used in order to capture the state of the fixed network for the coming years. In other words, LIME suggested that the model should represent a migration from current legacy and NGN assets to a fully NGN

asset base over the modelling period, to better represent a reasonable technology mix for a new entrant in the Jamaican market.

3.22. Flow agreed with the use of the MEA approach for asset valuation, without any further comments.

3.23. LIME took the opportunity of commenting on Flow's response to reaffirm its disagreement with the use of NGN assets to substitute all assets starting from the first year of the model. LIME argued that the implementation of a hybrid approach is more consistent with the transition from legacy technologies to the correspondent MEA, observed over the course of the modelling period. According to LIME, this hybrid approach would also be in line with the one taken in the Jamaican mobile LRIC model.

3.24. The Office agrees with LIME's position that modelling a network with only NGN assets would not reflect the current state of the incumbent's network. As such the Office will allow a transitioning of the asset to an all NGN network. Further detail on this issue is presented in Chapter 5.

3.25. Additionally, noting the reference to the Jamaican mobile LRIC model, the OUR points out that this is not comparable with the fixed case and should not be used as argument to support the hybrid approach. In the case of mobile, 2G/3G networks are generally implemented as layers providing for different types of service, which are concurrently kept in operation. On the other hand, the transition observed for fixed NGN networks is supposed to fully replace legacy networks at some point in time. In any case, the Office acknowledges the benefits of using this transition modelling approach, especially considering its consistency with Jamaican circumstances.

Determination 7: The Office will implement the MEA in the model using a transition modelling approach.

Annualisation Method

3.26. LIME is in agreement with the use of the tilted annuity approach in the model, due to its economic suitability and ease of implementation. LIME assumed that the following formula will be used for calculating the tilted annuity for assets, based on the OUR's description:

$$\frac{WACC - \Delta p}{1 - \left(\frac{1+\Delta p}{1+WACC}\right)^{Asset\ Life}} \times Asset\ Value$$

where:

- $WACC = the\ weighted\ average\ cost\ of\ capital$;
- $\Delta p = rate\ of\ price\ change$ ("tilt");
- $Asset\ Value = the\ current\ investment\ cost\ of\ the\ asset$;
- $Asset\ Life = the\ useful\ life\ of\ the\ asset$.

3.27. The Office confirms LIME's assumption that the formula used by LIME is the one to be used in the model and has included it in the Methodological Document.

3.28. Flow stated that it will provide comments further in the process, regarding the implementation of tilted annuities in the model.

3.29. The Office acknowledges Flow's intention to provide further comments throughout the process, provided that they do not affect the main methodological choices determined in this Document.

Determination 8: The following tilted annuity formula will be used in the model to be developed: $\frac{WACC-\Delta p}{1-\left(\frac{1+\Delta p}{1+WACC}\right)^{Asset\ Life}} \times Asset\ Value$

Treatment of Working Capital

3.30. In the Consultation Document (paragraph 4.55), the OUR described the three network cost components related to working capital, and if and how they are proposed to be included in the model:

- CapEx working capital, related *"to the fact that an operator requires a certain period of time before equipment can be fully installed and operational, and thus start generating revenues"*
- OpEx working capital, which *"mainly reflects the liquidity that any company must maintain in order to operate all network-related payments swiftly (...) and to finance the gap between the time these costs are incurred and revenues are generated"*
- Retail activities-related working capital

3.31. These topics are discussed in the following paragraphs.

Network CapEx Working Capital

3.32. The OUR proposed to capture the effect of network CapEx working capital using the planning-horizon mechanism.

3.33. LIME asked for additional detail on the "planning-horizon" mechanism, as it was not very clear to the operator whether the OUR is in fact proposing to incorporate CapEx-related working capital, even if not in a separate calculation. In any case, LIME considers that the OUR should adopt the same approach as was implemented for the mobile BULRIC model, where "*annuities are effectively multiplied by an estimated period before an asset is put in service*".

3.34. The Office acknowledges LIME's request for clarifications regarding the proposed planning-horizon mechanism. According to the detailed description

provided in the Consultation Document, the planning-horizon concept represents two different effects:

- "*that the operators usually anticipate the purchasing of network equipment in order to capture the time encompassed between the purchase of a resource and its commissioning*"; and
- "*that the resources are dimensioned to satisfy the demand within a period of time, without requiring capacity upgrades*".

3.35. The Office also notes the fact that this mechanism already incorporates all CapEx-related working capital in the model, confirming LIME's supposition.

3.36. For the implementation of such mechanism, the model will calculate the required elements to satisfy the maximum expected demand within a number of years in the future. This period will include both the time required for purchasing and installing the element and a reasonable time within which no capacity upgrades are required.

3.37. The Office believes that this approach is consistent with the one implemented in the mobile model.

3.38. Flow also questioned the use of the planning-horizon mechanism to incorporate the effect of the network CapEx working capital, showing concern to "*whether this approach would allow adequate recovery of costs in the context such inputs are imported and continuing devaluation*". Additionally, Flow reserves this matter for further consideration and comments to be provided in the next stage of the consultation process.

3.39. The Office confirms that the depreciation method described above will ensure total cost recovery and that the devaluation of the Jamaican Dollar will be taken into account. In fact, the cost inputs of the model will be included using the purchase currency of the elements (for instance Jamaican Dollars (JMD) or United States Dollars (USD)).

Network OpEx Working Capital

3.40. The OUR proposed to model the working capital associated with the network OpEx as a percentage of the OpEx costs for each year, based on data provided by the operators.

3.41. LIME agreed with the proposed approach to include network OpEx working capital, provided that the information from operators indicates a positive working capital. LIME also asked for additional clarifications regarding how the OUR proposes to introduce network OpEx working capital in the model, that is, derived as a percentage of OpEx, but applied as a mark-up to CapEx.

3.42. The Office disagrees with the proposal of LIME that the network OpEx working capital is only included if it is positive. The Office will include network OpEx working capital if it is significant (not negligible), regardless of whether it is positive or negative.

3.43. Regarding how the network OpEx working capital is to be included, the Office does not understand the reference to CapEx, since it will be calculated as a percentage of network OpEx and will be applied as a mark-up to network OpEx.

Determination 9: The Office will include network OpEx working capital as a percentage of network OpEx, independently of its sign.

Retail Working Capital

3.44. The working capital related to retail activities is also considered by the Office, as a relevant element to represent in the model.

3.45. Both LIME and Flow agreed with the inclusion of retail working capital, however, as in the case of network OpEx, LIME noted that only efficient amounts should be taken into account, when the information provided by the operators indicates a positive working capital. LIME assumed that retail

working capital would be derived as a percentage of OpEx, but applied as a mark-up to retail CapEx, and asks for confirmation from the OUR.

3.46. The Office's position is that the retail working capital should be included regardless of its sign as long as it is significant. Additionally, the Office notes that the application of a working capital calculated as a percentage of OpEx, but applied as a mark-up of CapEx, would be inconsistent. Therefore, the Office will apply it as a mark-up of retail OpEx.

Determination 10: The Office will consider retail Working Capital calculated as a percentage of retail OpEx, applied as a mark-up of retail OpEx, independently of its sign.

Chapter 4: Definition of the Reference Operator

4.1. Chapter 5 of the Consultation Document lays out different options for defining the operator to be modelled (i.e., reference operator). The Office will model a reference operator with similar characteristics to the Jamaican incumbent, LIME. This means that the Office will assume the same demand, taking into account international best practices for BULRIC models, as well as the Jamaican reality.

4.2. Both LIME and Flow agreed that the reference operator should be a fixed operator with demand similar to LIME, as proposed in the Consultation Document.

4.3. The Office acknowledges LIME's and Flow's agreement.

Determination 11: The Office will model a reference operator with similar characteristics to the incumbent.

Chapter 5: Network Details

Network Dimensioning Optimisation Approach

5.1. LIME agreed that the model should be based on a yearly approach, for dimensioning the network in the derivation of services costs for each year, highlighting its consistency with the mobile LRIC proceeding. However, LIME showed concern regarding the implementation of the forward-looking filtering tool mentioned in Question 13 of the Consultation Document. LIME requested additional details from the Office on what it means by forward-looking filtering tool, as well as the opportunity to stakeholders to comment and modify this approach if deemed inappropriate.

5.2. The Office agrees to provide additional information on the description of the proposed forward-looking filtering tool. The attached methodology includes further detail and examples of this mechanism. During consultation on the model, operators will be allowed to comment on the appropriateness of the forward-looking filtering tool. After such consultation, the filtering tool can easily be removed if necessary.

5.3. Flow considers that the historical approach should be used for services where traffic levels decline over the modelling period. According to Flow, both the yearly and historical approaches give similar results when traffic increases along the years, but differ with declining traffic, as the associated unit cost would tend to increase. The historical approach would more accurately reflect the expected unit cost movements in those situations, as stated by Flow.

5.4. LIME understood that Flow's interpretation of the proposed yearly and historical approaches differs from its own interpretation, as both approaches should lead to divergent results irrespective of whether the volumes are increasing or decreasing. LIME reaffirmed the importance of clarifying the discussion of this issue, as stated in its first round response to the Consultation Document.

5.5. The Office confirms the view of LIME that both approaches may in general lead to divergent results irrespective of whether the volumes are increasing or decreasing. Even though the traffic is increasing, the historic approach will base the optimisation on the network installed in previous years and that may differ from the optimum network, although the differences in the results in these cases tend to be small.

5.6. Regarding the implementation of historical approach when traffic is declining, the OUR disagrees with Flow's views, since this approach will lead to a non-optimum network.

Determination 12: The Office will use a yearly approach for network dimensioning and optimisation.

Fixed Services and Increments

5.7. LIME agreed with both the list of services and the grouping of services into increments proposed in the Consultation Document.

5.8. The Office acknowledges LIME's agreement.

5.9. Flow considers the proposed list of services as a "*useful starting point*", however reserves further comments regarding the service groupings into increments, referring to the considerations made on the modified scorch node approach for Fixed Network modelling.

5.10. The Office understands that Flow generally accepts the proposed list of services, though keeping some reservation due to the lack of definition regarding some issues in the model. However, the Office also notes that the services and corresponding groupings into increments are not expected to change significantly, even when a clearer view of the network is available.

5.11. Based on the responses to the data request the Office has modified the list of services to be included in the model which can be found in Annex I of the Methodological Document. Given that the model is for a generic operator,

the service 1888-CALL-CWJ will instead be categorised as Calls to Own Freephone in the model. It seems that National Collect service is no longer offered and will be removed from the list of services. The Leased Line Other service was also removed from the list of services since no information was provided by operators for other types of leased lines services. Also, the remaining leased line services have been renamed as follows:

- Total leased lines capacity (Intra-parish) – traffic travelling "inside" the same tandem exchange
- Total leased lines capacity (Inter-parish) – traffic travelling between different tandem exchanges
- Total leased lines capacity (core node-international) – traffic to international

Determination 13: The Office will consider the list of services outlined in Annex I of the Methodological Document.

Fixed Network Design

5.12. In the Consultation Document, the OUR outlined three main issues related to the design of the modelled fixed network:

- Boundary between access and core networks;
- Network topology design; and
- Technologies to be modelled.

5.13. These aspects are detailed below.

Boundary Between Access and Core Networks

5.14. The OUR proposed to separate the fixed network into two main blocks, access network and core network. The line card is considered an appropriate

boundary between the two parts, ensuring appropriate inclusion of resources that are relevant to the model (i.e., not related to the provision of access services).

5.15. LIME considered that "*the technology configuration and manner of deployment of the access network influences the costs of the core network and therewith the costs of traffic services*". Despite agreeing with the proposed point of demarcation between the access and core parts of the network, LIME disagreed with the statement that the access network is irrelevant for the model (Exhibit 6.1 in Consultation Document).

5.16. The Office understands LIME's point that many aspects of the access network, such as technology configuration and deployment, influence the costs of the core network and that these should be reflected in the model. However, the Office notes that this should not imply that the whole access network has to be included in the model, as stated by LIME. The decision of using a modified scorched node approach (paragraph 6.20 of the Consultation Document) ensures that the influence of the access network is taken into account. By "irrelevant" the Office means that the costs of the access network are not relevant for the exercise of costing interconnection and traffic services and, therefore, these costs will not be included in the model.

Determination 14: The Office will use a modified scorched node approach to model the fixed network, without including the assets associated to the access (below line card).

Network Topology Design

5.17. Regarding the location of the nodes of the network to be modelled, the Office proposes to use a modified scorched node approach, where the geographical locations of the main access nodes from LIME will be taken as a starting point for the modelled network, and then adjustments may be done where inefficiencies are detected. Moreover, the Office notes that additional

information regarding the network topology will be needed if a merged LIME/Flow network is to be modelled.

5.18. LIME considered OUR's proposal for a modified scorched node approach to be problematic for the reasons stated below:

- Proposed core technology assumptions imply modifications to the current location and number of access nodes that cannot be directly obtained from the current state of the network. LIME proposed to multiply the number of traditional access nodes by a factor that represents the typical number of Multi-Service Access Node (MSAN) locations that are installed to substitute one Time-division multiplexing (TDM) access node.

- The meaning of the "*main access nodes from LIME*", that will serve as a starting point for the geographical locations of the modelled network, should be clarified so as to avoid referring to an undersized portion of the network.

- The use of Flow's access node data, in order to incorporate the effect of a merged network, may be misleading as its network is not directly comparable to LIME's. The OUR should clarify how it proposes to consider Flow's access network.

5.19. Flow pointed out the uncertainty resulting from building the model using a modified scorched approach with LIME's network, in the current context of an impending merger between LIME and Flow. Given the likelihood of a changed network topology, consisting of a mix of both TDM and NGN technologies, Flow stresses the importance of understanding how this merged network may look some years from now before starting to implement the model.

5.20. In response to Flow's comments, LIME doubts the possibility of obtaining relevant information regarding the merger plan in the short period before the Office has to take a position on the final network configuration. That being

said, and without an official long-term plan for the final network configuration agreed between both operators, LIME claims that "*simply setting the LIME and FLOW network configurations side-by-side and guessing what a merged network might look like would be a very inadvisable exercise*" and recommends that only LIME's network be used as the reference for the model.

5.21. Regarding the impact of the migration to NGN in the number of access nodes, the Office disagrees with LIME's view that such migration requires by definition the increase of access nodes, since equivalent services may be provided with newer technologies while keeping the existing locations.

5.22. However, the Office recognises that while migrating the network to NGN, operators tend to shorten the copper loops (by increasing the number of nodes) to improve the quality of services provided (such as maximum broadband bitrate). The Office's position is that this fact should be taken into account in the context of Jamaica and that a progressive increase in access nodes should be considered in the model. This aspect will be included in the model and its considerations will be subject to consultation together with the model.

5.23. Regarding the term "main access nodes from LIME", the Office means the nodes where the subscriber's copper loops are connected. These nodes would include the locations of local exchanges, remote exchanges, Digital Subscriber Line Access Multiplexers (DSLAMs) and MSANs.

5.24. Finally, regarding the consideration of the merger between LIME's and Flow's networks, the Office acknowledges the concerns described by both operators. The Office agrees that it is still too soon to understand how such a merger would affect the network topology and trying to include such an effect in the model would be a theoretical exercise. Such an exercise would include in the analysis a number of hypotheses with relevant impacts on the results. Therefore, the Office believes it to be more conservative not to consider the

merger at this point. In the case that the merger is completed and it significantly affects the network topology, the Office will revisit the model to ensure it accurately represents the fixed market in Jamaica.

Determination 15: The Office will consider a progressive increase of access nodes, for the implementation of the modified scorched node approach.

Technologies to be Modelled

5.25. Regarding the core network technology, the OUR proposed an all-IP core network with media gateways to provide TDM connectivity for connection with traditional networks.

5.26. LIME disagrees with this approach for the reasons stated below:

- The TDM legacy network still carries the majority of the fixed voice traffic in Jamaica.
- Lack of benchmarks clearly supporting this aspect of LRIC modelling.
- Inconsistency with the approach taken in the previously developed Jamaican mobile LRIC model.

5.27. The Office understands LIME's concerns regarding the current situation between legacy and NGN networks in Jamaica and accepts it as a relevant argument against the implementation of an all-IP core network for voice carriage in the model. Notwithstanding, the LRIC model should be based on an efficient network and would therefore not have legacy equipment. It should also be noted that, as already mentioned in the Consultation Document, legacy equipment is being increasingly phased out by incumbents around the world and such equipment is not easily available in the market.

5.28. LIME proposed the implementation of a TDM to NGN migration profile into the model, more consistent with the reality of Jamaican deployment and the

previous mobile LRIC model. Using this approach, all traffic would end up in the NGN core, but a certain proportion of legacy nodes would still be retained linked to the IP core. This proportion would diminish over the modelling period.

5.29. The Office disagrees with the relevance of LIME's argument regarding consistency with the previous mobile LRIC model, for the same reasons as stated in paragraph 3.25. Technology deployment profiles used for assets valuation are not directly comparable between fixed and mobile networks and should not be used as argument to support the hybrid approach.

5.30. In line with the previous considerations regarding the use of the MEA approach for asset valuation, and agreeing with LIME's argument that the implementation of an all-IP core network would not realistically represent the current state of the incumbent's fixed network, the Office accepts LIME's proposal to implement a TDM to NGN migration profile into the model, where the initial proportion between legacy and NGN nodes would diminish over the modelling period. Such profile will be the subject of further discussion during consultation on the model itself.

5.31. Regarding the transmission technology, the OUR proposed to consider Native Ethernet fibre transmission and Ethernet over Wavelength Division Multiplexing (WDM) technologies, and the microwave links should be used for the connection of remote nodes.

5.32. Following the same line of thought as for the core network technology, LIME disagreed with this approach presenting the following reasons:

- The fact that most of core network transmission supporting voice traffic in Jamaica is still Synchronous Digital Hierarchy (SDH), and not Ethernet or WDM.

- There is no clear benchmark supporting this approach.

- Proposed approach is inconsistent with the approach taken for the previous Jamaican mobile LRIC model.

- Not clear what methodology the OUR is proposing for assuming different technologies.

5.33. As for the case of the core network technology, LIME proposed a hybrid approach, where SDH fibre is used between TDM access nodes and the core, and both Ethernet and WDM technologies for the remaining links. According to LIME, this mix of technologies is also implying that, as TDM access nodes are migrated to MSANs, the transmission will progressively migrate from SDH to the same technology as the IP network.

5.34. Since the Office has agreed to the implementation of a progressive migration to NGN core technology, the Office believes that for consistency, a migration in transmission technology should also be considered. Therefore, the Office also accepts LIME's proposal to implement a migration profile for transmission technologies into the model.

5.35. LIME also notes that additional details concerning network configuration, in particular configuration of the core layer and derivation of ducts and fibre lengths, should be provided by the OUR, as well as the opportunity to comment on them before the model implementation.

5.36. The core transmission links and the corresponding fibre and duct distances, consistent with the Modified Scorched Node approach, will be based on the real links installed in LIME's network, unless inefficiencies are found.

Determination 16: The Office will use a modified scorched node approach to model the fixed network, without including the access network. In addition, migration profiles will be used to model the core and transmission technologies of the network.

Chapter 6: Glide Paths, Price Gradients and Charging Basis

Use of Glide Paths

6.1. LIME disagreed with the proposed approach for implementing the glide path for adjusting termination rates from the TLRIC to the Pure LRIC values, regarding the following aspects:

- The OUR should not assume that termination rates generate unusual profits for LIME simply because they are higher than the TLRIC rate obtained for an optimised network.
- Absence of explanation regarding the proceedings for the cases where existing termination rate is below the TLRIC.
- According to the glide path defined for the mobile termination rate, the glide path adjustment period for fixed termination rates should be capped to three (3) years.

6.2. Flow presented concerns regarding OUR's definition of a "significant difference" between existing termination rates and the TLRIC rate. According to the operator, a better approach would be to first determine the rates resulting from the modelling exercise and use the information on the actual observed differentials to arrange for further consultation on glide paths.

6.3. LIME is not opposed to Flow's proposal to wait for the model results before consulting on the final glide paths. However, LIME considers that two principles should be set out in advance:

- "*The adjustment should take place over a three (3) year period*".
- The TLRIC rate should be set as an intermediate step between the existing rate and the Pure LRIC.

6.4. The Office however disagrees with LIME that termination rates higher than the TLRIC rate do not generate unusual profits. The model will estimate an efficient operator's cost of providing termination service. Consistent with the position in the mobile LRIC process, the Office will only consider a glide path from the TLRIC rate to the Pure LRIC rate. According to the Act, rates should be cost oriented. If the current termination rate is above the TLRIC rate estimated by the model then that means operators would have already reaped significant benefit from having a termination rate which is above cost. The Office is cognisant of the need for rates to be quickly aligned with costs to be compliant with the stipulations of the Act and to curtail the negative effects of having a fixed termination rate which is above cost.

6.5. The Office therefore acknowledges both operators' concerns regarding the definition of glide paths and is in general in agreement with Flow's proposal to only decide on the final glide paths after the results for the modelled rates have been reviewed. However, as stated in the Consultation Document, the Office will only consider a glide path up to a maximum of two years.

Determination 17: The Office may resort to glide paths for adjusting termination rates, the exact length of which will only be defined after reviewing the rates from the modelling exercise.

Use of Gradients

6.6. LIME disagreed with the proposal to remove the gradient of peak and off-peak pricing, presenting the following reasons to support its opposing position:

- A more economic use of the network is encouraged with peak/off-peak price gradient.
- Modelling for a single price point is problematic as debatable assumptions on busy hour voice traffic would have to be developed to reflect the case if the price gradient had not existed.

- Keeping the existing price structure is consistent with international best practice.

6.7. Flow agreed with the removal of day differentials for interconnection rates, for simplification purposes.

6.8. LIME commented on Flow's response, reaffirming its opposition to the removal of peak/off-peak price gradients. LIME also highlighted the fact that, while Flow did not present any arguments to justify its agreement, "*compelling reasons*" have been presented in LIME's first round submission not to eliminate gradients for fixed interconnection rates.

6.9. The Office reaffirms its position that time of day differentiation between interconnection rates will not be allowed. This decision follows the arguments provided in the Consultation Document (paragraph 7.6), stating that the interconnection rates should have similar gradients as in existing retail prices, to avoid undesirable opportunities for price arbitrage. It should also be noted that despite LIME's argument in favour of price gradients, it does not use gradients in its retail prices. Gradients were also not used by Flow. Additionally, as stated by Flow, the Office also notes the importance of simplifying the charging structure as an additional argument for this decision.

6.10. On the other hand, although the use of gradients is not uncommon in international practice, there is a trend to eliminate such differentiation in fixed interconnection charges.

Determination 18: The Office will not allow peak/off-peak price gradients for fixed interconnection rates.

Charging Basis

6.11. LIME does not oppose the transition to a charge basis that is only duration based. However, LIME noted that the OUR must ensure that "*all the cost*

components included in the derivation of the current interconnection specific, calls set-up and call duration charge are covered in the new duration charge".

6.12. The Office acknowledges LIME's concern related to the inclusion of relevant cost components in the model and reaffirms its reiterated intention to include all network efficient costs in the model.

6.13. Flow agreed with the proposal to charge for fixed interconnection using only duration per minute billed on a per second basis.

6.14. The Office acknowledges Flow's agreement to the proposed charging basis.

Determination 19: The Office will implement fixed interconnection charges using only duration per minute billed on a per second basis.

Charges Structure

6.15. LIME is not opposed to moving to a two-level set of charges, as long as the new structure does not disadvantage the interconnection service provider.

6.16. Flow is also in agreement with the simplification of the charging structure to a two-level set of charges. In addition, Flow noted the fact that, with the introduction of NGN, the number of interconnection points would be reduced and therefore expected a simplified charging structure.

6.17. LIME does not consider that the number of interconnection points is particularly relevant to promote a change in the charging structure. LIME stated that it is still not clear that the number of total points of interconnection will be reduced, considering the impending merger and NGN migration. Also, and since the current charging structure was implemented before Flow was created, it may happen that the number of interconnection points is reduced to the same number as when the interconnection regime was first created.

6.18. The Office maintains its position to keep to a charging structure with two (2) levels (Local and National/Regional), even considering the legacy to NGN transition of the network.

Determination 20: The Office will define two charges which depend on the interconnection level (1 - local and 2 – National/regional).

Annex A. : Glossary

BULRIC	Bottom-up Long Run Incremental Costing
CapEx	Capital Expenditure
CCA	Current Cost Accounting
DSLAM	Digital Subscriber Line Access Multiplexer
EC	European Commission
EPMU	Equi Proportional Mark-Up
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

Annex B.: List of Determinations

Determination 1: The Office will model the period 2013-2020 and set interconnection rates for 2016-2020.

Determination 2: The Office will use the information provided by operators as the primary source of data, and international benchmarks' information, deemed appropriate for the Jamaican reality, as the preferred alternative source of data.

Determination 3: The Office will capture the three proposed costs standards -Pure LRIC, TLRIC and SAC - in the model, without including the access network in these calculations. Network joint and common costs will be allocated using the Shapley-Shubik approach and the non-network common costs will be allocated using the EPMU.

Determination 4: The Office will include all planning, installation and operationalisation costs associated with CapEx investments in the network. Additional information regarding spectrum and way fees will be sought from operators to evaluate relevance for the model. Alternative methods for calculating retail costs will be further investigated.

Determination 5: The Office will ask for available cost accounting information from the operators to provide reasonable visibility of the Network OpEx and support calculations in the model. Alternative methods for calculating G&A costs will be further investigated.

Determination 6: The Office will implement asset valuation using the static CCA approach.

Determination 7: The Office will implement the MEA in the model using a transition modelling approach.

Determination 8: The following tilted annuity formula will be used in the model to be developed: $\frac{WACC-\Delta p}{1-\left(\frac{1+\Delta p}{1+WACC}\right)^{Asset\ Life}} \times Asset\ Value$

Determination 9: The Office will include network OpEx working capital as a percentage of network OpEx, independently of its sign.

Determination 10: The Office will consider retail Working Capital calculated as a percentage of retail OpEx, applied as a mark-up of retail OpEx, independently of its sign.

Determination 11: The Office will model a reference operator with similar characteristics to the incumbent.

Determination 12: The Office will use a yearly approach for network dimensioning and optimisation.

Determination 13: The Office will consider the list of services outlined in Annex I of the Methodological Document.

Determination 14: The Office will use a modified scorched node approach to model the fixed network, without including the assets associated to the access (below line card).

Determination 15: The Office will consider a progressive increase of access nodes, for the implementation of the modified scorched node approach.

Determination 16: The Office will use a modified scorched node approach to model the fixed network, without including the access network. In addition, migration profiles will be used to model the core and transmission technologies of the network.

Determination 17: The Office may resort to glide paths for adjusting termination rates, the exact length of which will only be defined after reviewing the rates from the modelling exercise.

Determination 18: The Office will not allow peak/off-peak price gradients for fixed interconnection rates.

Determination 19: The Office will implement fixed interconnection charges using only duration per minute billed on a per second basis.

Determination 20: The Office will define two charges which depend on the interconnection level (1 - local and 2 – National/regional).

Annex C.: Methodological Document

Office of Utilities Regulation

Cost Model for Fixed Termination Rates – Principles and Methodology

Methodological Document

OUR

OFFICE OF UTILITIES REGULATION

Publication Date: July 1, 2015

Table of Contents

Abstract

This Methodological Document has been prepared as a result of the discussion and consultation on the approach that the Office of Utilities Regulation ("OUR" or "the Office") will take in the development of a cost model to calculate the cost of wholesale fixed interconnection services, in accordance with the requirements of the Telecommunications Act (the "Act").

The Act stipulates that prices shall be established:

- Based on forward looking long run incremental cost[2] for fixed termination.
- Between the total long-run incremental cost ("TLRIC") and the stand alone cost (SAC) in the case of other interconnection services.

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

Chapter 1: Legal and Regulatory Framework

1.1. As part of its overall functions to regulate specified services and facilities under section 4(1) of the Act, and in keeping with its express power to determine the rates which 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"), the OUR is authorised to determine the prices charged by telecommunications operators for the provision of interconnection services.

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.*"

1.2. 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.

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

1.4. 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 provision of telecommunications services".

1.5. The Act grants the OUR specific powers with regard to the determination of tariffs charged for interconnection services. Sections 29 (4)(a) and (5) 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 -

(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."

1.6. The Act at section 30 requires that dominant public telecommunications carriers provide interconnection in accordance with various principles. 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".*

1.7. 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 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; and

(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."

1.8. In keeping with its express statutory powers to determine the charges for interconnection services as mentioned above, the OUR initiated a consultation process in January 2015 to decide on the principles and methodology to develop a cost model to determine costs and associated charges for wholesale fixed interconnection services.

Chapter 2: Introduction

2.1. Having determined that Cable & Wireless Jamaica Limited ("LIME") is dominant with respect to the fixed call termination service offered and given the mandatory requirement that interconnection tariffs must be cost oriented, the OUR needs to ensure that the charges imposed for this service conform to statutory requirements. While LIME is currently the only operator which has been found dominant with respect to fixed call termination service, the model to be developed will estimate a cost for interconnection services for a generic fixed line operator such that the rates from the model can be applied to any fixed network operator found to be dominant in the future. That is, the model will not calculate a cost specifically for LIME's fixed network.

2.2. The OUR will develop a cost model to determine the cost oriented rate for interconnection services. "Cost orientation" covers a range of costing standards. The purpose of this methodological document is to set out in detail the approach the OUR will take with respect to determining cost oriented rates and to seek comments on this approach. The Document addresses such issues as:

- Chapter 3: General Characteristics of the Model, including:
  - Whether a top-down or a bottom-up model should be used.
  - What period of time will be modelled.
  - Which sources of information will be used to populate the model.
- Chapter 4: Costs Treatment, including:
  - How costs will be allocated to services.
  - How common costs will be allocated to services.

- Which costs should be included.
- How the operating expenditures will be calculated.
- How capital expenditures will be calculated and annualised.

- Chapter 5: Definition of the Reference Operator, including which operator will be modelled.

2.3. 4.1Chapter 5 of the Consultation Document lays out different options for defining the operator to be modelled (i.e., reference operator). The Office will model a reference operator with similar characteristics to the Jamaican incumbent, LIME. This means that the Office will assume the same demand, taking into account international best practices for BULRIC models, as well as the Jamaican reality.

2.4. Both LIME and Flow agreed that the reference operator should be a fixed operator with demand similar to LIME, as proposed in the Consultation Document.

2.5. The Office acknowledges LIME's and Flow's agreement.

<u>Determination 11</u>: The Office will model a reference operator with similar characteristics to the incumbent.

- : Network Details, including:
  - What should be the main characteristics of the network modelled
  - What services will be offered by the modelled operator
  - How the increments will be defined

- Chapter 7: Glide Paths, Price Gradients and Charging Basis, including:
    - Whether different prices should be set for peak and off-peak times
    - Whether the change in prices should be introduced through a glide path
    - What should be the charging basis for the fixed termination rate

2.6. The OUR will proceed with the development of a suitable model, according to the principles and methodology defined in this document. The results will be sent to the operators for comment and thereafter the OUR will determine the wholesale interconnection rates for a period of five (5) years (from 2016 to 2020), taking account of any further comments from the operators.

Chapter 3: General Characteristics of the Model

Main Modelling Approach

3.1. There are two different types of models that may be used:

- **Top-down long run incremental cost models:** The main inputs of these models are the costs of the company from the general ledger (both OpEx and CapEx). Based on a number of steps (generally 2-3) and a number of allocation criteria, these costs are distributed between the final services. Top-down models ensure full calibration with the costs of the operator but do not allow forecasting and have limited power to identify inefficiencies. These models are not able to calculate the costs for theoretical operators.

- **Bottom-up long run incremental cost (BULRIC) models:** The calculations are based on a set of basic inputs (e.g. demand, coverage, geographical and technical information). Based on a number of engineering rules, the network is modelled from scratch and the number of network elements obtained. The cost of the network is calculated based on the network elements and their unitary costs, which are allocated to the services based on certain criteria. This approach does not calibrate exactly with the financial accounts of the operator, but it can be properly calibrated to accurately represent the operations in the country. Bottom-up models allow the calculation of forecasts, what-if analysis, different scenarios, etc. Additionally, the model is able to obtain the costs of a reference operator that is not exactly the same as one of the operators in the market (theoretical operator). However, certain non-network costs can be difficult to model in a bottom-up approach (especially retail costs).

3.2. The OUR will develop a bottom-up model.

3.3. The reasons for this approach include the following:

- Compared to top-down models, bottom-up models are more amenable to sensitivity analysis.
- Bottom-up models offer greater transparency than a top-down approach as the inputs, engineering rules and assumptions used in a bottom-up engineering model are all visible and can be more objectively tested. Transparency and visibility are important to help address the information disadvantage that the regulator has compared to the regulated operators.
- Bottom-up models are flexible to accommodate realistic costs faced by providers of fixed wholesale interconnection services.
- Bottom-up models are state of the art according to the European Commission's Recommendation.
- In developing the bottom-up model, the OUR will take account of whatever top-down information is provided by the operators and will make sure that bottom-up models are realistic. With this approach, the most important limitation of bottom-up models (see above: *"does not calibrate exactly with the financial accounts"*) will be neutralised.
- The OUR is not convinced that the fixed operators in the Jamaican market have in place reliable and updated regulatory cost accounting (top-down) systems. Given this consideration, a bottom-up model is the most practicable approach.

3.4. The OUR is cognisant that in its Recommendation on Regulatory Treatment of Fixed and Mobile Termination Rates in the EU, of 7 May 2009, the European Commission emphasized the potential discrepancies between theory and the actual results from the bottom-up modelling. Furthermore, current Jamaican circumstances raise issues of potential cost omission and

distortion due to the absence of relevant information on the current reality of the networks deployed, in particular regarding disaggregated financials.

3.5. To minimise the effect of these potential drawbacks, the OUR, following the same EC's recommendation, and given the lack of complete top-down data from operators in Jamaica, will take into account as much as possible, available information from the operators to check consistency of bottom-up results.

3.6. Additionally, the model to be developed will be subject to consultation with the operators. The OUR expects that the operators will be able to provide valuable comments on the model to ensure that no relevant costs are omitted.

Period of Time Modelled

3.7. Given that the unit costs of services calculated depend on the demand at a specific point in time, the period of time modelled will be crucial in the scope of the possible analyses of the model's results.

3.8. The model should include, at least, one past year to allow a proper calibration with the reality of the telecommunications operations in Jamaica.

3.9. Therefore, the OUR considers that a time frame starting in the year 2013 (which is the last full financial year) would ensure the proper calibration of the model.

3.10. OUR proposes to determine wholesale interconnection rates for a period of five years. Taking into account that the model is expected to be ready at the end of 2015, the OUR will determine the wholesale interconnection rates for the period 2016 to 2020.

3.11. Consequent on the above reasoning, the OUR has decided that the LRIC model will cover the period 2013-2020, with interconnection rates set for the period 2016 - 2020.

Data Sources

3.12. BULRIC models require a significant number of inputs to be able to model the network accurately and to reliably represent the specificities of the Jamaican market. Data required include inter alia, information about traffic volumes, traffic statistics and patterns, number of network elements, location of network sites, network dimensioning rules or CapEx and OpEx unit costs.

3.13. The OUR plans to use the information provided by the operators as a primary and preferential source to populate and calibrate the BULRIC Model. To do so, the OUR will issue one or more data requests and will engage with the operators to facilitate the exchange of information. The OUR expects timely responses and good cooperation from all operators to ensure the completeness and accuracy of the data gathered.

3.14. Data provided by operators in this process will be regarded as confidential by the OUR, unless other treatment is justified. Information which is already in the public domain will not be considered as confidential.

3.15. In cases where data are not available, or not provided by the operators, the OUR will resort to the use of international benchmarks as the preferred alternative data source.

3.16. In cases where a particular piece of data provided by the operators is not considered sufficiently reliable by the OUR (for instance, in the case of a material deviation versus the international norm, or in the presence of large variations in the values provided by different operators) the OUR will communicate this to the operator to afford an opportunity to justify the value provided with supporting evidence. In the event that such justification is not

deemed acceptable, and the provided data are not considered to be sufficiently reliable, the OUR may resort to the use of international benchmarks as the preferred alternative data source.

3.17. The OUR will provide the opportunity to operators to comment and ask for adjustments to the final data to be inputted into the model. This will be done via public consultation before the final version of the model is closed.

3.18. The illustration below shows the decision tree the OUR will apply in determining the appropriate data sources for the implementation of the BULRIC model.

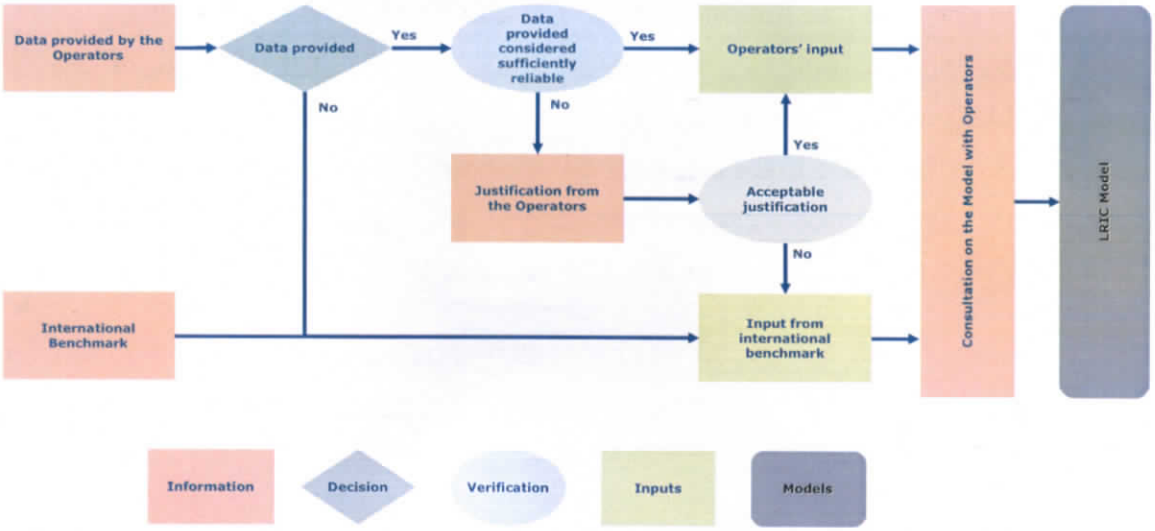

Exhibit 3.1 Diagram of OUR's data revision process. [Source: Axon Consulting]

3.19. The BULRIC model is planned to cover a period up to the year 2020 (see section "

3.20. Period of Time Modelled") and, therefore, forecasts are required, especially for traffic demand. In the opinion of the OUR, the operators are the most appropriate source of this kind of information as demand forecasting is an activity required for the preparation of business plans.

3.21. However, the reasonability and feasibility of the forecasts provided by the operators will be assessed by the OUR to ensure they are aligned with recent and expected market trends. In instances where the forecasts provided are considered unreliable, the OUR will use its own knowledge of the Jamaican market to estimate a reasonable level of demand for future years.

3.22. The OUR will however as a first choice, rely on the forecasts developed by the operators as the primary and preferential source of future data for the development of a BULRIC model.

Chapter 4: Costs Treatment

Cost Standard

4.1. The selected standard for network costs is a key issue in wholesale service costing. The methodological approaches that are more commonly followed for distributing network costs to services are outlined below:

- **Fully Allocated Costs (FAC):** this methodology attributes all the network costs (including common and joint costs) to services, based on the utilisation each service makes of the different network assets.

- **Pure Long Run Incremental Costs (Pure LRIC):** this methodology calculates the costs that would be saved if certain services, group of services or activities (defined as an increment) were not provided (avoidable costs). These incremental costs are aligned with the variable costs in the long run. Using this approach, neither common costs, nor joint costs are allocated to the services.

- **Long Run Incremental Costs plus Common Costs (LRIC+)**: unlike the pure LRIC approach, this allows the recovery of common and joint costs that are not incremental to any given service. This approach corresponds to the TLRIC standard defined in the Act.

- **Stand Alone Costs (SAC):** it calculates the costs of a network developed to provide only a group of services (increment).

4.2. As described in Chapter 1, the Act specifies that interconnection rates (with the exception of termination) should be between TLRIC (LRIC+) and SAC.

4.3. In the case of termination services, the Act states that the charge should be based on the avoidable costs (Pure LRIC).

4.4. Based on the constraints of the Act, the OUR needs information about service costs under the three standards (Pure LRIC; LRIC+ and SAC). Therefore, the BULRIC model will include these three standards.

4.5. In the case of the LRIC+ standard, it is important to define how the common and joint costs are allocated to the services. The following subsections address this topic under two categories:

- Allocation of common and joint network costs
- Allocation of common and joint non-network costs

Allocation of Common and Joint Network Costs for the LRIC+ Standard

4.6. As indicated earlier, the LRIC+ cost standard incorporates a fair share of common and joint costs. Thus, a methodology needs to be defined to establish the criteria that will be employed for cost allocation to services; in other words, to define what 'fair share' of these costs each specific service should bear.

4.7. The OUR has identified a number of potential methodologies that can be used for the allocation of common costs:

- **Equi-Proportional Mark-Up (EPMU)** - allocating common and joint costs to services in proportion to their incremental costs. This method is commonly used and it is simple to implement.

- **Efficient Capacity**[3] - allocates common and joint costs based on the capacity used by each service at the busy hour.

[3] Also called required capacity.

- **Shapley-Shubik** - consists of setting the cost of a service equal to the average of the incremental costs of the service after reviewing every possible order of arrival of the increment.

- **Ramsey Pricing** - recovers common costs from the services, based on the services' relative marginal cost of production and price elasticity.

4.8. The Ramsey Pricing approach is generally perceived as the most relevant approach in economic terms for common costs recovery, however the high level of complexity and data involved in its calculation have proven to be a considerable burden in its implementation. No national regulatory authority (NRA) is known to have adopted this approach in practice.

4.9. Alternatively, the EPMU approach is commonly employed as a considerably more workable solution. While the EPMU approach has the advantage of simplicity, it may also present severe limitations, particularly in cases where common and joint costs represent a significant amount of the cost base.

4.10. A major difficulty using the EPMU approach may arise when there are common and joint costs that may be common to several increments, but may not necessarily be relevant for all services. This is often the case of common and joint costs related to the network. The following exhibit illustrates this phenomenon in the particular case of a fixed BULRIC model, showing how there are different types of common and joint costs that may be relevant to different increments and services:

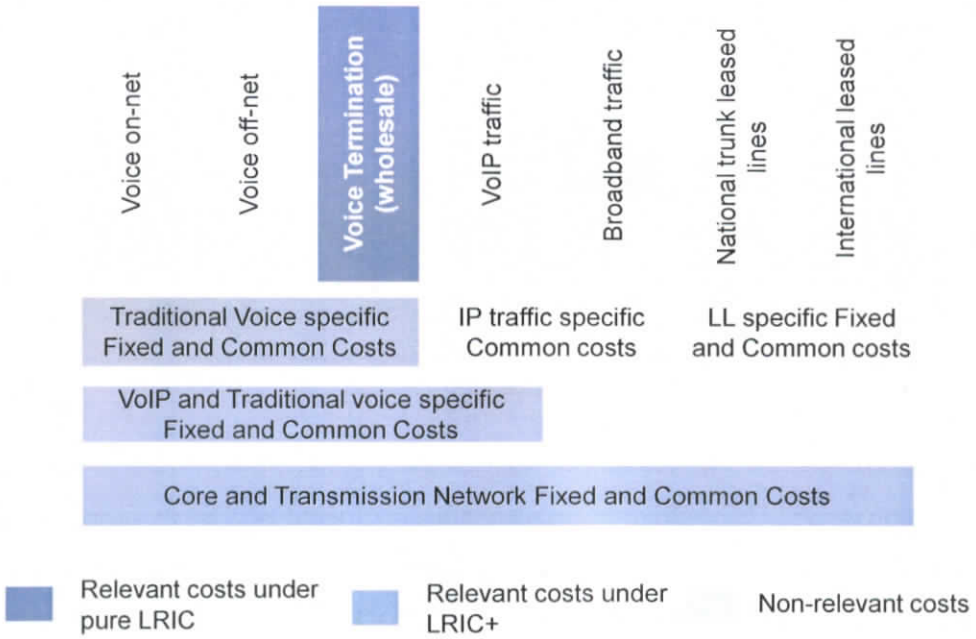

Exhibit 4.1: Example of relevant incremental costs under both the pure LRIC and LRIC+ standards of fixed voice termination [Source: Axon Consulting]

4.11. It would be inaccurate, in such cases, to allocate all common and joint costs indiscriminately based on a simple mark-up of purely incremental costs. A potential solution to this problem is the use of combinatorial analysis, by which different combinations of increments are run to more accurately identify those costs that are common, only to a sub-set of increments or services. This, however, results in a significant complication in the design of the BULRIC model and reduces transparency of cost calculations.

4.12. Based on the above, the most appropriate methodologies for the allocation of common and joint network costs are 'efficient capacity' and Shapley-Shubik.

4.13. During the consultation processes issued in the context of the LRIC model for mobile networks, there was a debate to decide which of these methodologies is more appropriate. In the determination notice "Determination Notice for Cost Model for Mobile Termination Rates" Document Number: TEL2012001_DET001 published on 24th July 2012, the OUR concluded:

"the 'required capacity' approach may not favour the development of new services that are heavy consumers of bandwidth, the Office believes that the Shapley Shubik approach is worth being implemented when calculating the TLRIC rate. This method can provide more stability to operators' revenues and is more forward looking."

4.14. On the other hand, it is important to note that the implementation of the Shapley-Shubik approach implies higher modelling complexity. Despite the higher complexity, the OUR believes that the Shapley-Shubik approach is more appropriate. Moreover, applying this methodology in the model for fixed termination would ensure consistency with the methodology applied in other models used by the Office. Therefore, the OUR will consider the Shapley-Shubik approach for the allocation of network common and joint costs to services.

Allocation of Non-Network Common Costs for the LRIC+ Standard

4.15. The OUR will include general and administrative (G&A) costs as part of the cost base to be considered in the BULRIC model.

4.16. Unlike network-related common and joint costs, those common costs related to G&A are normally only relevant to a particular set of services. Establishing a measure of 'efficient capacity' for such costs is often not obvious. The OUR will then employ an EPMU to allocate G&A common costs to services under the LRIC+ standard.

Costs Elements to be Considered

4.17. BULRIC models may include a number of cost elements, which can typically be classified within the following groups:

- Network CapEx
- Network OpEx

- Licences, frequency usage fees and way fees
- Retail costs
- G&A costs

4.18. The categories listed above are analysed in the following sections:

Network CapEx

4.19. Network CapEx includes the investments made by the operators for developing the network. More specifically:

- Network equipment purchasing (for example, switches), including related software;
- Network infrastructure (for example, network buildings, ducts);
- Supporting IT systems such as network OSS;
- One-off fees for subcontracted network services (for example, leased lines activation charges);
- Installation costs associated with the items above.

4.20. The OUR will include all the listed CapEx elements related to the modelled network and its planning, installation and operationalisation costs in the BULRIC models.

4.21. Notably, the section titled: ***Assets Valuation Method*** addresses the annualisation method which is to be applied to CapEx. This is the way in which the network CapEx will be recovered along the useful life of the asset.

Network OpEx

4.22. Network OpEx includes the recurrent costs associated with operating the network. This includes:

- Network personnel;
- Outsourced maintenance services;
- Power (electricity and fuel);
- Recurrent charges for subcontracted network services (for example, leased lines, dark fibre);
- Network sites rentals and other administrative fees or taxes.

4.23. The OUR will consider all the categories of network OpEx listed above.

Licences, Spectrum Fees and Way Fees

4.24. Licence costs and spectrum fees represent a significant cost to telecommunications operators. They have different purposes:

- Licences are related to the permission required to provide telecommunications services to the public, and they can take the form of annual or one-off fees. Both options will be considered in the models. They are commonly considered a non-network common cost and are included in BULRIC model as part of G&A costs;
- Spectrum fees (for example, microwave links) represent the rental of a resource that is essential for the network, and they can take the form of annual or one-off fees. Although the spectrum is crucial when using microwaves transmission, the fees usually represent a negligible cost within the overall fixed network costs. Therefore the OUR considers that, for simplification purposes, microwave spectrum fees are not considered in the model, unless operators can show that they represent a significant part of their costs.
- Way fees represent the payments related to passing cables (and supporting infrastructure such as poles) through the property of a

third party (for instance a piece of land or a building). Since these fees are mostly used for the development of the access network (which is not expected to be included in the model as described in chapter 6), the OUR, for simplification purposes, will not include way fees in the model for fixed networks, unless strong arguments are provided by the operators to justify their materiality for fixed operations in Jamaica (as with spectrum fees).

Retail Costs

4.25. The retail costs can be divided into the following categories:

- Marketing
- Sales
- Commissions to dealers
- Cost of Goods Sold (terminals, SIM cards, interconnection payments, etc.)
- Customer care
- Billing and invoicing
- Content and valued added services

4.26. The cost categories listed above are related to the provision of retail services and should not be allocated to wholesale services. Additionally, it is important to note that modelling retail costs based on a bottom-up approach could divert the efforts that should be dedicated to network modelling.

4.27. The OUR is of the opinion that retail costs should be included in the model to ensure the accurate representation of all operations of the fixed network. They will be included in the model based on a relatively simple mechanism based on the real costs of the operators and simple allocation criteria, namely:

- Marketing, sales and commissions to dealers: allocation to all retail services based on the traffic. If it is possible, a previous allocation to

group of services (i.e. voice, broadband, leased lines) will be done based on the information available at operators' accounts. Notably, these costs are associated to both access and traffic services. Only the costs associated with the latter will be included in the model. The percentage of costs included in the model will be based on the percentage of revenues associated with traffic services over the total revenues of the fixed services.

- Cost of Goods Sold: The costs associated with terminals are related to access and will not be included in the model. Regarding interconnection costs, they will be allocated to the related services based on consumption (i.e. minutes).

- Customer care, billing and invoicing: These costs are associated mainly with subscription (access) and therefore they will not be included in the model. In the event that relevant billing and invoicing costs associated with wholesale services are identified, these will be included in the model based on a simple criteria such as mark up over network costs.

- Content and valued added services: These will be allocated to the services associated with these costs. If allocation to more than one service is required, it will be based on the traffic.

4.28. The OUR acknowledges the limitation of allocating costs to access and traffic services based on revenues. However, as stated by operators during the consultation process, there is no clear alternative to such approach. In any case, the OUR intends to further investigate alternative methods for estimating retail costs for traffic services during the model implementation. In the case that a more appropriate method is found, it will be proposed and consulted on with stakeholders.

General & Administrative Costs

4.29. G&A costs are associated with management activities and are common for network and commercial activities (human resources, finance, management, etc.). It is common practice to include G&A costs in BULRIC models based on a mark-up on top of network costs.

4.30. The OUR will include G&A costs in the BULRIC models based on a mark-up percentage on top of costs. This percentage will be calibrated based on the data provided by the operators (see Chapter 2).

Cost of Capital

4.31. Costing of services needs to take into account a reasonable amount of return on the invested capital an operator would be able to earn in a truly competitive market. In order to estimate this reasonable amount of return, the OUR will make use of the **Weighted Average Cost of Capital (WACC)**, which is defined as the sum of the weighted cost of equity and debt. These weights are based on the market value of debt and equity, respectively.

4.32. The use of the WACC is the overwhelmingly preferred mechanism to reflect a reasonable regulated profit level in the telecommunications industry and is a de-facto international standard in the implementation of BULRIC models.

4.33. To set the appropriate rate of return, the OUR will apply the WACC approved in the determination "Determination Notice for Estimate of the Weighted Average Cost of Capital for Telecommunications Carriers" Document No: TEL2009005_DET001 of December 9th, 2010. Specifically, the pre-tax point estimate for fixed networks will be used (24.39%).

4.34. The section on **Assets Valuation Method** addresses the annualisation method to be applied to CapEx, which incorporates the effect of the cost of capital, based on the WACC value.

Treatment of OpEx

Determination of Network-related Operations and Maintenance Costs

4.35. Network-related operations and maintenance costs commonly represent a significant part of the operators' costs. Therefore, the precise calculation of these costs is a major factor to take into consideration when designing a BULRIC model.

4.36. There are two common methodological approaches when considering the operating costs associated with the operation and maintenance of the network, which are outlined below:

- **Based on percentages over CapEx**: OpEx is calculated indirectly using a percentage provided by operators. Operators often provide an estimation of what represents the annual operating cost expressed as a percentage of the investment. Also, some NRAs have estimated these percentages (for example, the Commission for Communications Regulation of Ireland (ComReg)) considered the OpEx related to DSLAMs as 10% of the investment[4])

- **Based on bottom-up calculation** (unit cost per element): the cost is calculated directly from bottom-up modelling of the operating costs for the modelled network. For instance, power costs can be calculated based on average kilowatt hour (kWh) consumption per site and the average cost per kWh paid by the operators in the market.

4.37. The international practice shows that both methodologies are valid approaches to determine Network OpEx, and reveal that a combination of

[4] See ComReg, Wholesale Broadband Access Consultation and draft decision on the appropriate price control, Document No: 10/56

both is frequently employed on a case-by-case basis. For instance, the United Arab Emirates' telecommunications regulatory authority (TRA), whose approach is based on percentages over CapEx, states in its public consultation[5] that the bottom-up approach requires a detailed examination of each of the activities undertaken by the operator in question and, as a result, bottom-up models have tended to use other methodologies. On the other hand, Bahrain's TRA states in its public consultation[6] that:

> *"Operating costs should be calculated using the operators' actual costs (top-down) with adjustments, or with a bottom-up calculation depending on the feasibility".*

4.38. In the OUR's view, the calculation of OpEx, based on a percentage of CapEx is not an optimal practice, especially since the ratios are commonly obtained from top-down models and may not necessarily be representative or applicable to BULRIC models.

4.39. The OUR considers that OpEx will preferably be based on bottom-up calculations in those cases where such bottom-up determination of OpEx is feasible and adequate data are available (for instance by looking into any activity-based costing system that operators may have available). In addition, the OUR will use available information to evaluate how appropriate the use of bottom-up calculations are and to ensure that the results are accurate. For those specific cases where there may not be enough information available, it would be preferred to simply rely on OpEx calculation as a percentage over CapEx.

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[5]The Development of bottom-up LRIC Models of Telecommunications Network in the UAE, July 2012
[6]Development, implementation and use of bottom-up fixed and mobile network cost models in the Kingdom of Bahrain, May 2011

4.40. Additionally, in the case that information provided by operators does not allow for calculating any required parameter, as described in Chapter 3, information from international benchmarks will be used for OpEx costs and the model will be properly calibrated to ensure the accuracy of the results.

Determination of General and Administrative Costs

4.41. General and Administrative costs (G&A) include the expenditure related to the management of the company and supporting departments, which are mainly the costs associated with the General Management and Finance, Human Resources and Legal functions.

4.42. The consideration of the G&A costs will be made taking into account that LIME has both fixed (access and traffic) and mobile operations under one company. Under this consideration, the G&A expenses that will be included in the model for fixed interconnection will be those allocated to the fixed traffic services according to their earnings compared with that of the total company.

4.43. As in the calculation of retail costs for traffic services, alternative methods for the determination of G&A costs will be further investigated during the model implementation. In the event that a more accurate method is found during the model implementation, it will be proposed and consulted on with operators.

Treatment of Capital-Related Costs

Assets Valuation Method

4.44. The OUR identifies two main potential approaches to be used for asset valuation:

- A **static approach,** by which all the assets are valuated every year (please see Chapter 3 about the Period of Time Modelled) based on the price of that year. Depending on how the unitary price is calculated there are two methodologies:

- Historical Cost Accounting (HCA) is the average price paid historically by the company to acquire an asset, based on the operator's book.

- Current Cost Accounting (CCA) reflects the current and expected market value of the assets.

- A **cash-flow** methodology, by which asset acquisitions are valued per the unitary price for the year when they are purchased. Unitary prices then vary over time, based on cost trends for each asset type.

4.45. The cash-flow methodology is more comparable to the real operations of an operator. However, its implementation is complex. Moreover, when applying tilted annuities (see section on Annualisation Method below) and a yearly dimensioning approach (see section on Network Dimensioning in 4.1), the results are equivalent to the static CCA approach.

4.46. The OUR considers the static CCA approach to be a more appropriate choice, since it sends accurate price signals in the market and avoids increasing the complexity of the model unnecessarily. Moreover, it is consistent with international best practices.

Consideration of Modern Equivalent Assets

4.47. The concept of forward-looking costs generally requires assets to be valued using a Modern Equivalent Asset (MEA). A Modern Equivalent Asset is defined by the IRG as:

> *"The lowest cost asset, providing at least equivalent functionality and output as the asset being valued".*

4.48. These assets should correspond to the ones a new operator would be expected to employ to build a new network.

4.49. According to the Accounting Guide published by the ITU[7],

> *"Modern Equivalent Assets (MEA) should be used whenever it is possible, as it is the most accurate valuation criterion to reflect the cost of an efficient operator, since it will capture the associated costs (and efficiencies) that an entrant/alternative operator would face, if entering into the market at a specific time."*

4.50. Accordingly, telecommunication equipment should be substituted for an MEA in the case that the existing asset is not commonly installed by new entrants in the telecommunications industry. For instance, traditional switching nodes should be substituted for newer technologies, like soft-switching based network.

4.51. However, in the specific case of Jamaica, it is expected that a new entrant operating a national network would reach national scale through the purchase of wholesale inputs for existing networks (that in Jamaica are currently still heavily populated by legacy switching nodes). Therefore, the OUR believes that a hybrid approach representing a migration from current legacy and NGN assets to a fully NGN asset base is recommendable for implementation in the model. That said, the OUR will implement a transition profile to model the migration from traditional telecommunication equipment for MEA assets, over the modelling period.

4.52. The section '**Technologies to be Modelled**' (in 4.1) describes in detail the technologies that will be considered in the model.

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[7] 'International Telecommunication Union Regulatory Accounting Guide', 2009

Annualisation Method

4.53. The pattern of cost recovery over time is critically dependent on the depreciation methodology assumed. The OUR is of the opinion that, when estimating the annualised costs for assets, the Financial Capital Maintenance (FCM) principle should be considered. The concern of the FCM is to maintain the financial capital of the company. This maintenance is achieved when the value of shareholder funds is the same in real terms at the start and at the end of the period. In practical terms, the FCM principle ensures that the costs incurred for the provision of services are recovered, including an appropriate level of profit, as discussed in the section '**Costs Elements to be Considered**'.

4.54. A number of annualisation methods may be used, which are compatible with the FCM principle:

- **Straight line depreciation** is the method most commonly used in financial accounts. It simply spreads the original cost of an asset evenly across its economic lifetime. The method is popular because of its simplicity, but is criticised for not reflecting economic reality. It also ignores the cost of capital, which must be calculated separately.

- **Standard Annuity** spreads the cost of an asset over its economic life, but in addition takes into account the opportunity cost of capital, i.e. the interest forgone which would have been earned had the cash been invested elsewhere. Therefore, annuities consist of two separate elements: the annualised cost of the asset (depreciation), and a financing or cost of capital charge. In a standard annuity, the annual charge remains constant over the life of the asset. Again, the method has been criticised for failing to reflect the true depreciation profile of the asset.

- **Tilted Annuity** relaxes the assumption of constant prices. In telecommunications networks, equipment prices tend to fall over time, whereas infrastructure costs (digging trenches, for example) tend to rise over time. If, for example, the standard annualisation method does not take into consideration falling prices, Entrant 2 would have an advantage over Entrant 1 as it would benefit from lower asset prices and consequently lower depreciation charges. When asset prices are falling, a tilted annuity recovers more of the capital value in the early years (and vice versa), which ensures that two entrants with an identical asset base, though acquired in different periods, have identical depreciation charges

- **Economic depreciation / Adjusted Tilted Annuity.** Economic depreciation is defined as the period-by-period change in the market value of an asset. The market value of an asset is equal to the present value of the net cash flows that the asset is expected to generate over the remainder of its useful life. As net cash flows vary with output, assets are depreciated at a rate consistent with use, resulting in a true depreciation profile. In practice, given the difficulty of objectively determining the economic depreciation, this is approximated by an **adjusted tilted annuity**, in which the tilt in the amount of depreciation each year incorporates, in addition to the variation in the asset price, the amount of output produced by the asset.

4.55. International practice shows that the tilted annuity and the economic depreciation/adjusted tilted annuity are the most commonly used methods when implementing BULRIC models.

4.56. The OUR will implement the tilted annuity approach, considering it to be the preferred annualisation methodology, as it offers the best equilibrium between economic accuracy and ease of implementation. The tilted annuity allows the

consideration of the evolution of network prices, while avoiding potential deviations due to uncertainty of traffic forecasts, which can affect the calculations in the case that an economic depreciation/adjusted tilted annuity method is used. That said, the following formula will be used to calculate tilted annuity for assets:

$$\frac{WACC - \Delta p}{1 - \left(\frac{1+\Delta p}{1+WACC}\right)^{Asset\ Life}} \times Asset\ Value$$

where:

- $WACC = the\ weighted\ average\ cost\ of\ capital$;
- $\Delta p = rate\ of\ price\ change$ ("tilt");
- $Asset\ Value = the\ current\ investment\ cost\ of\ the\ asset$;
- $Asset\ Life = the\ useful\ life\ of\ the\ asset.$

4.57. The useful lives of each asset class will be determined based on the data provided by the operators, with the safeguards described in Chapter 2 in cases where the data provided present material deviations from internationally accepted useful lives.

Treatment of Working Capital

4.58. Working capital is the amount of capital that a company uses in its day-to-day trading operations. More formally, the working capital is calculated as the current assets minus the current liabilities. If positive, this working capital generates revenues; if negative, it generates financial costs for the operator.

4.59. The OUR will consider working capital requirements in its BULRIC Model.

4.60. Working capital comprises network CapEx, network OpEx and Retail components.

- CapEx-related working capital refers to the fact that an operator requires a certain period of time before equipment can be fully installed and operational, and thus start generating revenues. The BULRIC Model to be developed by the OUR will capture this effect through the use of the planning-horizon concept[8], which avoids the need to include it in the depreciation formulas. The OUR thus believes that no additional mechanism is required to consider network CapEx-related working capital.

- On the other hand, network OpEx working capital mainly reflects the liquidity that any company must maintain in order to operate all network-related payments swiftly, such as network staff or site rentals, and to finance the gap between the time these costs are incurred and revenues are generated. The OUR considers that, in the cases that the working capital associated to network OpEx has been efficiently incurred and presents a certain level of materiality, it should be incorporated in the BULRIC models, irrespective of being positive or negative. Operators should provide relevant arguments to justify the inclusion of specific network OpEx working capital. The working capital will be calculated as a percentage of OpEx for each year, based on information provided by the operators.

- In the case of the working capital related to retail activities, it is proposed that these be incorporated in the retail costs (as a mark-up) to be included in the model as described in the section '**Costs**

[8] Planning-horizon concept represents that the operators usually anticipate the purchasing of network equipment in order to capture the time encompassed between the purchase of a resource and its commissioning. This concept also takes into account that the resources are dimensioned to satisfy the demand within a period of time, without requiring capacity upgrades. For this, the dimensioning algorithms will consider the maximum demand in a period of time in the future to include both concepts. Note that the planning-horizon concept already includes any required working capital term related to the Network CapEx, as it already accounts for the time elapsed between the purchase of the equipment and its commissioning.

Elements to be Considered'. These costs will be included in the model irrespectively of their sign.

Chapter 5: Definition of the Reference Operator

5.1. One of the most important methodological issues to be defined for the development of BULRIC models is the kind of operator that will be modelled - the so-called reference operator. One of the following options can be adopted:

- Developing one BULRIC model for each fixed operator in the market;
- Developing a BULRIC model that represents a hypothetical generic existing operator; or
- Developing a BULRIC model representing a hypothetical generic new entrant.

5.2. Unlike in the case of mobile networks, it is often difficult to define a generic operator for a fixed network that has enough economies of scale to be efficient. For example, the European Commission stated the difficulty in defining a generic fixed operator for BULRIC modelling:

> *"When deciding on the appropriate single efficient scale of the modelled operator, NRAs should take into account the need to promote efficient entry, while also recognising that under certain conditions smaller operators can produce at low unit costs by operating in smaller geographic areas. Furthermore, smaller operators which cannot match the largest operators scale advantages over broader geographic areas can be assumed to purchase wholesale inputs rather than self-provide termination services."*[9]

[9] European Commission – Explanatory note on the recommendations of TR - 2009

5.3. Accordingly, the most common international practice is for BULRIC models to represent a fixed operator with a demand similar to the incumbents.

5.4. In the case of Jamaica, there is one fixed-line operator with national coverage at present: LIME.

5.5. On the basis of this reality, and in agreement with international practice, the OUR will model a reference operator with similar characteristics to the incumbent, LIME. In particular, the reference operator will be presumed to have the same demand as LIME.

Chapter 6: Network Details

Network Dimensioning Optimisation Approach

6.1. In BULRIC models, two different approaches are generally identified in the dimensioning and optimisation of a network, which may have a direct impact on the services' cost:

- Yearly approach: Estimates the number of assets for a given year without taking into consideration the network status in previous years; and
- Historical approach: Dimensioning relies on the network built in previous years.

6.2. The OUR is of the opinion that the yearly approach is the most appropriate to send accurate pricing signals in the market, due to the fact that its results represent the optimum network for each year. Additionally, the yearly approach avoids introducing unnecessary complexity into the model. At the same time, it should be noted that when traffic demand is increasing year on year, these two approaches tend to produce similar results.

6.3. After dimensioning the network according to the yearly approach, the OUR considers it important to make some adjustments by adding or removing some resources, for instance, due to odd variations in traffic demand. This will be done resorting to a forward-looking filtering algorithm which takes the number of yearly dimensioned resources and optimises it to fit the variable needs of the network over the whole modelling period.

6.4. The forward-looking filtering algorithm will take into account that when resources are still within their useful life, the model should keep them in the network instead of dismantling them only to immediately install them again in the following years. The exhibit below illustrates the result from the filtering process, where resources are kept installed during years 2016 and 2017,

instead of being removed, due to the forward-looking inspection of resource requirements in the following years.

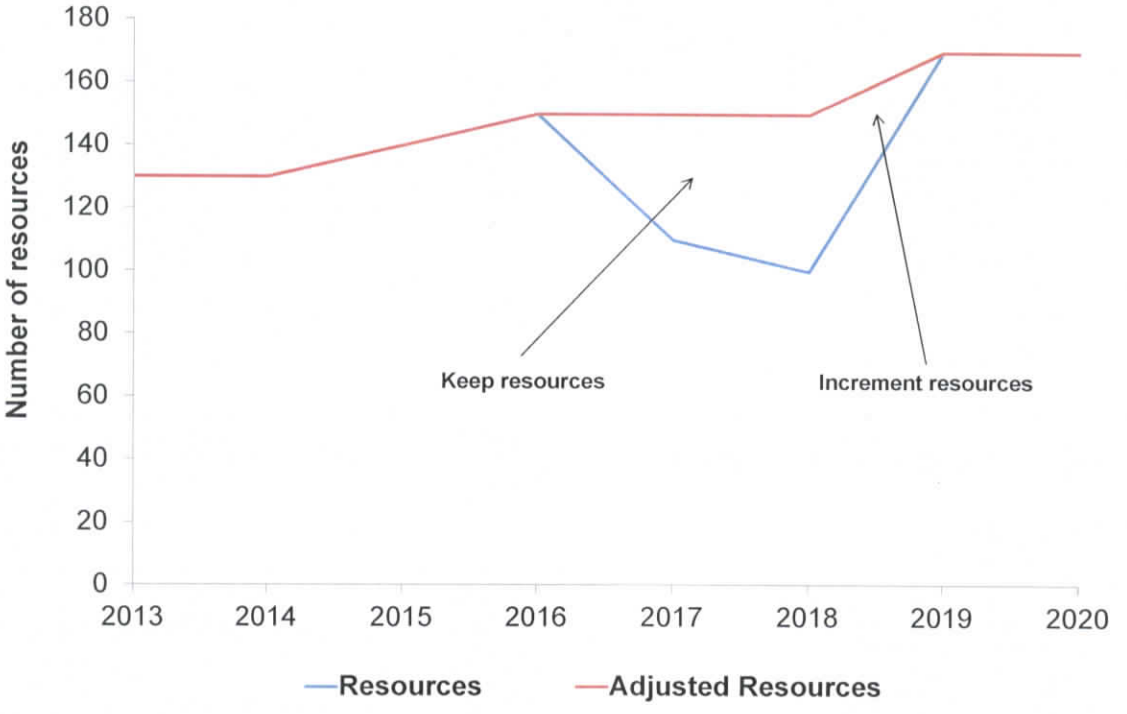

Exhibit 6.1 Illustrative example of the result from the filtering process. [Source: Axon Consulting]

Fixed Services and Increments

List of Services

6.5. The BULRIC model for fixed interconnection should include the services provided, or those that shall be provided in the foreseeable future, by the operators in Jamaica at a level of disaggregation that allows the accurate modelling of the networks and their costs. On the other hand, it is important not to over-split the services so as to avoid unnecessary complexity. Specifically, services should be individually considered in the BULRIC model on the basis of the following criteria:

- **Materiality:** services representing a significant number of connections or amount of traffic should be incorporated in the model.

- **Technical Singularity:** the provision of services implies that relevant technical differences in the use of network resources should be treated separately.

6.6. Additionally, the model should include all the services that share the resources used by the relevant services (that is, fixed interconnection). This factor is important to ensure that the model represents the economies of scale and scope achieved by Jamaican operators. Specifically, the OUR is of the opinion that retail voice services, broadband services, and leased lines services should be included since they use the core and transmission network.

6.7. On the other hand, sharing of resources between interconnection and access services is limited and, therefore, the OUR does not foresee the need to include access services in the model.

6.8. Accordingly, the OUR considers that a first categorisation should be made based on the type of service, namely:

- Wholesale voice traffic
- Retail voice traffic
- Other services (broadband and leased lines)

6.9. Annex I details the list of the services which are to be incorporated into the BULRIC model.

Definition of the Increments

6.10. The definition of increments is of high relevance when developing BULRIC models. The increments in a BULRIC model are generally defined as a group of services for which incremental cost is calculated.

6.11. As described in 0, the Act at Section 33(1)(g) states in part that:

"...the relevant increment is the wholesale termination service..."

6.12. Therefore, the model should differentiate the wholesale termination service from other services included in the model.

6.13. On the other hand, there are significant technical differences between the provision of voice services and other services to be included in the model (i.e. broadband and leased lines). With the objective of accurately representing the incremental costs of other voice services, the OUR will define different increments for other voice services (apart from termination) and non-voice services.

6.14. Based on the above, the increments are:

- Voice termination
- Other voice services
- Non-voice services

Fixed Network Design

6.15. This section describes the following issues related to the design of the modelled fixed network:

- Boundary between access and core networks
- Network topology design
- Technologies considered

Boundary Between Access and Core Networks

6.16. Fixed networks can be separated mainly into two main blocks: access network and core network. In the OUR's view, the definition of the boundary between both parts of the network is required to ensure that all the resources required for the provision of traffic services are included in the model and those related to the provision of access services are not.

6.17. The OUR delineates the following separation between access and core networks:

- **Access network** would include the equipment and infrastructure that is mainly subscriber-dependent. More specifically, access network would include the assets between the customer's premises and the line card (included);

- **Core network** would include the equipment above the line card, mostly capacity-driven. In particular, core network would include switching equipment, platforms, backbone and supporting infrastructure, etc.

Network Topology Design

6.18. The topology of the network to be designed is mainly defined by the locations of the nodes. There are three common approaches used for the network topology design in BULRIC models:

- **Scorched node:** this uses the location of existing network nodes. This option is relatively simple to implement but it may include potential inefficiencies in operators' networks.

- **Modified scorched node:** this is a variant of the scorched node approach. With this approach, the location of network nodes is not strictly equal to operators' network but is based on the existing nodes. Under this methodology, locations may be modified in cases where inefficiency is identified. The implementation complexity of this option is similar to the previous one, but allows the elimination of inefficiencies.

- **Scorched earth:** this approach estimates the locations of an optimised network without restrictions of the existing network. This option allows the calculation of a theoretical efficient network, not relying on existing networks. However, this option is significantly more complex to implement.

6.19. In the case of fixed networks, the complexity of designing an optimal network topology makes the Scorched Earth approach virtually unfeasible. Because of this, and especially in those cases where the reference operator is based upon the demand of the incumbent operator, it is standard practice to take the incumbent's existing geographical distribution of the main network access nodes as a given in the network design process. By main network access nodes, the OUR refers to those facilities where wireline connection is terminated (for example, location of the Main Distribution Frame in the case of traditional copper access networks).

6.20. Maintaining the existing main access nodes does not mean that potential inefficiencies cannot, or should not, be addressed. For instance, the ERG[10], which advocates the use of existing node locations as a starting point for the fixed network design in BULRIC models, states that:

> *"It can be appropriate to modify the scorched node approach in order to replicate a more efficient network topology than is currently in place. Such a modified scorched node approach could imply taking the existing topology as the starting point, followed by the elimination of inefficiencies. This may involve changing the number or types of network elements that are located at the nodes to simplify and decrease the cost of the switching hierarchy. Other important issues in this respect are how to deal with spare capacity in the network and the existence of stranded costs. When the modified scorched node approach is not applicable because the elimination of inefficiencies is not practical, it could be more appropriate to use a scorched earth approach."*[11]

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[10] ERG was the predecessor to the Body of European Regulators for Electronic Communications (BEREC)
[11] ERG - Recommendation on how to implement the commission recommendation C(2005) 3480 - 2005

6.21. A review of international practice shows that the use of the modified scorched node approach is the most widespread methodological choice for network topology design.

6.22. The opinion of the OUR is that a modified scorched node approach is the most adequate methodological choice for the implementation of a fixed BULRIC model in Jamaica. By adopting a modified scorched node approach, the OUR will make the following methodological assumptions:

- The existing geographical locations of the main access nodes (*i.e.*, nodes where the subscribers copper loops are connected, such as local exchanges, remote exchanges, DSLAMs and MSANs) will be taken as the starting point for the reference operator's fixed network design.

- The geographical locations of the main access nodes of the reference operator may be altered, only in cases where clearly identified inefficiencies are detected. The nature of the changes introduced would depend on the type of inefficiency detected.

6.23. When developing a LRIC model, the location of the starting point nodes is commonly obtained from the reference operator's real network. However, it is observed that the current network developments in the country tend to increase the number of access nodes. This fact is associated with the shortening of the subscribers' local loops addressed while the network is being migrated to a NGN. The OUR is of the opinion that this progressive increase of access nodes should be taken into account in the model to accurately represent the foreseeable context in Jamaica.

6.24. Also, regarding the specific case of Jamaica, it is important to bear in mind that the reference operator's (LIME's) parent company is in the process of acquiring another fixed operator's (Columbus Communications Jamaica Limited's – "FLOW's") parent company. If the acquisition is finally

accomplished, LIME's network can be merged with FLOW's network, which will likely affect the location of the nodes and the topology of the remaining network. In this context, the OUR foresees two valid approaches:

- Considering LIME's current nodes
- Considering the nodes that would result if LIME and FLOW's networks were merged

6.25. The OUR is disposed towards the position that the model should reflect the network that would result when merging both networks, as it is considered more representative of the likely evolution of fixed networks in Jamaica. However, to be able to represent such scenario, it is required that the OUR has a clear visibility of any merging plans (for instance, the final list of nodes that would be operative if the merging process is closed and the final topology). However, trying to analyse this issue at this stage of the merging process would involve an exercise that is too theoretical and that may have relevant impact in the model results.

6.26. That being said, the OUR considers that a more practicable approach is not to consider such a merger at this stage. In the case that the merger is completed and it significantly affects the network topology, the OUR will revisit the model to ensure it represents accurately the fixed market in Jamaica.

Technologies to be Modelled

6.27. This section describes the proposed technologies that are to be modelled in the BULRIC model for fixed interconnection. It addresses the following:

- Core network technologies
- Transmission technologies

Core Network Technologies

6.28. The following core technologies are currently used by fixed operators:

- **Legacy TDM switching,** based on switching exchanges (local, secondary, nodal, tandem, etc.). This technology is only suitable for voice services and it is complemented with a packet switching network for broadband services.

- **NGN core network**, core network is based on one all-IP network. The provision of traditional services (i.e. voice) is supported by dedicated servers such as soft-switches. Additionally, it is common practice to use Media Gateways (MGW) to provide TDM connectivity for interconnection with traditional networks.

6.29. The OUR takes the view that the NGN core network represents the MEA of the traditional fixed networks, being increasingly deployed by operators' around the world, especially new entrants, to fully replace previous legacy networks.

6.30. Despite plans being announced to migrate to full NGN networks, operators in Jamaica are currently still using their legacy switching networks for voice services. Therefore, the use of a full MEA approach for asset valuation (starting from the first year of the modelling period) would not realistically represent the current state of the incumbent's fixed network,

6.31. Therefore, the OUR will adopt a hybrid MEA approach to model the migration between TDM to NGN networks, where the initial proportion between legacy and NGN nodes would diminish over the modelling period.

6.32. The following diagram presents an illustrative example of the legacy TDM core network structure, currently deployed in Jamaica:

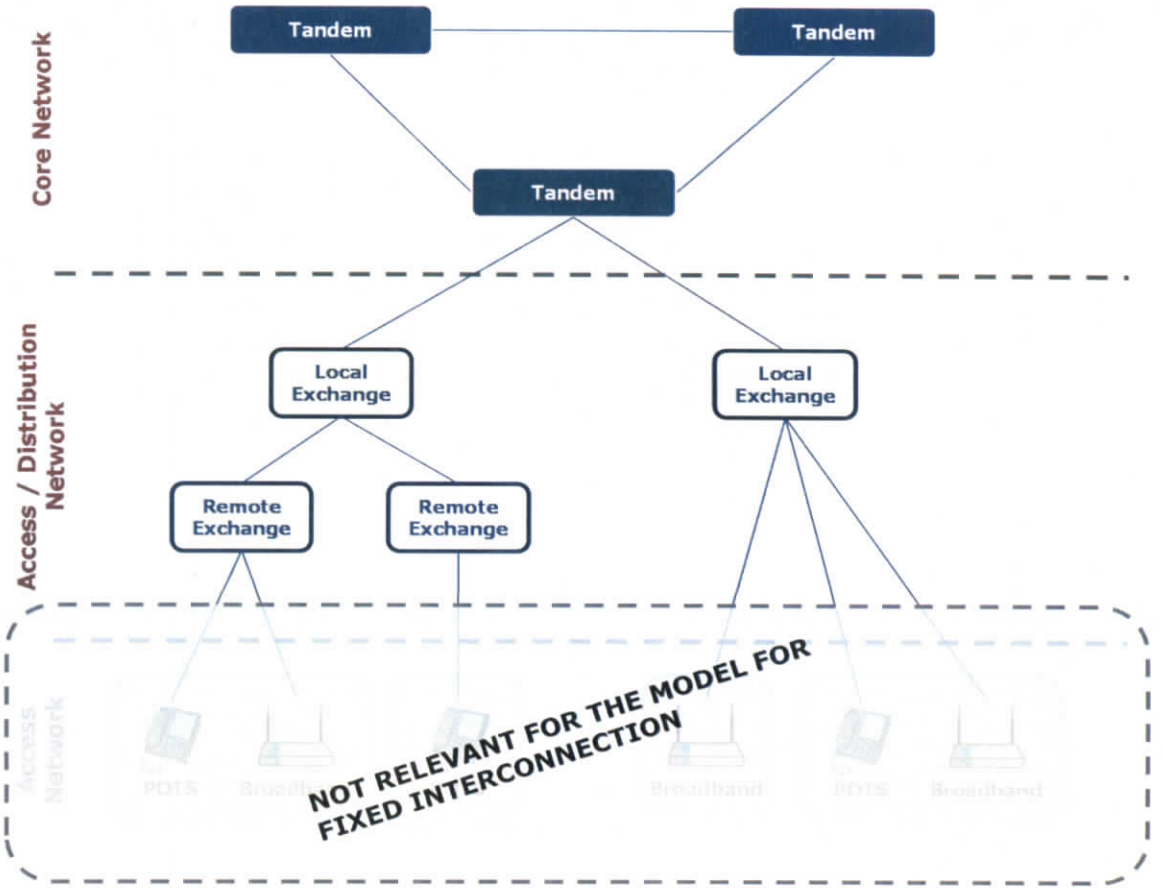

Exhibit 6.2: Illustrative structure of a fixed network based on legacy technology. [Source: Axon Consulting]

6.33. The following diagram presents an illustrative example of the final NGN core network structure:

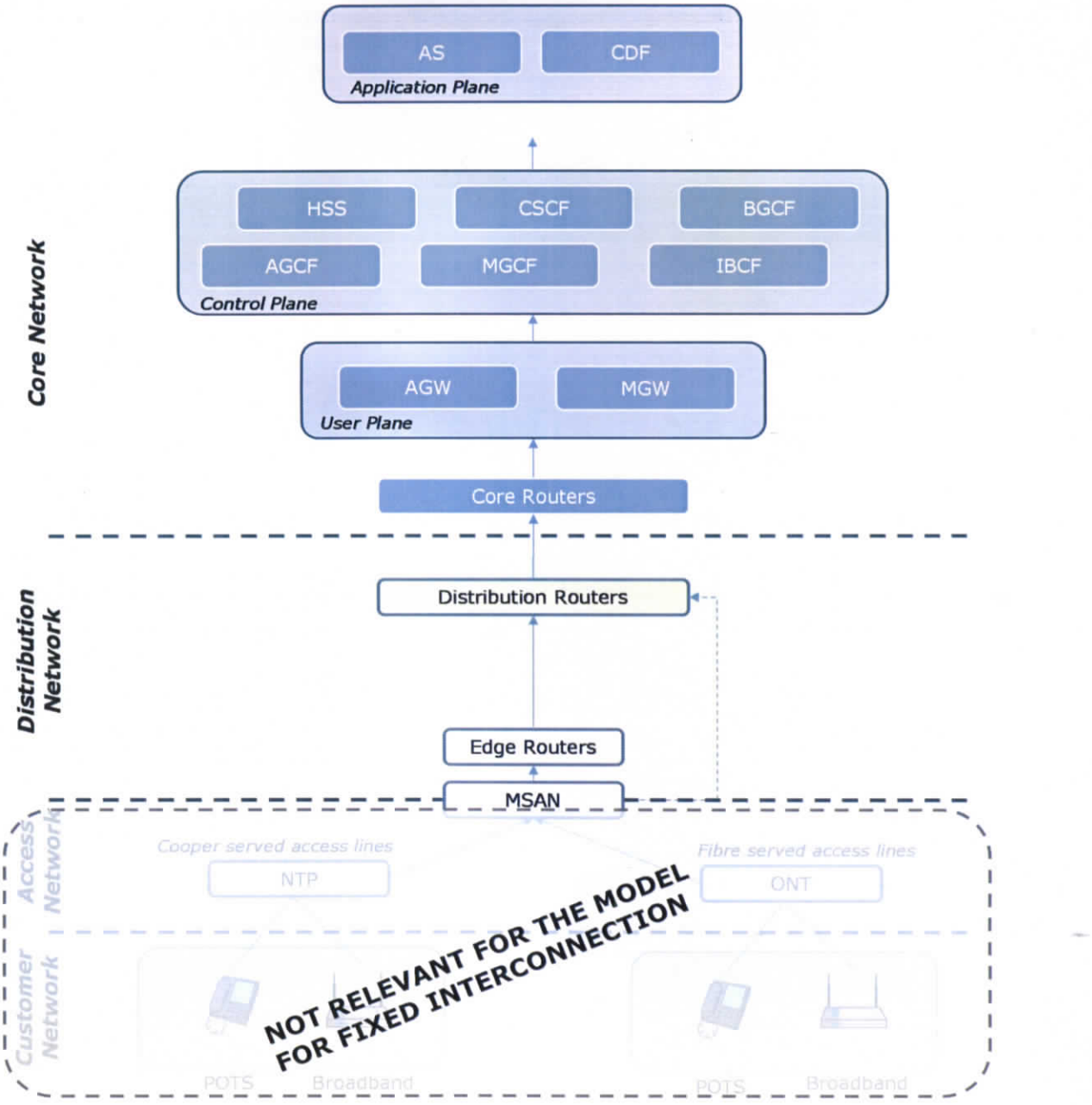

Exhibit 6.3: Illustrative structure of a fixed network based on NGN technology. [Source: Axon Consulting]

6.34. As presented above, the network elements associated to the access and customer networks are not considered relevant for modelling fixed interconnection[12] and, therefore, they will not be included in the model. Notably, part of the MSAN equipment (apart from the line cards) is proposed to be taken into account as processors and transmission ports are traffic-dependent.

6.35. On the basis of the selection of technologies presented above, Annex II gives a preliminary list of the network elements (including both legacy and NGN elements) which shall be considered in the BULRIC model for fixed interconnection.

Transmission Technologies

6.36. The following technologies are generally considered for transmission dimensioning:

- **SDH Fibre Transmission** (ADM and Cross-connect equipment).
- **Native Ethernet Fibre Transmission,** assuming that the dissociation between the different traffic flows at layer 2 will be done by VLAN technology.
- **WDM Fibre Transmission,** based on wavelength division multiplexing equipment.

6.37. Regarding the different technologies available, the OUR considers that, even though Ethernet transmission is being or is planned to be largely deployed by

[12] The OUR acknowledges that the core network topology and configuration depend on the Access network. This fact will be taking into account by adopting a modified scorched node approach. By not relevant, the OUR refers that the costs of those elements will not be included in the model.

fixed operators around the world, SDH transmission is still commonly used by Jamaican fixed operators.

6.38. Therefore, the OUR will consider a similar approach to the one proposed for the core network, modelling a progressive migration from SDH to NGN transmission technologies, in order to be able to realistically represent the current state of Jamaican networks and keep consistency with the approach for the core technologies.

6.39. In addition to the technologies listed previously, the OUR will also consider microwave links for the connection of remote nodes for which this technology is more cost-efficient than fibre links.

6.40. Both the core transmission links and the corresponding fibre and duct distances, consistently with the Modified Scorched Node approach, will be based on the real links installed in LIME's network, unless inefficiencies are found.

Chapter 7: Glide Paths, Price Gradients and Charging Basis

Use of Glide Paths

7.1. Models calculate unit costs of services. These unit costs can then be used to set regulated rates.

7.2. The cost model will probably estimate rates that are different from the rates currently used by the operators. In some countries, where a large change to termination rates would occur if the results of modelling were applied immediately, the regulator sets a "glide path" for a sequence of changes to bring the wholesale termination rates to the modelled costs.

7.3. Given that LIME's fixed termination rate was already regulated under a FAC regime, the OUR does not anticipate that the termination rate that results from this process will be substantially different, in dollar terms, from what exists now. If the existing termination rate is above the TLRIC rate estimated by the model then that means operators would have reaped significant benefit from having a termination rate which is above cost. In this case, the OUR will immediately adjust the termination rate to its TLRIC level. However, given that the amended Telecommunications Act stipulates that the termination rate is to be calculated using only avoidable cost, the OUR will allow a glide path from the TLRIC rate to the Pure LRIC rate where there is a significant difference in the rates in dollar terms.

7.4. The length of this glide path cannot be determined at this point as it will depend on the size of the difference between the TLRIC and Pure LRIC termination rates. It should also be noted that the mobile termination rate was immediately adjusted to the Pure LRIC level which has created an anomaly, which needs to be corrected, where the fixed termination rate is higher than the mobile termination rate, and is set using a different cost standard. The OUR is however mindful that the glide path needs to be reasonably short to

curtail the negative effects of having a fixed termination rate which is above cost. Therefore, the OUR anticipates that the maximum time period that will be considered for rates to adjust to cost will be two (2) years.

7.5. The OUR 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.

7.6. The OUR intends to set rates for the 5 years (2016 to 2020) but will amend the regulated prices in case significant changes in the parameters or structure of the models need to be reflected.

Use of Gradients

7.7. Price gradients are where an operator charges higher prices at peak times and lower prices at off-peak times. Where there are gradients in the retail prices, it is desirable that there should be similar gradients in the wholesale prices to avoid creating opportunities for arbitrage and to simplify charging structure. Currently, neither Flow nor LIME uses price gradients in their retail rates. These differences exist in the current retail rates charged by Digicel (Jamaica) Limited ("Digicel") for its fixed line services, although the differences between peak and off-peak rates are not significant.

7.8. In addition, the OUR has observed a trend to eliminate price differentiations in fixed interconnection charges in other countries.

7.9. Therefore, the OUR will not allow price gradients in the wholesale interconnection rates.

Charging Basis

7.10. The current charging basis for LIME's wholesale fixed interconnection rates differentiates the following concepts[13]:

- Interconnect Specific charge (per minute)
- Call setup charge (per call), differentiating by interconnection level (local, regional or national) and by time (peak, off-peak and weekend)
- Call duration charge (per minute), differentiating by interconnection level (local, regional or national) and by time (peak, off-peak and weekend)

7.11. In the opinion of the OUR, these charging basis are significantly complex and so the OUR proposes a simplification of the fixed interconnection services charging basis.

7.12. Specifically, fixed interconnection services are charged for based on duration only. This would simplify billing as there is one single charge per minute billed on a per second basis.

7.13. On the other hand, it is observed that the migration to NGN technologies is expected to lead to a reduction in the number of interconnection points used by the operators compared with the number of interconnection points used in a PSTN network. In this context, the ITU in its document "Coexistence of traditional and IP interconnection", states:

> *"the number of points of interconnection (PoIs) in an NGN will be reduced compared with the number of POIs in a PSTN network."*

[13] Fixed interconnection services can use one or more of these concepts.

7.14. Additionally, the differences in the cost of the interconnection levels are reduced due to the fact that transmission costs usually decrease over time and due to the effect of the economies of scope associated with the increase in broadband subscribers.

7.15. The OUR is, therefore, of the opinion that the simplification of charging with regards to the interconnection level would be more aligned with the evolution of the telecoms operations. Specifically, the OUR foresees the following alternatives for simplifying the charging basis:

- Defining one interconnection charge independently of the interconnection level.
- Defining two charges depending on the interconnection level (1 - local and 2 – National/regional).

7.16. Currently, the telecom operators in Jamaica are using a number of interconnection points, including interconnection from a local level to a national level. In this context, the definition of one interconnection charge would not capture the cost savings that induce the operators to interconnect at a local level.

7.17. Therefore, the OUR will define two charges depending on the interconnection level (1 - local and 2 – National/regional).

Annex I. : List of fixed services to be included in theBULRIC model for fixed networks

Voice Services

Services enclosing voice calls (measured in minutes), disaggregated based on the segment (wholesale and retail) and call direction:

Retail

- On-net voice calls
- Off-net voice calls to national fixed
- Off-net voice calls to national mobile
- Calls to international destinations
- Voice calls that ends in voicemail
- Calls to voicemail for retrieving messages
- Calls to emergency services
- Calls to weather warning service
- Calls to national directory inquiry service
- Calls to international directory enquiry service
- Calls to own freephone access service
- Calls to national on-net freephone access service
- Calls to national off-net freephone access service
- Calls to international freephone access service
- Calls to home country direct collect service

Wholesale

- Voice termination (local level)
- Voice termination (regional/national level)
- Voice on-net origination
- Voice off-net origination
- Domestic transit voice traffic
- International transit voice traffic

- Termination call to emergency services
- Termination call to weather warning service
- Termination call to national directory inquiry service
- Termination call to international directory enquiry service
- Termination call to own freephone access service
- Termination call to national freephone access service
- Termination call to international freephone access service
- Termination call to home country direct collect service

Other services

Other services that use the core and transmission network:

- Broadband traffic (measured as throughput in Gbps in the busy hour)
- Leased lines and Corporate Data services capacity (measured in Gbps), differentiated based on their use of the core network, namely:
  - Intra-parish
  - Inter-parish
  - Core node to international

Annex II. : List of network resources to be included in the BULRIC model for fixed networks

The following table shows an illustrative example of the resources considered in one of our models:

Category	Name	Unit
Site	For remote node	#
Site	For access node	#
Site	For core node	#
Site	Diesel Generator	#
Site	Electricity	kWh
Site	Fuel	litres
Access nodes	MSAN chassis medium	#
Access nodes	MSAN chassis large	#
Access nodes	Fast Ethernet port	#
Access nodes	Gigabit Ethernet port	#
Access nodes	Remote exchange chassis	#
Access nodes	Local exchange chassis	#
Access nodes	STM1 port	#
Access nodes	STM4 port	#
Trunk fibre[14]	Fibre Cable 2 strand	km
Trunk fibre	Fibre Cable 8 strand	km
Trunk fibre	Fibre Cable 12 strand	km
Trunk fibre	Fibre Cable 24 strand	km
Trunk fibre	Fibre Cable 48 strand	km
Trunk fibre	Fibre Cable 72 strand	km
Trunk fibre	Fibre Cable 96 strand	km
Trunk fibre	Fibre Cable 192 strand	km
Microwave Transmission	PDH Mw link	#

[14] Fibre elements including supporting infrastructure resources such as trenches, poles and ducts.

Category	Name	Unit
Microwave Transmission	SDH Mw link	#
Microwave Transmission	Ethernet Mw link	#
Fibre Transmission	DWDM Chassis	#
Fibre Transmission	DWDM amplifier	#
Fibre Transmission	DWDM lambda inserter	#
Edge Routers	Edge routers chassis	#
Edge Routers	Gigabit card	#
Edge Routers	10 Gigabit card	#
Distribution routers	Distribution routers chassis	#
Distribution routers	Gigabit card	#
Distribution routers	10 Gigabit card	#
Core routers	Core routers chassis	#
Core routers	Gigabit card	#
Core routers	10 Gigabit card	#
Converters	TDM to IP converter chassis	
Converters	E1 Card	
Converters	E3 Card	
Converters	STM 1 Card	
Converters	STM 4 Card	
Converters	STM 16 Card	
Converters	Gigabit Ethernet card	
Converters	10 Gigabit Ethernet card	
Core Network	Tandem exchange chassis	#
Core Network	Tandem exchange STM1 port	#
Core Network	Tandem exchange STM4 port	#
Core Network	Call Session Control Function (CSCF) hardware	#
Core Network	Call Session Control Function (CSCF) software	#
Core Network	Access Gateway Control Function (AGCF) hardware	#
Core Network	Access Gateway Control Function (AGCF) software	#
Core Network	Softswitch hardware	#
Core Network	Softswitch software	#
Core Network	Application server (AS) hardware	#
Core Network	Application server (AS) software	#
Core Network	Charging Gateway (CG) hardware	#

Category	Name	Unit
Core Network	Charging Gateway (CG) software	#
Core Network	Packet Switched Server (PSS) hardware	#
Core Network	Packet Switched Server (PSS) software	#
Core Network	Media Gateway Controller Function (MGCF) hardware	#
Core Network	Media Gateway Controller (MGCF) software	#
Supporting platforms	Network Management System (NMS) hardware	#
Supporting platforms	Network Management System (NMS) software	#
Supporting platforms	Home Subscriber Server (HSS) hardware	#
Supporting platforms	Home Subscriber Server (HSS) software	#
Supporting platforms	Voice Mail Server (VMS) hardware	#
Supporting platforms	Voice Mail Server (VMS) software	#
Supporting platforms	VAS, IN hardware	#
Supporting platforms	VAS, IN software	#
Supporting platforms	Billing system hardware	#
Supporting platforms	Billing system software	#

Table 1: Illustrative example of resources to be considered in the BULRIC model for fixed networks. [Source: Axon Consulting]

Annex III. : Glossary

ADM	Add/Drop Multiplexer
AGCF	Access Gateway Control Function
BC	Billing Center (also referred to as Billing System)
BIPT	Belgian Institute for Postal Services and Telecommunications (National Regulatory Agency)
BULRIC model	Bottom-up Long Run Incremental Costing model
Busy Hour	Period of 60 minutes during which occurs the maximum traffic load in a period of 24 hours
CapEx	Capital Expenditure
CCA	Current Cost Accounting
CG	Charging Gateway
ComReg	Commission for Communications Regulation (Irish National Regulatory Agency)
CSCF	Call Session Control Function
DSLAM	Digital Subscriber Line Access Multiplexer: equipment in charge of the connection of multiple subscriber line interfaces into a high-speed channel using multiplexing techniques

EPMU	Equi Proportional Mark-Up
ERG	European Regulators Group. ERG was the predecessor to the Body of European Regulators for Electronic Communications (BEREC)
FAC	Fully Allocated Costs
Gbps	Gigabits per second
HCA	Historic Cost Accounting
HSS	Home Subscriber Server
IRG	Independent Regulators Group
ITU	International Telecommunication Union
km	kilometre
kWh	Kilowatt hour
Line Card	Printed circuit board that interfaces with a telecommunications access network
LRIC	Long Run Incremental Cost
MEA	Modern Equivalent Asset

MGCF	Media Gateway Controller Function
MGW	Media Gateway
MSAN	Multi-Service Access Node
NGN	New Generation Network
NRA	National Regulatory Agency
NMS	Network Management System
OpEx	Operational Expenditure
PSS	Packet Switched Server
PSTN	Public Switched Telephone Network
SDH	Synchronous Digital Hierarchy
TDM	Time-division multiplexing
UAE	United Arab Emirates
VAS	Value Added Services

VLAN	Virtual Local Area Network
VoIP	Voice over IP. Voice over Internet Protocol
WDM	Wavelength Division Multiplexing