# FLLRIC Model for the Cayman Islands
# Background Document Draft Costing Manual

**Cable & Wireless Cayman Islands**

**Submitted 14 December 2005**

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# 1. Introduction

1. This document is the first part of a submission representing C&W latest contribution to the development of the LRIC model in the Cayman Islands and, in particular, its fulfillment of requirements set out in the Authority's *Public Consultation on Costing Manual* (CD 2005-1), dated 27 October 2005, to submit a draft LRIC costing manual. As required by the Authority, this submission includes

   a) our proposed costing manual along with supporting rationale and explanations;

   b) two example costing studies developed using this manual, the first being mobile termination service, the second being the residential fixed line access service;

   c) our proposal on how to allocate common costs, proposed determination and level of expense factors, and proposed economic asset lives;

   d) additional information from other jurisdictions where competition exists regarding the determination and level of expense factors as well as any information supporting the applicability of such factors to the Cayman Islands; and

   e) any supporting asset life studies used in developing its proposed economic asset lives.

2. We also use also use the opportunity to propose two WACCs for use in the fixed and mobile network models.

3. The submission is divided into three parts:

   1. The Background Document:

      - explains our understanding of the principles and guidelines set out in the Authority *Decision for the Forward-looking Long-Run Incremental Costing Consultation* (ICT Decision 2005-4);

      - describes the overall methodological approach and treats issues common to both the fixed and mobile issues, including the cost of capital, expense factors, asset lives and treatment of retail costs; and

- provides definitions for terms and acronyms used in the other parts of the submission.

2. The Fixed Network Model Manual, which describes the structure and functioning of the fixed network model. The Manual includes a Retail Case study—Residential Fixed Line Service, which traces the inputs and calculations of costs relevant to the retail residential fixed line service to identify how outputs are determined.

3. The Mobile Network Model Manual, which describers the structure and functioning of the mobile network model. The Manual includes an Interconnection Case study--Mobile termination, which traces the inputs and calculations of costs relevant to mobile termination to identify how outputs are determined.

# 2. The FLLRIC Approach

### Efficient networks and technology

4. In its ICT Decision 2005-4, *Decision for the Forward-Looking Long-Run Incremental Costing Consultation*, 22 July 2005, ("Decision 2005-4"), the Authority specified that the FLLRIC methodology capture those costs for services that would lead to prices found in an efficient market (Principle 1), that the costs be calculated as if the service was being provided based on the least cost technology currently available (Principle 2) and that the costs of services or network elements be based upon those costs assumed to be incurred by an efficient carrier operating in the Cayman Islands for the first time. (Principle 3).

**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 than 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.

**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.

**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.

5. In implementing these efficiency requirements, this draft manual assumes an efficient network (or, more properly, networks, as a fixed and a mobile network costing is described) which, using the latest technology current in use, can handle a specified level of customers and amount of traffic at a required quality of service.

6. With respect to technology, C&W Cayman and new entrants are currently moving towards an Internet Protocol (IP)-based network. Therefore, the LRIC methodology for the fixed network is based on an IP-based architecture as opposed to the traditional PSTN.

7. For the mobile network, to date all new entrants have pursued GSM technologies. Therefore, only GSM technologies are included in the model.

8. All equipment costs are based on current market prices.

### Cost Causality and Increment definition

9. In its Decision 2005-4, the Authority specified that the FLLRIC methodology should only include "causal" costs (Principles 4 and 5), that all relevant causal costs—be they start-up, volume sensitive, volume insensitive, etc.--be included (Principles 6 and 7), that incremental cost is the forward-looking additional cost of the entire output of a service or network element (Principle 8 and Guideline 5).

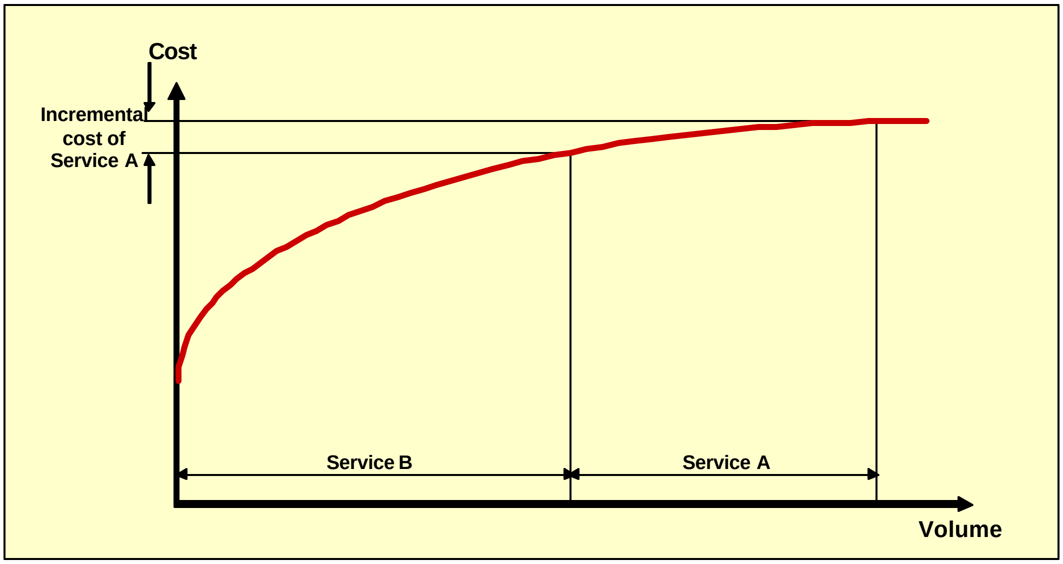
> **Principle 4:**
> FLLRIC should include only those forward-looking costs that are incurred as a direct result of providing the service or network element in question. These are referred to as "causal" costs. Conversely, only costs that could be avoided by not offering the service or network element should be included in FLLRIC.
>
> **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 realized 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.
>
> **Principle 6:**
> A FLLRIC study should include all relevant service or element-specific start-up costs, including installation costs.
>
> **Principle 7:**
> The FLLRIC of a service or network element should include both volume-sensitive and non-volume sensitive costs.
>
> **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.
>
> **Guideline 5:**
> The increment to be modelled is the total service increment.

10. LRIC is generally defined as the cost of adding a product or service to a portfolio of existing products or services or, conversely, the cost avoided if production of a product or service is taken away from the list of existing products or services. For

example, if the company currently produces two services (A and B) and then decides to stop producing service A, then the company's costs will decrease. The company will save:

- the variable costs associated with production of this service; and
- the fixed costs specific to the production of this service (service specific fixed costs).

11. Figure 1 (below) illustrates the definition of LRIC for a service (Service A). The LRIC approximates the slope of the cost curve, which is often referred to as the Cost-Volume Relation, or CVR.




12. This draft manual incorporates the Authority's principles in its definition and implementation of the service increments. An increment is the set of products or services over which the costs are being measured. We use the following increments:

*Fixed Line Network*

- Access: contains all the Access services currently offered by C&W Cayman (PSTN Access, ISDN Access, ADSL).
- Transmission: includes all retail and wholesale traffic services, leased lines and data services. On a service level, the traffic related services are split into call set up and call conveyance parts.

*Mobile Network*

- Traffic: contains all mobile traffic services
- Subscriber: contains all subscriber related costs, such as handsets and customer care.

- Mobile Coverage is considered to be a common cost to the two mobile increments. Mobile coverage relates solely to site costs and the network management system with the cost of providing the MCC is treated as incremental to traffic services.

13. The fixed and mobile models produce a range of incremental costs:

- Pure LRIC reflecting the variable cost associated with the single service
- Distributed LRIC reflecting the variable cost plus an equi-proportionate mark-up of the fixed costs associated with the increments outlined above. These Increment-Specific Fixed Costs are referred to as ISFCs in this submission. The pure variable incremental costs of a service are identified by "withdrawing" the service volume within an increment and comparing the difference between the total cost with and without the service volume. Only if the volume of all the services of an increment removed, are the ISFC of the increment removed as part of the LRIC cost.
- Full LRIC reflecting the variable cost plus ISFCs plus an equi-proportionate mark-up for the fixed common costs (FCCs) that run across both increments (Access and Transmission in the fixed model and Traffic and subscriber in the mobile model, respectively). See next section.

### Common Costs

14. In its Decision 2005-4, the Authority specified that the FLLRIC methodology should identify a reasonable assignment of common costs to all services and network elements regardless of whether the purpose of the FLLRIC cost is a "price floor" or "price ceiling" (Principle 10). As mentioned above, the models work on the principle that network costs and capital values are calculated for each network component according to the volume inputs given. If the volume input for a particular service is removed, then the reduction in costs shown by the model will indicate the LRIC value for that particular service increment. Similarly, volumes may be removed for a group of services which represent a higher-level increment.

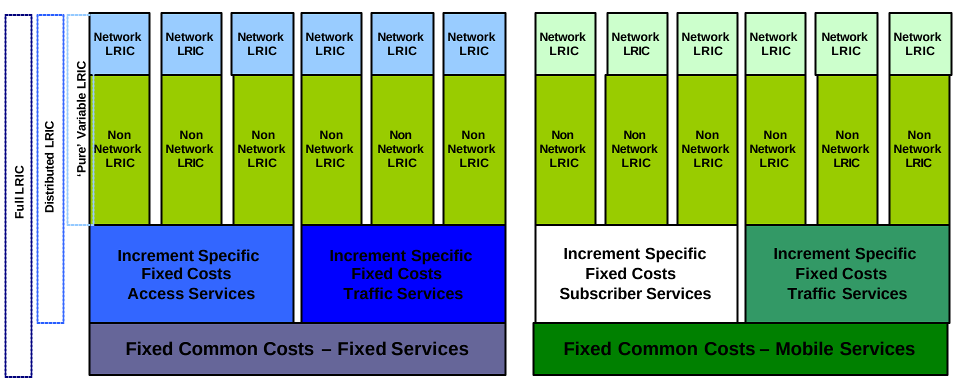
> **Principle 10:**
> Common costs are those costs that a carrier must incur in order to operate and are not directly attributable to any particular service or network element or group of services or network elements. C&W has the onus to prove the specific nature and magnitude of any forward-looking 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".

15. Fixed common costs (FCC) are fixed costs associated with the production of two or more services, which cannot be avoided unless production of all services to which they are common is stopped. FCC are fixed with respect to volume. In other words, FCC are the costs that are not incremental to any defined increments and are only avoided when the production of all services has ceased. Examples of FCC are the network equipment required for mobile coverage (as opposed to the mobile network required for capacity or traffic) and the fixed and mobile the license fees.

16. As the fixed and mobile networks are modeled as self-standing businesses, there are separate fixed and mobile FCCs, and none that span both models.

17. The model calculates network common and increment specific fixed costs for each cost category. There are a number of potential methodologies for calculating the value of the actual mark-up on services. The model employs the most widely accepted and used mark up methodology, Equal Proportionate Mark-Up (EPMU), where the FCC are allocated to the services based on the LRIC costs previously allocated.

18. The diagram below summarises the differences between these LRIC concepts.




19. Cable & Wireless has modeled all of the direct FCC associated with network elements and their derivation is found in the methodology below. For indirect capital expenses (non-operational buildings, vehicles general purpose computers, etc.), we have relied on benchmarks, see section on expense factors. We will

continue to present Cayman specific information on these expense factors over the course of these proceedings as they become available.

### Transparency and the Evolving Manual and Case Studies

In its Decision 2005-4, the Authority made it clear that the input data and the model structure and operation should be transparent and that the onus is on C&W to demonstrate that its methodology complies with the Authority's principles and guidelines (Principles 11 & 12). We believe that this draft manual and the attached case studies achieve that goal of transparency and that the methodology is consistent with the Authority's requirements. We recognize, however, that this is a draft manual and there is much work yet to be done, in terms of agreeing appropriate inputs, broadening the scope of the methodological discussion and broadening the outputs presented in the case studies. We therefore see both the manual and the case studies as living "documents" which will be revised a number of times over the coming weeks.

**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.

**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.

### The Bottom-up methodology

## a. Structure

20. In its Decision 2005-4, the Authority specified that the FLLRIC should be developed using a bottom-up methodology (Guideline 1). The balance of this introductory section describes in general form this methodology.

**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.

21. There are three critical assumptions on the networks that must be noted before a fuller discussion of the modelling:

- the networks are considered as separate entities, each with its own network and sites. When assuming separate fixed and mobile networks, the required number of sites is computed separately for the fixed and mobile networks. It is assumed that there is no site sharing between the fixed and mobile businesses and no sharing of infrastructure with other countries.
- the networks are assumed to be based entirely in Cayman Islands.
- as per Guideline 3 of Decision 2005-4, a scorched node approach is applied to both the fixed and mobile networks.

**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.

22. Following the Guideline 4, the bottom up model assumes “instantaneous build”: it takes specified traffic volumes and customer numbers as an input and constructs a theoretical network capable of handling these volumes, with due regard to a

particular grade of service (as per Guideline 2 of Decision 2005-4). The costs of all required network elements are then calculated and annualised. This annualised cost is then used to derive an in-year depreciation charge and net replacement cost (NRC) per network element. Figure 2 below provides a high level illustration of the logical structure of the model.

**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.

**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 the "instantaneous build" approach.

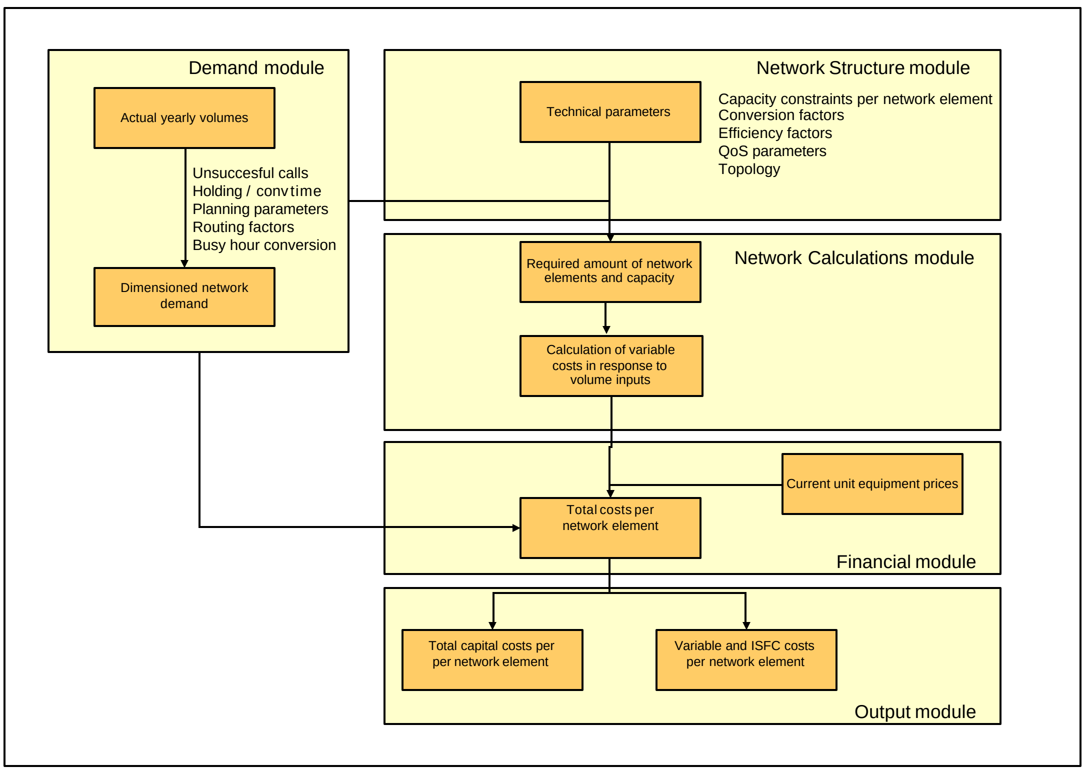



**Figure 2 Structure of the Bottom Up LRIC model**

23. In the **demand module**, the demand inputs for each service are collected. These include traffic per service and of the number of customers. These are all external

inputs for the model. These volumes are then translated into dimensioning volumes, using parameters such as percentage of unsuccessful calls, planning parameters, routing factors and busy hour data. The output from the demand module serves as an input to the network structure module and is used later on to calculate unit cost prices for network equipment and the cost prices of the services.

24. In the **network structure module** the network topology is described. External inputs are technical information regarding network elements (element size and modularity, the logical structure of the network, and the area types (urban, suburban, rural and highway) and their characteristics (e.g., cell radius, number of sectors)).

25. In the **calculations module**, the required number of each network and transmission element type is calculated. The inputs to this module are the required capacity per network and transmission element type (from the routing module), area type characteristics, radio and core blocking requirements, minimum requirements for coverage and availability and a translation method to calculate the required capacity from the amount of traffic or the number of subscribers (such as an Erlang formula). In this module the network elements and some of the other network related assets will be split into common costs and non-common costs. The output of this module is the required quantity of each element type and the classification into common and specific costs, which is used in the financial module to calculate the costs incurred by each element type.

26. In the **financial module** the required network investments are determined for the relevant year. The required equipment quantities are multiplied by the current equipment prices. For the case studies outlined in this manual, we have used a straight line method for depreciation.

27. In the **output module** the unit costs per network element and the network related fixed common costs are calculated using the network volumes. The result of this is a bottom up, fully distributed view, of the costs per network element. The incremental costs per network element are obtained by setting the volume of each service to zero and identifying the difference in cost per element with and without the relevant service. Figure 3 illustrates this on a high level

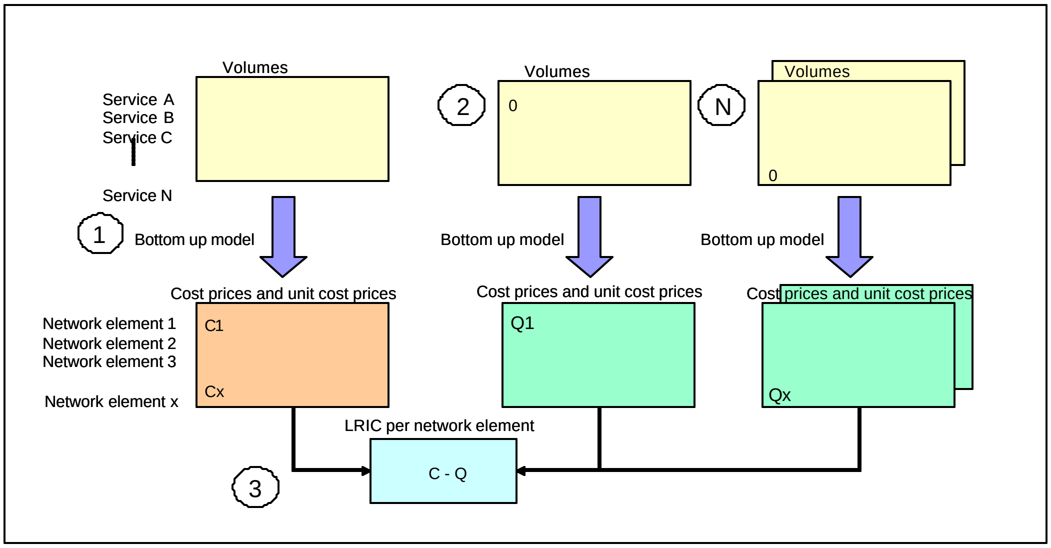



**Figure 3 Obtaining incremental costs per service**

## b. Volumes and Routing Factors

28. The model takes, as inputs, the actual service volumes for the various services, which may be measured in minutes of duration, number of calls or number of lines. These service volumes must be converted to a demand for the various network elements – the process for achieving this is:

- Volumes are scaled by factors to allow for such things as failed calls and planning allowances.
- The scaled volumes are then multiplied by the related routing factors for each network element to calculate a volume demand by network element.
- In the case of traffic products, the resulting annual demand is converted to busy-hour demand, which is used to dimension the network.

29. In the following sections, this process is described in more detail for the different volume types.

### Volume Scaling

*Minutes*

30. Call conversation minutes for each service (which are provided as an input to the model) are converted to network occupancy minutes via the following formula:

*Occupancy minutes = conversation minutes*
*+ number of successful calls * non-conversation holding time per call*

*+ number of calls * (ratio of total/successful calls) * non-conversation holding time per call*

where:the ratio of total/successful calls and non-conversation holding time per call are inputs to the model

*Calls*

31. The number of calls for each service (provided as an input to the model) are converted to total calls (successful and unsuccessful) via the following formula:

*Total calls = successful calls * ratio of total/successful calls*

*Lines*

32. The number of lines for each service is converted to a demand volume via the following formula:

*Lines network demand = Lines * Annual growth rate for lines*
*where the annual growth rate is a planning assumption to ensure that sufficient capacity* is provided to cover projected growth.

*Capacity*

33. For certain products a simple line driver is not adequate for modeling, because the lines may have different capacities. This applies to leased lines, frame relay and direct connections. In these cases, a capacity volume driver is derived from an analysis of the lines sold by capacity.

34. For each capacity of circuit, the capacity driver volume is calculated according to the following formula:

*Service capacity = number of lines * capacity /2Mbit/s*
The service capacity is then summed for all the capacities sold to give the total capacity for each product.

35. Service capacities are then converted to network capacities via the following formula:

*Network capacity = Service capacity * (1 + transmission capacity allowance)*
where transmission capacity allowance is a planning benchmark

**Routing Factors**

36. Routing factors tell us how many times each network component is used by each service. The routing factors can therefore be regarded as a set of weights which allow us to translate service demand into network element demand.

37. So for each network element, the routing factors are multiplied by the scaled service demands to arrive at the total demand for each network element. The formula is as follows:

$$\begin{aligned} \textit{Demand for NE1} = &\ demand_{service\ 1} * RF_{service1,\ NE1} \\ &+ demand_{service\ 2} * RF_{service2,\ NE1} \\ &+ demand_{service\ 3} * RF_{service3,\ NE1} \\ &Etc \end{aligned}$$

38. The end result is a set of demand measures for each network element which can then be used to dimension the network.

# 3. Economic Asset lives

39. Guideline 7 of the Decision 2005-4 states that the LRIC studies should identify and provide a basis for the projected economic life used to calculate depreciation cost of the equipment involved in providing the service or element or group of services or elements.

**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.

40. There are numerous LRIC studies that give economic asset lives for fixed network elements. For example, Europe Economics (2000) and PTS (2003) give the following economic asset lives[1]:

[1] "Study on the Preparation of an Adapatable Bottom-up Costing Model for Interconnection and Access Pricing in European Unioin Countries", Europe Economics, April 2000 and http://www.pts.se/Archive/Documents/SE/Model%20documentation%20-28%20mars%2003.pdf

| | Europe Economics (citing various) | PTS |
|---|---|---|
| Fixed cost of processor | 10-11 | 10 |
| Site costs | 37-38 | 30-35 |
| Processing costs per BHCA (variable costs) | 12 | 10 |
| Switchblock | 13 | 10 |
| DTU | 11-12 | 10 |
| Synchronisation & Signalling | 16 | 10 |
| Network Management | 9 | 10 |
| Transmission Electronics | 10 | 10 |
| Cable infrastructure | 23 | 20 |
| Duct & Trenching | 38 | 40 |

***PSTN asset lives***

41. Public records of economic asset lives for mobile network equipment are more difficult to find. One source is the 2002 Ofcom's review for mobile termination.[2]

[2] See, http://www.ofcom.org.uk/consult/condocs/mobile_call_termination/wmvct/annexc/?a=87101 It is worth noting that PTS in Sweden refer to largely the same lives in their 2003 proceeding. See "Mobile LRIC Model specification: Final version for the industry working group". PTS, 2003. .

| | | Asset Lives |
|---|---|---|
| Base Station Sites | Macrocell-omni sector: site acquisition and preparation and lease | 50 |
| | Macrocell: equipment (omni sector) | 22 |
| | Macrocell-3 sector: site acquisition and preparation and lease | 50 |
| | Macrocell: equipment (3 sector) | 18 |
| TRXs | Macrocell: additional TRXs | 15 |
| BSCs | BSC: base unit | 14 |
| | BSC: BS-facing port increment | 50 |
| | BSC: MSC-facing port increment | 50 |
| BSC-MSC transmission | 2 Mbit/s microwave link | 14 |
| | 8 Mbit/s microwave link | 14 |
| | 16 Mbit/s microwave link | 14 |
| | 32 Mbit/s microwave link | 14 |
| | 2 Mbit/s leased line | 50 |
| | 8 Mbit/s leased line | 50 |
| | 16 Mbit/s leased line | 50 |
| | 32 Mbit/s leased line | 50 |
| MSCs | MSC: processor | 14 |
| | Software | 15 |
| | Interconnect interface | 15 |
| | Switching Support Plant | 15 |
| | Buildings (switch building preparation) | 15 |
| | MSC: site lease | 50 |
| | MSC: BSC-facing port increment | 14 |
| | MSC: interconnect-facing port increment | 14 |
| | MSC: switch-facing port increment | 14 |
| Interswitch transmission | 140 Mbit/s leased line (per 2Mbit/s circuit) | 50 |
| HLRs | HLR | 14 |
| | HLR Upgrade | 50 |
| Licence fees | Annual GSM licence fee | 50 |
| NMS | Network management | 14 |

***Mobile Network asset lives***

42. The lifing for given assets in the fixed network are consistent with those that we have found in our discussion with engineers and vendors. However, we have found considerably shorter economic lives for NGN components relative to PSTN components. Similarly, the GSM network elements appear to be shorter lived in our experience than those on the public record. Our initial assumptions on asset lives are found in the cost assumptions sheets in the models, and reproduced here for ease of reference.

| **Fixed Network** | years |
|---|---|
| NGN Equipment | 5 |
| Duct | 20 |
| Fibre Cable | 15 |
| Fibre Joints | 15 |
| Poles | 20 |
| Management Systems | 5 |
| Manholes | 20 |
| Copper Cable | 15 |
| Copper Joints | 15 |
| DPs, Dropwire, NID | 10 |

| Mobile Network | years |
| --- | --- |
| BTS (including TRX) | 5 |
| BSC | 5 |
| MSC | 5 |
| TCU | 5 |
| HLR | 5 |
| SGSN | 5 |
| GGSN | 5 |
| PCU | 5 |
| Internet Gateway | 5 |
| Cell Site | 10 |

43. Currently the model uses an annuity approach to derive the annualised capital costs, including the cost of capital. The use of annuities for determining annual capital costs has the merit of smoothing annual capital costs over the life of the asset.

44. A simple annuity is the equal annual payment received from an investment. It represents the partial repayment of the capital invested and a return on the investment. The annual payment continues until the end of the investment term.

45. The bottom-up model uses a flat annuity approach to calculating annualised capex costs, where the annualised cost is given by the following formula:

*Annualised cost = capex * [wacc * (1+wacc)^asset life] / [(1+wacc)^asset life-1]*
This can be expressed more simply as an excel function:
*Annualised cost = -PMT(wacc, asset life, capex)*

46. A simple annuity approach is similarly used to calculate depreciation.

47. We are aware that a tilted annuity is preferred as it allows the incorporation of asset price trends. We intend to incorporate a toggle into the model so that capital costs can be viewed under both assumptions. Our next submission in this proceeding will include both the price trends and the results under both annualization assumptions.

# 4. Expense Factors for Network Opex, non-network capital and non-capital expenses

48. In its Decision 2005-4, the Authority states that the calculation of network operating costs should be developed based on a bottom-up approach and considers that the use of expense factors, adjusted for expected productivity gains, a reasonable method of estimating operating costs. Guideline 6 then states that to the extent that any cost factors were based on historic data, historic averages or rely on ABC, supporting studies, analysis and documentation must be provided to demonstrate they are relevant to forward-looking costs.

> **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.

49. The bottom-up modelling outlined in this submission direct derives all network capital costs. What the bottom-up modelling does not directly derive are the following:

- Network opex
- Non-network common opex (e.g., execution and planning, accounting and finance, human resources, information management, legal, procurement, etc.)
- Non-network common capex (e.g., non-operational buildings, vehicles, general purpose computers, etc.)
- Retail costs

50. This section deals with the first three of these costs types.

51. On the public record, there is a body of work on expense factors, which associate these costs to ratios derived ultimately to bottom-up modelled network costs. In recent submissions to a New Zealand proceeding, the studies from the FCC, ACCC/NERA, Europe Economics, iTST and PTS were cited. We have looked at these benchmarks. These are summarized in the table below.

| *Source* | *Network, Date* | *Expense Category* | *Factor* |
|---|---|---|---|
| MCMC-Taskforce (Malaysia) | Fixed, 2002 | Fixed Switching Opex, % of Inv. | 7%-8% |
| | | Fixed Transmission Opex, % of Inv. | 5% |
| | | Buried Cable, Opex % of Inv. | 4% |
| | | Duct, Opex % of Inv. | 4% |
| | | Common Cost Inv, % of Inv | 6.39% |
| | | Common Cost Opex, % of Opex | 31.20% |
| MCMC-Taskforce (Malaysia) | Mobile, 2002 | BTS site | 9.00% |
| | | BTS equipment | 31.00% |
| | | MSC | 10.00% |
| | | Fiber | 6.00% |
| | | Duct | 3.00% |
| | | Common Cost Inv, % of Inv | 8.60% |
| | | Common Cost Opex, % of Opex | 43.96% |
| FCC (US) | Fixed 1999 | Fixed Switching Opex, % of Inv. | 3.40% |
| | | Fixed Transmission Opex, % of Inv. | 1.10% |
| | | Buried Cable, Opex % of Inv. | 3.80% |
| | | Duct, Opex % of Inv. | 0.20% |
| | | Common Cost Inv, % of Inv | 6.20% |
| | | Common Cost Opex, % of Opex | 21.30% |
| iTST (Denmark) | Fixed 2002 | ISFC + Common Cost, % mark-up of Investment (minimum) | 24.40% |
| | | ISFC + Common Cost, % mark-up of Investment (maximum) | 26.40% |
| ACCC/NERA (Aus) | Fixed, 2000 | Local Network Opex, % of Inv. | 24.70% |
| | | LD Network Opex, % of Inv. | 43.40% |
| | | Common Cost, % of Inv | 6.90% |
| Europe Economics | Fixed, 2000 | Local Network Opex, % of Inv. | 24.80% |
| | | LD Network Opex, % of Inv. | 43.44% |
| | | Common Cost, % of Inv | 7.10% |

*Expense Factors Benchmarks.*

52. Because of the newness of the fixed network being modelled as well as current lack of a complete stable data series (due to Hurricane Ivan), we have not at this time been able to compare these factors with our actual experience. We hope to present a more systematic comparison in our next submission in this proceeding. In the absence of such, we will utilize in the modelling these expenses factors to take account of network opex, non-network common opex, non-network common capex.

# 5. Non-network Costs for Retail Services

### Introduction

53. While a bottom-up methodology is universally recognized as being adequate to measure hypothetical network costs, there is much less consensus about how well it measures non-network costs. As described in Section 5, expense factors are used to calculate network operating costs, however to calculate non-network costs for retail services, a top-down analysis is used to examine C&W Cayman Islands' actual annual operating expenses.[3] This section describes the top-down methodology for deriving LRIC measures for non-network costs.

54. All capital and operating costs associated with the provision of C&W Cayman Islands' network elements are calculated in the BU model or using expense factors. This includes common costs such as the finance department and legal & regulatory costs. Capital and operating costs incurred in the operation of the retail business are calculated using a Top Down (TD) methodology

55. The first step in the TD analysis is the categorization of actual operating expenditure and capital balances according to functional purpose and materiality, based on C&W Cayman Islands' product profitability reporting. This analysis provides a basis for understanding the cost drivers and dependency hierarchy for cost categories to be modeled on a top down basis, and involves the exclusion of all costs that are modeled using the bottom up and expense factors approaches in order to ensure that no costs are modeled twice. In cases where a cost type might be incurred in support of the network and retail parts of the business, an apportionment is made to segregate the two types of cost in order to avoid any double counting.

56. For example, if the company's product profitability reporting indicates that 60% of the HR department is attributable to parts of the business supporting the network part of the business, then only 40% of the cost of the department is included in the top down analysis. The 60% attributable to the network part of the business is excluded and simulated using the expense factor approach outlined in Section 5.

57. In order to strip current operating expenditures down into cost-causal measures, we develop and apply Cost Volume Relations (CVRs) to the defined cost categories. CVRs have been developed for around 10 of the more material and functionally important cost categories. The other categories use either Straight Line Through Origin (SLTO) or Horizontal Fixed Element (HFE) shaped CVR curves depending on the nature of the cost category.

[3] The output of this analysis is also used to inform any adjustment to non-network costs expense factors for network services

58. There are three types of top down (TD) cost category, defined according to their cost sensitivity:

- The cost of **independent** cost categories is driven directly by service volumes.
- The cost of **semi-independent** cost categories is driven by the net replacement cost of network elements as calculated in the BU part of the model.
- The cost of **dependent** cost categories is driven by the cost of one or more of the other TD cost categories.

59. It is, therefore, critical to calculate LRIC for independent and semi-independent cost categories prior to the calculation of the dependent cost categories that are driven by predecessor cost categories.

60. The non-network LRIC of a service is calculated for each service in turn following a sequence defined in the dependency order. The flow from service volumes, through the model to service costs is illustrated below.

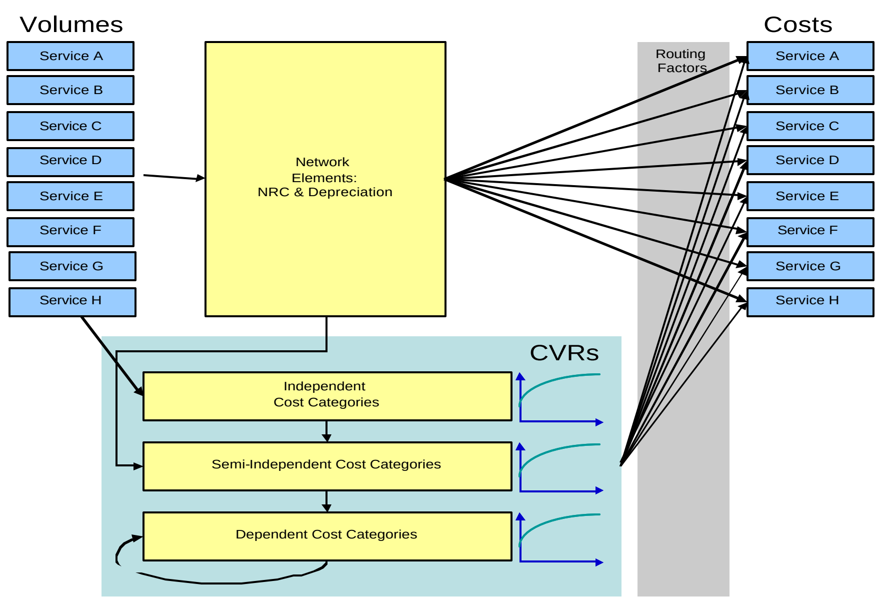



**Figure 3 Overview of structure of top down inputs into Retail Service Cost**

**Cost Volume Relationships**

61. This section describes the use of Cost Volume Relations (CVRs) used in the top-down part of the model for retail cost measurement.

## CVR background and definition

62. The quantification of the relationship between the volume of services provided and the cost of providing those services is fundamental to the calculation of LRIC. CVRs describe and quantify that relationship.

63. CVRs are used to model C&W Cayman's retail operating and non-network capital costs as service volumes (e.g. lines or minutes) vary. A CVR defines, for a particular cost category, how much variable cost would be avoided due to the removal of a particular product or service. Where there is no direct causal link between a cost category and service volumes, an indirect relationship is defined whereby a cost is dependent on the volume of cost in a category with a direct link.

64. For each cost category, a relationship is defined that represents the extent to which costs might be saved by the exclusion of one of the defined service increments. The costs can:

- be directly attributable to a one or more service increments being measured, and
- be variable or fixed.

65. The relationship between costs and volumes is mapped with cost driver volumes on the X-axis and the costs, caused by the cost driver, on the Y-axis. Fixed costs are represented on a CVR graph by an intercept that passes through the y-axis rather than through the origin of the graph.

66. In the diagram below, the first row of CVRs exhibit fixed costs. The first column exhibits a linear relationship between costs and volume, the second column exhibits a two stage linear relationship, and the third column exhibits economies of scale enjoyed at higher levels of volume

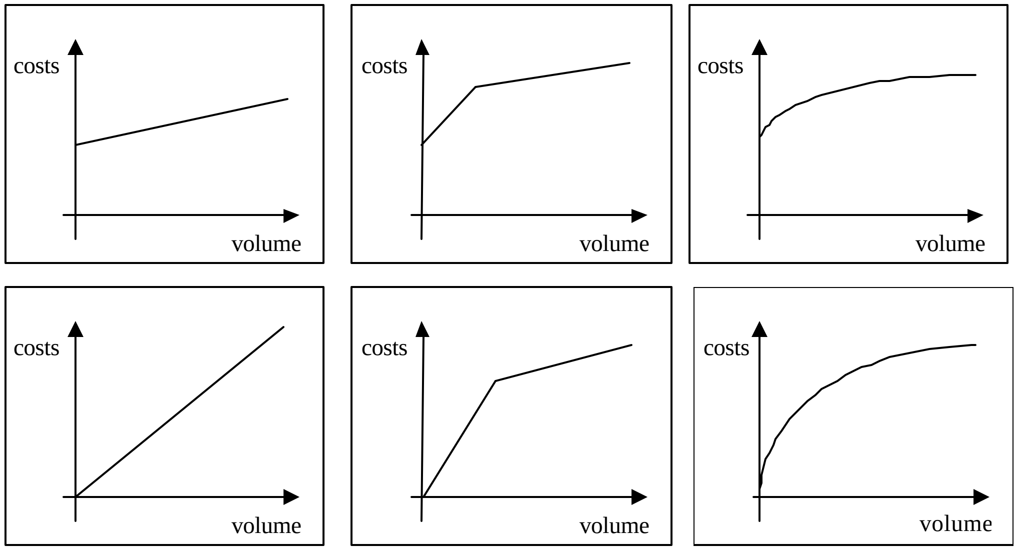



**Figure 1 Example CVRs**

67. As is the case in the BU part of the model, the LRIC of each service is calculated by removing the volumes of that service. In the BU part of the model, this causes a reduction in the Net Replacement Cost of the network elements providing that service. However, the top down part of the model includes many cost categories which do not have a direct relationship with service volumes. Therefore, in the top-down part of the model, cost categories may be driven by the reduction in the NRC of an asset, where that reduction in the NRC is calculated in the BU model resulting from a reduction in service volume.

68. Each CVR that defines a fixed element to the cost category is associated with an ISFC label that instructs the model how to treat that fixed element. If no ISFC label is defined, the fixed cost element is considered to be common to all services.

## Construction of CVRs

69. For each CVR it is necessary to identify the minimum and maximum points and the technique for joining the two points.

70. In defining the minimum point the scorched node principle is applied to the retail environment in order to ensure that the operating costs being modelled are sufficient to support the notional minimum volume of services provided by the network simulated in the BU model. The maximum point is the fully allocated cost (FAC) output from C&W Cayman Islands' product profitability system.

71. The following process is undertaken for each CVR:

- The cost driver is identified.

- The current cost structure of the cost category is investigated, in order to understand the most material elements of cost in the category, and how they might vary in respect of the cost driver volume.
- The resources necessary at the minimum point are determined. These are then expressed in cost terms taking account of any economies of scale which are enjoyed at the 100% point but may not be enjoyed at the minimum point.
- A method for linking the minimum and maximum points is determined (i.e. the shape of the curve). This is achieved for interim points, for example, 50% by replicating the process used to determine the minimum point.

72. Because CVRs are expressed as curves constructed from a finite number of data points (x, y co-ordinates), there will usually be a need to interpolate between data points to calculate the appropriate LRIC. The interpolation takes the x-axis value of the cost driver volume being measured and finds the two co-ordinates either side of that x-axis value. The decrease in cost from the higher data point is calculated by multiplying the gradient between the two data points by the difference between the cost driver volume being measured and the higher data point. Once the CVRs have been developed, it is possible to identify, for those which exhibit a fixed element, increment-specific fixed costs.

## Information Sources

73. CVRs are generated by way of interviews with key stakeholders in the business, particularly those responsible for management of cost centres represented in the cost categories for which CVRs have been defined.

74. In circumstances where there is currently insufficient data to support the development of a CVR, a benchmark from a similar operator within the Cable & Wireless group has been used.

### Defining the Dependency Hierarchy

75. Cost categories are identified as being independent, semi-independent or dependent. Independent cost categories are driven by exogenous drivers, such as minutes or number of lines. Semi-independent cost categories are driven by costs calculated by the BU part of the model. Dependent cost categories are driven by endogenous drivers, such as total salary costs or net replacement cost of an asset.

*Independent cost categories*

76. Independent cost categories each map to a cost volume relationship which describes the relationship between service volumes and cost. The model uses the CVR associated with the cost category to determine by how much the cost will fall if a given service increment is removed.

77. An example of an independent cost category is the Mobile Customer Services department. The operating expenditure associated with this department is a function of the number of active mobile customers. When the model calculates the LRIC of independent cost categories it references the CVR that describes the relationship between the cost driver volume (number of active mobile customers) and the cost of the category (departmental operating expenditure).

*Semi-independent cost categories*

78. Semi-independent cost categories each map to a CVR which describes the relationship between a cost calculated by the BU part of the model and the cost category. Therefore, semi-independent cost categories may be driven by either BU-derived Net Replacement Costs or by BU expense factor-derived operating costs.

79. An example of a semi-independent cost category is the Sales Support Engineering department, the operating cost of which is a function of the network cost of providing the products supported. When the model calculates the LRIC of semi-independent cost categories it references the CVR that describes the relationship between the cost driver volume (product network cost) and the cost of the category (departmental operating cost)

*Dependent cost categories*

80. Dependent cost categories each map to a CVR which describes the relationship between an independent or semi-independent cost category (or group of cost categories) and the cost category.

81. An example of a dependent cost category is the Mobile Retail Sales Management department, the operating cost of which is a function of the cost of other departments over which the management team has responsibility. When the model calculates the LRIC of a dependent cost category it references the CVR that describes the relationship between the cost driver volume (the total operating cost of the group of mobile retail sales cost categories) and the cost of the category (departmental operating cost).

82. Dependency groups such as the one described above, define which cost categories contribute to the cost driver volume of the affected cost category. For example, the dependency group for the Mobile Retail Sales Management cost category includes all the previously calculated Mobile Retail Sales cost categories, but cannot include the driven cost category or any of the cost categories that are calculated later in the dependency hierarchy.

*Dependency hierarchy*

83. In order to capture the different drivers, it is necessary to define 'hierarchies' of relationships within the analysis. This allows for cost categories that are driven by service volumes to be calculated first, with successive interdependencies being

‘rippled’ through the analysis. The dependency hierarchy is defined so as to ensure there is no circularity in the dependencies.

84. The dependency hierarchy is defined in the LRIC Driver Affected (LDA) table. The guiding principle in constructing the table is to calculate independent cost categories first, then semi-independent cost categories, and to calculate dependent cost categories last, whilst avoiding any circularities that would arise by including a cost category in the group which it is driven by.

**Worked Example**

85. The following worked example demonstrates the calculation process in the top-down part of the model.

*Assumptions*

86. The Weighted Average Cost of Capital (WACC) is assumed to be 10%.

87. There are five services in the increment:

| Product | Minutes |
|---|---|
| **Service A** | 1,000,000 |
| **Service B** | 1,000,000 |
| **Service C** | 2,000,000 |
| **Service D** | 500,000 |
| **Service E** | 500,000 |

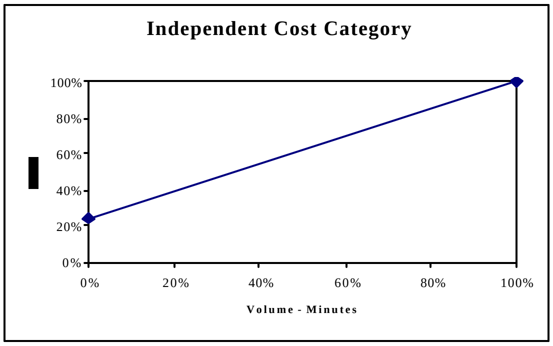
88. Two Network Elements provide the services. The incremental reduction in the cost of these network elements shown below results from ceasing to provide Service A:

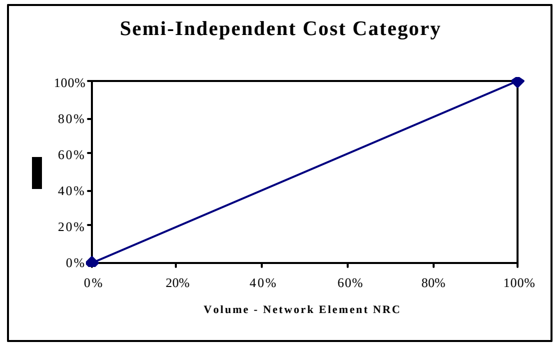
| Network Element | NRC | Reduction | Depreciation | Reduction |
|---|---|---|---|---|
| Network Element 1 | $ 1,000 | $ 400 | $ 200 | $ 80 |
| Network Element 2 | $ 4,000 | $ 1,000 | $ 800 | $ 320 |

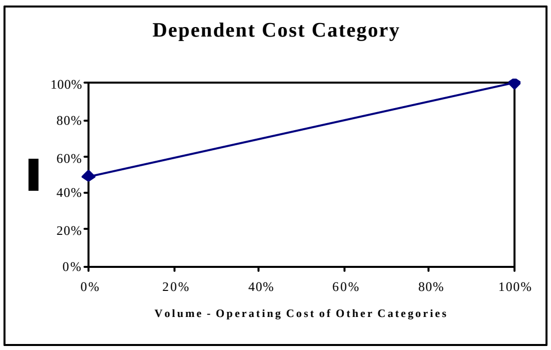
89. Three cost categories are driven by the volume of service A, or by the network elements which product Service A:

| Cost Category | Operating Cost |
|---|---|
| Independent Cost Category | $ 1,000 |
| Semi Independent Cost Category | $ 500 |
| Dependent Cost Category | $ 2,000 |

90. The CVRs constructed for the three cost categories are shown below:




- The CVR for the independent cost category has an intercept point of 25%. Fixed costs are increment specific to services A, B and C.
- The CVR for the Dependent cost category has an intercept point of 50%. Fixed costs are common to all five services.

*Step 1*

- The Independent Cost Category is an Operating Cost category driven by the volume of minutes for Services A, B and C.
- If Service A is reduced to zero minutes, this represents a 25% reduction in the driver volume for the cost category.
- The model therefore reads off the CVR graph from the 75% point on the x-axis, which corresponds to the 81.25% point on the y-axis.
- The cost reduction is therefore 18.75%, which is $187.50. This is the LRIC of the cost category in respect of Service A.
- The fixed cost of the independent cost category is an increment specific cost shared by Services A, B and C.

*Step 2*

- The Semi-Independent Cost Category is an Operating Cost category driven by the NRC of Network Elements 1 and 2.

- If Service A is reduced to zero minutes in the BU part of the model, this causes a reduction of $400 in the NRC of Network Element 1 and a $1000 reduction in the NRC of Network Element 2.
- This is a 28% reduction in the driver volume for the cost category.
- The model therefore reads off the CVR graph from the 72% point on the x-axis, which corresponds to the 72% point on the y-axis as the CVR is Straight Line Through Origin (SLTO) type.
- The cost reduction is therefore 28%, which is $140. This is the LRIC of the cost category in respect of Service A.
- There is no fixed cost for this cost category.

*Step 3*

- The Dependent Cost Category is driven by the amount of operating expenditure incurred in the Independent and Semi-Independent Cost Categories.
- If Service A reduces to zero minutes, this causes the operating cost in the Independent and Semi Independent cost categories to decline by a total of $327.50
- This is a 21.8% reduction in the driver volume for the cost category
- The model therefore reads of the CVR graph from the 78.2% point on the CVR graph, which corresponds to the 89.1% point on the y-axis
- The cost reduction is therefore 10.9%, which is $218. This is the LRIC of the cost category in respect of Service A
- The fixed cost of the independent cost category is a Common Cost shared by all Services
- The retail LRIC of Service A can now be calculated by adding the $545.50 of operating cost, to the capital cost (NRC x WACC) and depreciation increments for Service A of Network Elements 1 and 2.
- The LRIC of Service A is $1085.50.

*Step 4*

- The increment specific fixed cost calculated at Step 1 is apportioned over Services A, B and C on an equiproportionate basis using the calculated retail LRIC of each service.
- It is assumed that the retail LRIC of Service B is $1200, the retail LRIC of Service C is $800, the retail LRIC of Service D is $750 and the retail LRIC of Service E is $400.
- Service A would receive 35% of the increment specific fixed cost of $250 from the Independent Cost Category
- The retail Distributed LRIC of Service A is $1173.45

*Step 5*

- The fixed common cost calculated at Step 3 is apportioned over all services on an equiproportionate basis using the calculated retail DLRIC of each service.
- It is assumed that the retail DLRIC of Service B is $1297, the retail DLRIC of Service C is $864, the retail DLRIC of Service D is $785 and the retail DLRIC of Service E is $430.
- Service A would receive 26% of the increment specific fixed cost of $500 from the Semi-Independent Cost Category.
- The retail DLRIC plus Mark Up of Service A is $1302.39

# 6. Cost of Capital

91. Guideline 8 of the Decision 2005-4 requires a demonstration of a forward-looking weighted average cost of capital (WACC) for use in the FLLRIC model. C&W has conducted a WACC analysis looking at a group of fixed network operators (70% of revenues coming from fixed services) for the fixed network model and of wireless operators for the mobile network model. This section describes our approach and the results from the analysis.

> **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.

### General Approach

92. The WACC must represent the opportunity cost of funds invested in the businesses modeled, stated differently, it must reflect the level of return that must be earned by a business if it is to continue to attract investible funds. Companies raise funds in the form of equity or debt. Typically equity is viewed as the more costly of the two forms as the providers of equity will share in a less certain, more volatile source of return. Providers of debt receive generally stable, set returns.

93. The WACC by definition arrives at an estimate of the cost of capital as a function of the cost of each of the two forms of capital and the relative share of the two used to finance the investment. The WACC formula is as follows:

$$WACC = R_e W_e + R_d W_d$$

Where:

$R_e$ = cost of equity capital
$R_d$ = cost of debt capital
$W_e$ = weight of equity capital (equity/(debt + equity)); and
$W_d$ = weight of debt capital (debt/(debt + equity))

94. A standard approach for deriving the cost of equity is the Capital Asset Pricing Model (CAPM). Under the CAPM, the return on the investment must be equal to that of a risk-free investment (for example, US or UK Government bonds) plus an additional premium for the risk involved in making an equity investment in the company in question. The risk premium is measured by multiplying general equity market risk premium by the company specific beta. The beta is a measure of the specific riskiness of an individual company's stock compared to the average riskiness of investing in the equity market. The greater the beta, the higher the risk and the higher cost of equity.

95. Similar to the cost of equity, the cost of debt of a company is viewed in terms of a risk free rate plus a mark up for the company specific debt.

96. The weighting factor for debt (Wd) is commonly called the Gearing Ratio. The weighting factor for equity (We) is the complement of the Gearing Ratio (1- Wd).

**Cost of Equity**

97. For this submission, C&W Cayman Islands' has adopted the standard the Capital Asset Pricing Model (CAPM) for calculating the cost of equity.

98. The Capital Asset Pricing Model (CAPM) is generally written as:

$$R_e = R_f + \beta (R_m - R_f)$$

where

$R_f$ = the estimated return available from risk free investment

$R_m$ = the estimated returns available from risky investments in the market generally

$\beta$ = the correlation between movements in the share price of the company concerned compared with movements in the market generally, a measure of its systematic risk.

To account explicitly for the country equity risk, we measure $R_m$ and $R_f$ in terms of a minimum risk, developed market then add a separate country equity risk premium term, $R_c$:

$$R_e = R_f + \beta (R_m - R_f) + R_c$$

*Risk Free Rate*

99. The risk free rate is the return that can be earned on government securities that generally carry a negligible risk of default. We have chosen US Treasury bonds. With respect to term, there is no internationally accepted yield period when

selecting bonds for these purposes. Long-term bonds are a better proxy for the risk free rate than short-term bonds as the prices incorporate both short-term and long-term interest rate. We therefore have chosen the 30 year bond, which in the first week of December 2005 was sitting at **4.72%**.

*Equity Market Risk Premium (EMRP)*

100. The market risk premium is the premium of a broad portfolio of equity investments over the risk free rate. It reflects the extra return that investors require in return for investing in equities rather than a risk free asset.

101. For the market risk premium, we have compared volatility of Large US corporate stocks vs. that of Long-term Government Bonds. This gives us an equity Market Risk premium of **6.57%.**

*Equity Beta*

102. The equity beta measures the "covariance" of movements in a company's share price and movements in the market index and provides a measure of the specific risk associated with an individual company compared to the market.

103. There are several approaches that may be taken to calculating a beta. We have benchmarked it against other operators: fixed network operators earning 70% or more of their revenues from fixed services for the fixed network WACC and mobile network operators for the mobile network WACC. See Appendix IA for the Fixed network beta data and Appendix IB for the mobile network beta data.

104. The equity beta of their peer companies must be modified for our purposes as it measures not only the specific risk of the company but also the implications of its capital structure. In particular, volatility generally increases as a company's debt levels increases, On the other hand, interest payments on debt are tax deductible offsetting the effects of higher gearing.

105. In order to correct for these effects of debt and tax, we make the following adjustment-unlevering the company specific betas, then relevering on the basis of the assumed gearing.

$$\beta_a = \beta_e / [ 1 + ( W_d / W_e )^* ( 1 - t ) ]$$

where

$\beta_a$ = the asset (unlevered) beta

$\beta_e$ = the equity (levered) beta

$t$ = the corporate tax rate

$W_d$ = weighting of debt in the capital structure

$W_e$ = weight of equity in the capital structure

106. This calculation is performed assuming, as is done typically done in such studies, that the beta of debt is zero.

107. The tables in Appendix IA and IB contain levered and unlevered betas for a selection of listed telecoms companies. Unlevered or asset betas were calculated based on levered betas obtained from Bloomberg.

*Country Equity Risk Premium*

108. The last component is the Country equity risk. We add an additional premium to reflect the differential risk between investing in the United States and in Cayman. We have looked at a number of different proxies and have chosen Aswatch Damodaran's approach. See, http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html

109. The Damodaran's site provides methodology and justification. Here we simply replicate his numbers relevant for the Cayman Islands. The calculations implies that the country equity risk premium of **1.25%**.

### Cost of Debt

110. Turning to the debt component of the WACC, we follow the usual approach of adding a corporate debt premium to the risk-free return on government debt:

$R_d^{bt} = R_f + P_d$

where

$R_d^{bt}$ = the estimated pre-tax cost of debt;

$R_f$ = the estimated risk-free return on government debt; and

$P_d$ = the estimated corporate debt premium.

111. In considering the anticipated corporate debt premium, we looked at two measures: the historic yield to maturity of bonds issued by peer operators (with respect to the fixed operators we choose peers with 80% or more fixed revenues); and forward looking bond rating. The differences are significant so we provide both measures. We provide the base data in Appendices IIA and IIB.

| | Fixed operators | Mobile operators |
|---|---|---|
| Cost of Debt on historic basis | 10.34% | 11.65% |
| Cost of Debt forward-looking | 6.39% | 6.39% |

### Weighted Average Cost of Capital

112. The assumed capital structure has two impacts on the WACC, as a higher gearing level:

- Increases the weighting of the cost of debt relative to the cost of equity. Since the cost of debt is lower than the cost of equity this reduces the WACC
- Leads to an increase in the cost of equity since higher gearing is associated with greater financial risk

113. We use the average debt to equity structure of the peer group provided in Appendices IIA and IIB. These are 48.8%:51.2% for fixed network operators and 36%:64% for wireless.

114. Utilising the value of the parameters presented previously yields a value of WACC in the following ranges:

| | Fixed WACC | Mobile WACC |
|---|---|---|
| High | 11.03% | 12.59% |
| Low | 10.01% | 10.70% |

| Cost of Capital for Cayman Islands Fixed Line Operator | | | |
|---|---|---|---|
| **Country Equity Risk Premium** | | | |
| (a) Moody's rating of Cayman Island Long Term Government Bond | Aa3 | | |
| (b) Moody's U.S. Corporate Bond Yield (AA) | 5.55% | | |
| (c) Risk Free Rate - 30 year U.S. Treasury Bond | 4.72% | | |
| (d) Country Default Risk Spread | 0.83% | =b-c | |
| (e) Aswatch Damodaran's Average Equity Market to Debt Market Volatility | 1.5 | | |
| Country Equity Risk Premium | 1.25% | =d*e | |
| **Cost of Equity** | | | |
| Beta Sensitivity: Proxy Company Pool with Fixedline Revenue Percentage >=50%, >=70% | | | |
| Proxy Company Pool with Fixedline Revenue Percentage: | 70% | | |
| (f) Averaged Levered Beta | 1.02 | | |
| (g) Market Equity Risk Premium | 6.57% | | |
| (h) Risk Free Rate - 30 year U.S. Treasury Bond | 4.72% | | |
| (i) Cost of Equity | 12.68% | =i+(g*h)+f | |
| **Cost of Debt** | | | |
| Choose Accounting Cost of Debt, Forward Looking Cost of Debt, OR Cable & Wireless Cost of Debt: | Forward Looking | Accounting | |
| (j) Average cost of debt (peer companies) | 6.39% | 8.47% | |
| (k) Adjusted for Country Risk | 7.22% | 9.30% | =j+d |
| **Capital Structure** | | | |
| (k) Debt | 48.8% | | |
| (l) Equity | 51.2% | | |
| **WACC** | **10.01%** | **11.03%** | |

| Cost of Capital for Cayman Islands Wireless Operator | | | | |
|---|---|---|---|---|
| **Country Equity Risk Premium** | | | | |
| (a) Moody's rating of Cayman Island Long Term Government Bond | Aa3 | | | |
| (b) Moody's U.S. Corporate Bond Yield (AA) | 5.55% | | | |
| (c) Risk Free Rate - 30 year U.S. Treasury Bond | 4.72% | | | |
| (d) Country Default Risk Spread | 0.83% | =b-c | | |
| (e) [3] Aswatch Damodaran's Average Equity Market to Debt Market Volatility | 1.5 | | | |
| (f) Country Equity Risk Premium | 1.25% | =d*e | | |
| **Cost of Equity** | | | | |
| (g) Averaged Levered Beta | 1.02 | | | |
| (h) Market Equity Risk Premium | 6.57% | | | |
| (i) Risk Free Rate - 30 year U.S. Treasury Bond | 4.72% | | | |
| (j) Cost of Equity | 12.66% | =i+(g*h)+f | | |
| **Cost of Debt** | | | | |
| Choose Forward Looking Cost of Debt OR Accounting Cost of Debt: | Forward-Looking | Accounting | | |
| (k) Average cost of debt (peer companies) | 6.39% | 11.65% | | |
| (l) Adjusted for Country Risk | 7.22% | 12.48% | =k+d | |
| **Capital Structure** | | | | |
| (m) Debt | 36.0% | | | |
| (n) Equity | 64.0% | | | |
| **WACC** | **10.70%** | **12.59%** | | |

# Appendices

## Appendix IA.  Fixed network Betas

| Index | Company | Country | Corporate Tax Rate | Fixed Line Revenue Percentage | Wireless Revenue Percentage | Levered Beta [1] | Total Debt ($M) [2] | Total Shareholders Equity ($M) | Debt Ratio | Equity Ratio | Unlevered Beta |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Telefonos de Mexico | MEX | 30.0% | 100% | 0% | 0.85 | $ 8,073 | $ 8,416 | 49% | 51% | 0.51 |
| 2 | Citizens Communications | USA | 35.0% | 100% | 0% | 0.83 | $ 4,273 | $ 1,362 | 76% | 24% | 0.27 |
| 3 | CenturyTel Inc. | USA | 35.0% | 100% | 0% | 0.87 | $ 3,012 | $ 3,410 | 47% | 53% | 0.55 |
| 4 | Commonwealth Telelphone | USA | 35.0% | 100% | 0% | 0.76 | $ 336 | $ 266 | 56% | 44% | 0.42 |
| 5 | BT Group | GBR | 30.0% | 98% | 2% | 0.81 | $ 23,778 | $ 7,274 | 77% | 23% | 0.25 |
| 6 | Telemar Norte Leste | BRA | 34.0% | 96% | 7% | 1.09 | $ 3,450 | $ 4,489 | 43% | 57% | 0.72 |
| 7 | CT Communications Inc. | USA | 35.0% | 91% | 0% | 1.23 | $ 70 | $ 188 | 27% | 73% | 0.99 |
| 8 | Warwick Valley Telephone | USA | 35.0% | 90% | 0% | 0.53 | $ 12 | $ 41 | 22% | 78% | 0.45 |
| 9 | Iowa Telecom Services | USA | 35.0% | 86% | 0% | 0.50 | $ 478 | $ 276 | 63% | 37% | 0.24 |
| 10 | Tele Norte Leste Participacoes SA | BRA | 34.0% | 86% | 1% | 1.16 | $ 2,127 | $ 1,570 | 58% | 42% | 0.61 |
| 11 | BCE Inc. | CAN | 22.1% | 74% | 26% | 0.70 | $ 10,873 | $ 11,660 | 48% | 52% | 0.41 |
| 12 | Telecomunicacoes De SAo Paulo SA | BRA | 34.0% | 73% | 20% | 1.00 | $ 543 | $ 2,247 | 19% | 81% | 0.86 |
| 13 | IDT Corp. | USA | 35.0% | 65% | 0% | 0.66 | $ 197 | $ 1,038 | 16% | 84% | 0.59 |
| 14 | BellSouth Corp. | USA | 35.0% | 65% | 28% | 0.73 | $ 20,583 | $ 23,066 | 47% | 53% | 0.46 |
| 15 | TDC | DNK | 30.0% | 64% | 34% | 0.76 | $ 5,523 | $ 6,546 | 46% | 54% | 0.48 |
| 16 | North Pittsburgh System Inc. | USA | 35.0% | 64% | 0% | 1.01 | $ 25 | $ 87 | 22% | 78% | 0.85 |
| 17 | Telus Corporation | CAN | 22.1% | 63% | 37% | 1.03 | $ 5,265 | $ 5,838 | 47% | 53% | 0.60 |
| 18 | Brasil Telecom | BRA | 34.0% | 62% | 0% | 1.17 | $ 1,041 | $ 1,278 | 45% | 55% | 0.76 |
| 19 | Cable & Wireless | GBR | 30.0% | 60% | 20% | 1.02 | $ 1,556 | $ 3,434 | 31% | 69% | 0.77 |
| 20 | Telecom. de Chile | CHL | 17.0% | 60% | 19% | 0.77 | $ 1,101 | $ 1,765 | 38% | 62% | 0.51 |
| 21 | Telefonica SA | SPA | 35.0% | 59% | 40% | 0.92 | $ 32,739 | $ 21,966 | 60% | 40% | 0.47 |
| 22 | Verizon Communications | USA | 35.0% | 53% | 39% | 0.76 | $ 39,267 | $ 37,560 | 51% | 49% | 0.45 |
| 23 | Deutsche Telekom | GER | 26.4% | 50% | 50% | 0.90 | $ 57,742 | $ 45,918 | 56% | 44% | 0.47 |

| Fixed Line Revenue Percentage | Averaged Peer Group Debt | Averaged Peer Group Equity | Averaged Unlevered Beta | Averaged Levered Beta |
|---|---|---|---|---|
| >=50% | 45% | 55% | 0.55 | 1.011 |
| >=70% | 49% | 51% | 0.52 | 1.021 |

Notes & Sources:

[1] Levered data from Bloomberg

[2] Currency exchange of $0.444 per Real from YahooFinance Currency Converter as of December 9, 2005

[3] Accounting cost of debt financials from FactSet and Year End 2004 and Fiscal Year End 2005 financial reports

[4] Small Companies defined as those with an equity value less than $1 billion.

## Appendix IB. Mobile Network Betas

| Index | Company Pool | Country | Levered Beta [1] | Short Term Debt ($M) | Long Term Debt ($M) | Total Debt ($M) | Total Shareholders Equity ($M) | Debt Capital Stucture | Equity Capital Structure | Unlevered Beta | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Vodafone Group | | 0.81 | $ 740 | $ 21,935 | $ 22,675 | $ 187,590 | 11% | 89% | 0.72 | |
| 2 | U.S. Cellular | USA | 0.72 | $ 30 | $ 1,161 | $ 1,191 | $ 2,588 | 32% | 68% | 0.49 | |
| 3 | China Mobile LTD | HKG | 1.31 | $ 8,180 | $ 13,000 | $ 21,180 | $ 233,161 | 8% | 92% | 1.20 | 2 |
| 4 | SK Telecom Co LTD | KOR | 0.83 | $ 892 | $ 2,794 | $ 3,686 | $ 6,867 | 35% | 65% | 0.54 | |
| 5 | Telesp Celular Participacoes Tspp | BRA | 1.52 | $ 2,897 | $ 2,066 | $ 4,963 | $ 2,907 | 63% | 37% | 0.56 | 3 |
| 6 | Telefonica Moviles SA | ESP | 0.64 | $ 6,806 | $ 11,172 | $ 17,978 | $ 6,390 | 74% | 26% | 0.17 | |
| 7 | America Movil SA | MEX | 1.07 | $ 483 | $ 5,027 | $ 5,510 | $ 6,805 | 45% | 55% | 0.59 | |
| 8 | NTT Docomo Inc | JAP | 0.61 | $ 1,402 | $ 7,445 | $ 8,847 | $ 36,448 | 20% | 80% | 0.49 | |
| 9 | Turkcell Iletisim Hizmet | TUR | 1.04 | $ 563 | $ 270 | $ 833 | $ 1,986 | 30% | 70% | 0.73 | |
| 10 | Vimpel Communications | RUS | 1.12 | $ 190 | $ 1,392 | $ 1,581 | $ 2,157 | 42% | 58% | 0.65 | |
| 11 | Millicom International Cellular SA | LUX | 1.82 | $ 89 | $ 1,026 | $ 1,114 | $ 239 | 82% | 18% | 0.32 | |
| 12 | O2 | GBR | 1.07 | $ 1,681 | $ 1,375 | $ 3,056 | $ 10,091 | 23% | 77% | 0.82 | 4 |
| 13 | Priority Telecom NV | NLD | 0.46 | $ 2 | $ 15 | $ 17 | $ 101 | 15% | 85% | 0.39 | 5 |
| 14 | Mobistar SA | BEL | 0.65 | $ 6 | $ 250 | $ 256 | $ 441 | 37% | 63% | 0.41 | 5 |
| 15 | Advent Wireless Inc | CAN | 0.81 | $ - | $ 0 | $ 0 | $ 3 | 8% | 92% | 0.75 | 6 |
| 16 | China Motion Telecom International LTD | HKG | 0.69 | $ 56,900 | $ 69,382 | $ 126,282 | $ 705,567 | 15% | 85% | 0.59 | |
| 17 | America Telecom | MEX | 1.24 | $ 479 | $ 4,977 | $ 5,456 | $ 6,885 | 44% | 56% | 0.69 | |
| 18 | Tele Leste Celular Participacoes Tlcp | BRA | 1.34 | $ 20 | $ 99 | $ 118 | $ 141 | 46% | 54% | 0.73 | |
| 19 | Tele Norte Celular Participacoes | BRA | 0.88 | $ 47 | $ 61 | $ 108 | $ 85 | 56% | 44% | 0.39 | |
| 20 | Telemig Celular Participacoes | BRA | 1.16 | $ 215 | $ 268 | $ 483 | $ 1,046 | 32% | 68% | 0.79 | 3 |
| 21 | Suncom Wireless Holdings | USA | 1.56 | $ 17 | $ 1,688 | $ 1,705 | $ 404 | 81% | 19% | 0.30 | |
| 22 | Tele Centro Oeste Celular Participacoes Tcoc | BRA | 1.19 | $ 39 | $ 47 | $ 85 | $ 920 | 8% | 92% | 1.09 | |
| 23 | Tele Sudeste Celular Participacoes Tsep | BRA | 0.68 | $ 19 | $ - | $ 19 | $ 742 | 2% | 98% | 0.66 | |
| 24 | MobileOne LTD | SGP | 0.55 | $ 322 | $ 250 | $ 572 | $ 403 | 59% | 41% | 0.23 | 7 |
| 25 | MTN Group LTD | ZAF | 0.93 | $ 167 | $ 3,011 | $ 3,178 | $ 18,257 | 15% | 85% | 0.79 | 8 |
| 26 | Telefonica Moviles Peru Holding | PER | 0.57 | $ 1,597 | $ 335 | $ 1,932 | $ 2,727 | 41% | 59% | 0.33 | 9 |
| 27 | LEAP Wireless International | USA | 1.12 | $ 40 | $ 371 | $ 412 | $ 1,470 | 22% | 78% | 0.87 | |
| 28 | Partner Communications Company LTD | ISR | 0.88 | $ - | $ 450 | $ 450 | $ 368 | 55% | 45% | 0.40 | |
| 29 | Mobile Telesystems Ojsc | RUS | 1.01 | $ 379 | $ 1,558 | $ 1,937 | $ 2,523 | 43% | 57% | 0.57 | |

| | |
|---|---|
| **Averaged Peer group Debt** | **36%** |
| **Averaged Peer group Equity** | **64%** |
| **Averaged Unlevered Beta** | **60%** |
| **Averaged Levered Beta** | **0.93** |

Notes and Sources:

- Accounting cost of debt financials from FactSet and Year End 2004 and Fiscal Year End 2005 financial reports

[1] Levered data from Bloomberg

[2] Currency in Millions of Renminbi

[3] Currency in Millions of Reais

[4] Currency in Millions of Pounds

[5] Currency in Millions of Euros

[6] Currency in Millons of Canadian $

[7] Currency in Millions of Singapore $

[8] Currency in Millions of Rand

[9] Currency in Millions of Sols

## Appendix IIA.  Cost of Debt- Fixed Network Operators

| Index | Company Pool | Country | Fixed Line Revenue Percentage | Wireless Revenue Percentage | Forward Looking Cost of Debt: Moody's Rating[1] | Forward Looking Cost of Debt: Corresponding Rating Score | Accounting Cost of Debt: Short Term Debt ($M)[2] | Long Term Debt ($M)[2] | Total Debt ($M) | Total Shareholders Equity ($M)[2] | Debt Capital Structure | Interest Expense ($M)[2] | Cost of Debt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Telefonos de Mexico | MEX | 100% | 0% | A3 | 7 | $ 1,183 | $ 6,890 | $ 8,073 | $ 8,416 | 49% | $ 572 | 7.08% |
| 2 | Citizens Communications | USA | 100% | 0% | Ba3 | 13 | $ 6 | $ 4,267 | $ 4,273 | $ 1,362 | 76% | $ 381 | 8.92% |
| 3 | CenturyTel Inc. | USA | 100% | 0% | Baa2 | 9 | $ 250 | $ 2,762 | $ 3,012 | $ 3,410 | 47% | $ 211 | 7.01% |
| 4 | Commonwealth Telelphone | USA | 100% | 0% | none listed | | $ 36 | $ 300 | $ 336 | $ 266 | 56% | $ 17 | 5.00% |
| 5 | BT Group | UK | 98% | 2% | none listed | | $ 8,496 | $ 15,282 | $ 23,778 | $ 7,274 | 77% | $ 2,013 | 8.47% |
| 6 | Telemar Norte Leste | BRA | 96% | 7% | Baa3 | 10 | $ 850 | $ 2,600 | $ 3,450 | $ 4,489 | 43% | $ 762 | 22.10% |
| 7 | CT Communications Inc. | USA | 91% | 0% | none listed | | $ 5 | $ 65 | $ 70 | $ 188 | 27% | $ 5 | 6.71% |
| 8 | Warwick Valley Telephone | USA | 90% | 0% | none listed | | $ 2 | $ 10 | $ 12 | $ 41 | 22% | $ 0 | 2.48% |
| 9 | Iowa Telecom Services | USA | 86% | 0% | Ba3 | 13 | $ - | $ 478 | $ 478 | $ 276 | 63% | $ 54 | 11.30% |
| 10 | Tele Norte Leste Participacoes SA | BRA | 86% | 1% | Baa3 | 10 | $ 1,350 | $ 3,440 | $ 4,790 | $ 3,536 | 58% | $ 1,073 | 22.40% |
| 11 | BCE Inc. | CAN | 74% | 26% | Baa1 | 8 | $ 1,060 | $ 9,813 | $ 10,873 | $ 11,660 | 48% | $ 858 | 7.89% |
| 12 | Telecomunicacoes De SAo Paulo SA | BRA | 73% | 20% | A3 | 7 | $ 235 | $ 988 | $ 1,224 | $ 5,061 | 19% | $ 179 | 14.67% |
| 13 | IDT Corp. | USA | 65% | 0% | B2 | 15 | $ 33 | $ 164 | $ 197 | $ 1,038 | 16% | $ 16 | 8.03% |
| 14 | BellSouth Corp. | USA | 65% | 28% | A2 | 6 | $ 5,475 | $ 15,108 | $ 20,583 | $ 23,066 | 47% | $ 916 | 4.45% |
| 15 | TDC | DNK | 64% | 34% | Ba1 | 11 | $ 241 | $ 5,282 | $ 5,523 | $ 6,546 | 46% | $ 621 | 11.24% |
| 16 | North Pittsburgh System Inc. | USA | 64% | 0% | none listed | | $ 3 | $ 22 | $ 25 | $ 87 | 22% | $ 2 | 7.82% |
| 17 | Telus Corporation | CAN | 63% | 37% | Baa2 | 9 | $ 4 | $ 5,262 | $ 5,265 | $ 5,838 | 47% | $ 545 | 10.34% |
| 18 | Brasil Telecom | BRA | 62% | 0% | Baa3 | 10 | $ 490 | $ 1,855 | $ 2,345 | $ 2,878 | 45% | $ 257 | 10.97% |
| 19 | Cable & Wireless | UK | 60% | 20% | Ba3 | 13 | $ 43 | $ 1,513 | $ 1,556 | $ 3,434 | 31% | $ 134 | 8.62% |
| 20 | Telecom. de Chile | CHL | 60% | 19% | Baa2 | 9 | $ 262 | $ 839 | $ 1,101 | $ 1,765 | 38% | $ 97 | 8.80% |
| 21 | Telefonica SA | SPA | 59% | 40% | A3 | 7 | $ 12,744 | $ 19,995 | $ 32,739 | $ 21,966 | 60% | $ 1,679 | 5.13% |
| 22 | Verizon Communications | USA | 53% | 39% | withdrawn | | $ 3,593 | $ 35,674 | $ 39,267 | $ 37,560 | 51% | $ 2,561 | 6.52% |
| 23 | Deutsche Telekom | GER | 50% | 50% | A3 | 7 | $ 12,077 | $ 45,665 | $ 57,742 | $ 45,918 | 56% | $ 4,891 | 8.47% |

| Forward Looking: Fixed Line Revenue Percentage | Forward Looking: Average Moody's Rating Score | Forward Looking: Average Moody's Rating | Forward Looking: Yield / Cost of Debt | Accounting: Cost of Debt |
|---|---|---|---|---|
| >=50% | 9.65 | Baa3 | 6.39% | 9.32% |
| >=70% | 9.63 | Baa3 | 6.39% | 10.34% |

Notes & Sources:
[1] Moody's Senior Unsecured Debt Ratings obtained from Bloomberg
[2] Currency exchange of $0.444 per Real per YahooFinance Currency Converter as of December 9, 2005
[3] Criteria for company selection: The company is (1) an incumbent exchange carrier and (2) has greater than 50% revenue from wireline operations
[4] Accounting Cost of Debt from Year End 2004 and Fiscal Year End 2005 financial reports

# Appendix IIB.  Cost of Debt- Mobile Operators

| Index | Company Pool | Country | Forward Looking Cost of Debt: Moody's Rating[1] | Moody's Rating Score | Accounting Cost of Debt: Short Term Debt ($M) | Long Term Debt ($M) | Total Debt ($M) | Total Shareholders Equity ($M) | Debt Capital Structure | Interest Expense ($M) | Cost of Debt | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Vodafone Group | | A2 | 6 | $ 740 | $ 21,935 | $ 22,675 | $ 187,590 | 11% | 2,308 | 10% | |
| 2 | U.S. Cellular | USA | Baa3 (-) | 10 | $ 30 | $ 1,161 | $ 1,191 | $ 2,588 | 32% | 86 | 7% | |
| 3 | China Mobile LTD | HKG | A2 | 6 | $ 8,180 | $ 13,000 | $ 21,180 | $ 233,161 | 8% | 1,679 | 8% | 2 |
| 4 | SK Telecom Co LTD | KOR | A2 | 6 | $ 892 | $ 2,794 | $ 3,686 | $ 6,867 | 35% | 293 | 8% | |
| 5 | Telesp Celular Participacoes Tspp | BRA | A3 | 7 | $ 2,897 | $ 2,066 | $ 4,963 | $ 2,907 | 63% | 1,095 | 22% | 3 |
| 6 | Telefonica Moviles SA | ESP | A3 (-) | 7 | $ 6,806 | $ 11,172 | $ 17,978 | $ 6,390 | 74% | 804 | 4% | |
| 7 | America Movil SA | MEX | A3 | 7 | $ 483 | $ 5,027 | $ 5,510 | $ 6,805 | 45% | 412 | 7% | |
| 8 | NTT Docomo Inc | JAP | Aa1 | 2 | $ 1,402 | $ 7,445 | $ 8,847 | $ 36,448 | 20% | 92 | 1% | |
| 9 | Turkcell Iletisim Hizmet | TUR | B (+) | 16 | $ 563 | $ 270 | $ 833 | $ 1,986 | 30% | 122 | 15% | |
| 10 | Vimpel Communications | RUS | B1 | 14 | $ 190 | $ 1,392 | $ 1,581 | $ 2,157 | 42% | 86 | 5% | |
| 11 | Millicom International Cellular SA | LUX | B2 | 15 | $ 89 | $ 1,026 | $ 1,114 | $ 239 | 82% | 109 | 10% | |
| 12 | O2 | GBR | Baa2 (+) | 9 | $ 1,681 | $ 1,375 | $ 3,056 | $ 10,091 | 23% | 58 | 2% | 4 |
| 13 | Priority Telecom NV | NLD | none listed | - | $ 2 | $ 15 | $ 17 | $ 101 | 15% | 2 | 10% | 5 |
| 14 | Mobistar SA | BEL | none listed | - | $ 6 | $ 250 | $ 256 | $ 441 | 37% | 24 | 9% | 5 |
| 15 | Advent Wireless Inc | CAN | none listed | - | $ - | $ 0 | $ 0 | $ 3 | 8% | 0 | 8% | 6 |
| 16 | China Motion Telecom International LTD | HKG | none listed | - | $ 57 | $ 69 | $ 126 | $ 706 | 15% | 4 | 3% | |
| 17 | America Telecom | MEX | none listed | - | $ 479 | $ 4,977 | $ 5,456 | $ 6,885 | 44% | 408 | 7% | |
| 18 | Tele Leste Celular Participacoes Tlcp | BRA | none listed | - | $ 20 | $ 99 | $ 118 | $ 141 | 46% | 6 | 5% | |
| 19 | Tele Norte Celular Participacoes | BRA | none listed | - | $ 47 | $ 61 | $ 108 | $ 85 | 56% | 13 | 12% | |
| 20 | Telemig Celular Participacoes | BRA | none listed | - | $ 215 | $ 268 | $ 483 | $ 1,046 | 32% | 124 | 26% | 3 |
| 21 | Suncom Wireless Holdings | USA | none listed | - | $ 17 | $ 1,688 | $ 1,705 | $ 404 | 81% | 129 | 8% | |
| 22 | Tele Centro Oeste Celular Participacoes Tcoc | BRA | none listed | - | $ 39 | $ 47 | $ 85 | $ 920 | 8% | 19 | 22% | |
| 23 | Tele Sudeste Celular Participacoes Tsep | BRA | none listed | - | $ 19 | $ - | $ 19 | $ 742 | 2% | 15 | 79% | |
| 24 | MobileOne LTD | SGP | none listed | - | $ 322 | $ 250 | $ 572 | $ 403 | 59% | 10 | 2% | 7 |
| 25 | MTN Group LTD | ZAF | none listed | - | $ 167 | $ 3,011 | $ 3,178 | $ 18,257 | 15% | 571 | 18% | 8 |
| 26 | Telefonica Moviles Peru Holding | PER | none listed | - | $ 1,597 | $ 335 | $ 1,932 | $ 2,727 | 41% | 123 | 6% | 9 |
| 27 | LEAP Wireless International | USA | B1 | 14 | $ 40 | $ 371 | $ 412 | $ 1,470 | 22% | 21 | 5% | |
| 28 | Partner Communications Company LTD | ISR | Ba1 | 11 | $ - | $ 450 | $ 450 | $ 368 | 55% | 51 | 11% | |
| 29 | Mobile Telesystems Ojsc | RUS | Ba3 | 13 | $ 379 | $ 1,558 | $ 1,937 | $ 2,523 | 43% | 108 | 6% | |
| | **Averages** | | **Baa3** | **9.53** | | | | | **36%** | | **11.65%** | |

| Forward Looking: Average Moody's Rating | Average Moody's Rating Score | Moody's Average Yield | Accounting: Cost of Debt |
|---|---|---|---|
| Baa3 | 9.53 | 6.39% | 11.65% |

## Appendix III: Glossary

**BU – Bottom Up**

**CAPM – Capital Asset Pricing Model**

**CVR – Cost-Volume Relationship** – a graph which defines the relationship between a cost and a driver volume, with the driver being an exogenous variable (i.e., external to the system being considered)

**CCR – Cost-Cost Relationship** – a graph which defines the relationship between a cost and a driver volume, with the driver being an endogenous variable (i.e., internal to the system being considered).

**DLRIC** – Distributed LRIC

**DP** – Distribution Point

**EMRP** – Equity Market Risk Premium

**EPMU** – Equal Proportionate Mark-Up

**FCC** – Fixed Common Cost

**HFE** – Horizontal Fixed Element

**Increment:** The output over which costs are being measured.

**Incremental costs:** The additional costs that would result from a defined increment to demand.

**ISFC – Increment-Specific Fixed Costs** – those costs which do not vary with a particular driver volume, but which can be attributed entirely to a single increment.

**LDA – LRIC Driver Affected**

**Long run:** The period over which all factors of production, including capital, are variable.

**Long Run Incremental Costs (LRIC):** The incremental costs that would arise in the long run with a defined increment to demand.

**MSAN** – Multiservice Access Node – voice/broadband-enabled IP concentrators in an NGN network.

**MS E** – Media gateway

**NRC** – Net Replacement Cost.

**Network Component** – a group of costs which relate to a particular, identifiable part of the network infrastructure (e.g., a local switch), loaded with all the related direct and indirect costs.

**OLO – Other Licensed Operators** – telecommunications network or service providers other than C&W.

**RSU** – Remote Switching Unit.

**STLO –** Straight Line Through Origin

**TD –** Top Down

**WACC –** Weighted Average Cost of Capital