

*Introducing CPP in  
Sri Lanka*

**Calculation of Call termination  
Cost and setting of call  
Termination charges for fixed  
and mobile operators in Sri Lanka**

July 2003

Frontier Economics Limited

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## Executive Summary

Following the Government's decision to implement Calling Party Pays (CPP), Frontier Economics and GOS Consulting (the consultants) were appointed to develop cost-based interconnection call termination charges to support the introduction of CPP.

To ensure that the interconnection call termination charges developed would lead to the successful adoption and implementation of CPP, two overriding principles were adopted by the consultants.

- Rigorous analysis and transparent costing calculations.
- Correspondence with and acceptance by the Telecommunications Regulatory Commission (the TRC) and operators of each major deliverable in the project to achieve maximum buy-in of the final deliverables.

The consultants conducted a four-month study of call termination costs of all seven domestic operators. Based on this cost study, the consultants developed weighed average cost-based interconnection call termination charges for each group of operators (mobile, fixed wireless and fixed wireline). The recommended charges are:

	Average	De-averaged		
		Peak	Off-peak	Discount
SLT-“Local”	1.4	1.9	1.1	0.8
SLT- “National”	2.3	3.0	1.8	1.3
WLL- “Average”	3.7	4.6	2.7	1.9
Mobile	4.3	5.0	4.4	1.6

These charges have now been agreed by all parties and will be introduced on 1 August 2003.

# Executive Summary

## *Summary of agreed recommendations*

- Interconnection call termination costs are calculated based on the principles of *Fully Allocated Historic Costing*.

Given the time constraints of the project (aiming for completion of the project in time to introduce CPP at 1<sup>st</sup> July 2003) the costing of call termination should be based on the principles of Fully Allocated Historic Costing.

Although this methodology would incorporate certain allocation inaccuracies and current inefficiencies of the relevant operators, it provides for a useful first step in the process of developing cost-based interconnection charges. In addition, it has the benefits of being relatively fast to implement and its transparency means that it may be reconciled against published audited accounts.

Interconnection call termination charges are calculated by operator group ( mobile, fixed wireless and fixed wireline).

It was proposed and agreed that, although the consultants would calculate the costs of call termination for each operators, the results would be aggregated into averaged group-based costs such that the Interconnection call termination charges for each operator in a group would be identical. The three groups agreed are mobile operators, fixed wireless operators, and the fixed wireline operators. In addition to providing simplicity, this approach would protect the confidentiality of the data submitted by individual operators.

- Access Deficit issues are separate to the introduction of CPP and the calculation of cost-based interconnection call termination charges, but the models calculate the overall size of the Access Deficit, where appropriate.

In developing the model, key principle of the methodology needed to be agreed with operators, including defining the costs which should be limited to traffic volume- sensitive costs, not fixed costs which do not vary with traffic volume, such as the fixed wireline local loop network. This debate highlighted the possibility that the incumbent fixed wireline operator might have a loss-making local loop business, generally known as an Access Deficit.

It was agreed that the resolution of Access Deficit issues were separate to the introduction of CPP and the calculation of the cost-based interconnection call termination costs and charges. However, it was

deemed important to arrive at a general policy as to whether Access Deficit charges should be introduced in Sri Lanka at present and, if so, how these might inter-relate to the call termination charges. Therefore, the consultants produced a Discussion on the topic and also structured the model in such a way that the size of the overall Access Deficit may be calculated for the fixed wireline operator and for the two fixed wireless operators

- The weighed Average Cost of Capital (WACC) used in the calculations is 23.4% - this is substantially higher than the WACC value recommended by the consultants, but is a figure agreed between the TRC and the operators.

The consultants produced a discussion paper in which it set out its proposed methodology for calculating the appropriate WACC for the Sri Lankan telecommunications sector as a whole. The paper generated substantial debate and the issues of setting appropriate WACC was actively debated through much of the project duration.

The WACC applied in the finally agreed interconnection call termination rates represent a compromise between the consultants' recommended WACC (18.1%) and the WACC calculated using the operators' assumptions(28.7%) The WACC used is 23.4%

- interconnection call termination charges for all operators are de-averaged by time of day , using SLT's current retail time of day timebands, but different tariff gradients apply to mobile operators and fixed operators.

Having calculated the costs of call termination for each operator group, the consultants proposed a structure for hoe these costs could be recovered through interconnection call termination charges. The two main elements of this structure are the de-averaging by time of day and the de-averaging by distance and network components used to terminate the call.

Time of day da-averaging. The principle underlying the time of day de-averaging is to provide consumers the incentive to make calls when the network is used the least- thus spreading the traffic across the 24 hours in the day. An additional benefit from this is that cheaper call rates can be offered in the off-peak periods, making the use of telephones more affordable to those with limited means.

In Sri Lanka, each operator uses a different definition of the peak, off-peak and discount timebands and the tariff gradient used across these timebands also varies by operator.

The consultants suggested that for the purpose of setting interconnection call termination charges all operators would use the timebands currently being used by SLT for retail calls, for the sake of simplicity and transparency.

It proved impracticable, however to set a single tariff gradient for all operators and it was therefore agreed that all mobile operators would have the same gradient and all fixed operators would use the same gradient- thus introducing only two tariff gradient for interconnection call termination charges.

Distance de-averaging. The principle underlying distance de-averaging of interconnection charges is that operators should be encouraged to carry calls on their own network as far as possible, if they can do so more effectively and efficiently than handing the call to the terminating operators where the call is originated. This causes the terminating operator to recover the costs relevant to the specific call and it encourages roll-out of other operators' networks if they can deliver the calls at the far end at lower cost than the increment they would pay to the terminating operator if the call is handed over at the near end.

For mobile operators, the originating operator cannot know where the called customer is located, the consultants therefore recommended that interconnection call termination charges for mobile operators should not be distance de-averaged.

For fixed operators, however the called party's location is known and the originating operator should be able to take the call to the point of interconnection nearest practicable to the called party.

- *Only SLT's charges are de-averaged by distance.*

The fixed wireline operator (SLT) has a nation-wide network with points of interconnection in most major conurbations, it was recommended that SLT's interconnection call termination charges be distance de-averaged onto local and national call termination.

The fixed wireless operators have partial national coverage and points of interconnection in only two or three locations, therefore, although the called party's location is known, it is not always possible for the origination party to hand the call to the fixed wireless operators at the far end. It was consequently recommended that the interconnection call termination rates for fixed wireless operators not be distance de-averaged, although they could negotiate such de-averaging on a commercial basis.

# 1. Introduction

The telecommunications market in Sri Lanka has been liberalised for some time and seven operators are currently licensed to provide domestic telecommunications service in the incumbent fixed operator(SLT).

Whilst the telecommunications industry in Sri Lanka is growing, the TRC have identified the Mobile Party Pays (MPP) charging system (whereby a mobile customer pays to receive calls as well as to make calls) is potentially limiting the growth in mobile take-up and is reportedly causing current mobile customers to switch their phones off to avoid incoming calls.

The TRC has therefore decided that the system of MPP should be replaced by the system of CPP, where mobile operators can charge other operators for termination of calls to their customers, replacing current retail payments for receiving calls with interconnection call termination payment from other operators.

To ensure efficient and effective call routing by operators the TRC has decided that interconnection call termination payments should be cost-based and that this principle should be not just apply to mobile operators, but to all licensed domestic operators in Sri Lanka.

To support the introduction of CPP and the development of cost-based interconnection call termination payments, the TRC have scoped a project for which is sought the assistance of international consultants and this report sets out the findings and deliverables of that project.

The successful bidders for this project, a consortium of Frontier Economics, a specialised economics consultancy, set out in this report the findings and deliverables from the project.

## **2. Structure of this Document**

This document is a relatively short overview of the project undertaken by the consultants, setting out the key activities and the process by which the deliverables were developed and agreed. The detailed discussion of the technical modelling issues are contained in a series of Annexes which are cross-references from the main report.

### **2.1 The Report Sections**

The report is structured into 5 sections of which section 1 contains the Introduction to the report.

Section 2 of the report outlines the scope and the main deliverables from the report.

Section 3 describes the work undertaken during the project, the consultative process undertaken and the key analytical methodology recommendations made by the consultants.

Section 4 sets out the key deliverables of the project.

A series of Annexes are attached to the report- these contain technically detailed descriptions of the analysis undertaken and a discussion of the underlying economic and financial principles.

Other Annexes include the Case Studies developed within the project and the subject- specific Discussion papers issued during the project.

### **3. Project Scope and Deliverables**

This project 'Assistance to The Telecommunications Regulation Commission In Setting Fixed and Mobile Termination Rates' was scoped to assist the TRC in introducing CPP in Sri Lanka through the transparent analysis of cost data from all operators in Sri Lanka to support the development of cost-based interconnection call termination rates for all operators.

In its terms of reference and in all subsequent dealings on the project, the TRC stressed the importance of operator involvement in the process with the aim of achieving a consensus-based interconnection call termination charging framework in Sri Lanka.

The project was structured in three sections:

1. Development of analysis methodology and principles and cost analysis models and agreeing these with the TRC and all operators
2. Collection of costing and accounting data from all operators, processing of this data through the agreed models and in accordance with the agreed analytical parameters calculations of call termination costs for each operator and for each group of operators (mobile, fixed wireless, and fixed wireline ). The results of this analysis should be discussed and agreed with the TRC and all operators.
3. Development of proposal for interconnection call termination rates for each group of operators, based on the costs calculated. Such rates should be structured to reflect international good practice and reflect network topology as well as time of day charging differentials in Sri Lanka. All proposals should be presented discussed and, where possible, agreed with all parties.

Each of the three sections as outlined above had a series of activities and deliverables associated with it, in outline these were:

#### **3.1 Activities and Deliverables for Section 1**

Within Section 1 the following deliverables and activities were included :

- Development of generic model and modelling approach for discussion and approval by TRC and operators:

- A generic model was developed and, three separate versions of this model were developed to fit the network topology and product offerings of the three groups of operators (mobile, fixed wireless, fixed wireline).
- Production of four case studies from relevant jurisdictions of methodologies applied to the calculation of interconnection call termination rates and the introduction of CPP.
  - Comprehensive case studies<sup>1</sup> were developed for India, Mexico, Malaysia and the UK, showing a range of approaches and discussing the merits of these.
- Production of Discussion papers<sup>2</sup> on the issues of Access Deficit and the calculation of the appropriate Cost of Capital to be applied to the call termination costs to develop cost-based interconnection call termination rates.
- Conducting of workshops with operators and bilateral discussions with operators:
  - During this phase two workshop meetings were held and bilateral meetings were held with all operators. Additionally, extensive e-mail correspondence was undertaken with the TRC and operators.
- All deliverables from Section 1 were discussed in the First Interim Report<sup>3</sup>

## **3.2 Activities and Deliverables for Section 2**

Within Section 2 the following deliverables and activities were included:

- Collection of data to populate models for each operator, validation and verification of the data supplied and, based on the weighed average of the costing data supplied by operators in each group, calculation of call termination costs for each group of operators.

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<sup>1</sup>The Case Studies are attached to this paper in Annex 1

<sup>2</sup>The two Discussion papers developed are included in this report in Annex 2

<sup>3</sup>The initial Project Report is attached to this report in Annex 3

- To enable maximum transparency for the individual operators of how their costing and accounting data would be used in the analysis, an ‘empty’ model was sent to each operator for them to populate. This enabled the operators to understand the dynamics of the model and the impact of their respective data inputs.
  - Once an operator had submitted a populated model, the input was reviewed for consistency and validity, comments and questions were sent back to operators and a second, amended, data submission was requested and received.
  - Guidance was provided to operators in an initial workshop where the model was explained and through subsequent e-mail correspondence.
  - Based on acceptable data submission from all operators the weighed average call termination costs were calculated.
- Presentation and discussion of results with operators and TRC:
    - Workshops and bilateral meetings were held to discuss the costs calculated through the model and all operators approved the methodology and the corresponding costing calculations.
    - Issues surrounding WACC calculation and treatment of the Access Deficit were further highlighted in these workshops and meetings.
  - All deliverables from Section 2 were discussed in the Second Interim report.

### **3.3 Activities and Deliverables for Section 3**

Within Section 3 the following deliverables and activities were included:

- Proposed interconnection call termination rates structure for each operator group.
- Proposal of actual rates by operator group, using the proposed structure and applying the cost of capital
- Conducting workshops and bilateral meetings to further operator understanding and acceptance of the analysis undertaken and the resulting recommendations.

Extensive plenary and bilateral discussion were undertaken to secure agreement by all parties to the proposed rates.

## 4. Overview of Project Activities

To support the introduction of CPP in Sri Lanka, the TRC had decided, in agreement with the operators, that cost-based interconnection call terminations charges should be developed<sup>4</sup>

This report therefore focuses on the analysis and modelling undertaken to develop cost-based interconnection call termination charges.

### 4.1 Cost Modelling and Calculation

#### 4.1.1 Costing approach and methodology

Having decided to introduce cost-based interconnection call termination charges, the first step in achieving this was to agree the costing methodologies to be applied and to agree the high-level modeling approach.

The TRC could choose between a number of different costing approaches, including:

- *Historic costs.* Costs are based on an existing operator. The basis generally used for statutory accounts.
- *Current costs.* Costs are based on an existing operator with assets revalued to account for inflation.
- *Economic costs.* Costs are based on a theoretically efficient operator. The minimum costs of an operator to deliver current and future demand using the most appropriate technology currently available. Economic depreciation is used.

Within these broad categorizations, a number of different costs can be calculated based on different assumptions. In addition there are two commonly used methodologies for allocating costs to services:

- *Fully Allocated Costs (FAC) or Fully Distributed Costs (FDC).* The sum total of the costs of an operator are allocated to one or other of the services provided by the operator.

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<sup>4</sup>Annex A, section 1 sets out the options for price regulation open to the TRC and explains why regulated cost-based charges are the most appropriate approach to this situation

- Long Run Incremental Costs (LRIC)> An increment is defined, which may be all of the output of the company corresponding to one service, part of the output corresponding to one service, a network element or some other quantum of final or intermediate output. The cost assigned to this increment is either the cost that could be avoided, or alternatively the cost that are required, in delivering the increment of services. The “ Long Run” in LRIC means that the costing model considers the most efficient provision of services over the long term, where all costs are potentially avoidable rather than only considering the “ variable costs” which can be avoided in the short term.

The consultants recommended that, given the tight time frame of the project (the cost-based charges were required for introduction by end of June 2003 to support the introduction of CPP at this time) and that TRC has not issued any guidance to the operators in Sri Lanka on the preparation of regulatory accounting data, the most appropriate costing methodology would be Fully Allocated Historic Costing (FAHC)<sup>5</sup>

This recommendation was presented to the TRC and the operators and agreed by all parties at a meeting on 2 April 2003. Following this meeting bi-lateral meetings were held with all of the operators in order to explain more fully the methodology, to understand the operators cost structures and operating environment and to give the operators opportunity to raise questions.

To assist the TRC and the operators in their understanding of the relative virtues of the different costing approaches and methodologies, the consultants prepared four Case Studies<sup>6</sup> of how interconnection charges are set in other countries, describing the often gradual development of the approach to setting charges as the regulatory environment matures and more detailed costing data is made available to the regulator.

#### ***4.1.2 Development of costing model***

The consultants recommended that a generic modeling approach should be developed and that, once this had been achieved three different versions of the generic model should be developed to reflect the different network topologies, technologies and product offering by the three groups of operators(mobile, fixed wireless, fixed wireline)

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<sup>5</sup>Annex A Section 2 discusses each of the costing approaches and methodologies and why FAHC was recommended in this situation.

<sup>6</sup>Annex E holds copies of the four Case Studies developed by the consultants.

Having gained agreement to the proposed costing approach and methodology, the consultants constructed a generic cost calculation model and presented to the TRC and to the operators the underlying principles applied in this model at a meeting on 5 April 2003.

The following principles were proposed by the consultants:

- Using the operators' latest audited accounts, in most cases 2002 annual accounts, as the input for the model;
- Calculating a reasonable return by applying a weighted average cost of capital to the operating capital employed;
- Use of only network costs for setting interconnection rates - which would entail identifying all non-network costs and excluding these from the cost calculation- these non-network costs (retail costs) would typically include customer services costs, marketing, retail billing and other clear retail-related costs<sup>7</sup>;
- Use of only "traffic sensitive" network costs in the calculations of termination cost.
- That the final service costs would be calculated through an Element Based Charging, based on a set of network components defined by the consultants.

These principles were presented and explained to the TRC and the operators – all parties agreed to the recommendations made by the consultants.

In order to promote transparency in the process it was agreed, at the meeting of the 5 April 2003, that all operators would have sight of the methodology used to calculate termination rates for all three types of operator. It was also agreed that each operator would have sight of the cost calculations used to calculate their own termination cost but for reasons of commercial confidentiality would see neither the input data nor the results for other operators (with the exception of SLT where the results would be used to directly set prices.)

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<sup>7</sup>This approach was adopted for reasons of consistency in comparisons across operators, the limited time available to complete the exercise and the fact that this approach has previously been adopted in some other jurisdictions.

### ***4.1.3 Issue of Access Deficit Charges (ADCs)***

In developing the model, key principles of methodology needed to be agreed with operators, including defining the costs which should be included in the calculation of interconnection call termination costs. It was agreed that costs included should be limited to traffic volume-sensitive network costs, not fixed costs which do not vary with traffic volume, such as the fixed wire line local loop network. This debate highlighted the possibility that the incumbent fixed wire line operator might have a loss making local loop business which is generally known as an Access Deficit.

Although ADCs were not considered part of the original project scope, it was deemed important to arrive at a general policy as to whether ADCs should be introduced in Sri Lanka at present and, if so, how these might inter-relate to the call termination charges. The consultants therefore produced a discussion paper<sup>o</sup>, setting out the background and general principles of ADCs and analysed the macro-environment in Sri Lanka to get an indication of the likelihood of the need for and potential benefits from the introduction of an ADC regime.. The discussion paper was distributed to operators and the TRC and comments were sought from all parties.

Although it was acknowledged that the resolution of Access Deficit issues were separate to the introduction of CPP and the calculation of the cost based interconnection call termination costs and charges, the model for the fixed wire line operator and for the two fixed wireless operators were structured such as to calculate the size of the overall Access Deficit of each operator.

As part of the results of the cost modeling, an estimate of the size of the Access Deficit was provided. From the CPP model, it was estimated that SLT's Access Deficit is approximately Rs 12,628 million in total in the year 2002.

While the cost model demonstrated that SLT apparently had a significant Access Deficit (and the fixed wireless operators a proportionately smaller Access Deficit) and that this issue needed to be addressed, this was outside of the scope of the CPP call termination costing project.

<sup>o</sup> This paper is attached at Annex H.

#### ***4.1.4 Calculation of Call Termination Costs***

##### *Data collection and validation*

The first data request was sent out to operators on the 8 April 2003. Rather than sending a questionnaire to fill in, it was decided that the most appropriate way of collecting the information required to populate the models was to send out draft copies of the models themselves. This had a number of advantages:

- *Increased transparency* This procedure would allow operators to see what use was being made of the information;
- *Increased understanding of the data requirements.* As the operators could understand the use being made of the data, they were more likely to put in the correct information.
- *Increased accuracy of the data.* Data, which was obviously erroneous, could be identified quickly as it would lead to conspicuous model results.
- *Reduced risk of transcription errors.* If data is entered directly into the model then there is no risk of errors in the data being transcribed from a questionnaire to the model.

While providing the model makes it in theory easier for the operators to attempt to bias the end result by putting in biased data, the consultants believed that the risk was minimized due to the data checking applied to the data. In any case if an operator was intent on corrupting the results, then it is likely that they could work out how to do this without the aid of the model.

##### *Data collection and validation - Stage I*

Between 22 and 25 April 2003 bi-lateral meetings were held with all of the operators in order to explain the model in detail and also to give them the opportunity to raise questions on the data request before first submitting the data.

Completed data models were subsequently returned to the consultants by the operators between 2 and 19 May 2003 and a number of checks were run on the data. First the input data was checked for consistency with the methodology and credibility based on the judgment of the consultants. At this stage issues were found in all of the models submitted. Some of the issues identified included:

- interconnection costs to be allocated to retail;
- double counting of incoming minutes;
- further work required on routing tables;
- current assets and liabilities to be restricted to operational; and
- out payments for terminating international incoming calls to be removed .

Meetings were then held with each of the operators to discuss the issues found in the model for after which a note was sent to the operators with agreed actions. All operators then submitted a further set of data.

### ***Data collection and validation - Stage 2***

Operators resubmitted their completed data models between 21 and 28 May 2003. The second set of submissions were analysed and the issues highlighted in the first round of submission were found to have been addressed.

Having received the second data submissions, the consultants undertook a second series of validations tests of the models and the modeling results and found that the overall results in terms of call termination cost:

- were close between operators of a similar type, with a generally negative relationship between cost and number of subscribers; •
- showed the expected relationship between the types of operators, with mobile call termination being most costly, WLL less costly and wireline call termination least costly; and
- were broadly comparable with international benchmarks taking account of the operating environment and cost structures in Sri Lanka.

In view of the checks carried out on the models and data supplied by the operators and the credibility of the results, the second data submissions were therefore accepted by the consultants

### ***Data collection and validation -Supplemental***

Following the circulation of the ADC note, on 4 June 2003 SLT submitted a revised data submission, with a re-allocation of costs between "traffic sensitive" and "customer sensitive". When the new data was checked for

both consistency with other results for Sri Lanka and against benchmark models and cost data from other countries, it was found that the new data did not appear credible. Thus this submission was not used for the calculation of the rates, but instead the previous version was used.

### *Processing of modeling results*

The results of the service costing exercise were eight separate call termination costs, one each for the four mobile operators and the two fixed wireless operators and two for SLT, for "local" call termination and "national" call termination. It would not make sense to have so many different call termination rates for a number of reasons:

- Having different rates for calling subscribers of different operators, even if both were for example, mobile operators, would be confusing for customers;
- The operators themselves would have problems setting prices, billing and running settlement systems between themselves with a multitude of rates;
- Setting rates according to the cost for each operator would act as a reward for inefficiency as those operators with the highest costs, i.e. the least efficient, would receive the greatest in-payments. This effect would be particularly noticeable amongst operators of the same type, for example mobile operators. Flows of traffic between these operators tends to be close to balanced in that each operator receives roughly the same amount of traffic as it sends. If the termination rates are different for the each type of operator then there will be a net payment from the most efficient operator to the least efficient operator.

In order to overcome these problems a common termination rate was set for each type of operator: mobile, fixed wireless and fixed wireline<sup>9</sup>. The reason for setting a different rate for each type of operator rather than a single rate for all operators, is that there are demonstrable differences in cost for delivering traffic on the different types of network, which are unrelated to inefficiencies.

The TRC and the operators agreed to this approach to achieving a pragmatic and manageable set of interconnection call termination charges for Sri Lanka.

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<sup>9</sup> Annex C discusses the process and reasoning for averaging call terminations cost by operator type in more detail

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In summary, the resulting three sets of interconnection call termination costs were as follows:

- Fixed wireline (SLT) had the lowest cost of call termination, because the local loop is not traffic sensitive;
- Fixed wireless had a higher costs of call termination than fixed wireline because a wireless local loop is traffic sensitive;
- Mobile networks had the highest cost of call termination as the radio network is fully traffic sensitive and the provision of the mobility functionality increases costs.

Given that a single rate is to be set for the fixed wireless operators and a single rate for the mobile operators, then the question arises as to how to set this single rate. There are four obvious choices:

- As the lowest rate of the group of operators;
- As the highest rate of the group of operators;
- As a simple average of the operators;
- As a weighted average of the operators.

The consultants recommended the use of a weighted average, with the weights based on traffic volumes, on the basis that this should result in the overall profitability of the industry being close to the reasonable rate of return. Both the TRC and the operators agreed this approach.

## **4.2 Calculating Call Termination Charges**

It is a generally accepted principle that the calculation of costs for the purposes of setting interconnection call termination charges should include an allowance for a 'reasonable profit'. The value of this reasonable profit is calculated as a percentage of the amount of capital invested to deliver the services in question. This percentage is known as the "Cost of Capital".

### ***4.2.1 Calculating the WACC***

The standard approach to calculating the cost of capital used by regulators around the world is to calculate a weighted average of the cost of debt and the cost of equity. This is known as the Weighted Average Cost of Capital

(WACC). The following basic formula is used for calculating the

WACC:<sup>10</sup>

$$WACC = g'Y_d + (1-g)r_e$$

where;

$g$  = gearing;

$r_d$  = the cost of debt; and  $r_e$  = the cost of equity.

The calculation of the values for the WACC parameters involved a number of steps:

- An outline of the consultant's proposed methodology to the operators on 25 April 2003.
- A consultation paper on the principles underlying our WACC calculation methodology was prepared and sent to the TRC for onward transmission to the operators on 4 May 2003.
- Values for each of the parameters in the calculation were estimated and presented to the operators on 27 May 2003.
- The calculation of the WACC was adjusted following discussion with the operators and a final estimate of the WACC was presented on 29 May 2003.

### **Methodology**

As outlined in the issues paper<sup>11</sup> that we sent to the TRC and the operators on 4 May 2003, the consultants' WACC calculation was based on the following methodology steps:

- International benchmarks were used in the calculation of some of the WACC parameters.
- The Capital Asset Pricing Model was used in the calculation of the WACC.

<sup>10</sup> Adjustments are sometimes also made for tax. These are discussed below.

<sup>11</sup> Annex G includes a copy of this paper.

- Yields on a range of Sri Lankan Government debt were used to calculate the risk-free rate.
- A mixture of local and international data was considered in the calculation of the equity risk premium.
- Estimates of the values of Beta for telecommunications operators in other countries were used in the calculation for Sri Lanka.
- A single value of the WACC was calculated and applied to all operators in Sri Lanka.
- The value of gearing used in the WACC calculation was based on the actual debt levels of operators in Sri Lanka.

### ***Results***

The results of the preliminary calculation of the WACC for Sri Lanka are given in Table 4-1.

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Table 4 L WACC calculation parameter values

	Low	High
Gearing	32%	32%
Risk-free rate	8.7%	8.7%
Debt premium	1.1%	4.0%
Equity premium	6.4%	8.0%
Beta (asset)	0.9	0.9
Beta (equity)	1.23	1.23
Tax	21%	21%
Nominal post-tax cost of equity	16.6%	18.6%
Nominal pre-tax cost of equity	21.0%	23.5%
Nominal cost of debt	9.8%	12.7%
Nominal post-tax WACC	14.4%	16.7%
Nominal pre-tax WACC	17.4%	20.0%

On the basis of this calculation, the consultants proposed to use an average of the low and the high estimates of the WACC which gave a figure of 18.7%.

These preliminary results were presented to the operators on 27 May 2003. Following discussion with the operators, we revised our estimates of some of the parameters used in the calculation. In particular:

- A broader range of Government securities was included in the calculation of the risk-free rate. This raised the estimate of the riskfree rate from 8.7% to 8.9%.
- Information from the Central Bank of Sri Lanka on commercial corporate lending rates was introduced. This raised the estimate of the debt premium from 1.1% - 4.0% to 2.5% - 6.2%.

Following these changes, the final recommendation from the consultants on the value of the WACC was in the range 18.1% - 21.0%. We

recommended using a simple average of this range of 19.5%. This was presented to operators on 29 May 2003.

#### *WACC used in the calculation*

During discussions on the WACC with TRC staff, the operators argued the following:

- The risk-free rate should take account of historical yields on Government securities. They concluded that the risk-free rate used in the WACC calculation should be 14.0%.
- The debt-premium should be 6.4%.
- The value of Beta should be 1.07.

Together, these values result in a WACC of 28.7%.

At the meeting on 29 May 2003, it was decided by the operators and the TRC that the WACC to be used in the calculation of termination charges should be an average of the operators' calculation of 28.7% and the consultants' lower estimate of 18.1%. This average is 23.4%.

### ***4.2.2 Rate Structuring***

Having calculated the costs of call termination for each operator group, the consultants proposed a structure for how these costs could be recovered through interconnection call termination charges. The two main elements of this structure are the de-averaging by time of day and the deaveraging by distance and network components used to terminate the call.

#### ***De-averaging by time of day'***

The principle underlying the time of day de-averaging is to provide consumers the incentive to make calls when the network is used the least - thus spreading the traffic across the 24 hours in the day. An additional benefit from this is that cheaper call rates can be offered in the off-peak periods, making the use of telephones more affordable to those with limited means.

In terms of de-averaging by time of day, there was no consistent approach across the operators in terms of charge bands and tariff gradients. At the

" A fuller description of the reasoning and methodology for this de-averaging is given in Annex D.

meeting on 29 May 2003, it was agreed that SLT's retail charge bands should be used as the basis for charging for all call termination, as SLT had the largest retail customer base. In order to progress the process, the consultants tentatively suggested a tariff gradient of 3: 2: 1 - peak: off peak: discount.

In order to calculate the de-averaged tariffs, operators were asked to submit information on the distribution of call termination traffic on an hourly basis over a normal week.

Following receipt of traffic distribution information from all but one of the operators, the CPP rates were calculated, based on the consultant's suggestion of a 3: 2: 1 tariff gradient, and distributed to the operators. This prompted Celltel to suggest a revised tariff gradient, moving the peak and off-peak prices dose together, reflecting the nearly equal traffic loading in these periods on mobile networks.

On the 23 June 2003 a meeting was held with the operators where Celltel put forwards their proposal for a 3.2: 2.8: 1-tariff gradient. This was agreed by the other mobile operators. At this meeting, the WLL operators also agreed that they would follow SLT's tariff gradient in order to arrive at a common fixed tariff gradient. SLT agreed at the meeting to derive their preferred gradient. Following the meeting they suggested a gradient of 2.4: 1.4: 1.

Using these tariff gradients, and the mid-point WACC, the following prices were determined.

**Table 4-2: Table of Final Charges  
De-averaged**

	Average	Peak	Off-peak	Discount
SLT - "Local"	1.4	1.9	1.1	0.8
SLT - "National"	2.3	3.0	1.8	1.3
WLL -"Average"	3.7	4.6	2.7	1.9
Mobile	4.3	5.0	4.4	1.6

*Distance related charging*

The principle underlying distance de-averaging of interconnection charges is that operators should be encouraged to carry calls on their own network as far as possible, if they can do so more effectively and efficiently than



handing the call to the terminating operators where the call is originated. This causes the terminating operator to recover the costs relevant to the specific call and it encourages roll-out of other operators' networks if they can deliver the calls at the far end at lower cost than the increment they would pay to the terminating operator if the call is handed over at the near end.

The differentiation of pricing by distance for call termination was also discussed at the meeting on the 5 April 2003 and at the bilateral meetings that week. SLT requested that their prices be separated into "local" and "national" call termination, as currently defined (based on the local calling areas rather than by network hierarchy). It was agreed to calculate a single averaged price for the fixed wireless operators. As it is not possible for the originating operator to know where a called mobile customer is located, differentiation clearly was not appropriate for the mobile operators.

At the meeting of the 29 May 2003 distance based termination prices were further discussed. The inter-relationship between SLT's retail prices, which were distance-based, and a single fixed wireless termination charge, could cause confusion in the marketplace. In addition the asymmetry between the fixed wireless and SLT could act to SLT's disadvantage: as the fixed wireless operators could take advantage of the lower "local" termination rate on SLT's network, while SLT would have to pay the single fixed wireless rate. It was agreed that the fixed wireless average price would form a ceiling on the termination rate, but that the fixed wireless operators would be able to commercially negotiate lower de -averaged rates. The mobile operators and SLT would have their rates set according to cost, without the flexibility to negotiate.

Following a request from the fixed wireless operators, the consultants later attempted to estimate the relative costs of "local" and "national" call termination for the fixed wireless operators, by entering assumptions about the routing of these two types of calls. However following further discussions with the fixed wireless operators it became apparent that it was not possible to accurately determine distance differentiated prices in the time available and so this would be left to commercial negotiation".

**" Annex B section: calculating the usage of Each Component' discusses this in more detail.**

## Results

Based on the second round of data submissions, the average termination cost was calculated and presented on the 29May 2003 for each of the three operator types according to three different WACCs:

- The lower limit of the range suggested by the consultants of 18.7%;
- An estimate based on the operators' views of the appropriate inputs to the WACC calculation of 28.7%;
- The mid-point of the two above calculations.

The results of the cost allocation process with the three WACC values above are shown below.

**Table 4-3: Table of WACC by Operator**

	Weighted Average Cost of Capital		
	Consultants' Upper Bound (19.7%)	Agreed WACC (23.4%)	Operators' Assumptions (28.7%)
SLT - "Local"	1.3	1.4	1.6
SLT - "National"	2.1	2.3	2.6
Fixed wireless	3.4	3.7	4.0
Mobile	4.0	4.3	4.7

The operators agreed, to use a WACC of 23.4 % as the basis for setting rates.

## 5. Project Deliverables

the main objective of the project was to develop a set of agreed interconnection call termination charges for all operators in Sri Lanka, to support the introduction of CPP. These charges therefore constitute the main deliverable.

A subsidiary deliverable of the project is the set of 4 case studies of how interconnection costing and charging has been developed in other countries.

### 5.1 Call termination Charges

Based on the detailed analyses of the consultant and agreed by TRC and all domestic operators in Sri Lanka, the interconnection call termination charges to be applied in Sri Lanka from the 1<sup>st</sup> August 2003 are as set out below:

Average	Peak	De-averaged		
		Off-peak	Discount	
SLT-“Local	1.4	1.9	1.1	0.8
SLT- “National”	2.3	3.0	1.8	1.3
WLL-“Average	3.7	4.6	2.7	1.9
Mobile	4.3	5.0	4.4	1.6

### 5.2 Interconnection Case Studies

Four case studies were developed to assist the TRC and the operators in Sri Lanka in understanding the relative merits of different costing and charging methodologies, and to assess these against the prevailing conditions in Sri Lanka.

The four countries covered in the case studies are;

- The UK – with a long history of development of interconnection charging and costing, the UK provides a good overview of how a progressive approach can be adopted by the regulator.

- Malaysia - has also moved through a series of different interconnection charging methodologies and has recently introduced interconnection charges based on LRIC costing, for both fixed and mobile operators.
- India - here different costing and charging methodologies are being applied to different operators, creating inequities in the market and potentially distorting investment incentives.
- Mexico - whereas in the other countries, interconnection rates have been set by the regulator (except for in the UK where the regime has moved to a price-cap framework for interconnection charges, but only after several years of specific interconnection price setting by the regulator), the Mexican regulator has opted for a price-cap regime for interconnection charges. The regulator collects detailed accounting data from the operators to support its analyses in setting the price cap.

The four case studies are annexed to this report.