ICT Decision 2011-3

Grand Cayman, 22 December 2011

Decision for the FLLRIC Implementation Consultation (CD 2009-1)

Overview

*The ICT regulatory regime in the Cayman Islands requires that Cable & Wireless (Cayman Islands) Ltd. ("LIME") adopt a **F**orward-**l**ooking **L**ong-**r**un **I**ncremental **C**osting ("FLLRIC") methodology when it performs cost studies for regulatory purposes. FLLRIC costs are calculated using the least cost technology currently available and ignore historical costs or technologies.*

In this decision, the Authority makes determinations on the revised FLLRIC model, the inclusion of inter-operator billing, whether to make an annual adjustment to the cost studies and the cost recovery by LIME of costs related to building the 3G module.

This decision results from the follow-up process initiated by the Authority's 2008 Phase II decision on the Costing Manual Consultation, ICT Decision 2008-2 and the Phase I decision prior to that on the FLLRIC Principles and Guidelines, ICT Decision 2005-4. The reader may find it beneficial to review both decisions for more background information.

The Authority determines that, subject to a number of revisions, it is satisfied with the FLLRIC costing methodology proposed by LIME for the purpose of costing the Mobile Termination Rate ("MTR"). The Authority is also generally satisfied with the overall costing methodology for the fixed network. However, the potential use of the model for both fixed and mobile costing when those results are used for imputation tests, determination of an access deficit or the determination of wholesale rates, may require further review of the inputs and methodology assumptions.

In addition, as mentioned above, there are a number of issues that remain outstanding related to the costing of the MTR and this decision specifies a procedure to complete that process.

With regard to annual adjustments to a FLLRIC produced MTR, the Authority concludes that these will not be required at this time.

Finally, the Authority denies LIME's application for recovery of costs related to building the 3G module.

Table of Contents

INTRODUCTION

1. The Information and Communications Technology Authority ("the Authority") has used a three phase process for the development of a Forward-looking Long-run Incremental Costs ("FLLRIC") model:

   - Phase 1 - establish model foundation;
   - Phase 2 - evaluate model implementation; and
   - Phase 3 - final model implementation and use.

2. This process was prompted by the terms set out in Cable & Wireless (Cayman Islands) Ltd.'s (trading as "LIME") Licence in which it commits to building a FLLRIC model.

3. Phase 1 was initiated by a public consultation on 24 May 2004 and dealt with the economic and regulatory costing principles and parameters for a FLLRIC model. Phase 1 was concluded with the issuance of an Authority decision on 22 July 2005 entitled "ICT Decision 2005-4 - Decision for the Forward-looking Long-run Incremental Costing Consultation (CD (2004) 1)" ("Decision 2005-4").

4. On 27 October 2005, after receiving input from interested parties concerning the process for the Phase 2 proceeding, the Authority launched the Phase 2 proceeding by issuing a public consultation on a costing manual to be used by LIME to develop FLLRIC for its services. Phase 2 was concluded with the issuance of an Authority decision on 31 July 2008 entitled "ICT Decision 2008-2 - Decision for the Costing Manual Consultation (CD (2005-1)" ("Decision 2008-2").

5. This decision document marks the end of the third and final phase in the FLLRIC development process and deals with implementation and application, where LIME is to file, among other things, a final costing model.

6. The purpose of constructing a FLLRIC model is threefold: the FLLRIC model will be used to: 1) establish cost based rates for interconnection services; 2) ensure that LIME's retail rates are not anti-competitive by providing input to imputation test analysis; and 3) to quantify an access deficit if any. The initial purposes of the FLLRIC model are set out in LIME's licence, although other uses for the model may become evident as the market develops.

7. In this decision, the Authority specifically makes determinations on:

   - the implementation of a regulatory costing methodology using the revised FLLRIC model, including a FLLRIC based Mobile Termination Rate ("MTR") and whether inter-operator billing is to be included in the FLLRIC model;
   - what, if any annual adjustments would be appropriate to a FLLRIC based MTR; and
   - LIME's application for the recovery of the costs of developing the 3G module.

8. This decision first provides a description of the main steps in the process that were used for this proceeding. That is followed by a detailed discussion and analysis of the information received during this proceeded, including the Authority's determinations on the key issues as identified above. Finally, a description is

provided of the process the Authority intends to use for future cost studies using the FLLRIC model.

PROCESS

9. In Phase 1 of the FLLRIC process, the Authority established a foundation for the modelling work to be performed by setting out the overall modelling principles and guidelines.

10. In Phase 2, the Authority made final determinations on a number of parameters and the methodology to be used in FLLRIC studies, for example, the cost of capital, the economic asset lives for various classes of network equipment, and the methodology to calculate annualised capital costs. In addition, the Authority raised certain concerns over other aspects of the FLLRIC model.

11. In Decision 2008-2, issued 31 July 2008, the Authority directed LIME to make a number of revisions to its proposed FLLRIC methodology and to provide additional documentation and modelling. LIME was also directed to identify the date by which it would be able to file a complete FLLRIC cost model and MTR cost studies reflecting the Authority's determination. In addition, the Authority directed any other party that intended to participate in the FLLRIC Phase 3 proceeding to identify the number of days it would need in order to review LIME's submission and file any proposed changes and supporting rationale.

12. On 14 August 2008, Digicel Cayman Limited ("Digicel") requested that the Authority reconsider certain elements of Decision 2008-2 arguing that many aspects of the decision were fundamentally flawed in terms of the substantive approach adopted by the Authority.

13. In letter dated 22 August 2008, LIME noted the filing of Digicel's request for reconsideration and indicated that it would be in a position to file the required information as required in Decision 2008-2 within six months or within seven months subject to the interpretation of one particular revision that would significantly influence the completion date. Specifically, LIME queried the interpretation of the term "current investment" as either requiring asset revaluation or not. If no asset revaluation was necessary, then LIME would require six months. If asset revaluation was required, then it would require seven months.

14. By letter dated 22 August 2008, amongst other items, Digicel indicated that a period of not less than ninety calendar days would likely be required for it to review, assess and provide responses to LIME's FLLRIC Phase 3 submission.

15. By email dated 22 August 2008, TeleCayman indicated that it would need three months in order to review and comment on LIME's FLLRIC Phase 3 submission.

16. On 1 September 2008, Digicel provided comments on the timeframe suggested by LIME. Digicel stated that it was not convinced that the necessary work could be done within the six or seven months as suggested by LIME.

17. On 5 September 2008, the Authority denied Digicel's 14 August 2008 request for reconsideration. Also on 5 September 2008, the Authority identified to LIME that the term "current investment" was specified in footnote 85 of Decision 2008-2 to mean "using physical quantities and current unit prices for the same or equivalent assets as in the C&W FAC model".

18. On 15 January 2009, the Authority launched a public consultation on FLLRIC Implementation (CD-2009-1). In its consultation document, the Authority sought comment from all interested parties on the revised FLLRIC model and Mobile Termination Rate ("MTR") cost studies to be developed by LIME. In addition, the Authority sought comment on a related matter, namely annual adjustments to a FLLRIC based MTR. When setting the dates for the proceeding the Authority noted that the parties of the proceeding were in the best position to estimate how much time would be needed to develop its own submissions and that the Authority had given due consideration to the requests of the parties.

19. On 17 March 2009, LIME submitted a request to extend the deadline for the submission of the 3G module. LIME stated that it did not have the in-house expertise to develop a 3G module, that it had engaged an external consultant to assist in the work and that that consultant could only begin work on developing a 3G module at the date of the letter. Based on the consultants estimate of the time required to develop the module, it requested an extension from 6 April 2009 to 18 May 2009.

20. In a letter dated 20 March 2009, LIME submitted an application for the recovery of the costs of developing the 3G module.

21. On 27 March 2009, the Authority approved LIME's 17 March 2009 extension request for a deadline extension for the submission of the 3G module.

22. On the 6 April 2009 due date for submission by LIME of information other than that related to the 3G module. LIME informed the Authority that it would be unable to file its submission, but that it expected to file complete documentation, on 9 April 2009, and accordingly requested an extension to that date.

23. On 8 April 2009, the Authority approved LIME's 6 April 2009 extension request.

24. On 9 April 2009, LIME submitted revised fixed network and 2G network cost modules. LIME stated that the modifications mandated by the Authority had touched all aspects of the model build and, in some instances, aspects were quite fundamental to the working of the model. In addition to electronic cost modules, LIME provided an attachment summarising LIME responses to the various directives in Decision 2008-2 and 17 appendices as documentation for the cost modules.

25. In correspondence of 7 May 2009, the Authority notified interested parties that it considered that LIME's cost recovery application would most appropriately be dealt with as part of the FLLRIC Phase 3 proceeding and that it had been included in the scope of the proceeding. Further, the Authority provided the parties with a revised process for the proceeding.

26. On 21 May 2009, LIME submitted to the Authority the 3G mobile network module, as directed by paragraph 398 of Decision 2008-2. LIME also provided a document entitled "Revision of LRIC Mobile Model from 2G to 3G" explaining the changes made to the 2G mobile network module in order to create the 3G module.

27. On 3 June 2009, Digicel submitted a request to extend the deadline for submission of comments on LIME's 3G cost module. Digicel indicated that it was working with cost modelling consultants to populate the model as it did not have in-house

expertise to comment comprehensively on the module. Also, due to the availability of its consultants and time required to complete the review, it would not be able to respond to LIME's submissions within the deadline. Accordingly, Digicel requested an extension of the deadline from 7 July 2009 to 7 August 2009.

28. On 16 June 2009, the Authority approved Digicel's 3 June 2009 extension request and amended dates for the process to accommodate this extension.

29. On 7 August 2009, LIME submitted its comments on proposed annual adjustments to the MTR. LIME recommended the MTR not be adjusted on an annual or other predetermined periodic basis. In LIME's view the MTR should only be reviewed in the event of a material change to a factor, variable or input affecting the MTR and only as determined by the Authority.

30. On 10 August 2009, Digicel provided a submission titled "Submission related to any proposed annual adjustments to a FLLRIC based MTR", but provided no comments related to those adjustments. Instead Digicel identified that its consultant had calculated an MTR of CI$ 0.0929 per minute using the module and Digicel data where possible.

31. On 19 August 2009, the Authority addressed first round of interrogatories to LIME with responses due by 7 October 2009. The document contained 149 interrogatories.

32. On 7 September 2009, the Authority received interrogatories from Digicel addressed to both LIME and the Authority. In addition to interrogatories, Digicel stated it was broadly in agreement with LIME that annual recalibrations of the MTR would unlikely be in the public interest. Digicel also included two annexes with its submission: one discussing the implications of mobile termination being one side of a two-sided market and a second presenting testimony from a UK High Court case which Digicel has taken against C&W involving a number of Caribbean jurisdictions, including Cayman.

33. On 7 September 2009, the Authority issued interrogatories to Digicel regarding its 10 August 2009 submission.

34. On 9 September 2009, Digicel provided the FLLRIC distribution list with two attachments that were referenced in its 7 September 2009 submission.

35. On 4 November 2009, the Authority received a letter from Digicel concerning Interconnect Billing System and the MTR. In that letter Digicel claimed, among other things, that the cost of inter-operator billing had to be included in the FLLRIC model and that the Authority must reassess the model to ensure that it includes an inter-operator billing system.

36. In a letter dated 5 October 2009, Digicel submitted a request to extend the deadline for its submission of responses to the Authority's 7 September 2009 interrogatories. Digicel argued that due to the resource constraints of its consultant it would be unable to provide responses to the interrogatories within the time frame allotted and that a further two weeks would be required to provide adequate responses. Accordingly, Digicel requested an extension of time from 7 October 2009 to the 21 October 2009.

37. In letter dated 6 October 2009, LIME indicated that it would not be in a position to file responses to interrogatories on 7 October 2009 as requested. Accordingly, LIME requested an extension of the time to respond to the interrogatories. LIME suggested a three tranche approach by providing responses on 14 October 2009, 21 October 2009 and 4 November 2009.

38. On 13 October 2009, the Authority approved the extension requests by both LIME and Digicel. The Authority noted that LIME's multi-staged reply dates may complicate any disclosure process because of the possibility of multiple simultaneous request and reply phases at the same time that LIME is attempting to respond to the remaining interrogatories. Therefore, for the LIME interrogatory responses that were originally due on 7 October 2009, the Authority set the due date for any disclosure requests for all of the LIME interrogatory responses to be within ten calendar days of the last batch of interrogatory responses being filed.

39. On 15 October 2009, LIME submitted to the Authority its "tranche 1" of first round interrogatory responses.

40. On 23 October 2009, Digicel filed responses to the Authority's 7 September 2009 interrogatories.

41. On 16 November 2009, LIME submitted to the Authority its "tranche 3" of first round interrogatory responses.

42. On 16 November 2009, LIME also submitted a response to Digicel's 7 September 2009 letter by responding to the interrogatories contained in that submission. LIME also submitted that the bulk of what Digicel filed on 7 September 2009 could not reasonably be characterised as interrogatories and requested that Digicel's submission, except for the seven actual questions, be stricken from the record and not considered in any deliberations by the Authority in this proceeding.

43. In a 20 November 2009 letter, the Authority required Digicel to provide a copy of its 4 November 2009 submission to the FLLRIC Phase 3 distribution list and the Authority provided an opportunity for any party to provide comments on whether Digicel's letter should be added to the record of the FLLRIC Phase 3 proceeding.

44. In a letter dated 25 November 2009, Digicel requested that the Authority order the public disclosure of all details contained in the FLLRIC model (including the fixed, 2G and 3G modules) and all information redacted by LIME in its responses to interrogatories submitted in the FLLRIC Phase 3 proceeding. Digicel's letter set out the reasons for its request. Digicel claimed that, without access to the un-redacted versions of the FLLRIC model, it was unable to detect the errors noted by the Authority. As a consequence and going forward, Digicel would be unable to establish whether errors had been corrected or whether any such corrections were reasonable. Digicel submitted that it was unreasonable, especially in light of the number of errors and alleged corrections, for it to be subjected to any outputs of the FLLRIC model without having the chance of unfettered scrutiny of them. In the same letter, Digicel also requested full disclosure be permitted at an in camera meeting if full public disclosure was not given.

45. In a letter of 18 December 2009, LIME stated its opposition to Digicel's request for full disclosure of the information it filed in confidence in response to the ICTA

interrogatories and its FLLRIC model (including fixed, 2G, 3G modules). LIME believed the underlying premise of Digicel's application to be false. LIME stated that it had provided a complete cost model with all formulas left intact, albeit with confidential information removed and substituted with "dummy data". LIME noted that cells containing dummy data were all highlighted as blue "user input" cells. In LIME's view, it was not necessary for Digicel to have access to LIME's confidential data to assess corrections to formulas. LIME submitted that the objective of the FLLRIC proceedings is to determine the costs of a forward-looking efficient operator, not necessarily the cost of a specific operator. As such it was not necessary for Digicel to have access to LIME's confidential information. In its letter, LIME also opposed Digicel's proposal to allow for an in camera proceeding.

46. On 14 January 2010, the Authority responded to Digicel's disclosure request. The Authority noted that its 9 December 2009 email to the FLLRIC distribution list set out its reasons for dealing with Digicel's 25 November 2009 disclosure request. In particular, given that the Authority had not received the LIME responses that were due on 21 October 2009 and in an effort to continue developing the record of the proceeding, the Authority considered that it would be appropriate to deal with Digicel's request for disclosure of the two batches of LIME interrogatory responses already submitted. The Authority noted that it dealt with disclosure requests individually and with due consideration of the particularities of each request and the purposes of the proceeding. In this particular case, the Authority noted that LIME was directed to submit, in addition to a FLLRIC model, the MTR cost studies and that this would be the first time during the FLLRIC process that the Authority would be considering the cost of an interconnection service. Following the Authority's consideration of the nature of the information and an assessment of the relative weight of the specific direct harm to the party providing the confidential information against the broader public interest in a full and fair public process, the Authority directed LIME to disclose certain information and revised public versions of the modules by 28 January 2010.

47. In letter of 14 January 2010, the Authority dealt with Digicel's submissions of 7 September 2009 and 4 November 2009. The Authority determined that except for the seven actual questions that were repeated in LIME's 16 November 2009 response, Digicel's submissions of 7 September 2009 and 9 September 2009 were to be stricken from the record of the this proceeding and would not be considered in any deliberations by the Authority in this proceeding. With regard to the 4 November 2009 submission, the Authority received no comments from any party. Taking into consideration that mobile-to-mobile billing could have a material effect on the mobile termination cost, the Authority consented, as a limited exception to the established procedure, to making the 4 November 2009 letter part of the record of the proceeding.

48. On 27 January 2010, LIME submitted to the Authority its "tranche 2" of first round interrogatory responses.

49. In a letter dated 27 January 2010, LIME requested that the Authority reconsider its 14 January 2010 determinations ordering the public disclosure of certain information claimed confidential by LIME in the FLLRIC model and interrogatory responses submitted in the FLLRIC Phase 3 proceeding.

50. In a letter dated 28 January 2010, further to the Authority's 14 January 2010 disclosure determination, LIME filed certain information to be placed on the public record noting that several other documents addressed in the Authority's 14 January 2010 determinations were the subject of a reconsideration request and therefore would only be provided following a determination on that reconsideration.

51. A call for comments on LIME's request for reconsideration was issued by the Authority on 28 January 2010.

52. On 9 February 2010, Digicel filed comments on LIME's request for reconsideration. Digicel was of the view that there were no grounds for reconsideration of the Decision within the legislation and that view was consistent with a previous Authority determination on a similar issue in Decision 2009-1.

53. On 26 February 2010, the Authority denied (in ICT Decision 2010-2) LIME's reconsideration application except for one mistake by the Authority and directed LIME to provide revised public versions of documents to the parties on the FLLRIC Phase 3 distribution list by 4 March 2010.

54. On 11 March 2010, further to the Authority's 14 January 2010 disclosure determination and 26 February 2010 reconsideration determination, LIME filed the remaining information to be placed on the public record.

55. On 31 March 2010, LIME submitted revised confidential versions of the FLLRIC modules as it had inadvertently not updated certain figures in the 3G module submitted in November 2009.

56. On 5 May 2010, the Authority addressed a second round of interrogatories to LIME with responses due 10 June 2010. The document contained 57 numbered interrogatories.

57. On 30 June 2010, LIME submitted responses to the Authority's 5 May 2010 interrogatories.

58. On 2 August 2010, the Authority addressed a third round of interrogatories to LIME with responses due 1 September 2010. The document contained 16 numbered interrogatories.

59. On 2 September 2010, LIME submitted responses to the Authority's 2 August 2010 interrogatories.

60. On 20 October 2010, the Authority addressed a fourth round of interrogatories to LIME with responses due 10 November 2010. The document contained 13 numbered interrogatories.

61. On 10 November 2010, LIME submitted responses to the Authority's 20 October 2010 interrogatories.

62. On 23 November 2010, the Authority notified the parties to the FLLRIC Phase 3 proceeding that the interrogatory phase of the proceeding was completed and in accordance with the Authority's intent as identified in CD 2009-1, it set the dates for final Comments and Reply Comments. The Authority specified that parties may submit comments by no later than 14 December 2010 and that these were to

be limited to the topics addressed in the record of the proceeding and must not introduce any new evidence. The date for reply was set to 6 January 2011.

63. On 13 December 2010, LIME filed revised public versions of the model.

64. On 14 December 2010, LIME submitted closing comments on implementation of the FLLRIC model and on 6 January 2011 LIME filed a letter noting that no closing comments had been received from any other parties and as a result was not filing reply comments.

65. The full public record for the proceeding is available for viewing on the Authority's website at: http://www.icta.ky/da_fllric.php or by selecting "Public Consultations" from the menu across the top of the www.icta.ky homepage and then selecting the "The Public Record of FLLRIC Phase III" link.

FLLRIC MODEL AND MTR

Background

66. LIME's FLLRIC model consists of the following cost modules:

- a fixed network cost module;
- a 2G network cost module; and
- a 3G network cost module.

67. In this section the Authority makes determinations regarding the FLLRIC model and the MTR. While this analysis has been guided by the specific Principles and Guidelines from Decision 2005-4, the Authority has also relied on more generic criteria in its analysis, including:

- Reliability. The model should produce reliable results that are logically sound.
- Cost/Time. The benefit of having information and cost estimates developed in certain ways must outweigh the costs involved in developing those estimates.
- Applicability. The model must be able to meet the overall requirements, namely be used for cost inputs in the development of cost based rates for interconnection services, be used to ensure that LIME retail rates are not anti-competitive by providing cost inputs to imputation analysis, and be used to quantify an access deficit if any.
- Understandability. The model must be reasonably clear and understandable.
- Flexibility. The model should provide users with the capability to adjust key inputs in order to assess their sensitivities and ensure the validity of results.

68. This decision first discusses modelling issues of a more general nature that, to a large extent, are common between the different modules or that require a consistent treatment between them. Each module is then reviewed in turn and directions are provided where relevant. Since both fixed and 2G modules were subject to review in Decision 2008-2, the focus of the review of these modules is whether the directions provided have been followed. For the 3G module a more thorough review is conducted.

69. Following determinations related to the specific modules, this decision reviews the need for inclusion of inter-operator billing in the modelling framework. This issue was not considered in Decision 2008-2 as it was only introduced following 4 November 2009 letter from Digicel. In that letter Digicel claimed, among other things, that the cost of inter-operator billing had to be included in the FLLRIC model and that the Authority must reassess the model to ensure that it includes an inter-operator billing system. As noted in the previous section, taking into consideration that this cost item may have a material effect on the mobile termination cost, the Authority consented, as a limited exception to the established procedure, to making the letter part of the record of this proceeding.

70. On several occasions the Authority refers to determinations and directions provided in Decision 2008-2, indeed the Authority has to a large extent adopted the same structure of analysis as in Decision 2008-2. References are also made to the Principles and Guidelines adopted by the Authority in Decision 2005-4.

Such references are abbreviated to the word "Principle" or "Guideline", as appropriate, followed by the relevant number of the Principle or Guideline from Decision 2005-4, e.g. Guideline 3.

Authority's Analysis and Decision on General Modelling Issues

71. In Decision 2008-2 the Authority identified the following general modelling issues:

- Scorched node;
- Network technology;
- Cost allocation to services;
- Standalone networks;
- Demand assumptions / projections;
- Asset lives;
- Exchange rates;
- Import duty;
- Annualisation of capital costs;
- Cost of capital;
- Expense factors;
- Model transparency and clarity of information; and
- Sensitivity analysis and model function.

72. In the following the Authority makes determinations on each of these issues and provides directions where relevant.

Scorched Node

73. In Decision 2008-2 the Authority determined that the number and locations of cell sites should not be fixed at the currently existing number or locations and directed LIME to:

(a) Allow for flexibility in costing the optimal number of cell sites.
(b) Provide evidence that demonstrates the optimality of the number cell sites adopted.

74. In response to (b) LIME submitted[1] that it had obtained more accurate information on one of the key inputs for node dimensioning, namely the maximum cell radius based on GIS analysis. Upon update of this parameter, the number of sites had been increased and was now much closer to the actual number of sites in LIME's network. This, LIME believes, attests to the model's ability to calculate an optimal number of sites as required by the Authority in (a). Further, LIME submitted documents containing technical information on existing cell site radial distances,

[1] Attachment A, Revisions to FLLRIC Model Ordered by the Authority in Decision 2008-02, Submitted by LIME in CD 2009-01 (8 April 2009), comment to No. 2.

Google earth maps showing coverage areas and technical documentation used by its engineering department when sizing and determining optimal coverage for its network.

75. After consideration of the information provided by LIME, the Authority is satisfied that the 2G cost module contains sufficient flexibility in costing the number of sites and produces optimal results within the modelling framework adopted.

The Authority's directions: Scorched Nodes

76. None.

Network Technology

77. LIME uses Next Generation Network ("NGN") technology in its fixed network model. In Decision 2008-2 the Authority concluded that NGN represents a valid and viable option for FLLRIC modelling.

78. However, with regard to mobile technology, in Decision 2008-2, the Authority directed LIME to supply a fully functional and documented 3G mobile module, where account was taken of growth in the network and in particular for higher bandwidth services. In this proceeding, LIME has submitted a 3G module. The Authority has reviewed that module in a separate section below dealing with the 3G module.

Cost Allocation to Services

79. In Decision 2008-2, the Authority directed LIME to implement a cost allocation methodology based on a large increment approach. Specifically, LIME was directed to: 1) divide the total annual cost of each network element (incl. expense factors) within each increment by the total usage (measured by number of minutes, calls or lines as appropriate) for all services that use that element; 2) use routing factors to determine how intensely a particular network element is used; and 3) calculate service unit costs by multiplying the network element's per unit costs by the service's routing factor profile and adding up the individual network elements costs. In addition, the Authority required LIME to remove all calculations related to the old cost allocation methodology.

80. The changes to the modules, as a result of these directions, were very extensive and have resulted in a simplified and more transparent model. The large increment approach makes calculations easier to trace and review and markedly increases transparency of an otherwise complex model. After careful review of the costing modules, the Authority is satisfied that LIME has implemented the required cost allocation approach.

The Authority's directions: Cost Allocation to Services

81. None.

Standalone Networks

82. In paragraph 104 of Decision 2008-2, the Authority considered that LIME's approach of modelling the fixed line business and the mobile business as standalone businesses with some shared costs to be appropriate. However, the Authority directed LIME to:

    (a) Revise (where relevant) and clearly indicate for both the fixed and mobile modules, the inputs/cost factors used to account for economically efficient sharing.
    (b) Use transmission costs in the mobile network modules, which are the lower of the rates for commercially provided fixed-line links or the costs of self-supplied wireless facilities.

83. In response to (a), LIME stated that the top-down approach to allocating operating expenses ensures that the costs are those of a combined business whose structure and processes reflect economically efficient sharing, and not that of stand-alone businesses. Nevertheless, LIME submitted that it had identified further opportunities for economically efficient sharing of facilities, for example some of the cell sites in the 2G/3G module had been identified as being shared with the fixed line network and national submarine cable cost had been split between the fixed and 2G/3G networks. After careful consideration, the Authority is satisfied with LIME's approach.

84. Regarding (b), use of transmission costs that are the lower of the rates for commercially provided fixed-line links or the costs of self-supplied wireless facilities, LIME revised the module to include an Excel switch which automatically chooses the lowest cost solution. The Authority is satisfied with this revision.

The Authority's directions: Standalone Networks

85. None.

Demand Assumptions / Projections

86. Demand assumptions include service and traffic parameters that are used to develop the service demand and dimension the network.

87. In Decision 2008-2, the Authority directed LIME to:

    (a) Increase the unsuccessful call rate from 24% to 32% in both mobile and fixed modules.
    (b) Use a busy hour (BH) assumption of 25 days per month for both the mobile and the fixed modules[2] and adopt a percentage of traffic in the busy hour of 9%, also in both modules.
    (c) Develop and document a clear and consistent definition of the factors used to develop actual, network and dimensioned demand. In particular, those associated with the provisioning allowance used for demand driven by lines should be addressed.

[2] This is roughly equivalent to 312 busy hour days per year or busy hour every day except Sunday.

(d) Explicitly show existing demand and forecasted demand for services in both fixed and mobile modules, i.e. a growth rate should be shown for each service and the relevant planning horizon provided.
(e) Provide documentation and supporting evidence for the existing demand volumes and forecasted changes in demand.
(f) Provide justification for both explicit and implicit utilisation[3] in the different parts of the network.
(g) Provide supporting descriptions associated with all key volume input entries and in particular inputs such as ADSL Retail minutes.

88. In each LIME network cost module, a list of assumptions related to the calculation of services demand is presented in a separate tab.

89. The assumptions common to both fixed and 2G/3G modules are:

- The percentage of traffic in the busy hour: 9%
- Number of busy hours in a month: 25 (the fixed module shows this on an annual basis)
- Average non-conversation holding time for successful calls: 0.11 minutes per call
- Ratio of total/successful calls: 1.32

90. This is in line with Authority directions in (a) and (b).

91. In LIME's response to (c), the development and definition of factors used to develop actual, network and dimensioned demand, it stated that the term "provisioning" when used for 'lines' represents catering for stopped and allocated lines.[4] LIME defined stopped lines as lines that are temporarily disconnected and allocated lines as lines that are assigned but not yet activated.[5] To document the line provisioning factor of 5% used in the fixed module, LIME submitted a cabinet forecast record based on actual line counts for 2008.[6] The number of stopped and allocated lines as a proportion of working lines is in excess of the 5% provisioning allowance for lines. The Authority considers that the choice of a lower provisioning factor is in line with the requirement to model an efficient operator and accordingly, that 5% represents a reasonable provision.

92. The fixed module also contains a provisioning allowance for other network equipment equal to 5%. LIME indicated that this is a benchmark. Despite not providing detailed documentation for this value, the Authority believes that it, as an average for remaining network elements, is within reasonable bounds and as such the Authority accepts the value.

93. LIME's cabinet forecast record also contains information on the growth rate for lines. Specifically, LIME estimated growth rates for two year periods. The growth

[3] Utilisation factors, or fill factors, measure the utilisation of capital resources relative to the available capacity provided by the resource.
[4] Attachment A, Revisions to FLLRIC Model Ordered by the Authority in Decision 2008-02, Submitted by LIME in CD 2009-01 (8 April 2009), comment to No. 38.
[5] LIME Interrogatory Responses, Implementation of FLLRIC Model, 15 October 2009, response to interrogatory no. 141.
[6] Appendix XIV - Cabinet forecast 2008 - CONFIDENTIAL.xls, submitted 9 April 2010.

rate assumed in the fixed module of 3% is roughly an average of these rates. The Authority accepts the annual growth rate for lines used in the fixed module.

94. The 2G and 3G modules contain service and traffic parameters that differ from those used in the fixed module. Specifically the 2G and 3G module contains monthly usage per subscriber derived from actual LIME traffic numbers while usage per SMS of 0.5 kbits (bothway) is a benchmark figure. In Decision 2008-2 the Authority noted concern with inputs related to SMS and data as these were based on benchmarks with no link to the actual usage in LIME's network. The Authority considers that usage per SMS measured in kbits is a technical feature of the SMS service itself and not peculiar to the LIME network and therefore accepts LIME's benchmark figure. The monthly usage per subscriber on the other hand should reflect the realities of the Cayman market. LIME's revision reflects this and is accepted by the Authority.

95. In addition, the 3G module contains the following parameters:

- Percentage of daily PS traffic in the busy hour: 9%
- OSR (Over Subscription Ratio x:1): 1.3
- 3G (Rel99) MB usage / data active sub / month: 4
- HSDPA MB usage / data active sub / month: 40
- Usage for each MMS (bothway): 44.548 kbytes
- Video call data rate: 64 kbps

96. The percentage of daily PS traffic in the busy hour is used to convert monthly traffic per data active subscriber to busy hour traffic. The over subscription ratio assumption accounts for overbooking on the air interface due to higher cell peak throughput versus aggregated site level traffic requirement. It is used in the 'Radio calculations' sheet to calculate the channel element demand per sectorised cell site. Rel99 and HSDPA usage details the assumed data usage per data active subscriber per month. Both inputs are used in the traffic calculations. MMS usage details the assumed data traffic per MMS and is used in the 'Radio Calculations' sheet to calculate the busy hour MMS Mbit/s. After careful consideration, the Authority accepts these inputs.

97. Regarding (d), the requirement to explicitly show existing demand and forecasted demand for services in both fixed and mobile modules, LIME has updated the modules to show this input.

98. With regard to justification for both explicit and implicit utilisation in the different parts of the network as required in (f), LIME provided appendices detailing various utilisation rates in the access network, for cell sites, exchanges and transmission.

99. During the Phase 2 proceeding, LIME provided information indicating that the utilisation rate in LIME's domestic transmission network is lower than 66% and close to 66% for international circuits.[7] LIME used 66% as a circuit efficiency factor in the 'Technical Assumptions' sheet in the fixed module. During this proceeding LIME provided additional information for the calculated efficiencies or

[7] LIME Cayman Islands Response to ICTA/Telcordia Interrogatories, first round, Cost Manual, revised version 3 May 2007, p.16.

utilisations in various parts of its national transmission network.[8] These are lower than 66%. However, adjusting for efficiency the Authority believes the estimate of 66% to be reasonable. For the access network, LIME has submitted data containing actual utilisation ratios for cabinets in different parts of its access network. The actual observed average utilisation is below the value used for the MG fill ratio in the fixed module. LIME contends that the MG fill ratio employed in the fixed module is reasonable for an efficient operator given that it is above the actual utilisation of LIME's network and is supported by its design engineers.[9]

100. The 2G and 3G modules use a utilisation factor of 80% for cell sites (the capacity planning max load factor). This is in line with the average of the median range for cell sites utilisations submitted by LIME.[10] LIME also believes 80% is in line with international benchmarks.

101. The Authority accepts the explicit and implicit utilisation in the different parts of the fixed and 2G and 3G modules.

102. To justify its demand volumes and forecasted changes in demand as required in (e) and (g), LIME submitted an Excel spreadsheet with a collection of demand data from various LIME sources.[11] This spreadsheet did not detail how the data was used in the FLLRIC model. Hence the Authority asked LIME to provide detailed documentation that would show which information from the worksheet is used and where it is applied in the FLLRIC model. LIME responded that the spreadsheet captures the volumes of the services shown in the "Volume Input for TD" sheets of the modules and provided cell ranges from which the volumes were sourced (this also included volumes measured in 2Mbps for services such as ADSL and leased circuits which LIME convert into a "minute" equivalent).[12] This raw demand input in each module is subsequently converted (using growth factors) to a base year which LIME has defined as 2009 / 2010.[13] The resulting demand set is then used as the starting point for dimensioning and to allocate costs in the modules.

103. The Authority has reviewed the information provided and notes that the volumes are a mix of actual (volumes obtained from LIME's CIS System and Carrier Services) and forecast volumes. In some cases it is unclear as to which year the numbers relate. While LIME has been forthcoming in the provision of demand information, the Authority continues to have concerns with some of the information provided especially for the fixed network. Therefore, in future proceedings that entail determining a unit cost of selected fixed network services or imputation test purposes, the Authority may require further documentation for and review of the demand figures and costing methodology.

104. Regarding 3G traffic, a number of specific issues arose following the Authority's review.

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[8] Interrogatory Responses Implementation of FLLRIC Model 16 November 2009, Appendix XIII.
[9] LIME Cayman Islands Response to First Round Interrogatories, Interrogatory no. 141.
[10] Interrogatory Responses Implementation of FLLRIC Model 16 November 2009, Appendix XIII, sheet '60%-90%'.
[11] LIME confidential, Appendix XI - Traffic and product.xls, submitted 9 April 2009
[12] LIME Response to ICTA First Round Interrogatories, Implementation of FLLRIC Model, 16 November 2009, answer to question No. 112
[13] LIME Cayman Islands Response to First Round Interrogatories, Interrogatory no. 61.

105. In the first round of interrogatories the Authority noted that LIME makes no mention of the potential substitution effects of fixed subscribers moving to a 3G only service. LIME's initial response was to state that this assumption was not separately modelled, but already taken into account in the demand projections. In later interrogatories LIME was asked to provide detailed calculations for the demand projections used. While the explanations provided were not satisfactory due to the lack of readily available data for Cayman, the Authority accepts the current volume inputs after careful consideration, but notes that it may revisit the issue of substitution at a later date.

106. When using the 2G and 3G modules to determine the MTR, LIME made a number of assumptions regarding a sustainable forward-looking competitive mobile market in the Cayman Islands by changing the base demand used in the modelling.

107. First, LIME argued that there would be at most three sustainable mobile operators in Cayman. According to LIME the size of the Cayman Islands sets an upper limit of three.[14] LIME stated that in none of the markets in the Caribbean where LIME's affiliates operate have more than three competitors been sustainable. Indeed, LIME considered it arguable whether many of those markets could in fact sustain more than two mobile operators.

108. Second, LIME considered that each operator would have the same market share. In essence, assuming that each operator has comparable network coverage, service quality and marketing skills.

109. Third, LIME submitted that the overall market in Cayman would not grow beyond the growth assumptions already built into the 2G and 3G modules. Given the saturation of the existing market, LIME considered it unlikely that the presence of a third operator would result in any significant growth in subscribers or in minutes of use. Rather, existing subscribers would either leave LIME or Digicel, or join the third operator's network in addition to their existing subscriptions to LIME and/or Digicel services.

110. Conceptually, LIME incorporated these assumptions into the 2G and 3G modules by first determining total market demand by grossing up LIME's demand volume by two (making the assumption that LIME has half the market) , and then dividing by three (representing three operators with an equal market share) to derive the new volumes.

111. During first round interrogatories[15], the Authority noted that no adjustments were made to the following services: 900MOBILE DATA, 900-MOBILE VOICEMAIL RETAIL, 900-SMS, 900-MMS, 900-VIDEO CALLING, 900-MMS TERMINATION, 900VIDEO CALL TERMINATION and 900-INBOUND DATA ROAMING.

112. In response, LIME submitted that the services in question were assumed to be less material to the calculation of the MTR, although LIME acknowledged that 900MOBILE VOICEMAIL RETAIL should have been adjusted like the other services.

[14] LIME response to first round interrogatories, 27 January 2010, Interrogatory No. 128.
[15] Interrogatories to LIME, 31 August 2009, Interrogatory No. 129

113. The Authority also asked[16] LIME to explain how the demand forecasts would be affected should only two mobile carriers be assumed to operate sustainably. LIME responded that total market demand would be divided by two based on the principle that the market shares of equally effective competitors would tend to be the same in the long run.

114. Further, LIME was asked[17] to indicate whether the total demand would be higher or lower if three mobile operators were present and whether the potential substitution of subscribers from wireline to wireless would be higher or lower if three mobile operators were present. LIME responded that it was unable to find decisive evidence that the advent of a third mobile operator in the Cayman Islands would increase total demand beyond the demand that is experienced today with two operators. With respect to the 3G module, LIME noted that the 3G service volumes differ from the 2G service volumes only where there are new services delivered by the 3G network.

115. Based on the Authority's review of the modules, it is clear that the level of demand used to determine the MTR has a significant impact on the outcome. The Authority has therefore carefully considered this issue and makes the following observations.

116. First, LIME and Digicel started mobile operations at different points in time. In the early phases of market liberalisation LIME was the larger of the two operators, however, Digicel has managed to make up significant ground and now both operators are much closer in terms of size in the market for mobile services. These historic developments reflect how successful the operators have been in attracting customers and in the Authority's view should not have any impact on the MTR. Instead the Authority is guided by the forward-looking nature of the FLLRIC concept.

117. Second, in Decision 2008-2 the Authority noted on several occasions that the appropriate benchmark for FLLRIC is that of a hypothetical new entrant to the market. However, within that concept the Authority does not envisage an efficient new entrant who by virtue of being an entrant would not have immediate access to the economies of scale and scope that might be achievable over time. When seeking to emulate the outcomes realisable in a competitive market, some regard must be had to the dynamics by which operators compete and establish themselves in markets. The Authority has previously in Decision 2008-2 dealt with this balancing requirement and the need to take actual circumstances into account. Indeed, when discussing sharing options and building networks over time the Authority considered it appropriate to assume that the network from a technical perspective is built overnight (or instantaneously), but all input parameters (sharing, equipment prices, etc.) are verifiable and reflect the costs of actual networks built over time the result of which is that equipment prices may follow from normal purchases and sharing may reflect normal planning and construction activity.[18]

[16] Interrogatories to LIME, 31 August 2009, Interrogatory No. 132
[17] Ibid
[18] Decision 2008-2, paragraph 135.

118. The Authority considers the most appropriate approach to defining a market share for establishing the MTR is to consider what an efficient operator would be able to achieve in the long run, given competition between efficient mobile operators in the Cayman Islands market. LIME believes that three mobile operators will be sustainable in the long run, but at the same time acknowledge that many of the markets in which it operates may only be able to sustain two mobile operators. LIME presents no evidence on minimum scale efficiencies in Cayman, nor any evidence that the Cayman market would be able to support three operators.

119. The Authority notes that it is difficult to make direct comparisons among markets/countries given the differences in size, players, demographics, spectrum availability, and other considerations. While two operators may be sustainable in other LIME markets, this is not necessarily a good indication of the outcome in Cayman. Most Caribbean countries are still at a fairly early adoption stage with regard to data services and 3G technology. 3G (and eventually 4G) rollout may be able to drive further mobile growth, stimulating more advanced data service adoption and ultimately have influence on the existing market structure in Cayman.

120. Without a more rigorous analysis of the competitive outcomes in Cayman and more concrete evidence that entry into the Cayman market is eminent, the Authority is not convinced that "sustainable" translates into a 33% market share. Current market conditions show that a 50% market share is both achievable and sustainable. Accordingly, the Authority determines that the FLLRIC module should adopt a market share of 50% consistent with two equally efficient mobile operators in the long run. As LIME and Digicel have roughly similar market shares the Authority determines that LIME's unadjusted demand inputs can reasonably be used for the purpose of determining a FLLRIC based MTR.

The Authority's directions: Demand Assumptions

121. For the assumed demand in the mobile modules, LIME is directed to remove the calculations that gross up the LIME demand by two and then divide by three; that is, use its unadjusted demand inputs.

Asset Lives

122. The Authority has reviewed the asset lives used in the latest version of the fixed module and 2G module and notes that these are consistent with those determined in Decision 2008-2. In the fixed module, however, LIME has introduced an asset life for Interconnect Billing and VOIP equipment of 6 and 8 years respectively. The 2G module also makes use of these asset lives. The Authority accepts the values as they are consistent with other asset lives determined by the Authority.

123. The 3G module contains a number of asset categories that differ from those used in the 2G module. These include CE cards (3G TRX), Node B Unit, HSDPA Upgrade, Carrier upgrade (per sector), Radio Network Controller (RNC), Mobile Switching Centre Server (MSS), Media Gateway, IP Core Network and Applications Platform. Except for the asset life of 6 years for the Media Gateway the Authority is satisfied with the asset lives used in the 3G module.

124. Following the inclusion of direct mobile billing in the 2G and 3G module, LIME has made direct Excel references to the asset lives in the fixed module when

annualising mobile billing costs in the mobile modules. This results in the user being prompted to update these links when opening the 2G and 3G modules. In the Authority's view this is an unnecessary complication when other assumptions that potentially could be regarded as common between the modules are kept in separate modules.

The Authority's directions: Asset Lives

125. LIME is directed to use the asset lives as set out in the table below in the FLLRIC model. For completeness the table incorporates the asset lives previously approved in Decision 2008-2.

Table 1: Authority's determination on asset lives

Equipment Type	Life (yrs.)
Fixed network	
NGN Equipment	**8**
Duct	**40**
Fibre Cable	**20**
Fibre Joints	**20**
Poles	**20**
Management Systems	**6**
Manholes	**40**
Copper Cable	**20**
Copper Joints	**20**
Distribution Points, Dropwire, Network Interface Devices	**15**
Transmission Equipment	**10**
Payphone Equipment	**8**
Digital Subscriber Line Access Multiplexer Equipment	**6**
Indefeasible Right to Use	**20**
Data Network Equipment	**10**
2G / 3G network	
Cell site	**15**
Transceiver / CE cards	**8**
Base Transceiver Station / Node B Unit	**10**
HSPDA upgrade	**8**
Carrier upgrade	**8**
Base Station Controller (BSC) / RNC	**10**
Mobile Switching Centre (MSC) / MSS	**10**
Media Gateway	**8**
Trunk Controller Unit (TCU)	**8**
Home Location Register (HLR)	**10**
Serving GPRS Support Node	**7**
Gateway GPRS Support Node	**7**
Packet Control Unit (PCU)	**7**
IP Core Network	**7**
Internet Gateway	**7**
Voicemail	**7**
Applications Platform	**7**
Network Management Systems	**6**

126. LIME is also directed to remove the asset life Excel links in mobile modules where direct mobile interconnection has been implemented.

Exchange Rates

127. In Decision 2008-2, the Authority determined that the FLLRIC model should use commercial exchange rates and provide supporting documentation.

128. LIME has updated the modules to reflect exchange rates as provided by Management of LIME's Purchasing Department. The Authority accepts this approach.

The Authority's directions: Exchange Rates

129. None.

Import Duty

130. In Decision 2008-2, the Authority directed LIME to take account of duty exemption where this is relevant. LIME responded that it is no longer entitled to any duty exemptions on imported network equipment and it pays 20% on all imported equipment.[19] In other words, LIME has assumed an approach which reflects the costs of actual networks built over time.

131. In terms of the actual percentage duty that applies, the Authority notes that, as of December 2009, 22% duty applies to telecommunications equipment (see: http://gazettes.gov.ky/sites/default/files/gazette-supplements/Gs792009_web.pdf). Therefore, LIME should update the model to reflect the current applicable duty rate.

The Authority's directions: Import Duty

132. LIME is directed to update the model to reflect the current applicable duty rate..

Annualisation of Capital Costs

133. In Decision 2008-2, the Authority determined that costs should be annualised using a standard annuity approach. Further, the Authority considered that, when the FLLRIC results are used for rate setting purposes, the annualisation methodology should assume monthly payments rather than annual payments.

134. As noted in paragraph 149 of Decision 2008-2, the conversion from an annual to a monthly annuity requires a conversion of the inputs to the annuity formula. An asset life measured in years should be multiplied by twelve to get the number of months and the monthly equivalent of the cost of capital and price trends (on an annual base) should be calculated using the following formula:

$$Monthly\ rate = (1 + annual\ rate)^{1/12} - 1$$

[19] Attachment A, Revisions to FLLRIC Model Ordered by the Authority in Decision 2008-02, Submitted by LIME in CD 2009-01 (8 April 2009), comment to No. 22

135. Upon the review of the cost modules, the Authority notes that LIME has not applied the required monthly conversion of the cost of capital, but simply divided the annual rate by twelve.

The Authority's directions: Annualisation of Capital Costs

136. LIME is directed to amend the cost modules to apply a monthly cost of capital (used in the Excel PMT function).

Cost of Capital

137. In Decision 2008-2, the Authority determined individual values in the calculation of the cost of capital for both mobile and fixed network and directed LIME to use an average WACC of 9.5% in both fixed network and mobile network modules in line with the Authority's technology neutral approach to regulation. LIME was also directed to ensure that input values elsewhere in the FLLRIC model reflected the use of a nominal WACC.

138. The Authority is satisfied that LIME has made the relevant changes to the FLLRIC model to reflect the Authority's determined WACC.

The Authority's directions: Cost of Capital

139. None.

Expense Factors

140. The expense factor components of the FLLRIC model are used to derive the network operating expenses, annualised cost of support assets and network recharges. Non-network capital and operating costs that are common to both fixed and mobile networks are also captured by the expense factors used in each module. Retail costs are not modelled as expense factors but input from LIME's FAC model and allocated to network elements and services using cost drivers. This methodology is discussed in the next section.

141. The expense factor calculations are spread over four worksheets including 'FAC Inputs' and 'Reval_Assets',' Expense Factors' and 'overhead_exp'. Each sheet is briefly discussed in the following.

142. The 'FAC Input' sheet contains all network operating expenses and non-network expenses for all three modules. In addition, the cost of working capital (network and non-network) is also listed in the spreadsheet. All of these entries are brought in from a separate file employed in the study (Appendix IV-FAC-TD Values 10_09_01.xls, 'Expense Factor Adjusted' sheet). The main expense categories include:

- Fixed Network Operating Expenses
    - Distribution Network Operating Expenses
    - Core Network Operating Expenses
    - Other Fixed Network Operating Expenses
    - International Network Operating Expenses
    - Interconnect Specific Operating Expenses

    - Fixed Network Recharges
    - Fixed Network Specific Costs
    - Fixed Network Support Expenses
    - Fixed Network Cost of Working Capital
    - Fixed Network Capital Cost of Support Assets
- Mobile Network Operating Expenses
    - Mobile Network Operating Expenses
    - Mobile Interconnect Specific Operating Expenses
    - Mobile Network Recharges
    - Mobile Network Specific Costs
    - Mobile Network Support Expenses
    - Mobile Network Cost of Working Capital
    - Mobile Network Capital Cost of Support Assets
- Overhead Expenses
    - Fixed & Mobile Network Overhead Expenses
    - General Overhead Expenses – Apportioned to Networks
    - Overhead Recharges
    - Overhead Specific Costs
- Retail Business Expenses
    - Retail Expenses
    - General Overhead Expenses – Apportioned to Retail
    - Retail Recharges
    - Retail Specific Costs
    - Fixed Retail Cost of Working Capital
    - Mobile Retail Cost of Working Capital
    - Fixed Retail Capital Cost of Support Assets
    - Mobile Retail Capital Cost of Support Assets

143. Each of the categories listed above contains several expense sub-categories.

144. Each expense value has an associated efficiency adjustment factor. These adjustment factors are used to account for cases where the modelled network varies from the actual network. A total of eight expense entries are adjusted. These include:

- Maintain International Switching Expense adjusted to 0%: Saving incurred through elimination of separate international switch in modelled network.
- INTER-Region Recharges IN (7504195) - Call centres: Expense adjusted to 0% since it is directly addressed in the bottom-up model.
- Consultancy Fees associated with Hurricane Ivan: Expense adjusted to 0% as per ICTA Decision 2008-2.
- R&M Exchange Equipment - Switch Maintenance Expense: Adjusted to 75% to account for a 25% NGN efficiency.
- Maintain Mobile Switch Expense: Adjusted to 600% of original value to account for presence in Cayman of MSC in modelled network.
- Provide Mobile Switching Equipment Expense: Adjusted to 600% of original value to account for presence in Cayman of MSC in modelled network.
- INTER-Region Recharges IN (8004195) Mobile Roaming: Eliminated as calculated in the bottom-up model prior to expense factor sheet.
- Manage Hurricane Recovery: Adjusted to 0% as per the ICTA Decision 2008-2.

145. All other cost categories show a 100% factor, meaning no adjustment is made. In the 3G module an option for secondary adjustments associated with the 3G mobile network are provided. However, all factors are set to 100%, indicating that no adjustments are driven by 3G.

146. The 'Reval_Assets' sheet collects and aggregates the Gross Replacement Costs ("GRC") for all of the network and infrastructure components in LIME's fixed and mobile networks. The Authority notes that the cells AX1 and AY1 contain the exact same formula[20] resulting in the value '400-3G: MSC - duration sensitive' being returned twice.

147. The 'Expense Factors' sheet contains factors used to derive the network operating expenses and annualised cost of support assets. These are developed by multiplying derived expense ratios by the GRC of the network element that is calculated in the module.

148. The 'overhead_exp' sheet contains factors used to derive overhead costs. The basic structure of this sheet follows that of the 'Expense Factor' sheet. The Authority notes that cell BH4 is empty which is inconsistent with all other cells in this section of the spreadsheet. This would appear to be an error. Following the sequence on prior and subsequent cells, the contents of this cell should read "='Expense Factors'!T4".

149. In Decision 2008-2 LIME was directed to:

    (a) Explain the apparent disparity in detail between interconnect specific costs incurred in the fixed module with those in the mobile module.
    (b) Ensure that expense factors do not include any costs specific to Hurricane Ivan, but only those costs that are required in the operation of a telecommunications business in a hurricane prone area.
    (c) Explain the relevance of the fixed network specific costs "100-R&M Exchange Equipment – Ericsson Switch" considering that an NGN is being modelled.
    (d) Split the cost centre/activity combination (in the ABC model) if relevant into what can be capitalised labour expenses and non-capitalised labour expenses for the mobile network operating expenses '100-Provide Mobile Cellsites' or alternatively, explain why spitting the costs would not be appropriate.
    (e) Explain the cost centres/activity centres related '100-Provide Mobile Switching Equipment' (in the ABC model), and if relevant split them into capitalised labour expenses and non-capitalised labour expenses.
    (f) Explain the relevance of including both '100-Non Broadband Radio – Ericsson Support' and '100-Telecoms Equipment – Nortel Support' in the light of the forward-looking assumption and modelled technology.
    (g) Allocate royalty costs based on revenue rather than costs.
    (h) Base its network expenses factors on 'current investment' (as opposed to 'forward-looking investment') and 'current expenses'.
    (i) Add an option to the FLLRIC model allowing the user to take account of efficiency improvements, i.e. by adding an input parameter that adjusts the

[20] "='Network Elements'!H2&'Network Elements'!H3&'Network Elements'!H4"

expense factors directly by whatever efficiency improvement the user is investigating. This factor should per default be set to zero percent.

150. Further, subject to any modifications resulting from the items in the preceding paragraphs, the Authority determined that LIME's expense factors should be used for both fixed and network cost modules and that the same expense factors should be used for both 2G and 3G network modules.

151. Regarding (a), the interconnection costs and the inclusion in the FLLRIC model, LIME stated that the management of PSTN Interconnection arrangements and facilities is conducted by LIME's Carrier Services Division which must act in a non-discriminatory manner towards all interconnecting parties, including LIME's Mobile business. In essence the FLLRIC model reflects the current interconnection situation where LIME's fixed network is used as a hub for interconnection between the different licensees. This situation and whether direct interconnect with LIME's mobile operation should be modelled is subject to a separate determination and discussed in more detail below.

152. In response to (b), LIME indicated that no costs specific to Hurricane Ivan are included in the expense factors. The Authority notes that the cost category '100-Consultancy Fees (Hurricane Ivan)' has been zeroed out in the expense factor input sheet.

153. With regard to (c), the relevance of the fixed network specific costs "100-R&M Exchange Equipment – Ericsson Switch", LIME considers this expense item to be relevant under forward looking assumptions. LIME stated that NGN switching equipment would require supplier support, but that the level of support may vary from that of the past. LIME applies an efficiency adjustment of 75% to reflect the cost of a forward-looking operator.[21] Further, LIME renamed the expense item to '100-R&M Exchange Equipment - Switch Maintenance', a more generic term. The Authority agrees with this adjustment to both name and value.

154. In response to (e), the relevance of splitting the cost category '100-Provide Mobile Switching Equipment' into capitalised labour expenses and non-capitalised labour expenses, LIME noted that capitalised labour expense had been removed from the expense input costs and therefore that it is not relevant to apply a further split. The Authority accepts this.

155. Regarding (f), LIME agreed that the terms '100-Non Broadband Radio – Ericsson Support' and '100-Telecoms Equipment – Nortel Support' refer to supplier specific legacy switching equipment. Nonetheless, LIME believes that these expense items are relevant under forward-looking assumptions and that mobile switching equipment and radio equipment would require supplier support. The level of support, however, may vary from that of the past. LIME noted that an efficiency adjustment can be applied and that the cost categories have been renamed to reflect more generic expense terms. A review of the FLLRIC model reveals that the term '100-Telecoms Equipment – Nortel Support' is still used in the 'FAC input' sheet. However, LIME would appear to have renamed this category to '100-Mobile

[21] The FAC input sheet contains input data related to expense factors in all three cost modules. As directed by the Authority in (i), LIME has added an option to each module allowing the user to take account of efficiency improvements adjustments directly against each and every expense factor cost category. Any percentage so applied represents the proportion of cost allowed.

Switch Support' in the 'Expense Factors' sheet. Since the model uses a formula that is reliant on the name of the expense factor in the 'Expense Factors' sheet to look up the cost in the 'FAC input' sheet and no match can be made. This results in the cost of '100-Mobile Switch Support' to be excluded from the model. In addition, the Authority notes that LIME also would appear to have renamed the cost category '100-Non Broadband Radio - E-mail' in the 'Expense Factors' sheet and left the name unchanged in the 'FAC input' sheet. This too results in an exclusion of that cost.

156. With regard to (g), LIME has made appropriate changes to the model in order to allocate royalty costs based on revenue.

157. Before embarking on direction (h), LIME sought clarification on how the term 'Current Investment' should be interpreted for the purpose basing its network expenses factors on current investment (as opposed to forward-looking investment) and current expenses. In the Authority's response of 5 September 2008 it pointed LIME to footnote 85, paragraph 231 of Decision 2008-1 where in reference to the term "current investment", is stated "*i.e. using physical quantities and current unit prices for the same or equivalent assets as in the C&W FAC model.*"

158. For the purpose of asset revaluation LIME adopted the following approach: 1) the most recent full financial year ending Fixed Asset Register (FAR) was chosen, this being end of March 2008; 2) assets were grouped into categories to match that of the FLLRIC network assets; and, 3) the ages and technology of each asset category were analysed. Assets less than three years old, including works in progress, were considered sufficiently current and were left at book value. Assets aged over three years were subject to indexation type revaluation using Turner Indices. The results of the revaluation are captured in each module in the 'Reval_Assets' sheet which is then linked to the 'Expense Factors' sheet and 'overhead_exp' sheet. The Authority accepts LIME's revaluation. The Authority finds this approach acceptable.

The Authority's directions: Expense Factors

159. LIME is directed to:

- Correct the identified duplication of formulas in cells AX1 and AY1 of the 'Reval_Assets' sheet and any associated input.
- Review whether cell BH4 of the 'overhead_exp' should be empty and make appropriate corrections in the event this is an error.
- Review the names used in the 'Expense Factors' sheet and the 'FAC input' sheet in all modules to ensure all appropriate matches are made and costs only are excluded when this is relevant.

Retail Costs

160. In the first iterations of the FLLRIC model LIME had included a separate module (using top-down costing principles) to allocated retail expenses and capital costs relating to the retail part of the business. These results were since imported to

another module which is also retired (the Consolidation module) and then used to determine retail service costs. In the most recent version of the FLLRIC model, each module contains a sheet named 'Retail Costs' which contains retail cost input and allocations based on same principles to those originally submitted.

161. In Decision 2008-2, the Authority noted general satisfaction with the retail calculations but could not verify the accuracy of some of the calculations due to the lack of more detailed information. Accordingly, LIME was directed to provide supporting material to allow a more thorough review. In addition, LIME was directed to apply a bad debt factor to both retail and wholesale services.

162. With regard to the latter, LIME has updated the individual modules with bad debt costs which are added directly to service costs. The source for bad debt is from its ABC model and it may be traced to a single activity termed "Bad & Doubtful Debts". This lump sum amount is then allocated to all services according to revenue.

163. In each module, the bad debt input for wholesale services is sourced from the 'Retail Cost' sheet, row 119. Coincidently, the same row summarises retail costs for the retail services (which also includes bad debt). This is potentially confusing to the user. Bad debt costs should be shown separately for all service costs that are an output of the FLLRIC model.

164. From a technical modelling point of view, the Authority notes that LIME sources retail costs from "Appendix IV-FAC-TD Values 10_09_01.xls" in the 'Retail Cost' sheet which was submitted during third round interrogatories. This is unnecessary as the same retail costs are available in column D in the 'FAC Input' sheet in each module.

The Authority's directions: Retail Costs

165. LIME is directed to:

- Show bad debt costs separately for each modelled service i.e. remove bad debt costs from the retail costs and have one row for retail costs and another for bad debt.
- Remove links to retail costs sourced from "Appendix IV-FAC-TD Values 10_09_01.xls" and instead link to column D in the 'FAC Input' sheet.

Model Transparency and Clarity of Information

166. In Decision 2008-2, the Authority noted that the FLLRIC model suffered from lack of transparency and that the ordering and organisation of the worksheets and use of macros make the calculations difficult to follow. Accordingly, the Authority required LIME to improve the readability and transparency of the FLLRIC model by directing it to:

(a) Introduce colour coding in the FLLRIC model, i.e. different cell or font colours depending on the nature of the cell.

(b) Remove Pivot tables in the FLLRIC model and replace these with alternative calculations.

(c) Use named ranges in the FLLRIC model to assist in the understanding of calculations.

(d) Eliminate the use of macros in the FLLRIC model where possible.

(e) Minimise duplication in the FLLRIC model.

(f) Show any hidden cells in the FLLRIC model.

(g) Provide clarifying descriptions associated with inputs making it clear from where each are derived and/or from where they originate.

(h) Remove redundant information in the FLLRIC model and remove assumptions and input which are not used for any purposes in the modules.

167. Following the Authority's review of the updated FLLRIC model submitted in response to Decision 2008-2, the Authority noted several concerns with the continued use of macros and asked LIME to explain its use during several rounds of interrogatories. While significant progress has been made in improving model transparency and functionality, the Authority continues to have some concerns with the functionality and in particular, that macros are still present in the model that serve no use. Upon opening the modules the user is asked to enable or disable macros.[22] Excel will prompt the user for this even if there are no active Excel macros in this workbook. For example, if an Excel macro has been added and then removed, the empty macro module will still trigger the macro query. To remove this query the following steps may be used:

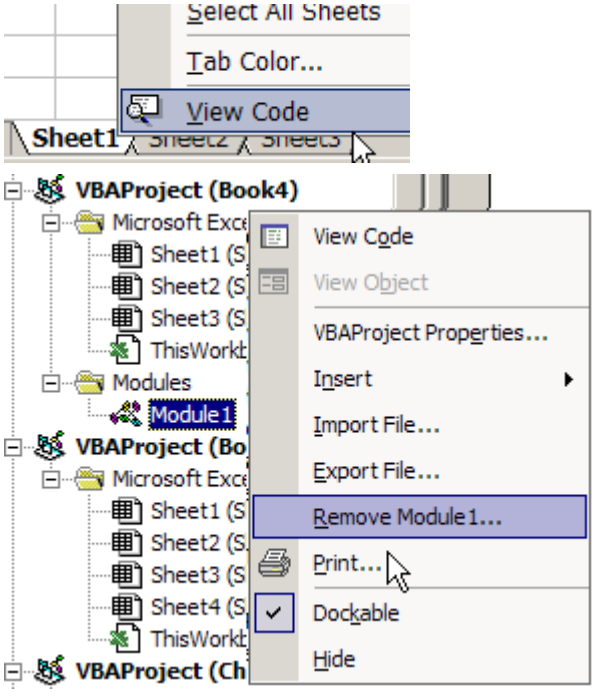
(1) Open the cost module

(2) Right click on any sheet tab and choose View Code, to open the Visual Basic Editor

(3) In the Project Explorer at the left of the screen, find the workbook. In the sample (right), Book4 is the workbook name "VBAProject (Book4)".

(4) Open the Modules folder.

(5) In the folder right-click on the module name and choose Remove Module1 as shown. Click "No" when asked if you want to export the module in question. Repeat this process for the seven modules contained the cost modules.

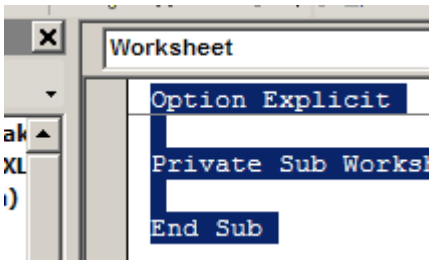


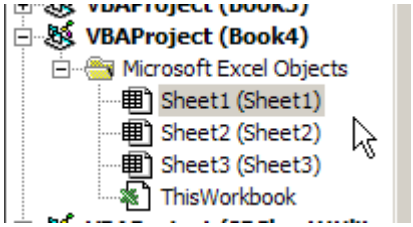
[22] When the macro security level in Excel is set to Low, macros can be run without prompting. However, when macro security is set to Medium or High as is common for most users, Excel displays a dialog box asking if you want to enable macros.

(6) Open the Microsoft Excel Objects folder.

(7) For each worksheet, double-click on the object name, to open its code module (Sheet 1 in the example), press "Ctrl+A" to select all the code followed by the Delete key. This will delete any code particular to the sheet.

(8) Look for a Forms folder, open it and delete any forms by right clicking on the form and selecting remove (clicking "No" when asked to export).





(9) Close the Visual Basic Editor and save the changes to the workbook

168. Improvements to transparency could be made in the modules by making more extensive use of range names. For example, cell C8 on the 'Traffic' sheet in the 3G module contains the formula: *Volume input for TD'!$E$2*(1+'Volume input for TD'!$W$38)* to calculate the number of "Data active subscribers". Cell references do not allow the user to readily know what the values used in equations and functions represent. A user is required to look up the cell reference, sometimes across several worksheets to understand the values. Range names can assist in making cell references clearer by assigning a relevant explanatory name to a particular input or value. The equation for the number of "Data active subscribers" referenced above could be written: *Mobile Data Lines*(1+ % data inbound roaming traffic vs sub origination)*. A dictionary of range names can be created showing location, equation or source of all the name ranges used.

169. An issue that has arisen due to the lengthy FLLRIC process and extensive rounds of interrogatories is the lack of coherent model documentation. With each successive round of the interrogatory responses from LIME, these issues have been resolved and changes have been made to both approaches and values used in the model. As it currently stands, model documentation is now spread out over dozens of Excel workbooks and documents without any organisation other than sporadic references to some of the files. Model documentation would be greatly improved if the number of files were minimised and the documentation as a whole was treated as a single unit with an organised structure. In addition, it would be possible to link input values used in each module directly back to supporting model documentation.

170. While the Authority would encourage LIME to provide consolidated and streamlined model documentation, it also recognises that significant effort is required to make these changes. In the Authority's view, the transparency of the calculations and the model itself in the current case takes precedence over transparent and structured model documentation. However, if there are significant changes to the model in any future regulatory proceedings, LIME should

work to improve the structure and transparency of the model and provide better model documentation. At this time, the Authority considers that LIME's removal of the macros in the model will help improve model transparency.

The Authority's directions: Model Transparency and Clarity of Information

171. LIME is directed to remove all macros in all modules.

Sensitivity analysis and Model Function

172. In Decision 2008-2 the Authority directed LIME to revise the workings of the model to make it more simple to use and to provide documentation for those parameters that require several steps to be performed when updating.

173. After careful consideration of the current version of the FLLRIC model the Authority is satisfied that model function has been simplified.

Authority's Analysis and Decision on Fixed Network module

174. In the following section the Authority discusses and makes determinations on issues specific to the fixed network module.

Access Network

175. The access network is the part of the fixed network from the exchange to the subscriber locations and includes costs related to ducting, trenching, cabling, manholes, distribution points etc.

176. In Decision 2008-2 the Authority directed LIME to:

(a) Justify the optimality of all the inputs used in the access network part of the fixed network module. The Authority emphasised that the access network should reflect forward-looking principles and a simple replication and re-valuation of C&W's existing access network cannot be regarded as a cost efficient solution without proper documentation.

(b) Align and use a consistent set of cable sizes through-out the access network modelling in the fixed network module.

(c) Ensure that interpolation between equipment sizes does not result in erroneous component costs in the fixed network module.

(d) Address the Authority's concerns with regard to the allocation of duct costs between access and core network.

(e) Provide documentation to show that exclusive duct is used in the same proportions as number of km in each network or where this is in error, correct the approach ensuring it is reflective of a forward-looking operator.

177. In response to (a), the optimality of the access network, LIME responded[23] that the design and roll out of LIME's access network is facilitated through the use of a modern GIS tool. This tool allows LIME's engineers to efficiently design the best route for cable runs, locate distribution cabinets, install distribution points and also identify obstacles, for example when preparing for cable runs a chosen path may not always be the best as buildings or other operator's facilities may be in the way. Further, LIME noted that prior to the implementation of the GIS system, LIME's access network design and planning would involve extensive field surveys in order to determine the best possible route or location for its facilities.

178. As part of first round interrogatories, the Authority sought further information on the GIS tool and numbers used in the module. In response to these interrogatories, LIME provided an appendix completed by LIME's engineers and based on information captured in its GIS system. The information provided in this appendix is essentially a summary of values derived by the GIS system and does not explain how the values were derived.

179. While the Authority accepts LIME's inputs for this decision, it notes that these may be subject to further review should the module be used in a regulatory proceeding dealing specifically with costing the access network and access services.

180. In the first round of interrogatories to LIME the Authority noted among other things some inconsistencies in the calculation of cable pair sizes. These and other concerns on cable related issues as identified in (b) and (c), have been addressed by LIME in the latest version of the fixed cost module.

181. With regard to (d) and (e), the allocation of duct costs and use of duct in access and core networks, LIME clarified in its response that a wrongful labelling in the module resulted in a misinterpretation and clarified that ducts are shared between core and access networks.

182. Several additional corrections have been made during the various rounds of interrogatories. Overall the Authority is satisfied with the approach and changes made, however, should the Authority need to assess the access deficit and for the purposes of imputation testing estimate access service costs, the Authority may need to review the approach and inputs used in more detail.

The Authority's directions: Access Network

183. None.

Switching Network

184. LIME has used NGN equipment in the switching network. The solution consists of a number of MGs (or MSANs) and two softswitches that are assumed to be located at existing local switch sites.

185. In Decision 2008-2, LIME was directed to:

[23] Attachment A, Revisions to FLLRIC Model Ordered by the Authority in Decision 2008-02, Submitted by LIME in CD 2009-01 (8 April 2009), comment to No. 59

(a) Separate the MG investment into fixed and variable costs according to dimensioning rules and functionality of the equipment. Where this is not possible, LIME was to correct for the methodological problems identified by the Authority.

(b) Use a consistent demand set to separate the fixed cost investment per MG into a 'Fixed Cost per MG' and the 'Variable Cost per MG'.

(c) Eliminate the use of estimates that mix old and new switching technologies and update the fixed network module to reflect MG investments based on NGN equipment only.

186. The Authority has reviewed LIME's revisions to the fixed modules and accepts the changes made.

The Authority's directions: Switching Network

187. None.

Transmission Network

188. LIME has a modelled a transmission network based on traditional SDH equipment, in a resilient ring configuration. The modelled network provides a minimum of one STM-1 link to each Media Gateway (MG).

189. In Decision 2008-2 the Authority noted that it accepted the basic structure of the modelled transmission network. It also noted that it was largely static in a network demand sense, and asked LIME to provide further explanation in this regard. In response, LIME provided a NGN network diagram setting out the structure of its core network infrastructure including transmission rings stating that this largely informed the build of the transmission module.

190. In the first round of interrogatories[24] to LIME, the Authority also asked LIME to provide the utilisation assumptions for the network depicted in the diagram and to identify how growth assumptions would affect the design and equipment requirements. In response, LIME provided and explained utilisation rates, transmission capacity allowances and growth rates. The Authority accepts LIME's method of addressing available capacity and forecasted demand in this part of the network.

The Authority's directions: Transmission Network

191. None.

Infrastructure Network

192. Infrastructure costs consist of cabling, ducting (and trenching) and poles. The fixed network module uses direct input from LIME's existing network to model infrastructure. For fibre cable this is the size (in terms of fibre strands/pairs) and length measured in kilometres and whether the cable is aerial or underground. For duct, it is the number of bores and the length of each.

[24] Interrogatory No. 127.

193. In Decision 2008-2, the Authority noted a number of concerns with the approach and directed LIME to:

(a) Provide documentation for the optimality and/or efficiency of the infrastructure inputs used (cabling, ducting trenching etc.). This should include a discussion of how excess capacity has been taken into account, how legacy impacts[25] have been dealt with and the choice of trenching terrain.

(b) Correct the input duct dimensions to match the cost inputs used in the fixed network module.

(c) Ensure an appropriate portion of pole costs are allocated to the core network.

194. In response to (a), the optimality of infrastructure inputs, LIME essentially provided the same explanation as used to justify the efficiency of its modelled access network (see the section above on the access network), namely use of a GIS tool. While the Authority has not reviewed the underlying GIS analysis by LIME the Authority is satisfied with the quantities that are a result of the analysis.

195. With regard to (b), the mismatch between duct dimensions and the cost inputs used, LIME has made adequate adjustments in the module. Finally, in response to (c), the allocation of pole costs, LIME has allocated a portion of pole cost (initially allocated solely to the access network) to the core network based on km length proportion of total aerial cable in the core network. The Authority is satisfied with this approach.

The Authority's directions: Infrastructure Network

196. None.

International Transmission / Infrastructure / Switching

197. The fixed network module uses submarine cable systems to provide international connectivity for voice and data. The module assumes that the costs associated with these systems are similar to the cost associated with the system that provides resilient connectivity via Jamaica, Panama and Miami. In particular LIME has explained that the dollar amount of the investment used in the module corresponds to a 25-year Indefeasible Right to Use ("IRU") contractual agreement on the existing Maya Consortium.[26] Using the total cost of that particular deployment, a unit cost per STM-1 per km is developed and multiplied by the estimated busy hour demand for international traffic for the Cayman Islands (in STM-1 equivalents) to derive an estimated cost.

198. In Decision 2008-2, the Authority direct LIME to:

(a) Provide documentation of the IRU price given that the cost of International Transmission (submarine) is a considerable component of total costs.

(b) Split the costs of the STM capacity for national inter-island traffic between the fixed and mobile modules by ensuring there is no double counting.

[25] For example, duplicative cable runs in LIME's current network as a result of the construction and reinforcement of the network over the course of a number of years.

[26] C&W Cayman Islands Response to ICTA/Telcordia Round 2 LRIC Interrogatories, Part 2, 25 May 2007, response to question 3.7.1.

199. In response to (a), the Authority received documentation of the IRU and several follow-up interrogatories on international transmission. Upon review of these responses the Authority is satisfied with LIME's approach.

200. With regard to (b), the Authority notes that the national submarine link cost is allocated between fixed and mobile modules based on capacity calculations in each module. The Authority accepts the resultant split of national submarine transmission between mobile and fixed modules. From a modelling perspective, however, this results in a direct link between the modules. Changes in capacity in either module may therefore result in changes in the split of these costs between the modules and hence affect the final service costs in each module. However, given the modularity of capacity and the relatively minor impact changes in these costs have on the final service costs, the Authority considers it appropriate to fix the current cost split between fixed and mobile modules and hence remove the link. This will also simplify the modules and service calculations.

201. The 'International TX Costs' sheet also contains costs related to national submarine costs to the Sister Islands. The capital cost of this link is based on the cost per STM-1 km from the IRU and operating costs are calculated using a 3.5% operations and maintenance charge rate. The 3.5% charge rate is applied to the total cost of the international link rather than only the costs related to transmission to the Sister Islands. This results in excessive operating costs for the national link.

The Authority's directions: International Transmission / Infrastructure / Switching

202. LIME is directed to:

- Correct the fixed module to correctly capture the operating costs of the national submarine link by applying the 3.5% charge rate to the capital costs of domestic international transmission.
- Remove the link to the 2G and 3G modules by pasting the value in cell C36 (Allocation to Fixed) of the 'International TX Cost' sheet.

Unitisation Methodology

203. Within the LIME model, the investments associated with each network element are unitised according to the demand cost driver associated with the network element.

204. In Decision 2008-2, LIME was directed to provide justification for the unitisation of the 400-Contact Centre Platforms based on minutes rather than calls. In response[27], LIME submitted that call servers are typically sized using busy hour call completions or busy hour call attempts and that the performance indicator employed in monitoring performance of call centres is number of completed calls. The Authority accepts LIME's explanation.

The Authority's directions: Unitisation Methodology

205. None.

[27] Attachment A, Revisions to FLLRIC Model Ordered by the Authority in Decision 2008-02, Submitted by LIME in CD 2009-01 (8 April 2009), comment to No. 60.

Cost Assumptions

206. Cost assumptions are the pricing values or component costs used to derive the cost of equipment or activities considered in the fixed modules cost analysis. These include capital costs related to the specific items, labour costs related to installation, duty paid and spares.

207. In Decision 2008-2 the Authority had several concerns with the cost assumptions used in the fixed module and directed LIME to.

(a) Provide information explaining in detail the source of all assumptions marked as "C&W", "Benchmark" or "Cayman".

(b) Indicate whether one or two USP's are needed in the fixed network module.

(c) Amend the fixed network module to take account of the cost of spare equipment inventory in a manner consistent with the mobile network module approach, i.e. as an additional percentage of the original investment. The percentages used should be justified and documented.

(d) All equipment cost inputs must reflect a "real life" level of discount from list pricing.

208. In response to (b), LIME submitted an updated network diagram of its NGN showing 2 USPs, and updated the model to ensure two USPs are modelled. The Authority accepts this.

209. With regards to ensuring consistent use of spares as directed in (c), LIME has made changes to the structure of the fixed module. LIME has also provided documentation for the spare values used and implemented the values in the module.

Table 2: Spare percentages used in the fixed module

Asset category	Spare pct.
Ducts	14%
Copper Cables	16%
DPs and NIDs	18%
Manholes/Jointing Box	25%
Transmission Cable	7%
Transmission Electronics	6%
NGN Soft Switch	6%
MG/MSAN Equipment	6%
Broadband/IP Equipment	6%
Data equipment	6%
Other equipment	6%

210. However, upon review of this documentation the Authority notes that the calculated percentages are for asset categories that include equipment costs only. While the percentages in most cases are applied to equipment items that exclude any installation costs there are several capital items in the module where this does not appear to be the case. These include:

- Add Drop Multiplexers (STM-1, STM-4, STM-16, STM-64);
- Tributary Cards (Access Ring, Transport Ring);

- Digital Cross Connects (STM-1, STM-4, STM-16, STM-64);
- Electronics Module;
- MG (Network Management hardware, Network Management software, Voicemail Platform); and
- MSE (CS-2K Compact (2) ETSI Hardware, CS-2K Compact (2) ETSI Software, Gateway Controller, UAS, USP, PP-8600, PP-15K, IMS).

211. For all of the items identified above, LIME has only provided an equipment cost category and not specified separate installation costs. This indicates that installation costs are bundled into the equipment cost. When spare percentages are applied to both equipment costs and installation costs, the resulting costs will be exaggerated.

212. With regard to documentation and sourcing for equipment costs and installation costs in the fixed module ('Cost Assumptions' sheet) as directed in (a) and (d), the Authority accepts the inputs for the purpose of this decision. However, for the purpose of determining costs of selected fixed network services, further review of the values may be required where reliance on these values may have a significant influence on the outcome.

The Authority's directions: Cost Assumptions

213. LIME is directed to ensure there is no inconsistency in the application of its spare percentages. That is, where a spare percentage is estimated with reference to equipment costs alone excluding any installation costs, then this percentage is applied only to equipment costs in the module and not to both the cost of equipment and installation.

Technical Assumptions

214. Technical assumptions are parameters that are used to structure the network and identify the properties of the equipment considered in the cost analysis. The technical assumptions used in the fixed network module are shown below.

Table 3: Technical assumptions fixed module

Assumptions	Values
Conversion factor for minutes to Erlangs	60
# of 64 kbits/s channels in a 2 Mbits/s link	30
MG Fill Ratio	75%
SOFTSWITCH ratio of call-sensitive/duration-sensitive	74%
Number of Core NGN Sites	2
Max Lines per MG	2,048
Circuit Efficiency Factor	66%
Main Exchange Sites	2

215. In Decision 2008-2, LIME was directed to provide complete documentation and clarifying descriptions of each technical assumption. In response LIME referred the Authority to manuals previously submitted. The Authority has reviewed previously submitted material and interrogatory responses and accepts that adequate information has been provided for all but the softswitch ratio of call-sensitive to duration sensitive costs. Regarding the softswitch ratio factor, however, this factor only influences the allocation of costs between call-sensitive and duration sensitive

elements and does not affect the overall cost. For the purposes of this decision the Authority therefore accepts the factor, but may revisit it for the purpose of determining costs of selected fixed network services.

216. The conversion factors follow international standards and the maximum lines per MG is vendor specific. With regard to the assumed circuit efficiency factor, this is discussed in paragraph 99 of this decision. The number of core NGN sites and main exchange sites is obtained from LIME's design engineers and is shown in a forward-looking NGN diagram[28] of LIME's core network infrastructure. The MG fill ratio is also discussed in paragraph 99.

217. In first round interrogatories, LIME was asked to define each of the inputs used in the factor used to convert 2Mbps capacity to annual minutes.[29] LIME replied the term 'BH_pcent' represents the percentage of total traffic carried that occurs during the busy hour which was set at 9% by the Decision 2008-2. The term 'mins_erlangs' represents the international standard for converting minutes to erlang and is set at 60. The term 'channels' represents the international standard for converting 2Mbps capacities to voice channels which is 30 (64kbps voice channels to make one 2Mbps capacity). The Authority finds LIME's explanation to be adequate.

The Authority's directions: Technical Assumptions

218. None.

Routing Factors

219. Routing factors are used to dimension the core network and to allocate costs to services. In Decision 2008-2 the Authority noted several concerns with the routing factors used and directed LIME to explain in detail issues related to their use. Generally the Authority is satisfied with the explanations provided. In the following the Authority discusses the more important changes to the routing factors and explanations provided by LIME.

220. In Decision 2008-2 the Authority directed LIME to base the routing factor calculations on a revised traffic sample containing no irregular events that affect the distribution of traffic or, if such data was not available, adjust for the impact of irregular events and justify the associated assumptions. LIME responded that it had been unable to obtain an updated sample of traffic at the level of detail previously provided and in the lieu of this has adjusted the existing sample to exclude the hurricane period containing the irregular data.[30] The Authority has reviewed this adjustment and finds it to be reasonable.

221. In Decision 2008-2 the Authority directed LIME to explain in detail routings for each service. In response LIME provided an appendix setting out the derivation of the routing factors and explanations for each. The Authority has reviewed the data

[28] LIME Cayman Islands Response to Decision 2008-2 – Decision for the Costing Manual Consultation, Appendix XVII, 09 April 2009.
[29] "=1/(BH_pcent/mins_erlangs/channels)"
[30] Attachment A, Revisions to FLLRIC Model Ordered by the Authority in Decision 2008-02, Submitted by LIME in CD 2009-01 (8 April 2009), comment to No. 46

provided and is generally satisfied with the results. However, in any future proceedings with the purpose of determining costs of selected fixed network services, further review of the routing factors may be necessary.

The Authority's directions: Routing Factors

222. None.

Services

223. In Decision 2008-2 LIME was directed to update the fixed network module service list to reflect all significant services that LIME currently provides.

224. In response to the Authority's concerns over the inclusion of all relevant services in the fixed module, LIME noted some labelling errors and other minor changes to the list of services.[31] The resultant list of services in the fixed module is shown in the table below.

Table 4: List of service in the fixed module

Retail services	Access Services	PSTN Residential PSTN Business ADSL residential ISDN Access retail
	Voice Services	Fixed call to LIME fixed Fixed call to LIME mobile Fixed call to other carrier fixed Fixed call to other carrier mobile Fixed call voicemail retail National (domestic) payphone Operator assistance Domestic DQ Emergency services retail Fixed international outgoing International payphone International DQ retail VoIP
	Data Services	Dialup internet Direct connect (DIA) Domestic leased circuit retail MPLS IP-VPN QoS retail International leased circuit retail
	Other Services	Card CPE
Wholesale services	Access Services	ADSL Wholesale

[31] Attachment A, Revisions to FLLRIC Model Ordered by the Authority in Decision 2008-02, Submitted by LIME in CD 2009-01 (8 April 2009), comment to No. 36

	Voice Services	Fixed termination incoming** Domestic DQ wholesale Domestic transit Emergency services wholesale Fixed International incoming International transit to OLO International transit from OLO International DQ wholesale
	Data Services	Domestic leased circuit wholesale International leased circuit wholesale MPLS IP-VPN QoS wholesale

*termed national call in module
**termed PSTN Termination in module

225. The Authority considers the list of services to be appropriate at this point in time.

The Authority's directions: Services

226. None.

Authority's Analysis and Decision on 2G network module

227. The 2G network module divides network costs into radio, transmission and switching network categories. Based on demand input and various technical parameters (including routing factors and an Erlang table), the module dimensions the various equipment types. Using the resultant equipment numbers the module then calculates capital costs using component cost inputs. In the following the Authority discusses and makes determination on issues specific to the 2G network module.

Radio Network

228. In Decision 2008-2 the Authority accepted the radio network calculations for the purpose of dimensioning a 2G network. No changes have been made to the module since that decision.

The Authority's directions: Radio network

229. None.

Switching Network

230. In Decision 2008-2 the Authority directed LIME to.

a) Provide information to justify the division of the number of data and SMS subscribers by ten and make the assumption explicit in the module.

b) Split the cost of VLR and HLR and allocate the costs based on primary cost driver of each or where LIME believes it is appropriate to regard HLR and

VLR costs together, provide detailed documentation to the Authority showing that this is an appropriate treatment of these costs.

231. With regard to (a), LIME has removed the assumption.

232. In response to (b), LIME submitted[32] that both the HLR and VLR primary functions are subscriber based. LIME referred to Appendix VI, Nokia Electronics Documentation, where descriptions of the HLR and VLR are provided. With regards to the VLR, LIME referred to the following quote: "*The VLR, embedded in the MSCi, stores the subscriber information of all mobile subscribers currently using the network controlled by the MSCi…*" In LIME's view this means that the VLR keeps a running tab of all subscribers attached to a particular MSC, if there is more than one MSC. In the case of the Cayman Islands, where there is only one MSC, all active subscribers are monitored by the VLR.

233. During first round interrogatories, the Authority noted that the VLR and HLR perform different functions and use of VLR and HLR can vary from call to call. For example, when the mobile moves from one cell site to another served by the same MSC (intra-MSC Handover) within the duration of a call, extra VLR processing is required. Accordingly the Authority asked LIME to provide detailed additional documentation to justify combining the HLR and VLR or alternatively revise the module to capture the cost of the VLR and HLR separately.[33]

234. In response LIME submitted that it did not have the cost of the VLR separately identified as its supplier did not provide such for a single switch network. LIME further emphasised the difficulty in splitting the cost of VLR and HLR given its single switch network and claimed that any attempt to do so would be arbitrary at best, and the benefit of which, in LIME's view, would be immaterial. LIME acknowledged that VLR processing takes place during an intra MSC cell site hand-over, however, LIME expressed the view that the module recognises this when a portion of the HLR/VLR cost, through appropriate routing factors, is allocated to the network element 'HLR/VLR - traffic sensitive' .

235. In second round interrogatories, LIME was asked to explain in detail how the need for additional VLR processing during intra MSC cell-site handover is taken into account given that all the routing factors associated with the network element 'HLR/VLR -traffic sensitive' in the 2G module are 1.[34] As an alternative, LIME was asked to update the routing factors to recognise the need for additional VLR processing during intra MSC cell-site handover.

236. In response LIME updated the routing factors to reflect additional VLR processing during intra MSC cell-site handover by assuming that a call will access the HLR/VLR once on initiation, and then an additional time for each "handover" between cell sites. According to LIME a number of public studies suggest that a per call handover rate of around the 0.3-0.4 is reasonable. LIME therefore

[32] Attachment A, Revisions to FLLRIC Model Ordered by the Authority in Decision 2008-02, Submitted by LIME in CD 2009-01 (8 April 2009), comment to No. 32.
[33] Interrogatory No. 147, Interrogatories regarding LIME's FLLRIC Phase 3 submissions, published 19 August 2009.
[34] Interrogatory No. 17, Second Round of Interrogatories regarding LIME's FLLRIC Phase 3 submissions, published 13 May 2010.

assumed an average handover rate of 0.35 for the 2G module, and changed the "1" in the routing table to "1.35" for the HLR/VLR - call sensitive routing factor.

237. In first, second and third round interrogatories LIME was also asked to provide detailed documentation (for example, an invoice) to show the cost of the HLR element used in the models, how this cost reflects the cost of both the HLR and VLR and how the allocation of the cost reflects both the different functions of the HLR and VLR.[35] LIME responded with a detailed invoice for the HLR which resulted in an updated and more accurate cost for HLR. No further explanation for the combined HLR/VLR allocation method was provided.

238. It is the Authority's view that the VLR and HLR perform different functions that vary from call type to call type and therefore that different routing factors should be developed for both the VLR and HLR for each different call type. Combining the HLR and VLR forces the cost of each to be treated as a unit. LIME's approach is therefore in principle unable to allocate correctly the cost of each to the different call types and hence may result in the costs associated with some call types being too high and others too low. However, taking into consideration that LIME is unable to provide separate costs for each of the VLR and the HLR and that LIME has adjusted the routing factor table to reflect increased use of the HLR/VLR component the Authority accepts the approach used for the purpose of determining the MTR.

The Authority's directions: Switching network

239. None.

Transmission Network

240. As noted in the section 'Standalone networks', in Decision 2008-2 the Authority directed LIME to apply transmission costs that are the lower of commercial rates for fixed line links or costs for self supplied facilities. LIME has revised the module to include a switch which automatically chooses the lowest cost solution. The Authority is satisfied with this revision.

The Authority's directions: Transmission Network

241. None.

Unitisation of Network Elements

242. In Decision 2008-2 the Authority accepted LIME's unitisation of network elements. No changes have been made to the module since the 2008 decision.

The Authority's directions: Unitisation of Network Elements

243. None.

[35] Interrogatory No. 147, Interrogatories regarding LIME's FLLRIC Phase 3 submissions, published 19 August 2009 and Interrogatory No. 17, Second Round of Interrogatories regarding LIME's FLLRIC Phase 3 submissions, published 13 May 2010 and Interrogatory No. 2, Third Round of Interrogatories regarding LIME's FLLRIC Phase 3 submissions, published 8 August 2010.

Cost Assumptions

244. In Decision 2008-2 the Authority directed LIME to:

(a) Provide documentation for the cost assumptions (including the level of discounts) employed in the mobile network module, indicating in the documentation whether these inputs correspond to actual invoiced items, average values derived from recent procurement activity, benchmark values (and if so their origin) or some other source.

(b) Provide information supporting its use of spares in the mobile network module.

(c) Split the costs of the STM capacity for national inter-island traffic between the fixed and mobile modules, rather than fully counting the costs in both fixed and mobile modules.

245. With regard to (a), LIME was to provide Appendix XVI, as well as Appendix X Part I (both submitted 9 April 2009). During subsequent interrogatories the Authority made several queries to LIME regarding the unit costs used for various equipment types. During second round interrogatories, LIME was asked to provide an Excel spreadsheet that was used as the source for the values in cells E31 and E33 of the 'Cost Assumptions' sheet containing the cost for the SGSN. LIME responded that it was unable to find the spreadsheet referred to but was able to provide a detailed invoice for the SGSN. This resulted in an updated and more accurate cost estimate for the SGSN. While the Authority is generally satisfied with level of costs used in the module, it is not satisfied with the piecemeal approach to provision of unit cost information and number of times LIME has changed unit cost assumptions during the four rounds of interrogatories.

246. In response to (b), LIME submitted that Appendix X (from 9 April 2009) contained the relevant information. However, upon review of the information contained in this appendix the Authority was unable to find the derivation of the spare percentages used in the mobile module. As part of first round interrogatories LIME was asked to provide documentation to support the spares used.[36] In response LIME provided clarification on the derivation of "proxy" spare percentages for the BSC, MSC and TCU. For the BTS, LIME submitted that it had used a proxy from one of its operations in another jurisdiction, namely information contained in Appendix E – BTS spares. For remaining spare percentages, LIME noted that it had been unable to obtain internally supporting documentation and therefore relied upon an international benchmark of 5%. The spares percentages used in the 2G module are shown in the table below.

Table 5: Spare percentages used in the 2G module

Asset category	Spare pct.
BTS	15.0%
BSC	5.0%
MSC	6.8%
TCU	6.8%
HLR	6.8%

[36] Interrogatory No. 148, Interrogatories regarding LIME's FLLRIC Phase 3 submissions, published 19 August 2009.

Asset category	Spare pct.
SGSN	5.0%
GGSN	5.0%
PCU	5.0%
Internet Gateway	5.0%
Cell Site	5.0%

247. The Authority accepts the spare factors used.

248. With regard to (c), the Authority notes that the national submarine link cost is allocated between fixed and 2G module based on capacity calculations in each module. The Authority accepts the resultant split of national submarine transmission between 2G and fixed modules. From a modelling perspective, however, this results in a direct link between the modules. Changes in capacity in either module may therefore result in changes in the split of these costs between the modules and hence affect the final service costs in each module. However, given the modularity of capacity and the relatively minor impact changes in these costs have on the final service costs, the Authority considers it appropriate to fix the current cost split between fixed and 2G module.

The Authority's directions: Cost Assumptions

249. LIME is directed to remove the link to the fixed module by pasting the value in cell J56 (Fixed Network Requires) of the 'Transmission Links' sheet.

Technical Assumptions

250. In Decision 2008-2 the Authority noted it was satisfied with the technical assumptions used for the modelled network. No changes have been made to the module since the 2008 decision.

The Authority's directions: Technical Assumptions

251. None.

Routing Factors

252. In Decision 2008-2 the Authority directed LIME to:

(a) Explain the routing factors used for the SMS service.

(b) Provide documentation showing that the added processor time for specific call types is reasonable within the mobile network it is modelling.

(c) Provide a service definition of the 'Mobile Voice Mail (retail)' service and justify the routing factors used for this service.

(d) Demonstrate that the routing factors in the mobile network module accurately reflect the use of the prepaid platform.

(e) Explain and justify the routing factors for 'fixed to mobile (C&W)' and 'fixed to mobile (other)' are the same.

253. In response to (a), (c) and (d), LIME submitted "Appendix VIII RF Analysis Revised" documenting the routing factors used in the FLLRIC model. The

Authority accepts the documentation of routing factors for SMS and 'Mobile Voice Mail (retail)' services. Regarding the use of the prepaid platform the Authority notes that LIME has used historic data on the proportion of active prepaid customers in the network. The Authority accepts this approach.

254. Regarding (b), the reasonableness of the added processor time for specific call types, LIME has removed added processor time for certain services time in the module. The Authority is satisfied with this approach.

255. In response to (e), justification for the equality of routing factors for 'fixed to mobile (C&W)' and 'fixed to mobile (other)', LIME explained that the utilisation of network resources between the customer originating the call and the point of interconnection on average is the same, especially given the relatively small and simple PSTN network in the Cayman Islands. The Authority is satisfied with this explanation.

The Authority's directions: Routing factors

256. None

Services

257. In Decision 2008-2 the Authority directed LIME to update the mobile network module to reflect all existing services in use.

258. In response LIME included the SMS Termination service. Further, LIME noted that it had not specifically modelled it's Push to Talk service as it was only used by a handful of customers with very little usage or no usage. Rather, it was included as a subset of LIME's Mobile Data service. The resultant list of services in the 2G module is shown in the table below.

Table 6: List of services in the 2G module

Retail services	Access Services	Mobile Subscriber
	Voice Services	Mobile On Net Call Mobile to Fixed Mobile to Other Mobile Mobile Voicemail Retail Mobile International Outgoing
	Data Services	Mobile Data SMS
Wholesale services	Voice Services	Mobile Termination Mobile International Incoming Inbound Roaming
	Data Services	SMS Termination

259. The Authority is satisfied with the services included in the 2G module.

The Authority's directions: Services

260. None

Authority's Analysis and Decision on 3G network module

261. In Decision 2008-2 the Authority directed LIME to supply a fully functional and documented 3G mobile model, where account was to be taken of growth in the network and in particular for higher bandwidth services. The Authority further noted that it would select the technology to be used in the FLLRIC model based on which technology provides the lowest mobile termination rate ("MTR").

262. The LIME 3G mobile network module is based on the 2G model template and hence is similar in build. It divides network costs into radio, transmission and switching network categories. Based on demand input and various technical parameters (including routing factors and an Erlang table), the module dimensions the various equipment types. Using the resultant equipment numbers the module then calculates capital costs using component cost inputs.

263. The following key network elements are included in the 3G module:

- Cell site land and masts;
- Node B. This is the 3G base transceiver station (BTS), inclusive of channel element cards and optional upgrades to HSPA functionality. This element effectively replaces the 2G BTSs;
- RNC (Radio Node Controller). Effectively replaces the 2G BSC. The RNC handles radio resource processing and call (mobility) handovers for both circuit and packet switched sessions;
- IP core for packet switching, which combines SGSN, GGSN and IP backbone.
- 3G MSC. A revised definition of the 2G MSC, which takes into account the revised architecture and cost structure typically associated with 3G MSCs which are comprised of soft switch and media gateway elements;
- Transmission links. A revised definition of the transmission network, which takes into account cell site backhaul and transmission links between two RNC sites;
- Server platforms (voicemail, roaming, handset/SIM, applications, prepaid). Processing elements associated with network features which interconnect with both circuit and packet switched sessions. These are revised to reflect the increased application functionality typically associated with a 3G Release 99 core network;
- SMSC/MMSC. A revision of the 2G short message service centre 2G element to reflect the inclusion of multimedia messaging service offered with 3G networks;
- HLR/VLR/AUC. Providing a similar function to the 2G HLR/VLR/AUC element;
- Interconnect links. Reflecting higher traffic levels with the 3G network; and
- NMS (Network Management System). Revised with new cost benchmark data.

In the following sections the Authority briefly discusses the methodology employed, the calculations performed, the inputs used and provides determinations and directions for LIME for further perusal.

Radio Network

264. The composition and scope of the radio network is defined within the "Radio Calculations" worksheet. The structure of the sheet is similar to that used in the 2G module. The main differences between the two modules occur due to the different dimensioning requirements. The worksheet is used to calculate the number of sites, number of cells, Rel99 CE cards, HSDPA CE Cards, Data Cards and carrier upgrades. These values are then used to calculate the quantities of network switching equipment required in the network. To calculate the number of cells required, the network is divided into dense, medium and rural mobile network coverage areas. The number of cells is determined through an iterative calculation. The starting point is the maximum cell radius from which the module calculates the required number of sites and cells (assuming both omni and sectorised sites), and determines the traffic per cell. The Erlang-B table is used to determine the required number of CE cards and Data cards based on the busy hour voice and data demand.

265. The Authority has not found any errors in the calculations on the 'Radio Calculations' sheet. However, on the top of the sheet there is a list of demand values that are referenced from other sheets in the module. The values for the Annual SMS (cell C7), Annual MMS (cell C8), BH SMS (cell C11), and BH MMS (cell C12) do not appear to be used anywhere in the module in the sheet.

The Authority's directions: Radio network

266. LIME is directed to evaluate the use of cells C7, C8, C11 and C12. If the values in these cells are not needed they should be removed.

Data Traffic Assumptions

267. The 'Traffic' sheet presents all of the assumptions and inputs used as part of the traffic analysis and network dimensioning within the model. It is structured as three distinct sections: General Inputs, 3GRel99 Radio Access Bearer (RAB) traffic calculations, and Results.

268. Under the General Inputs section, factors related to percentage busy hour traffic, days per month, total subscriber base and data active subscribers are referenced from other spreadsheets, in particular, the 'Demand Assumptions' and 'Volume Input for TD' sheets. Other factors, referenced from the 'Technical Assumptions' sheet are the HSDPA enablement selector and monthly usage per data active subscriber. The data active subscribers as a percentage of total subscriber base is calculated to be 19%.

269. The second section in the spreadsheet contains the inputs for service characteristics and RAB utilisation.

Table 7: Assumed service mix for an average data user

Service type	*Mix of sub data usage (%)*	*Monthly usage per data active sub (MB / month)*	*Bearer data rate (kbps)*	*Av. user throughput requirement per session (kbps)*
HTTP PDA web browsing	27.16%	10.86	128	41.60
FTP PDA file sharing	27.16%	10.86	384	93.81
VoIP	2.04%	0.81	64	4.80
IM	0.00%	0.00	64	0.00
LBS	0.20%	0.08	128	26.67
Gaming	2.04%	0.81	128	24.80
Video / media streaming	12.22%	4.89	384	66.00
PTT voice	2.04%	0.81	64	4.80
Email	27.16%	10.86	64	1.41

270. Input values for the data usage mix show that the three dominant applications are web browsing, FTP file sharing and email, each with 27% of the total data usage for a total of 81%. All other applications represent the remaining 19% of data consumption. Using this data usage mix and the aggregate average data usage per month listed in the general inputs, the monthly data usage per data active subscriber is determined for each of the applications. Depending on the status of the HSDPA toggle selector, the aggregate data usage per month varies. Two other inputs included in this section are the bearer selection (64, 128 or 384 kbps) and average throughput requirement per session. These values are shown in the table above.

271. The next set of calculations address the RAB utilisation. For each of the above applications, the throughput contribution per RAB is computed as a function of the bearer data rate, the busy hour aggregate throughput, and the percentage traffic per RAB attributable to each application. No new inputs are introduced for these calculations.

272. The final section of the spreadsheet summarises the relevant traffic results, specifically, the busy hour throughput per data user, the busy hour throughput across all subscribers, and the average RAB utilisation for the three bearer rate categories.

273. While the Authority finds the data adoption rate to be conservative, it accepts both inputs and calculations.

The Authority's directions: Data Traffic Assumptions

274. None.

Switching Network

275. The number and types of switching components for the 3G network are calculated in the 'Switching Calculations' worksheet.

276. The mobile network switching equipment is assumed to be made up of the following components:

- MSS – Mobile Switching Server
- MGW – Media Gateway
- RNC – Radio Network Controller
- TCU - Trunk Controller Units
- HLR – Home Location Register
- SGSN - Serving GPRS Support Node
- GGSNs - Gateway GPRS Support Node
- Internet Gateway unit.
- IP Core
- Applications platform

277. The calculations for the MSS and HLR are based on the number of voice subscribers. The calculation for the RNC is based on the number of cell sites calculated on the 'Radio Calculations' sheet. TCU is indirectly based on the number of voice subscribers since it is tied to the MSS calculation. The SGSN, GPRS, Internet Gateway unit, IP Core, and Applications Platform are based on the number of data and SMS subscribers.

278. The 'Switching Calculations' sheet is generally structured in the same way as in the 2G module. The main difference between the two modules is reflected in the use of different network components. The Authority accepts LIME's approach.

The Authority's directions: Switching network

279. None.

Transmission Network

280. The 3G module has the option to use own-build (i.e. a wireless system), or leased lines. Transmission calculations in the 'Transmission Links' sheet therefore estimate the number of required microwave units and leased line products required for transmission of traffic.

281. The number of leased links is based on the calculated number of CE cards for each cell radii where the radii is based on the classification of each cell as covering a dense, medium, or rural area. The formula used is: *total CE card kbits/s = Number of CE cards per cell x Capacity per CE card kbits/s*. Using the total CE card kbits/s required, a look-up is made in a leased line capacity table to determine the leased line product needed for omni cells and sectored cells in each geographic area. The Authority accepts LIME's approach.

The Authority's directions: Transmission network

282. None.

Unitisation of Network Elements

283. The 'Network Element' sheet contains the list of network elements used throughout the module. Within the 3G module, the investment associated with each network

element is unitised according to the demand cost driver associated with the network element, as shown in the table below.

Table 8: Unitisation of network elements

Network Element	*Unit of unitisation*
400-3G: Node B	Minutes
400-3G: RNC	Minutes
400-3G: MSC - call sensitive	Calls
400-3G: MSC - duration sensitive	Minutes
400-3G: National Tx	Minutes
400-3G: Voicemail platform	Minutes
400-3G: IP Core Network	2 Mbit links
400-3G: Roaming platform	Minutes
400-3G: SMSC/MMSC	Calls
400-3G: Prepaid platform	Calls
400-3G: HLR - call sensitive	Calls
400-3G: Cellsite land & masts	Minutes
400-3G: Handsets and SIM card/activation platform	Lines
400-3G: HLR - subscriber sensitive	Lines
400-3G: Interconnect Specific Links	Minutes
400-3G: Applications platform	2 Mbit links

284. During several rounds of interrogatories a few minor adjustments were made to the list of network elements used in the 3G module. The Authority considers the current list of network elements to be appropriate for the 3G network and is of the view that the units of unitisation for those network elements are reasonable.

285. However, due to an incorrect reference the 3G module associates a demand cost driver of "minutes" to the HLR-call sensitive network element when the clear intention is for this element to driven by calls. The reference error is in cells P159:P161 in the 'Network Costs' sheet. These currently refer to the cell site network element. The resultant allocation should be 100% to calls.

The Authority's directions: Unitisation of network elements

286. LIME is directed to correct the allocation of the HLR –call sensitive costs.

Cost Assumptions

287. Cost assumptions are the pricing values or input costs used to derive the cost of equipment or activities considered in the 3G cost analysis. However, LIME has also included allocation assumptions within this category.

288. In line with the categorisation used in the 2G module, LIME has arranged cost assumptions into the following categories:

- Radio and Other network. These include Site costs, CE cards (3G TRX), Node B Unit, HSDPA upgrade, Carrier upgrade, RNC, MSS, Media Gateway, TCU, HLR, SGSN, GGSN, IP Core Network, PCU, Internet Gateway, Voicemail Platform, Applications Platform and NMS.
- Backhaul transmission. The option to select between leased facilities in capacities ranging from 64 kbits/s to 45 Mbits/s or a mini link MLE 6 GHz radio system. Submarine cable connectivity charges are also listed.

- Cell site rental listing the recurring lease charges for each of the cell sites in the network.
- Other included allocation percentages of certain equipment components between duration, call attempts and subscribers and cost estimates associated with spare equipment inventory.
- Platform costs recharged were the LIME Cayman share of service platform costs that are shared across other LIME businesses in the region.
- Interconnect link costs.

289. In addition, the 3G module includes a number of general factors such as currency exchange rates, the WACC, spare percentages and network element allocations between key cost drivers (call attempts, minute/bandwidth and subscribers). These have been dealt with in previous sections.

290. Some of the cost assumptions are common between the 2G and 3G module. The Authority has reviewed these instances and is satisfied that the input values used are appropriate.

291. With regards to cost components specific to the 3G module several issues where raised with LIME throughout the interrogatory period.

292. During the first round of interrogatories, the Authority asked LIME to explain why no account was taken of spares in the costing of the 'Mini Link MLE 6 GHz Radio System' and queried the inconsistent use of the allocation table in several cases.[37] In response LIME submitted a revised model that captured the cost of spares for the mini link and made an improvement to the allocation table. During both first and second round interrogatories, LIME was asked to explain the use of different spare percentages for similar network elements in 2G and 3G modules[38], in all cases LIME adjusted the input values to ensure consistency.

293. In third round interrogatories, LIME was asked to provide detailed documentation (for example, an invoice) to show the cost of the HLR cost element.[39] LIME responded with a detailed invoice for the HLR which resulted in an updated and more accurate cost for HLR.

294. In fourth round interrogatories, LIME was asked to provide detailed documentation to show the cost of the MSS and Media Gateway cost element as indicated in cell E27 and E28 of the 'Cost assumptions' sheet in the 3G module. In response LIME provide a confidential quote for MSS and Media Gateway elements as part of a recent Cayman network upgrade. LIME replaced the module values with the vendor values taking account of discounts.

295. The Authority accepts the cost assumptions used in the 3G module.

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[37] Interrogatory No. 78, Interrogatories regarding LIME's FLLRIC Phase 3 submissions, published 19 August 2009.
[38] Interrogatory No. 79 and 148, Interrogatories regarding LIME's FLLRIC Phase 3 submissions, published 19 August 2009 and Interrogatory No. 18, Second Round of Interrogatories regarding LIME's FLLRIC Phase 3 submissions, published 13 May 2010.
[39] Interrogatory No. 2, Third Round of Interrogatories regarding LIME's FLLRIC Phase 3 submissions, published 8 August 2010.

296. The Authority notes that the national submarine link cost is allocated between fixed and 3G modules based on capacity calculations in each module. The Authority accepts the resultant split of national submarine transmission between 3G and fixed modules. From a modelling perspective, however, this results in a direct link between the modules. Changes in capacity in either module may therefore result in changes in the split of these costs between the modules and hence affect the final service costs in each module. However, given the modularity of capacity and the relatively minor impact changes in these costs have on the final service costs the Authority considers it appropriate to fix the current cost split between fixed and mobile modules.

The Authority's directions: Cost Assumptions

297. LIME is directed to remove the link to the fixed module by pasting the value in cell J67 (Fixed Network Requires) of the 'Transmission Links' sheet.

Technical Assumptions

298. Technical assumptions are parameters that are used to structure the network, select the locations to be modelled and identify the properties of the equipment considered in the cost analysis. The numerous technical assumptions that are used by LIME in the 3G module are basic to the equipment deployed or the technology used and are mostly given as capacity limits or engineering values which cannot be derived.

299. Compared to the 2G module the 'Technical Assumptions' sheet has undergone significant change. The main technical input assumptions are summarised in the table below.

Table 9: Technical input assumptions (3G module)

Assumptions	***Values***
Radio and Switching	
Available 3G Frequency	850 MHz
Spectrum allocation	10 MHz
Carrier bandwidth	5 KHz
Max carriers per sector	2
Soft handover allowance	40%
HSDPA enabled?	Yes
Channel	Dedicated
Radio Path GoS	2,0%
HSDPA peak cell throughput (Dedicated Carrier)	7.2
HSDPA peak cell throughput (Shared Carrier)	3.6
Minimum BH throughput per customer (kbps)	40
Tessalation factor used for planning	20%
Number of MSC	1
Traffic Distribution	
Dense	59.10%
Medium	32.10%
Rural	8.80%
Coverage Area Surface	
Dense	22 km^2

Assumptions	***Values***
Medium	47 km^2
Rural	195 km^2
Cell Sectorisation per area	
Dense	0%
Medium	0%
Rural	0%
Maximum 3G cell radius	
Dense	0.8 km
Medium	1.3 km
Rural	2.7 km
Other	
Capacity planning max load factor	80%
Assumed traffic per 2Mbit/s E1	20.3 E
3GRel99 Circuit Switched RABs	
Voice call (CS 12.2kbps)	1 CEs
Video call (CS 64kbps)	4 CEs
3GRel99 Packet Switched RABs	
Data (PS 64kbps)	4 CEs
Data (PS 128kbps)	4 CEs
Data (PS 384kbps)	16 CEs
Average PS RABs	
Average user data rate	46 Kbps
Average RAB data rate	209 Kbps
Average channel elements	8.73
Average RAB utilisation	22%
Capacity per carrier	
3GRel99	0.73 Mbps
HSDPA (Dedicated carrier)[40]	7.2 Mbps
Baseband Capacity	
Channel elements per baseband card	64
CE blocks per HSDPA carrier	4
Network Increments	
MSS increment	250,000 subscribers
MGW per MSS	1
HLR increment	500,000 subscribers
Number of cell sites per RNC	100
Minimum RNC requirement	2
SGSN capacity	600,000 subscribers
GGSN capacity	1,200,000 subscribers
PCU Capacity	270 timeslots
IP CORE	1,200,000 subscribers
Internet Gateway Capacity	1,200,000 subscribers
Applications Platform	25,000 subscribers
No. of 64kbps channels in a 2 Mbps link	30

300. During second round interrogatories, the Authority noted that the Max 3G cell radius did not match the average distance in the supporting documentation provided with the modules and that some average distances were larger than 2

[40] This technology was firstly introduced in the Release 5 specification (R5) of the 3GPP. It can reach a maximum of 14.4 Mbps in the downlink. However, currently most advanced terminals only can reach a maximum binary rate of 7.2 Mbps.

times the maximum value given as the assumption.[41] Further, the Authority asked LIME to explain the purpose of an 850 MHz 3G data cell radius reduction factor of 25% compared to 2G.[42]

301. In response to the cell reduction factor, LIME referred the Authority to Ofcom analysis which implied a cell range reduction of between 11% (for a shift from GSM900 to UMTS900 data) and 48% (for a shift from UMTS900 voice to UMTS900 data).

302. In third round interrogatories the Authority noted that the Ofcom report referred to by LIME was an old one and a new one was published by Ofcom in which reference is made to two whitepapers both showing that UMTS900 voice coverage is better than GSM900, and that GSM900 voice coverage in a suburban area indoors is similar to the coverage obtained by the same network for 1 Mbps data service using WCDMA 900.[43] In response, LIME amended the calculations to be in line with the most recent data. The Authority is satisfied that the amended calculation improves the accuracy of the investment associated with the mobile network equipment.

The Authority's directions: Technical Assumptions

303. None.

Routing Factors

304. Routing factors specify the average number of units of each network element used by a particular service. The purpose and use of these factors in the 3G module are the same as in both 2G and fixed modules.

305. The initial submission of the 3G module contained no documentation to justify the routing factors shown in the 'Routing Factors Input' sheet. Accordingly, LIME was asked in first round interrogatories to provide documentation similar to that provided for the fixed and 2G modules.[44] In response LIME submitted a spreadsheet 'CYM 3G Routing Factors 20091012.xls' setting out how individual routing factors had been determined. Due to similarities with the 2G module, several references were made to the previously submitted Appendix VIII.

306. In the second round interrogatories, LIME was asked to clarify several observations made by the Authority on the submitted documentation and the use of routing factors. Following revisions to the 3G routing factors over the various rounds of interrogatories, the Authority is now satisfied that the corrected routing factor values result in a more accurate allocation of costs to services.

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[41] Interrogatory No. 35, Second Round of Interrogatories regarding LIME's FLLRIC Phase 3 submissions, published 13 May 2010.
[42] Interrogatory No. 36, Second Round of Interrogatories regarding LIME's FLLRIC Phase 3 submissions, published 13 May 2010.
[43] Interrogatory No. 7, Third Round of Interrogatories regarding LIME's FLLRIC Phase 3 submissions, published 8 August 2010.
[44] Interrogatory No. 99, Interrogatories regarding LIME's FLLRIC Phase 3 submissions, published 19 August 2009.

The Authority's directions: Routing factors

307. None.

Services

308. The services in the 3G module may be grouped into two major groups: retail and wholesale.

309. Retail services:

- Mobile Subscriber
- Mobile On-Net Calling
- Mobile to Fixed
- Mobile to Other Mobile
- Mobile Voicemail Retail
- SMS
- MMS
- Mobile International Outgoing
- Mobile Data
- Video Calling

310. Wholesale services

- Mobile termination
- Mobile International Incoming
- Inbound voice roaming
- Video Call Termination
- SMS Termination
- MMS Termination
- Inbound data roaming

311. For the purpose of modelling a 3G network the Authority considers the list of services to be appropriate.

The Authority's directions: Services

312. None.

Volumes

313. Volumes used in the 3G module are collected in the 'Volume input for TD' sheet. The types of volumes considered include calls, lines, minutes of use, and 2Mbps equivalent capacity. Most of the volume entries represent inputs taken directly from LIME, while others are computed values, these include:

- Volume of calls involving MMS and video services that are represented as a percentage of SMS and voice calls respectively.

- Total minutes of data usage which is derived by taking call volumes and applying a conversion factor (MB per voice minute, SMS per voice minute and MMS per voice minute).

- 2M equivalent capacity for mobile data which is based on the average data consumption per user per month assumption.

314. The Authority finds the computed values to be reasonable.

315. For each of the services and each of the volume categories growth rates can be entered. The Authority considers the growth assumptions to be within a plausible range based on overall industry figures, but would note that that the growth rate for mobile data is conservative.

The Authority's directions: Volumes

316. None.

Authority's Analysis and Decision on Inter-operator Billing

317. In second round interrogatories the Authority asked LIME to respond to the following questions:

(a) Provide a detailed explanation of, and provide detailed calculations and supporting documentation for the amounts shown for the costs (both one-off and / or re-occurring) of each of the following items included in the (Budgetary) Mobile to Mobile Costing for Digicel Cayman:

- Omnil.inc SS ADM,
- E1 Ports,
- IRM,
- Nokia Signalling Ports,
- Billing upgrade, and
- IT service costs.

(b) For each cost item identified above explain whether it is incurred as a result of upgrading or expanding LIME's existing network and / or whether it would be incurred by a hypothetical efficient entrant to the Cayman market with a market share equivalent to that assumed by LIME in its MTR study.

(c) For each cost item listed above, identify whether or not LIME's proposed FLLRIC model includes such costs. If it does not, provide a detail rationale for the exclusion of such costs. If such costs are included, provide cell references and a detailed explanation of how each cost item included in the budgetary offer is reflected in the MTR study.

318. In response to (a), LIME provided a revised invoice "(Budgetary) Mobile to Mobile Costing for Digicel Cayman" which was a spreadsheet "10_06_30 2nd round

FLLRIC interrog 57 - attach 1 - conf.xls." detailing how the individual costs are determined. LIME provided descriptions of each item as follows:

- Omnil.inc SS ADM (Working & Spare): Multiplex equipment SDH/Sonet interface with optical tributary cards,
- E1 ports: A MUX will connect directly to STM-1 interface cards on the LIME Mobile Media Gateway (MGW). The E1 links (or ports) to the switch are taken from these cards. That is, the MGW must be provisioned with additional STM-1 interface cards to facilitate the E1s required for M2M with Digicel,
- Nokia Signalling Ports: Two signalling cards required for signalling interface with the mobile network, and
- IRM: Installation materials required to support E1 ports.

319. The "Billing Upgrade" cost category was replaced by a cost category termed "Mobile CDR Processing" representing the incremental costs necessary to process the additional mobile Call Data Records (CDRs). The IT services cost category was withdrawn.

320. In response to (b), LIME submitted that the costs it had provided represented the costs an efficient entrant would incur if another network operator requested a separate interconnection arrangement with LIME's mobile network.

321. In response to (c), LIME submitted that the 2G and 3G modules include costs associated with interconnect via the fixed network and there were no costs associated with mobile-to-mobile interconnect, and that the FLLRIC model would need to be adjusted if the assumption of interconnection via the fixed network was replaced with an assumption of direct mobile-to-mobile interconnect.

322. In order to allow the Authority to evaluate the two interconnection scenarios (as discussed above), LIME was requested in third round interrogatories to provide: (i) G, 3G and fixed cost modules which reflect interconnect via the fixed network; (ii) revised 2G, 3G and fixed cost modules which have been adjusted to accommodate direct mobile interconnection in addition to direct fixed interconnection; and (iii) a table showing for each module (2G, 3G and fixed) the interconnection functions needed and associated cost items in each of the interconnection scenarios.

323. In order to comply with the Authority's request LIME undertook several modifications to the modules to account for direct mobile interconnect. The steps followed where first to adjust the relevant volumes in the modules to reflect that mobile-to-mobile traffic would no longer be routed through the fixed switch as domestic transit traffic. Second, remove any variable interconnection specific cost from the fixed model for carrying mobile-to-mobile traffic. Third, add direct interconnection costs to the 2G and 3G modules.

324. The Authority has conducted a detailed review of the revisions to the FLLRIC model. While the Authority has some concerns with the approach used to remove variable interconnection specific costs in the fixed module and its implication for service costs, the Authority accepts the additions made to the 2G and 3G module to take account of direct mobile interconnection subject to the clarifications below.

325. In response to third round interrogatories, LIME noted[45] that operating costs for direct mobile interconnection would be introduced through expense factors. The Authority's inspection of the modules suggests that the only additional operating expense introduced is an annual recurring costs related to civil works. While this cost is allocated as an operating expense it is in fact an annualised capital cost sourced from the spreadsheet 'FLLRIC Interrog 13 attachment2 10_11_10 Conf.xls' and therefore not an operating expense. As with other additions of capital costs related to direct interconnect (including signalling equipment, STM-1 cards, ADM multiplexer and billing platform), these should be input as investment values and annualised using assumptions within the module(s). Further, while operating expenses related to interconnection links are included in the module(s), the total amount of operating expenses in the module(s) with and without direct mobile interconnection is the same. In other words, operating costs are simply reallocated not increased as a result of the introduction of direct mobile interconnection.

326. For capital cost items signalling equipment, STM-1 cards, ADM multiplexer and billing platform, a mark-up of 60% to capital costs is added for planning costs. No detailed documentation has been provided to support the resultant planning cost. The Authority notes that 'FLLRIC Interrog 15 attachment 10_09_01 Conf.xls' in sheet 'joining services – inputs' contains planning costs of a much smaller magnitude and do not include any planning costs for the billing platform element.

327. In evaluating whether the modules should include direct mobile interconnection or retain the existing interconnection arrangement where traffic is transited to the fixed network the Authority has evaluated two questions: 1) is direct (fixed and) mobile interconnection a service a new operator would have to provide?; and 2) are there any particularities related to Cayman that make a direct mobile interconnection prohibitive from a cost perspective?

328. In Decision 2008-2 the Authority noted on several occasions that the appropriate benchmark for FLLRIC is that of a hypothetical new entrant to the market. In that Decision the Authority also considered that LIME's approach of modelling the fixed line business and the mobile business as standalone businesses with some shared costs to be appropriate. While these assumptions do not rule out some outsourcing of billing arrangements to a third party, physical interconnection would be required to each standalone network. Further, the total costs of separate direct mobile interconnection and direct fixed interconnection compared to the current situation where LIME transits traffic between its fixed network and mobile network for the purpose of mobile interconnection would not appear to be too dissimilar. Hence from a costing perspective there does not seem to be any significant hindrance to the implementation of direct mobile interconnection.

329. It is therefore the Authority's determination that the FLLRIC model should reflect direct mobile and fixed interconnection.

The Authority's directions

330. LIME is directed to:

[45] Interrogatory No. 16, Cable & Wireless (Cayman Islands) Limited, d.b.a. "LIME", Interrogatory Responses FLLRIC Phase 3 Submissions – Third Round Interrogatories, 01 September 2010

- Use direct investment costs from the 'FLLRIC Interrog 13 attachment2 10_11_10 Conf.xls' to account for civil work costs.
- Provide detailed documentation for the inclusion of a 60% mark-up to equipment cost to account for direct mobile interconnect planning considering the planning costs included in 'FLLRIC Interrog 15 attachment 10_09_01 Conf.xls'.
- Confirm the reasonableness of the '400-GSM: Interconnect Specific Links' operating costs as shown in the 'Expense Factors' sheet given the operating costs provided in 'FLLRIC Interrog 13 attachment2 10_11_10 Conf.xls' and that no additional operating costs have been added to the mobile cost module to account for direct mobile interconnection.

Authority's Analysis and Decision on MTR

331. In paragraph 77 of Decision 2008-2 the Authority determined that it would select the technology to be used in the FLLRIC model based on which technology provides the lowest MTR.

332. In previous sections of this decision, LIME has been directed to make several changes to the 2G and 3G modules that will have an effect of the calculated MTR.

333. As there remain a number of changes that LIME must make to the 2G and 3G modules, the Authority, at this point, is unable to conclude which modelled technology produces the lowest MTR. Therefore, in the follow-up processes specified later in this decision, LIME is required, among other items, to provide revised 2G and 3G modules. Upon receipt and approval of these final revisions, the Authority will direct which technology will be used for FLLRIC purposes.

ANNUAL ADJUSTMENTS TO MTR

Background

334. In CD 2009-1, the Authority sought views of interested parties on what, if any, annual adjustments would be appropriate to a FLLRIC based MTR. For example, should the rate be adjusted to reflect inflation and/or productivity improvements and if so, on what basis should any such adjustments be made.

Submissions

335. On 7 August 2009, the Authority received a submission from LIME on annual adjustments to a FLLRIC based MTR.

336. In considering annual adjustments, LIME submitted that the public interest in ensuring the MTR remains current needs to be balanced against the public interest in having a reasonably predictable interconnection regime. LIME agrees that the MTR should be updated from time to time in order to ensure it continues to reflect the costs of a forward-looking efficient operator. However, annual updates are, in LIME's view, inappropriate.

337. In LIME's view forward-looking costs should not change much from year to year. An annual exercise to revise the inputs to the FLLRIC cost model would, based on LIME's experience, be unlikely to yield much benefit, but would require considerable effort to accomplish. Further, interconnected operators require some degree of stability in the MTR in order to properly plan from year to year. LIME submitted that this would not be possible if the MTR were to change in unpredictable ways from year to year.

338. LIME recommended, therefore, that the MTR not be adjusted on an annual or other predetermined periodic basis. LIME submitted that it is most appropriate, and best balances the various interests of the affected parties, if the MTR were reviewed only in the event of a material change to a factor, variable or input which affects the MTR. LIME considered that such a review could be requested by any interested party or by the Authority, with appropriate justification, but would be conducted only as determined by the Authority, i.e. once the Authority had determined that the change was in fact material.

Authority's Analysis and Decision

339. The Authority agrees with LIME that the benefits of an annual update of the cost model would likely not outweigh the costs involved. However, the Authority notes that it had sought comments of the parties on making annual adjustments to the MTR produced by the cost model rather than, as addressed by LIME, annual revisions of the model itself

340. Considering that the MTR produced from the final cost model will be based on relatively recent vintage input costs, the Authority is satisfied at this point, not to require annual adjustments to the FLLIRC produced MTR.

COST RECOVERY

Background

341. In a letter dated 20 March 2009, LIME submitted an application for the recovery of the costs of developing the 3G module, pursuant to paragraph 51 of Annex 5 of its ICT Licence.

342. LIME submitted that the development of the FLLRIC model had taken much longer than the original estimate of two years set out by the Authority in the 2003 Liberalisation Agreement between LIME, the Authority and the Government of the Cayman Islands. LIME also noted that the bulk of the work required to develop the FLLRIC model for the Authority had fallen upon LIME and it had assumed and internalised the cost of the hundreds of hours of work this had entailed and that this had been possible as the work had been done by internal resources at LIME.

343. In the case of the 3G costing module, LIME submitted that this module was required solely by the Authority, and was not a natural requirement of the Cayman Islands marketplace, where no operator currently operates a 3G network. Further, the work to develop the 3G module could not be done in-house and hence required the services of external consultants. LIME noted that it had solicited bids from external consultants for the necessary work and selected the lowest bid.

344. In LIME's view all telecommunications licensees would benefit equally from the FLLRIC model. Accordingly, LIME submitted that the costs ought to be divided equally among the licensees.

345. On 7 May 2009, the Authority added LIME's cost recovery application to the FLLRIC Phase 3 proceeding.

Submissions

346. In first round interrogatories of 19 August 2009, the Authority asked LIME to provide the following information related to its cost recovery application:

- A description of, and supporting documentation for, the process used by LIME to identify potential bidders;
- A copy of the information that was sent to potential bidders;
- A list of parties to whom the request for bids was sent;
- A list of the parties who made bids and copies of those bids; and
- The criteria and documentation used by LIME in its evaluation of the bids.

347. Further, the Authority requested LIME to: a) explain why it did not make use of internal (in-house) resources for the 3G model building, considering that in 2008 LIME was engaged in the roll out of a 3G network in Jamaica; b) explain whether and why, in LIME's opinion, the costs of developing the 3G model are "start-up costs" under paragraph 51 of Annex 5 of LIME's ICT licence; and c) identify if LIME would make any further applications for the cost recovery of any FLLRIC model costs other than those identified in its 20 March 2009 letter.

348. In its response LIME submitted that it, due to personnel changes in 2008, no longer had sufficient internal resources for building a 3G module and as a consequence were forced to contract externally to obtain the necessary resources.

349. LIME stated that the fact that it was engaged in the roll out of a 3G network in Jamaica was not of particular assistance in the modelling of a 3G network. According to LIME, network vendors do not typically provide the detailed information necessary to build a model from the ground up, rather they provide whole solutions based on the specifications of their customers and which are not scalable to satisfy a different set of requirements.

350. LIME submitted that the cost of developing the 3G module were clearly "start-up costs" associated with that module as without the activities associated with creating the module, there would be no module.

351. Regarding future cost recovery applications, LIME submitted that it expected to make further applications for the recovery of FLLRIC model costs, where the FLLRIC model development process required LIME to rely on external consultants. LIME noted that it is also considering the possibility of including in its applications the internal costs it had incurred since the start of the FLLRIC model development process in 2003.

352. The Authority did not receive any comments from parties other than LIME on the cost recovery issue.

Authority's Analysis and Decision

353. The Authority acknowledges that the FLLRIC process has taken longer than originally anticipated. However, the timing of the process is not relevant for the determination of cost recovery.

354. LIME stated that the 3G module is a requirement of the Authority and is not a natural requirement of the Cayman Islands marketplace, where no operator currently operates a 3G network. The Authority reminds LIME that, as discussed in paragraphs 64 and 65 of Decision 2008-5, the development of a FLLRIC model entails the evaluation of the forward looking costs and as such must contain an evaluation of various available technology options, even options that are not currently deployed in the Cayman market place

355. Paragraph 51 of Annex 5 of LIME's Licence states "*The Authority will consider an application from C&W for the recovery of start-up costs for building the model. If the Authority determines that the costs were reasonably incurred, the Authority will set up a mechanism to allow C&W to recover its costs.*"

356. The Authority notes that, under this requirement, any costs would have to have been reasonably incurred. In evaluating the reasonableness of the costs, the Authority has reviewed the information supplied by LIME. In its interrogatory response, LIME stated that it only sought proposals from two firms for the development of the 3G module. LIME was requested by the Authority to provide a copy of the information sent to potential bidders and copies of those responses. LIME did not provide any of the requested documentation. Without knowing the full details of the work that was requested and terms and conditions of the supply of that work, the Authority cannot evaluate whether or not the costs were

reasonably incurred. In addition, the Authority does not consider LIME's approach of only seeking quotes from a small number of bidders to be indicative of reasonably incurred costs.

357. LIME also indicated that it may make further applications for recovery of other costs related to FLLRIC that it considered to be start up costs. The Authority considers that this would be an inappropriate way of dealing with the cost recovery issue as it could result in multiple piece-meal proceedings, each dealing with incomplete information. Also, the Authority finds LIME's suggested approach of multiple applications is not consistent with the wording of paragraph 51 of Annex C of its Licence that "[t]he Authority will consider an application".

358. Given the above, the Authority denies LIME's application for cost recovery for the development of the 3G model.

359. Any future application for FLLRIC costs recovery must include all elements for which LIME is seeking recovery and must be supported by documentation sufficient to demonstrate that the costs were reasonably incurred.

SUMMARY OF DIRECTIONS

360. Below is a summary of the directions to LIME identified in this decision. The Authority notes that LIME need only make revisions to the 2G and 3G module with direct interconnection implemented. The Authority stresses that the FLLRIC model must satisfy the Authority's Principles and Guidelines and LIME must therefore, in its revision of the model, ensure any changes adequately adhere to them.

The Authority's Directions - All Modules

361. LIME is directed to:

- In the mobile modules, remove the calculations that gross up the LIME demand by two and then divide by three; that is, use its unadjusted demand inputs.
- Use the asset lives as set out in the table 1.
- Remove the asset life Excel links in mobile modules where direct mobile interconnection has been implemented.
- Amend the cost modules to apply a monthly cost of capital (used in the Excel PMT function).
- Update the model to reflect the current applicable duty rate.
- Correct the identified duplication of formulas in cells AX1 and AY1 of the 'Reval_Assets' sheet and any associated input.
- Review whether cell BH4 of the 'overhead_exp' sheet should be empty and make appropriate corrections in the event this is an error.
- Review the names used in the 'Expense Factors' sheet and the 'FAC input' sheet in all modules to ensure all appropriate matches are made and costs only are excluded when this is relevant.
- Show bad debt costs separately for each modeled service, i.e. remove bad debt costs from the retail costs and have one row for retail costs and another for bad debt.
- Remove links to retail costs sourced from "Appendix IV-FAC-TD Values 10_09_01.xls" and instead link to column D in the 'FAC Input' sheet.
- Remove all macros in all modules.

The Authority's Directions - Fixed Module

362. LIME is directed to:

- Correct the fixed module to correctly capture the operating costs of the national submarine link by applying the 3.5% charge rate to the capital costs of domestic international transmission.
- Remove the link to the 2G and 3G modules by pasting the value in cell C36 (Allocation to Fixed) of the 'International TX Cost' sheet.

- Ensure there is no inconsistency in the application of spare percentages. That is, where a spare percentage is estimated with reference to equipment costs alone excluding any installation costs, then this percentage is applied only to equipment costs in the module and not to both the cost of equipment and installation.

The Authority's Directions - 2G Module

363. LIME is directed to:

- Remove the link to the fixed module by pasting the value in cell J56 (Fixed Network Requires) of the 'Transmission Links' sheet.
- Use direct investment costs from the 'FLLRIC Interrog 13 attachment2 10_11_10 Conf.xls' to account for civil work costs.
- Provide detailed documentation for the inclusion of a 60% mark-up to equipment cost to account for direct mobile interconnection planning considering the planning costs included in 'FLLRIC Interrog 15 attachment 10_09_01 Conf.xls'.
- Confirm the reasonableness of the '400-GSM: Interconnect Specific Links' operating costs as shown in the 'Expense Factors' sheet given the operating costs provided in 'FLLRIC Interrog 13 attachment2 10_11_10 Conf.xls' and that no additional operating costs have been added to account for direct mobile interconnection.

The Authority's Directions - 3G Module

364. LIME is directed to:

- Evaluate the use of cells C7, C8, C11 and C12 in the "Radio Network" sheet. If the values in these cells are not needed they should be removed.
- Correct the allocation of the HLR –call sensitive costs.
- Remove the link to the fixed module by pasting the value in cell J67 (Fixed Network Requires) of the 'Transmission Links' sheet.
- Use direct investment costs from the 'FLLRIC Interrog 13 attachment2 10_11_10 Conf.xls' to account for civil work costs.
- Provide detailed documentation for the inclusion of a 60% mark-up to equipment cost to account for direct mobile interconnection planning considering the planning costs included in 'FLLRIC Interrog 15 attachment 10_09_01 Conf.xls'.
- Confirm the reasonableness of the '400-GSM: Interconnect Specific Links' operating costs as shown in the 'Expense Factors' sheet given the operating costs provided in 'FLLRIC Interrog 13 attachment2 10_11_10 Conf.xls' and that no additional operating costs have been added to account for direct mobile interconnection.

FURTHER PROCESS

365. Within forty-five calendar days from the date of this decision, LIME is directed to file a complete FLLRIC cost model reflecting the Authority's determinations in this decision. All changes made to the model must be documented by listing, for each change that is made: the excel file name, the spreadsheet name, the specific cell references, a description of the change, and the paragraph number from this decision directing that specific change. At the same time that LIME files the completed FLLRIC model, LIME is also directed to file, on the public record, its proposed MTR.

366. When LIME provides the revised FLLRIC model to the Authority, it must also provide to the parties on the FLLIRC distribution list a full working copy of the model with any confidential information marked and replaced with dummy data. The replacement of confidential data with dummy date must be made in accordance with the Authority's determinations in CD 2009-1 proceeding. All formulas and calculations and non-confidential data are to be left intact. Any information filed in confidence should be done so in accordance with the Authority's Confidentiality Regulations and requests for disclosure will be dealt with in accordance with those Regulations.

367. Any requests for disclosure of any information claimed in confidence must be made within ten calendar days of the material being filed and the Authority requires that any disclosure requests and responses to disclosure requests be in accordance with the procedures in the ICTA Confidentiality Regulations. Any requests for disclosure must be copied to the FLLRIC distribution list at the same time that they are submitted to the Authority.

368. If there are no requests for disclosure, parties other than LIME may provide written comments on the FLLIRC model, proposed MTR rates, and other information filed by LIME pursuant to paragraph 365 above within fifteen calendar days of the filing of the information submitted by LIME pursuant to that paragraph. The Authority stresses that the parties' submissions in this follow-up process should relate solely to the changes to the model pursuant to this decision and must not attempt to re-argue items on which the Authority has already made determinations in this or previous decisions. LIME may file any written reply comments within seven calendar days of the filing of comments by other parties. Any comments or reply comments must be copied to the FLLRIC distribution list at the same time that they are submitted to the Authority.

369. If there are any requests for disclosure for information submitted by LIME pursuant to paragraph 365 above, the Authority will issue comment and reply comment due dates at the time it makes its determination related to any such disclosure request.

370. The Authority will review the changes made by LIME and any comments and reply comments received pursuant to the above directions and, it anticipates, that it will then be able to approve a final FLLRIC model.

ASSESSMENT OF FLLRIC MODEL RELATIVE TO ICTA PRINCIPLES AND GUIDELINE

371. Throughout this decision, the Authority has evaluated LIME's proposed FLLRIC methodology against the Principles and Guidelines determined by the Authority in Decision 2005-4. The Authority provides a summary of its conclusions in the following section.

372. Principle 1:

> *The FLLRIC methodology should capture those costs for services or network elements that would lead to prices found in an efficient market for provision of such elements or services. Efficient market prices are those that ensure the service provider has the opportunity to recover efficiently incurred, forward-looking costs and encourage the service provider to operate in a cost effective manner. In addition, efficient market prices should provide the right incentives for efficient facilities-based investment, entry and exit.*

373. In order to fulfil Principle 1 the Authority must be satisfied that the approach adopted by LIME as a whole is reflective of a FLLRIC approach. Subject to the directions provided in this decision and any necessary further review of the assumptions and methodology as noted in this decision, the Authority accepts LIME's approach.

374. Principle 2:

> *Forward-looking costs are the costs to be incurred by a carrier in the provision of a service. These costs shall be calculated as if the service was being provided for the first time by a new carrier and shall reflect planned adjustments in the company's plant and equipment. Forward-looking costs ignore embedded or historical costs; rather, they are based on the least cost technology currently available whose cost can be reasonably estimated based on available data. As such forward-looking cost estimates must reflect technologies that are currently operational, used and available in the marketplace.*

375. The Authority considers LIME's FLLRIC material fulfils the requirements of Principle 2.

376. Principle 3:

> *The forward-looking long-run incremental costs of services or network elements are to be based upon those costs assumed to be incurred by an efficient carrier operating in the Cayman Islands for the first time. A carrier is deemed to be efficient where the total capital and operating expenditures are those that are necessary and sufficient in order to meet the required demand at a particular grade of service.*

377. The Authority is satisfied that the modelled networks are capable of meeting requirements of Principle 3.

378. Principle 4:

FLLRIC should include only those forward-looking costs that are incurred as a direct result of providing the service or network element in question. These are referred to as "causal" costs. Conversely, only costs that could be avoided by not offering the service or network element should be included in FLLRIC.

379. In Decision 2008-2 the Authority determined that a large increment approach (where the service increment is taken to be a whole network or group of services) is appropriate and routing factors and demand are to be used to allocate costs to services. LIME has implemented this approach.

380. Principle 5:

Costs that remain the same whether or not the relevant course of action (e.g., proposed introduction of a new service, proposed reduction or increase in rates, or other changes to existing services) is undertaken are not causal to the course of action and therefore are not taken into account in calculating the incremental costs associated with that course of action. Since costs and revenues that have been realised prior to the start of the course of action cannot be affected by that course of action, incremental costs and revenues do not consider cost and revenue components prior to the course of action. Historical or sunk costs are an example of this type of cost because no action after a decision point can affect costs already incurred prior to that decision point.

381. LIME's use of current estimates for input costs satisfies the requirements of Principle 5.

382. Principle 6:

A FLLRIC study should include all relevant service or element-specific start-up costs, including installation costs.

383. Based on its review of the relevant service and element-specific start-up costs included in the model, the Authority concludes that LIME's FLLRIC methodology fulfils the requirements of Principle 6.

384. Principle 7:

The FLLRIC of a service or network element should include both volume-sensitive and non-volume sensitive costs.

385. The Authority accepts that LIME's FLLRIC methodology fulfils the requirements of Principle 7.

386. Principle 8:

The FLLRIC of a service or network element is the forward-looking additional costs incurred by an efficient company to provide the entire output of a service or network element, including any required additional resources such as labour, plant, and equipment. These are the direct incremental costs of providing a service. FLLRIC excludes

any costs, including any common costs that would be incurred if the service is not produced.

387. LIME's FLLRIC methodology fulfils the requirements of Principle 8.

388. Principle 9:

Long-run costs are the economic costs over a planning horizon long enough so that there are no sunk inputs or costs.

389. LIME's FLLRIC methodology fulfils the requirements of Principle 9.

390. Principle 10:

Common costs are those costs that a carrier must incur in order to operate and are not directly attributable to any particular service or network element or group of services or network elements. C&W has the onus to prove the specific nature and magnitude of any forward-looking common costs. A reasonable assignment of common costs should be applied to all services and network elements regardless of whether the purpose of the FLLRIC cost is a "price floor" or a "price ceiling".

391. LIME's FLLRIC methodology fulfils the requirements of Principle 10.

392. Principle 11:

The process used to generate FLLRIC cost information should be transparent. In this context, transparency means that the processes for generating cost information are clear and understandable, that the numbers are objective and based on verifiable data, and that any models used in the FLLRIC process are fully documented.

393. While significant progress has been made in the fulfilment of the requirements of Principle 11, the Authority considers further improvement can be made. However, at this time, the Authority will not require any further changes to the model and documentation other than those directed in this decision.

394. Principle 12:

C&W has the onus to establish to the satisfaction of the Authority that its costing methodology complies with the approved FLLRIC principles and guidelines and produces reasonable results.

395. LIME's FLLRIC methodology fulfils the requirements of Principle 12.

396. Guideline 1:

The FLLRIC of a service or network element should be developed using a bottom-up methodology. That is, costs should be built up from the costs of the components that would be required in order to deliver those services or elements. The bottom-up approach requires the following steps:

A. specifying the components necessary to provide the volume increment,

B. estimating the volume increment and required capacity of each of these components,

C. dimensioning the components to serve the estimated increment on an efficient, forward-looking basis,

D. determining the cost of different components,

E. estimating the capital costs and operating expenses associated with the different components,

F. quantifying the unit costs of each component, and

G. aggregating the component unit costs by the use made of them by different services or network elements. Routing factors may be used for this purpose pursuant to the definition and requirements specified below.

397. LIME's FLLRIC methodology fulfils Guideline 1 as the network modules address each of the steps described above.

398. Guideline 2:

> *The modelled network should also be capable of providing a particular grade of service. The issue of the appropriate service standards for the mobile and fixed line networks and services shall be addressed in phase two of this proceeding.*

399. While the model does not explicitly demonstrate a particular grade of service the Authority believes that network modules are capable of meeting required demand and appropriate service standards.

400. Guideline 3:

> *The FLLRIC study shall be based upon the locations of, and planned locational changes to, the existing central office and facilities configuration. "Facilities" shall be interpreted to include feeder routes, central offices, drop wire, network interface devices, and other specific items that make up the facilities of a telecommunications company. This is referred to as the "scorched node" approach. The adoption of this approach does not imply that the modelled equipment located at the network nodes is of the same type or function as the equipment currently situated at those locations; however, the locations themselves are retained.*

401. LIME's FLLRIC methodology fulfils Guideline 3.

402. Guideline 4:

> *Carriers are constantly upgrading, developing and refining their networks. As a result, a carrier's network will at any time include a range of technologies and vintages of equipment types, all of which must interwork. A FLLRIC approach, however, should approximate those costs that would be faced by a new carrier investing in the*

network at the time of the study. Thus, it is assumed that the network will be fully constructed using the current generation of technology, without any allowance for the need to interwork with previous generations. This is referred to as the "instantaneous build" approach.

403. LIME's FLLRIC methodology fulfils Guideline 4 in that it assumes fully constructed networks based on a single technology and without the need for inter-working with previous generations of technology.

404. Guideline 5:

The increment to be modelled is the total service increment.

405. LIME's FLLRIC methodology fulfils Guideline 5.

406. Guideline 6:

If cost factors are based on historical data, historic averages or rely on ABC, C&W must provide the underlying supporting studies, analysis and documentation showing that those historical data, historic averages or the ABC relationships are relevant to the study of forward-looking costs.

407. LIME's FLLRIC methodology fulfils Guideline 6. Studies, analysis and documentation have been provided.

408. Guideline 7:

Each FLLRIC study shall identify and provide a basis for the projected economic life used to calculate depreciation costs of the equipment involved in providing the service or element or group of services or elements.

409. LIME's FLLRIC methodology fulfils Guideline 7.

410. Guideline 8:

FLLRIC should allow the carrier to earn a reasonable return on its investment as measured by a weighted average cost of capital ("WACC"). The carrier is required to provide support for the forward-looking WACC assumed in its FLLRIC analysis. Among other things, the carrier is required to demonstrate, with specificity, the business risks it faces in providing certain carrier services such as interconnection and access to infrastructure sharing, as contrasted to the business risks it faces when providing retail services in competition with other carriers. Alternatively, or in the absence of sufficiently robust supporting information, benchmarking analysis of the WACCs of similarly situated carriers providing comparable services may be used to support a proposed forward-looking WACC for C&W.

411. LIME's FLLRIC methodology fulfils Guideline 8.

APPENDIX A: LIST OF ABBREVIATIONS AND TERMS

2G	Second Generation
3G	Third Generation
4G	Fourth Generation
ABC	Activity Based Costing
ADM	Add Drop Multiplexer
ADSL	Asymmetrical Digital Subscriber Loop
BHE	Busy Hour Erlang
BRAS	Broadband Access Server
BSC	Base Station Controller
BTS	Base Transmission Station
BU	Bottom-Up
C&W	Cable and Wireless Cayman
CAPEX	Capital Expenditure
CD	Consultation Document
CPE	Customer Premises Equipment
CVR	Cost Volume Relationship
DIA	Direct Internet Access
DPLC	Domestic Private Leased Circuit
DSLAM	Digital Subscriber Line Access Multiplexer
DQ	Directory Inquiry
DWDM	Dense Wavelength Division Multiplex
FAC	Fully Allocated Cost
FCC	Fixed Common Costs
FLLRIC	Forward Looking Long Run Incremental Cost
FLLRIC+	FLLRIC including a contribution to common costs
Gbps	Gigabits per second (also Gbits/s)
GGSN	Gateway GPRS Support Node
GIS	Geographical Information Systems
GoS	Grade of Service
GPRS	General Packet Radio Switching
GRC	Gross Replacement Cost
GSM	Global System for Mobiles
HCA	Historical Cost Accounting
HLR	Home Location Register
HSDPA	High-Speed Downlink Packet Access
HSPA	High-Speed Packet Access
IC	Incremental Cost
ICT	Information & Communication Technology
ICTA	Information & Communication Technology Authority
IDD	International Direct Dial
ITU	International Telecommunications Union
IRU	Indefeasible Right to Use
IP	Internet Protocol
IPLC	International Private Leased Circuit
ISDN	Integrated Services Digital Network
kbps	Kilobits per second (also Kbits/s)
KYD	Cayman Dollar
KwH	Kilowatt Hour

LRIC	Long Run Incremental Cost
Mbps	Megabits per second (also Mbits/s)
MEA	Modern Equivalent Asset
MHz	Megahertz
MSC	Mobile Switching Centre
NGN	Next Generation Network
Ofcom	Office of Communications (UK)
OFTEL	Office of Telecommunications (UK)
OLO	Other Local Operator
OLS	Ordinary Least Square
OPEX	Operating Expenditure
ORC	Optimised Replacement Cost
PCU	Packet Control Unit
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RSU	Remote Subscriber Unit
SDH	Synchronous Digital Hierarchy
SFA	Stochastic Frontier Analysis
SGSN	Serving GPRS Support Node
SMS	Short Message Service
STM	Synchronous Transport Module
TCU	Trunk Controller Unit
TDMA	Time Division Multiple Access
TRX	Transceivers
TSLRIC	Total Service Long-Run Incremental Cost
Tx	Transmission
US	United States
USD	US Dollar
USP	Universal Signal Point
VAS	Value Added Services
VLR	Visitor Location Register
VPN	Virtual Private Network
WACC	Weighted Average Cost of Capital