



Concessionaire Information

# **Modelling Documentation**

**For the Long Run Average Incremental Cost (LRAIC) Model**

October 2012

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# 1 Introduction

Frontier Economics (“Frontier”) has been engaged by the Telecommunications Authority of Trinidad and Tobago (“the Authority”) to assist in the implementation of the Costing Methodology<sup>1</sup>. This methodology requires modelling the forward looking long run average incremental cost (LRAIC) of telecommunications networks in Trinidad and Tobago, on a top down basis. The Authority has further decided to use cost data on a current cost accounting (CCA) basis with the LRAIC model.

As such, two spreadsheet models have been developed as part of this requirement:

- a CCA model, revaluing concessionaires’ historic cost information based on an indexation approach; and
- a LRAIC model, deriving unit cost estimates for individual services offered by concessionaires, based on inputs from the concessionaires and the results of the CCA model on a forward looking LRAIC basis.

These have been implemented as separate spreadsheets for practical reasons. This document provides a detailed overview of the spreadsheet model and how to use it.

## 1.1.1 Objective of this documentation

This document sets the regulatory context and motivation for the LRAIC modelling exercise; provides an overview of the model specification as set out in the LRAIC Specification Paper; and provides insight into the model structure and each worksheet contained in the spreadsheet.

## 1.1.2 Relevant reference documentation

This document needs to be read in conjunction with other documentation prepared by the Authority. In particular:

- the LRAIC Specification paper<sup>2</sup>; and
- the LRAIC data request documentation<sup>3</sup>.

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<sup>1</sup> TATT, ‘The Costing Methodology for the Telecommunications Sector’, 29 May 2008

<sup>2</sup> TATT, ‘Top Down Long Run Average Incremental Cost (LRAIC) Model Specification Paper’, 01 March 2010 and updated October 2012

## 1.2 Overview of this document

The remainder of this document is structured in line with its main objectives set out below.

- Section 2 presents an overview of the model specification, as detailed in the LRAIC Specification Paper.
- Section 3 provides an overview of the LRAIC model, including the main modelling flows, the model structure and the contents of each worksheet within the spreadsheet.

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<sup>3</sup> Telecommunications Authority of Trinidad and Tobago, “LRAIC data request”, October 2012

## 2 Model specification

The LRAIC model has been developed to be consistent with the LRAIC Model Specification Paper. This sets out the methodology that the Authority will use to implement the top down LRAIC model. In particular, it discusses the following seven elements.

- **Key principles.** The LRAIC Model Specification paper introduces the LRAIC concepts and discusses the key assumptions that will be applied in the LRAIC calculations.
- **Model outputs.** The paper defines the required outputs of the overall costing process, and thus the LRAIC model. The requirements for the model outputs are driven by the nature of regulation which may vary for different services. This will then feed into the definition of the increments within the model.
- **Network type.** The LRAIC Model Specification paper discusses the main access and core networks to be modelled in order to adequately reflect all concessionaires' network infrastructures.
- **Increment structure.** The document provides a detailed overview of the cost categories, increments and network elements defined within the model, as well as the defined increment hierarchy.
- **Input data.** The LRAIC Model Specification paper sets out the main input data requirements of the LRAIC model and how each of the input data is used within the model.
- **Main calculations.** The document provides an overview of the LRAIC calculation process applied within the model, reflecting the specifications set out with the LRAIC Model Specification paper.
- **Model structure.** A series of annexes setting out the proposed structure of the LRAIC cost model including, for example, the network elements to be modelled, the LRAIC cost categories; and a definition of the Cost Volume Relationships (CVRs) contained in the model.

The Authority consulted on the LRAIC Model Specification Paper extensively over the period September 2009 to March 2010. The final version, taking the

comments received from concessionaires into account is available on the Authority's website.<sup>4</sup>

### 3 Overview of LRAIC model

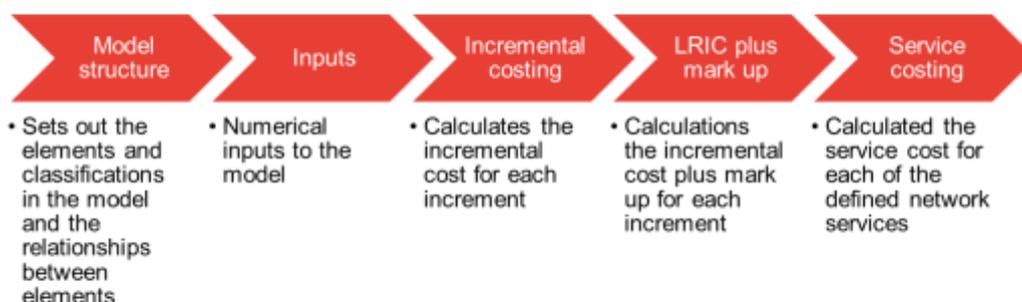
This section aims to provide an overview of the LRAIC model. This is undertaken in two steps. First, a general overview of the main modelling flows and the overall model structure is provided. This is followed by a more detailed description of each worksheet contained in the LRAIC model.

#### 3.1 Main modelling steps and model structure

##### 3.1.1 Overview

Figure 1 below presents the overall model structure in the LRAIC model.

Figure 1. Overview of the model structure



Source: Frontier Economics

##### 3.1.2 Model structure

This section of the model is used for two main tasks:

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<sup>4</sup> [http://www.tatt.org.tt/LinkClick.aspx?fileticket=ZQ\\_tfqj-w-A%3d&tabid=254](http://www.tatt.org.tt/LinkClick.aspx?fileticket=ZQ_tfqj-w-A%3d&tabid=254)

1. Provide definitive classification for use in the rest of the model, consisting of text labels and short codes for each set of inputs (such as cost and volume data), outputs (the services to be costed) and intermediate results (increments, CVRs, drivers and network elements); and
2. Setting out the relationships between inputs, intermediate results and outputs which (implicitly) define how costs are attributed to network services.

This section of the model does not include any numerical inputs from the concessionaires and hence does not set out how much cost should be attributed to services.

To a large degree this section of the model reflects the LRAIC specification and does not need to be updated for each concessionaire. However to the extent that a concessionaire may provide cost data in non-standard cost classifications, there may be some need for user intervention in this section.

### 3.1.3 Inputs

The inputs section is divided into two:

1. A section bringing in the raw data provided by the concessionaire and outputs of the CCA model;
2. A section with data reformatted and normalised for input into the model, along with non-concessionaire specific numerical input such as WACC, CVRs and conversion factors.

### 3.1.4 Incremental costing

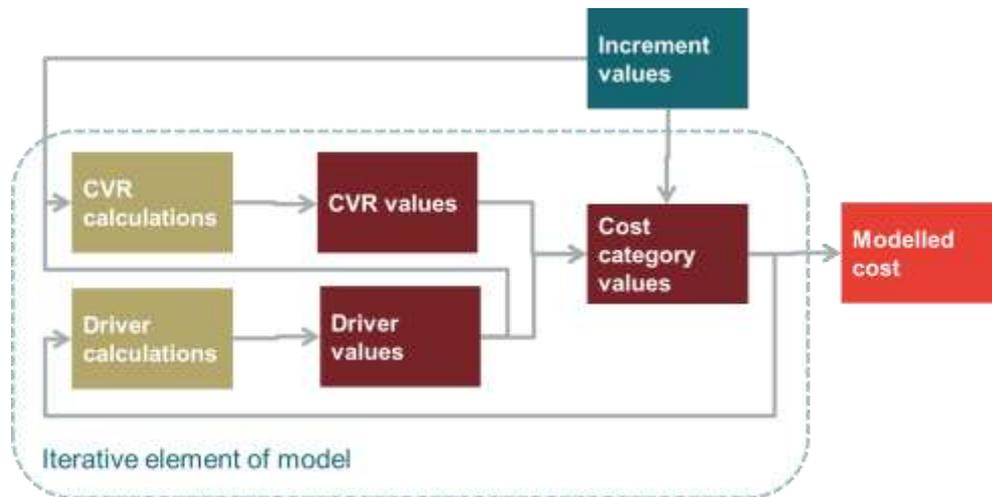
The incremental costing section combines the data on the relationships between costs and increments from the model structure section and the numerical data to produce the cost of each increment.

There are two important features to note in this section of the model:

1. The model calculation is for a single increment in turn, with the model running sequentially through all of the increments;
2. The model calculates the business costs excluding the increment currently being modelled, iteratively starting with those costs and drivers directly dependent on demand, and working through the higher levels up the dependency hierarchy.

The calculation flow for the incremental costing section of the model is shown in **Figure 2** below.

**Figure 2.** Calculation Flow for a Single Increment



The incremental cost is then calculated by subtracting the modelled cost from the total “base” cost input into the model.

$$LRAIC_{Increment(s) \text{ to be measured}} = Cost_{Total \text{ business}} - Cost_{Total \text{ business excluding } Increment(s) \text{ to be measured}}$$

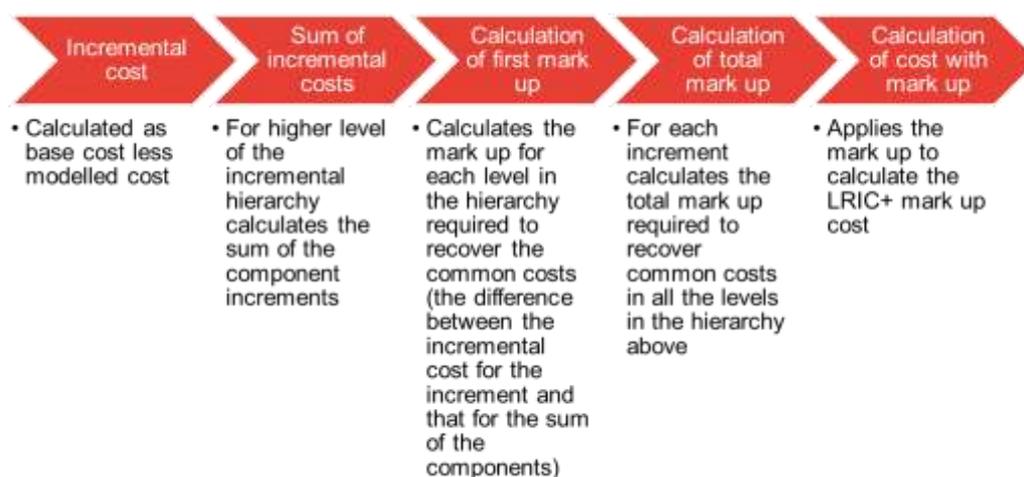
The final stage in this section is a summary sheet which runs the calculations for each defined increment in turn in order to calculate the incremental cost for each increment.

### 3.1.5 Incremental costs plus mark up

The incremental costs calculated above exclude any common costs between increments. As set out in the LRAIC specification paper, the results of the LRAIC model should produce results including a mark up for common costs. In addition, this mark up should be calculated on a cost category by cost category basis, that is, any common costs are estimated for each cost category and the mark up to recover these common costs is applied to the incremental costs **for this cost category**. This ensures that common costs are recovered across relevant services, for example any costs common to the mobile network are only recovered from mobile services rather than recovered across all services.

**Figure 3** shows the calculation process for each cost category.

**Figure 3.** Calculation process for LRIC plus mark up section



### 3.1.6 Service costing

The final service costing sheet calculates the network service costs from the incremental costs with mark up. This process is carried out in four stages:

1. The total usage of each network element is calculated by multiplying service volumes by the average usage of the element by each service;
2. The total cost of each network element is calculated by adding the allocated cost of increments allocated across a number of network elements to costs of increments directly mapped to the network element;
3. The unit cost of each network element is calculated by dividing total cost by total usage;
4. The costs of network services are calculated by combining the average usage of network elements by the unit costs of network elements

## 3.2 Content of LRAIC model

The spreadsheet is structured as a MS-Excel workbook with 57 sheets which can be grouped into eight sections:

1. **Spreadsheet management worksheets.** This section includes the main navigation menu, an overview of the contents of the spreadsheet, and some support functions to facilitate data management and version control aspects.

2. **Model testing and cross-checks.** This section includes a sheet containing a set of cross-checks.
3. **Model Structure.** Eight sheets which allow defining the modelling structure (i.e., defining the cost volume relationships (CVRs), cost drivers and network elements and network services in the model) and selected allocation rules within the model (i.e., allocating CVRs to each LRAIC cost category and defining which activities and assets respectively are used to calculate the employee and cost drivers).
4. **Operator data.** Ten sheets containing the concessionaire-specific input data used to populate the model (i.e., the costing and operational data provided in response to the LRAIC data request template file and the CCA costing data from the concessionaire-specific CCA model).
5. **Model inputs.** Six sheets transforming the operator input data into the format required for the LRAIC modelling.
6. **LRIC Calculation.** The calculations required to determine the cost of the business for a given level of demand (set of increments).
7. **LRIC Plus mark up.** The calculation of a set of incremental costs including mark ups for each LRAIC cost category.
8. **Service costing.** Calculation of LRAIC cost estimates for each service by allocating the incremental costs for each LRAIC cost category to the service provided by the concessionaire (i.e., based on the route factor information).

### 3.2.1 Model testing and cross-checks worksheets

The LRAIC model contains worksheets containing a set of cross-checks to verify the current calculations in the LRAIC model.

#### *Checks*

The 'Checks' sheet contains a series of internal consistency checks. These checks test both whether the model logic is correct and the model inputs are appropriate. This is illustrated in the screen shot below.

Figure 4: Screen Shot of 'Checks' Sheet

Diagnostics				
Initial LRIC model cost input				
Cost type	Operator data	LRIC inputs	Check?	
Non-pay expenditure	1,400,000	1,400,000	Check	
Pay	4,600,000	4,600,000	Check	
CCA Depreciation	600,000	600,000	Check	
CCA Capital Employed	6,055,000	6,055,000	Check	
GRC	12,000,000	12,000,000	Check	

LRIC Calculation - Press F9 to update				
Increment costed	Reference value	Model output	Check?	
Base	-	-	Check	
Total business	7,481,208	7,481,208	Check	

LRIC plus mark up						
Increment	LRIC calculation	LRIC before markup	Check?	LRIC with markup	Sum of LRIC components	Check?
BAS Base	-	-	Check	-	-	Y/N
TOT Total Business	7,481,208	7,481,208	Check	7,481,208	7,481,208	Check
TOT Other	4,278,962	4,278,962	Check	4,278,962	4,278,962	Check
SAO Retail and other	3,992,245	3,992,245	Check	3,992,245	3,992,245	Check
MN Mobile network	1,128,434	1,128,434	Check	1,128,434	1,128,434	Check
FN Fixed network	3,150,528	3,150,528	Check	3,150,528	3,150,528	Check
MC Mobile core	899,158	899,158	Check	899,158	899,158	Check
MW Mobile access	429,276	429,276	Check	429,276	429,276	Check
FC Fixed core	1,820,433	1,820,433	Check	1,841,529	1,841,529	Check
FA Fixed access	1,281,994	1,281,994	Check	1,303,489	1,303,489	Check
DDN Other services	258,111	258,111	Check	-	-	Y/N
WIS Wholesale arbiters	38,304	38,304	Check	-	-	Y/N
NET Retail arbiters	2,965,931	2,965,931	Check	2,965,931	2,965,931	Y/N

Allocation of increments to network elements		
NET	Total cost of network increment	4,278,962
FIX-OTH	less Other fixed	- 318,611
M-OTH	less Other mobile	- 116,526
	Specific network costs	3,843,825
	Total cost of network elements	3,843,825
	Check?	Check

Service costing	
Total cost of elements allocated to services	3,350,623
Service cost x volume	3,350,623
Check?	Check

Source: Frontier Economics

The 'Checks' sheet provides checks of the consistency of the inputs and outputs at a number of stages of the model, thus enabling the source of any problems to be identified.

The checks run are as follows:

- A check that the operator data has been correctly input into the LRIC cost model.

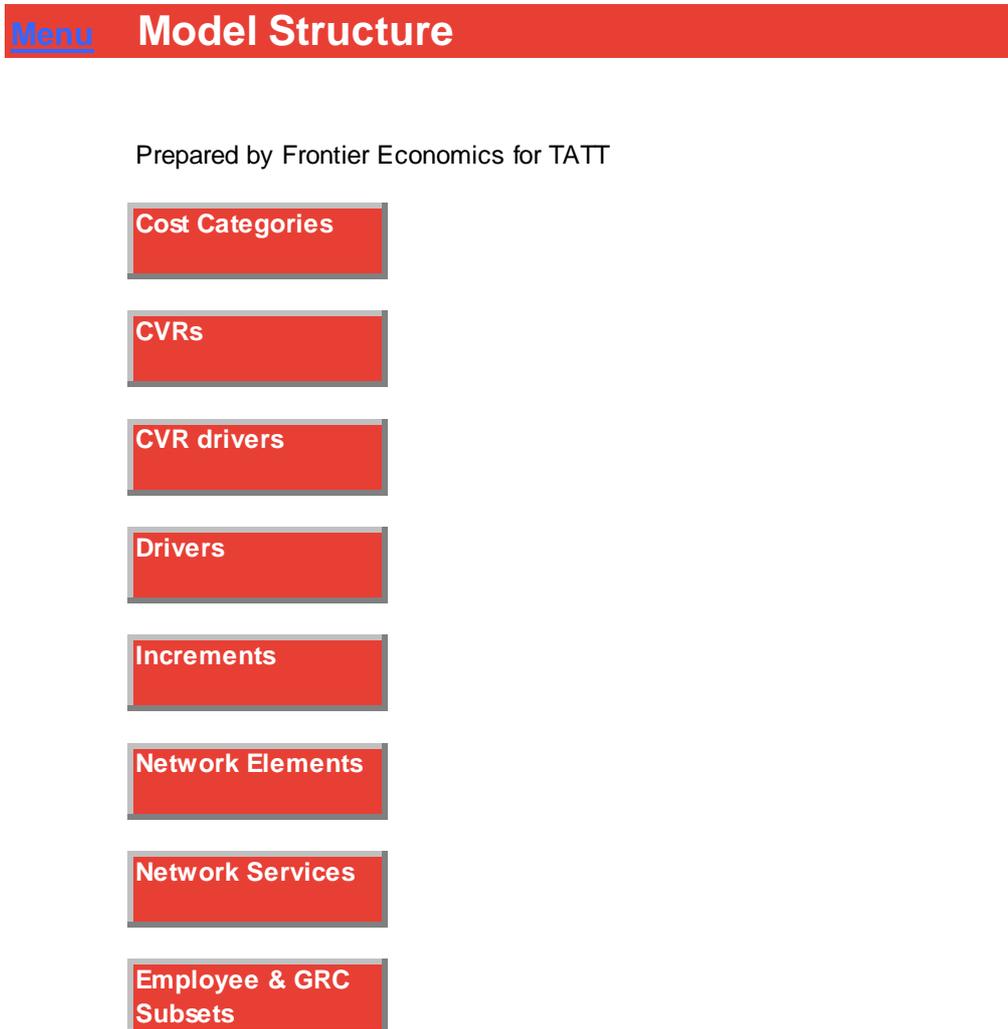
- A check that the incremental cost element of the LRIC model is attributing all costs. This check compares:
  - the calculated incremental cost for the ‘Base’ increment with no demand for services. This should give a value of zero as not costs would be incurred to deliver zero demand; and
  - the calculated incremental cost for the ‘Total business’ increment, with the total demand for services. This should give a cost equal to the total cost of the business as n costs can be avoided.
- Two checks on the ‘mark up’ element of the model which calculated the equi-proportionate mark up:
  - A check that the inputs to the module are consistent with the estimated ‘pure LRIC’ costs; and
  - A check that within the increment hierarchy the sum of components on a LRIC+EPMU basis is equal to the cost of the ‘parent’ increment, and hence that the total cost of the business has been attributed.
- A check of the allocation of increment costs to network elements includes all relevant network costs.
- A check that the allocation of network elements to network services includes all the costs of the relevant elements.

### 3.2.2 Model Structure worksheets

This section of the LRAIC model contains eight worksheets which allow defining the modelling structure and determining allocation rules within the model.

The section has a menu sheet (i.e., contained in the ‘Model Structure’ sheet), providing links to the following sheets.

**Figure 5:** Screen Shot of 'Module Structure' sheet



Source: Frontier Economics

### 'Cost Categories' sheet

This sheet defines the cost categories in the LRIC model, and the CVR used for each category.

A LRIC cost category code is entered in Column A and the corresponding description in Column B. In general these cost categories should not be altered to ensure consistency with the LRIC Specification and the data requests sent to the operators. However there are spare rows which can be used to input non-standard cost categories added by the concessionaires. In addition, if the data entered by concessionaires does not fully accord with the definitions assumed, it may be appropriate to revise the remaining entries in the row, corresponding to this cost category.

The columns D, E and F set out that the cost category is dependent on either:

- An increment;
- A driver; or
- A CVR.

Column D is used to select which of these three types of elements, the cost category is dependent on. Column F is then used to input the corresponding label for the increment/driver/CVR and column E looks up the appropriate short code for the label introduced in column F (and outputs #NA in the case that an error has been made).

Column H is used to define the appropriate WACC required to calculate the cost from the mean capital employed for the category.

**Figure 6:** Screen Shot of 'Cost Categories' Sheet

LRIC Cost Categories		Increment, CVR or Driver		
LRIC Cost Code	LRIC Cost Category Description	Type	Code	Description
<b>Fixed Network Components</b>				
ACF001	Main distribution frame	Increment	FAD	Fixed access network (dedicated access)
ACF002	Remote switching unit	CVR	CVR01	Fixed voice (TDM) concentrator
ACF003	Digital local exchange	CVR	CVR02	Fixed voice (TDM) local exchange
ACF004	Digital tandem exchange	Increment	N3	Transit exchange
ACF005	International switch centre	Increment	N4	International gateway
ACF006	VOIP soft switch or media gateway	Increment	N3	Transit exchange
ACF007	Network management system	Increment	FIX-OTH	Other fixed network
ACF008	Intelligent network platform	Increment	FIX-OTH	Other fixed network
ACF009	Co-axial cable	Increment	FAS	Fixed access network (shared access)
ACF010	Twisted pair cable	Increment	FAD	Fixed access network (dedicated access)
ACF011	Access fibre	Increment	FAS	Fixed access network (shared access)
ACF012	HFC optical node	Increment	FAS	Fixed access network (shared access)
ACF013	Point to point wireless	Increment	FAD	Fixed access network (dedicated access)
ACF014	Point to multi-point wireless	Increment	FAS	Fixed access network (shared access)

Source: Frontier Economics

### 'CVRs' sheet

This sheet defines the CVRs applied in the LRAIC model, including the associated CVR codes. This is illustrated in the screen shot below.

**Figure 7:** Screen Shot of 'CVRs' sheet

CVR	
CVR Code	CVR Description
CVR01	Fixed voice (TDM) concentrator
CVR02	Fixed voice (TDM) local exchange
CVR03	DSLAM
CVR04	MSAN
CVR05	Duct
CVR06	Network buildings
CVR07	Masts& towers
none	none

Source: Frontier Economics

**'CVR drivers' sheet**

This sheet contains the inputs required to define the CVRs applied in the LRAIC model (i.e., each CVR defined in the previous sheet). This is illustrated in the screen shot below. Each CVR must have at least two inputs which are either drivers or increments.

**Figure 8:** Screen Shot of 'CVR drivers' sheet

CVR inputs					
The inputs, either drivers or increments, that determine the CVRs					
CVR		Increment or driver			
Code	Description	Type	Code	Description	
<b>CVR01 - Fixed voice (TDM) concentrator</b>					
CVR01	Fixed voice (TDM) concentrator	Increment	N1S	Remote narrowband access node (subscriber sensitive)	
CVR01	Fixed voice (TDM) concentrator	Increment	N1T	Remote narrowband access node (traffic sensitive)	
<b>CVR02 - Fixed voice (TDM) local exchange</b>					
CVR02	Fixed voice (TDM) local exchange	Increment	N2S	Local exchange (subscriber sensitive)	
CVR02	Fixed voice (TDM) local exchange	Increment	N2T	Local exchange (traffic sensitive)	
<b>CVR03 - DSLAM</b>					
CVR03	DSLAM	Increment	B1S	Broadband level 1 - access node (subscriber sensitive)	
CVR03	DSLAM	Increment	B1T	Broadband level 1 - access node (traffic sensitive)	
<b>CVR04 - MSAN</b>					
CVR04	MSAN	Increment	MSAN-S	MSAN - subscriber sensitive	
CVR04	MSAN	Increment	B1T	Broadband level 1 - access node (traffic sensitive)	
<b>CVR05 - Duct</b>					
CVR05	Duct	Increment	FAC	Fixed network (cabled)	
CVR05	Duct	Increment	TR-DC	Transmission domestic (capacity)	

Source: Frontier Economics

This sheet should generally not be changed when running the model.

### 'Drivers' sheet

This sheet defines the cost drivers applied in the LRAIC model, including the associated driver codes. This is illustrated in the screen shot below.

**Figure 9:** Screen shot of 'Drivers' sheet

Driver	
Driver Code	Driver Description
Non-Network Endogenous Drivers	
NNED01	Vehicle numbers
NNED02	Workstations (exc. Support)
NNED03	spare
NNED04	spare
Employee drivers	
ED01	Employees total
ED02	Employees network (exc. Management)
ED03	Employees NFO

Source: Frontier Economics

This sheet should generally not be changed when running the model.

### 'Increments' sheet

This sheet defines the increments contained in the LRAIC model. It also allows the increment hierarchy to be defined by inputting a “parent” increment for each increment. Note that higher level increments must be entered below their component sub-increments to ensure that mark ups are accurately estimated.

Finally for increments which directly map to a single network element, the mapping can be input. This is illustrated in the screen shot below.

**Figure 10:** Screen shot of 'Increments' sheet

Increments		Direct mapping				
Abbreviation	Label	Level	"Parent" code	"Parent" description	Element abbreviation	Network Element Description
B3	Broadband level 3 - BRAS	4	FC	Fixed core	B3	Broadband level 3 - BRAS
B4	Broadband level 4 - core router	4	FC	Fixed core	B4	Broadband level 4 - core router
TR-DC	Transmission domestic (capacity)	4	FC	Fixed core		
TR-DL	Transmission domestic (length)	4	FC	Fixed core		
TR-INT	Transmission international	4	FC	Fixed core	TR-INT	Transmission international
FIX-OTH	Other fixed network	4	FC	Fixed core		
TV	Television broadcast	4	FC	Fixed core	TV	Television broadcast
M-BSS	Base station subsystem	4	MA	Mobile access	BSS	Base station subsystem
M-MSC	Mobile switching centre	4	MC	Mobile core	MSC	Mobile switching centre
M-MPD	Mobile packet data network	4	MC	Mobile core	MPD	Mobile packet data network
M-LR	Mobile location registers	4	MC	Mobile core	M-LR	Mobile location registers
M-SMS	SMS messaging centre	4	MC	Mobile core	SMS	SMS messaging centre
M-OTH	Other mobile network	4	MC	Mobile core		
RET	Retail activities	4	RAO	Retail and other		
WS	Wholesale activities	4	RAO	Retail and other		
OTH	Other activities	4	RAO	Retail and other		

Source: Frontier Economics

This sheet should generally not be changed when running the model.

### 'Network Elements' sheet

This sheet defines the network elements contained in the LRAIC model, including the associated abbreviation. This is illustrated in the screen shot below.

**Figure 11:** Screen Shot of 'Network Elements' sheet

Network Element	
Element abbreviation	Network Element Description
FAD	Fixed access network (dedicated access)
FAV	Fixed access (shared access - voice)
N1S	Remote narrowband access node (subscriber sensitive)
N1T	Remote narrowband access node (traffic sensitive)
N2S	Local exchange (subscriber sensitive)
N2T	Local exchange (traffic sensitive)
N3	Transit exchange
N4	International gateway
TR-N1-N2	Transmission N1-N2
TR-N2-N2	Transmission N2-N2
TR-N2-N3	Transmission N2-N3
TR-N3-N3	Transmission N3-N3
TR-N3-N4	Transmission N3-N4
B1S	Broadband level 1 - access node (subscriber sensitive)
B1T	Broadband level 1 - access node (traffic sensitive)
B2	Broadband level 2 - aggregation node
B3	Broadband level 3 - BRAS
B4	Broadband level 4 - core router

Source: Frontier Economics

This sheet should generally not be changed when running the model.

### 'Network Services' sheet

This sheet allows defining the network services modelled, including the units and the associated service number. This is illustrated in the screen shot below.

**Figure 12:** Screen Shot of 'Network Services' sheet

Driver		
Service Number	Service Description	Units
Fixed access services		
FAS01	Narrowband PSTN access line	Number of lines
FAS02	Narrowband ISDN BRA line	Number of lines
FAS03	Broadband access line (assymetric)	Number of lines
FAS04	Broadcast television subscriber	Number of lines
FAS05	Metro ethernet access	Number of lines
FAS06	Fully unbundled loop	Number of subscribers
FAS07	Shared access unbundled loop	Minutes (per second basis)
FAS08	Domestic retail leased circuit	Minutes (per second basis)
FAS09	International retail leased circuit	Minutes (per second basis)
FAS10	Domestic wholesale leased circuit	Minutes (per second basis)
FAS11	International wholesale leased circuit	Minutes (per second basis)
FAS12	Wholesale partial private circuit - local end	Minutes (per second basis)
FAS13	Wholesale partial private circuit - trunk segment	Minutes (per second basis)
FAS14	Other services	Minutes (per second basis)

Source: Frontier Economics

This sheet should generally not be changed when running the model.

### 'Employee & GRC Subsets' sheet

This is an input sheet used to define which cost categories (activities and assets respectively) which are used as inputs when calculating the employee and gross replacement cost (GRC) drivers. Each row corresponds to a cost category and each column to a driver. Where the value "TRUE" is entered at the intersection of a cost category (row) and driver (column), the corresponding number of employees/GRC is included in the calculation of the driver.

This selection serves two purposes:

1. Where a cost is driven by a subset of other costs, for example the number of network managers is a function of the number of network staff, the sheet allows the relevant subset to be defined; and
2. It can be used to remove circularities in the model calculation, for example if a cost category is dependent on "total cost" including this cost category in the calculation of the total cost driver would result in a circularity

This is illustrated in the screen shot below.

**Figure 13:** Screen Shot of 'Employee & GRC Subsets' sheet

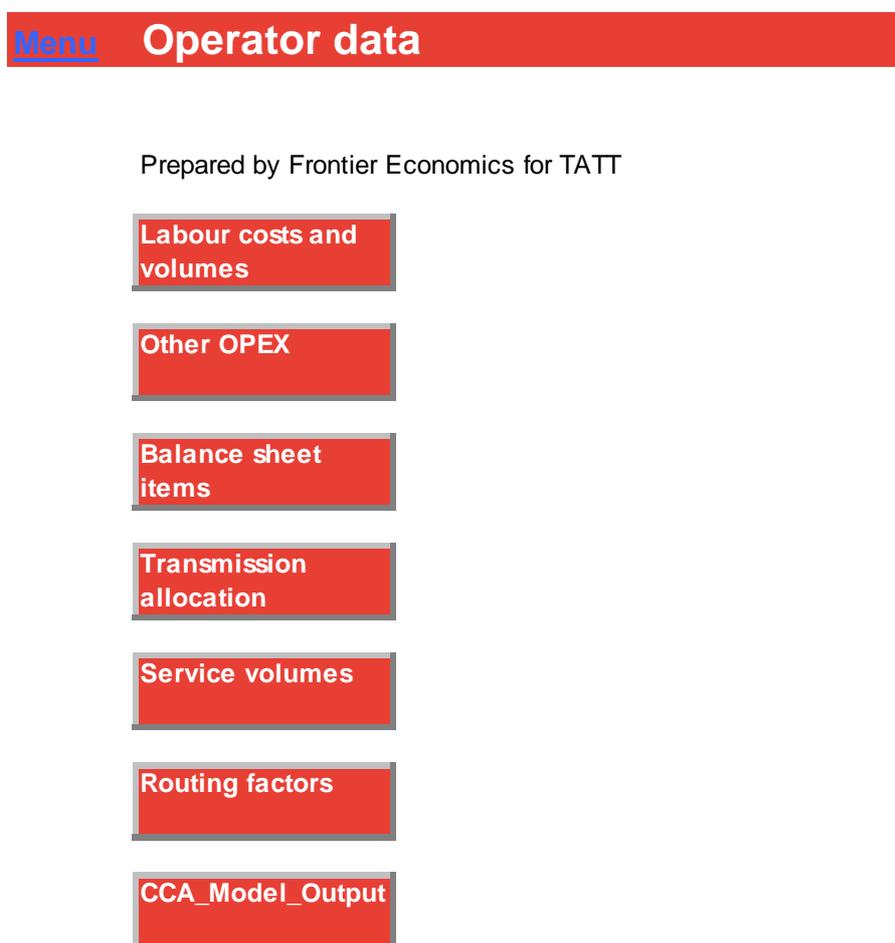
LRIC Cost Category		OCDXX	Inputs for Employee Drivers (TRUE if included)					
LRIC Cost Code	LRIC Cost Category Descriptions	Non-Support Costs	ED01	ED02	ED03	ED04	ED05	ED06
			Employee total	Employee network (inc. Management)	Employee M/C	spare	spare	spare
NA02	Network strategy, planning and procurement	TRUE	TRUE	TRUE				
NA03	Network management	TRUE	TRUE	TRUE				
NA04	Network field operations - outside plant	TRUE	TRUE	TRUE	TRUE			
NA05	Network field operations - other	TRUE	TRUE	TRUE				
NA06	spare	TRUE						
NA07	spare	TRUE						
NA08	spare	TRUE						
NA09	spare	TRUE						
NA10	spare	TRUE						
<b>Product Management</b>								
PM01	Retail product management	TRUE	TRUE					
PM02	Marketing and communications	TRUE	TRUE					
PM03	Sales	TRUE	TRUE					
PM04	Customer care	TRUE	TRUE					

Source: Frontier Economics

### 3.2.3 Operator data worksheets

This modelling section consists of seven sheets containing the concessionaire-specific input data used to populate the model (i.e., the costing and operational data provided in response to the LRAIC data request template file and the CCA costing data from the concessionaire-specific CCA model).

**Figure 14:** Screen Shot of 'Operator data' sheet



Source: Frontier Economics

### 'Labour costs and volumes' sheet

This sheet contains a table for concessionaire-specific labour cost and volume information required for the LRAIC model. This includes, for a predefined set of activities:

- All direct labour costs (including salaries, benefits and so on);
- Number of employees (full time equivalents – FTEs);
- Number of vehicles used; and
- Number of workstations used.

This is illustrated in the screenshot below.

**Figure 15:** Screen shot of 'Labour costs and volumes' sheet

Activity Category number	Activity category description	Notes	Total pay costs (£'000)	Number of employees (Full Time Equivalents)	Number of vehicles used (units)	Number of workstations (PCs/laptops)
NA01	Network executive management	Management of network activities and staff	100000	1	1	3
NA02	Network strategy, planning and procurement		200000	2	1	3
NA03	Network management	Day to day management of the functions of the network	300000	3	2	3
NA04	Network field operations - outside plant	Installation, repair, provisioning and maintenance of equipment not housed in network buildings such as cables, duct, masts, street cabinets	400000	4	2	3
NA05	Network field operations - other	Installation, repair, provisioning and maintenance of equipment housed in network buildings	500000	5	3	3
NA06	Spare 1					
NA07	Spare 2					
NA08	Spare 3					
NA09	Spare 4					
NA10	Spare 5					
PM01	Retail product management	Design and management of products, including pricing	100000	1	1	3
PM02	Marketing and communications	Design, commissioning and management of marketing and communications	200000	2	1	3
PM03	Sales		300000	3	2	3
PM04	Customer care	Management of existing customer for fault repairs, billing inquiries, changes to services etc.	400000	4	2	3

Source: Frontier Economics

The entire sheet is identical to the equally named sheet contained in the LRAIC data request template file. As such, the information contained in the worksheet sheet from that concessionaire's LRAIC data request template file is transposed into this worksheet.

### 'Other Opex' sheet

This sheet contains a table for concessionaire-specific operational expenditure information. This information should be transposed directly from the corresponding table contained in the LRAIC data request template file.

**Figure 16:** Screen Shot of 'Other Opex' sheet

OPEX category number	OPEX category description	Notes	Total Opex (TT\$)
NET01	Utilities (energy and fuel)	Energy, fuel and other utilities required for network equipment	50000
NET02	Site rental costs	Rental of sites for buildings and external equipment	50000
NET03	Network maintenance fees	Fees for 3rd party maintenance of equipment	50000
NET04	Frequency fees	Fees for usage of frequency	50000
NET05	Other regulatory fees	Other fees paid to the regulator	50000
NET06	Network insurance costs	Costs of insurance for network equipment	50000
NET07	Network transportation		50000
NET08	Leased transmission	Cost of transmission links leased from other concessionaires in Trinidad	50000
NET09	Leased building (co-location) space	Costs of leasing buildings or space within buildings	50000
NET10	Leased mast/tower (sharing)	Costs of leasing space on mast/towers operated by other concessionaires	50000
NET11	Other network costs	Other operational expenditure for the network not specified	50000
NET12			
NET13			

Source: Frontier Economics

### 'Balance sheet items' sheet

This sheet contains a table for concessionaire-specific balance sheet items. This information should be transposed directly from the corresponding table contained in the LRAIC data request template file.

**Figure 17:** Screen Shot of 'Balance Sheet Items' sheet

Balance sheet category number	Balance sheet category description	Notes	Opening value (TT\$)	Closing value (TT\$)	Average value in year (TT\$)
BS01	Cash and cash equivalents		50000	60000	55000
BS02	Investments		50000	60000	55000
BS03	Inventory - Network		50000	60000	55000
BS04	Inventory - Non Network		50000	60000	55000
BS05	AR - Wholesale		50000	60000	55000
BS06	AR - Retail		50000	60000	55000
BS07	Short term loans		-50000	-60000	-55000
BS08	AP - Employees		-50000	-60000	-55000
BS09	AP - Trade Creditors		-50000	-60000	-55000
BS10	Provisions		-50000	-60000	-55000
BS11	Vat Payable		-50000	-60000	-55000
BS12	Vat Receivable		50000	60000	55000
BS13	Deferred Income		-50000	-60000	-55000
BS14					
BS15					

Source: Frontier Economics

## 'Transmission allocation' sheet

This sheet contains an input data table setting out how a concessionaire's transmission capacity is split between different network elements.<sup>5</sup> This information should be transposed directly from the corresponding table contained in the LRAIC data request template file.

**Figure 18:** Screen Shot of 'Transmission allocation' sheet

Network element number	Network element description	Notes	TDM (e.g. SDH) network		IPM (e.g. Ethernet) network	
			Total capacity (T1/E1 equivalents)	Total capacity by length (T1/E1 km equivalents)	Total number of links	Total link length
TR-N1-N2	Transmission N1-N2	Voice (TDM) transmission between remote concentrators and local switches (or other concentrators)				
TR-N2-N2	Transmission N2-N2	Voice (TDM) transmission between 2 local switches				
TR-N2-N3	Transmission N2-N3	Voice (TDM) transmission between a local switch and a tandem switch				
TR-N3-N3	Transmission N3-N3	Voice (TDM) transmission between 2 tandem switches				
TR-N3-N4	Transmission N3-N4	Voice (TDM) transmission between a tandem switch and an international gateway				
TR-B1-B2	Transmission B1-B2	Packet data transmission between DSLAMMSAN and aggregation nodes				
TR-B2-B3	Transmission B2-B3	Packet data transmission between aggregation nodes and routers				

Source: Frontier Economics

## 'Service volumes' sheet

This sheet contains three tables for the service volume related input data required for the LRAIC model. This information should again be transposed directly from the corresponding table contained in the LRAIC data request template file.

<sup>5</sup> As set out in the LRAIC Specification Paper, there are two types of transmission equipment: (i) capacity dependent domestic transmission consists of network components for which the cost is dependent on the number and capacity of links but largely independent of the length of links, and (ii) length dependent domestic transmission consists of network components for which the cost is dependent on the length of links they serve (which may also be dependent on the number and capacity of links). For each of the network elements listed in the table, concessionaires need to provide details of the total capacity (in T1/E1 equivalents or E1 equivalents as appropriate) and the total length (in T1/E1 km equivalents, for example, a T1 link of 10km length should be recorded as 10 T1 km equivalents).

**Figure 19:** Screen Shot of 'Service volumes' sheet

Mobile services				
Service number	Service description	Notes	Units	Volume
MOB01	Mobile subscribers (active)		Number of subscribers	100000
MOB02	Mobile to mobile voice calls - on-net		Minutes (per second basis)	100000000
MOB03	Mobile to mobile voice calls - domestic off net		Minutes (per second basis)	100000000
MOB04	Mobile to fixed calls - domestic		Minutes (per second basis)	100000000
MOB05	Mobile to international calls		Minutes (per second basis)	100000000
MOB06	Wholesale mobile call origination - domestic		Minutes (per second basis)	100000000
MOB07	Wholesale mobile call origination - international		Minutes (per second basis)	100000000
MOB08	Domestic mobile call termination		Minutes (per second basis)	100000000
MOB09	International call termination		Minutes (per second basis)	100000000
MOB10	SMS - originated		Messages	100000000
MOB11	SMS - terminated		Messages	100000000
MOB12	MMS - originated		Messages	100000000
MOB13	MMS - termination		Messages	100000000

Source: Frontier Economics

### 'Routing factors' sheet

This sheet contains two tables setting out the routing factor data for fixed and mobile call services required for the LRAIC model.<sup>6</sup> This information should again be transposed directly from the corresponding table contained in the LRAIC data request template file.

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<sup>6</sup> Routing factors are used to describe the way in which a call makes use of different network elements.

**Figure 20:** Screen Shot of 'Routing factors' sheet

		R1T	MSAN	R2T	R3	R4	VOIP	III	CHET	R2
		Remote concentrator	MSAN	Digital local exchange	Digital tandem exchange	International switch centre (ISC)	VOIP soft switch or media gateway	Intelligent network platform (IN)	Cable headend equipment - Telephony	Packet switched aggregation node
Service number	Service description									
FCS01	Voice - fixed to fixed (onnet)									
FCS02	Voice - fixed to fixed (offnet)									
FCS03	International call from fixed									
FCS04	Call to domestic mobile from fixed									
FCS05	Dial up internet access from fixed									
FCS06	Other retail calls from fixed									
FCS07	Wholesale domestic fixed call origination									
FCS08	Wholesale international fixed call origination									
FCS09	Domestic fixed call termination									

Source: Frontier Economics

### 'CCA Model Output' sheet

This sheet contains four identically formatted tables in which the concessionaire-specific CCA results need to be entered. The tables relate to the four main asset groupings contained in the CCA model (i.e., mobile network assets, fixed network assets, network infrastructure assets, and non-network related assets).

Within each table, four CCA modelling outputs need to be transposed from the relevant CCA modelling file: (i) the CCA depreciation charge, (ii) the CCA capital employed value, (iii) the WIP value and (iv) the GRC value. This is illustrated in the screen shot below.

**Figure 21:** Screen Shot of 'CCA Model Output' sheet

Asset Category number	Asset category description	CCA Depreciation	CCA Capital employed	WIP	GRC
ACF001	Main distribution frame (MDF)	-	-	-	-
ACF002	Remote concentrator	-	-	-	-
ACF003	Digital local exchange	-	-	-	-
ACF004	Digital tandem exchange	-	-	-	-
ACF005	International switch centre (ISC)	-	-	-	-
ACF006	VOIP soft switch or media gateway	-	-	-	-
ACF007	Network management system	-	-	-	-
ACF008	Intelligent network platform (IN)	-	-	-	-
ACF009	Co-axial cable	-	-	-	-
ACF010	Twisted pair cable	-	-	-	-
ACF011	Access fibre	-	-	-	-
ACF012	HFC optical node	-	-	-	-
ACF013	Point to point wireless	-	-	-	-
ACF014	Point to multi-point wireless	-	-	-	-
ACF015	Pre-wiring of client premises and first time installations	-	-	-	-

Source: Frontier Economics

The entire sheet is identical to the results sheet (i.e.. 'CCA\_Model\_Outputs') contained in the CCA model template file. As such, the information contained in the worksheet sheet from the concessionaire's CCA model file is transposed into this worksheet.

### 3.2.4 Model inputs worksheets

This modelling section transforms the operator input data into the format required for the LRAIC modelling.

#### 'WACC Input' sheet

This sheet allows entering the cost of capital (WACC) estimates, as determined by the Authority in a separate study, required for the LRAIC modelling. There are two parts to the sheet: (i) in the top table, the current WACC estimates for each network technology need to be entered, and (ii) in the second part, the user needs to select the relevant technologies for the concessionaire under consideration (from a drop-down menu). This selection will then update the last table, setting out the WACC estimates which will feed into the LRAIC calculations.

**Figure 22:** Screen Shot of 'WACC Input' sheet

Menu <b>WACC Input</b>											
WACC Input data											
WACC Inputs											
	<table border="1"> <thead> <tr> <th colspan="2">Annual rate determination</th> </tr> </thead> <tbody> <tr> <td>Fixed wireline</td> <td>14.0%</td> </tr> <tr> <td>CATV</td> <td>13.5%</td> </tr> <tr> <td>Fixed wireless</td> <td>14.8%</td> </tr> <tr> <td>Mobile network</td> <td>15.3%</td> </tr> </tbody> </table>	Annual rate determination		Fixed wireline	14.0%	CATV	13.5%	Fixed wireless	14.8%	Mobile network	15.3%
Annual rate determination											
Fixed wireline	14.0%										
CATV	13.5%										
Fixed wireless	14.8%										
Mobile network	15.3%										
Mapping to model categories											
	<table border="1"> <thead> <tr> <th colspan="2">Concessionaire type</th> </tr> </thead> <tbody> <tr> <td>Network type</td> <td>Mobile only</td> </tr> </tbody> </table>	Concessionaire type		Network type	Mobile only						
Concessionaire type											
Network type	Mobile only										
	<table border="1"> <thead> <tr> <th colspan="2">Used in model</th> </tr> </thead> <tbody> <tr> <td>Fixed</td> <td>15.3%</td> </tr> <tr> <td>Mobile</td> <td>15.3%</td> </tr> <tr> <td>Common</td> <td>15.3%</td> </tr> </tbody> </table>	Used in model		Fixed	15.3%	Mobile	15.3%	Common	15.3%		
Used in model											
Fixed	15.3%										
Mobile	15.3%										
Common	15.3%										

**'LRIC Base Costs' sheet**

Using the mapping from CCA cost categories to LRIC cost categories, this sheet calculates the appropriate costs for each cost category by aggregating the CCA cost input data into non-pay expenditure, pay-related costs, CCA depreciation, CCA capital employed and GRC components as required for the LRIC calculations.

**Figure 23:** Screen Shot of 'LRIC Base Costs' sheet

LRIC Cost Category		Base Costs (TT\$ 000s)				
LRIC Cost Code	LRIC Cost Category Descriptions	Non-pay expenditure	Pay	CCA Depreciation	CCA Capital Employed	GRC
ACF030	spare			-	-	-
<b>Mobile Network Components</b>						
ACM001	Base station			10,000	100,000	200,000
ACM002	Base station controller			10,000	100,000	200,000
ACM003	Mobile switching centre			10,000	100,000	200,000
ACM004	GPR, GGSN and SGSN			10,000	100,000	200,000
ACM005	Short message service centre			10,000	100,000	200,000
ACM006	Voice mail system			10,000	100,000	200,000
ACM007	Home location register			10,000	100,000	200,000
ACM008	Network management system			10,000	100,000	200,000
ACM009	Signal transfer point			10,000	100,000	200,000
ACM010	BTS to BSC link			10,000	100,000	200,000
ACM011	Assets not used in T&T			-	-	-

Source: Frontier Economics

The sheet then filters these costs for the purpose of setting the base values for the “Other Cost Drivers” (OCD), excluding support costs which could result in circularities in the LRIC calculations.

### 3.2.5 LRIC calculation worksheets

This modelling section contains the calculations required to determine the cost of the business for a given level of demand (set of increments) and hence the incremental cost of the defined increments.

#### 'LRIC Summary' sheet

This sheet allows the user to select the increment to be costed in the previous section (see drop down menu in cell B6) and shows the resulting modelling outputs from this selection in a summary table. Below a “Table sheet” runs the model a number of times to cost all the defined increments

**Figure 24:** Screen Shot of 'LRIC Summary' sheet

LRIC Summary				
FAW	Fixed network (wireless)			
Cost Selected Increment (TT\$ M)				
	Base	Model	Incremental Cost	As %age of base
Non pay expenditure	1,400,000	1,400,000	-	-
Opex Pay	4,600,000	4,600,000	-	-
Depreciation	370,000	370,000	-	-
NRV & Capital employed	3,755,000	3,755,000	-	-
Total Cost	6,944,515	6,944,515	-	-

Cost All Increments (TT\$ M) - Pres F9 To Calculate					
Non pay expenditure	Non pay expenditure	Opex Pay	Depreciation	NRV & Capital employed	Total Cost
-	-	-	-	-	-
Base	-	-	-	-	-
Total Business	1,400,000	4,600,000	370,000	3,755,000	6,944,515
Network	650,893	2,488,146	259,071	2,564,340	3,790,454
Retail and other	749,107	2,111,854	110,929	1,190,660	3,154,061
Mobile network	372,266	1,279,631	146,726	1,457,146	2,021,766
Fixed network	276,945	1,238,148	111,119	1,093,887	1,785,577
Mobile core	226,260	812,703	99,955	994,665	1,290,136
Mobile access	147,005	467,126	46,771	462,261	731,630
Fixed core	263,942	1,019,754	95,391	940,396	1,511,967

Source: Frontier Economics

### 3.2.6 LRIC Plus mark up worksheets

This section calculates the incremental costs including mark ups for each LRAIC increment, by calculating common costs and mark ups.

The stages required to calculate LRIC plus a mark up are calculated in a sequential manner with each sheet carrying out a single part of the operation.

Each sheet is structured similarly with a column for each increment and each row containing data for a given cost category.

#### 'Modelled Cost By Category' sheet

This sheet shows the modelled cost for all increments by cost category. The results are compiled by a TABLE function which draws in information from the 'Modelled Costs' sheet.

#### 'Incremental Cost By Category' sheet

This sheet calculates the incremental cost for all increments by cost category by subtracting the modelled cost for the increment from the base cost. All underlying costing data is sourced from the 'Modelled Cost By Category' sheet.

**Figure 25: Screen Shot of 'Incremental Cost By Category' sheet**

Incremental Cost by Category												
This sheet calculates the incremental cost for all increments by cost category.												
LRIC Cost Category												
LRIC Cost Code	LRIC Cost Category	BS	TS	HS	SS	MS	FS	MS	MS	FS	FS	OTR
		Base	Total	Network	Fixed and other	Mobile network	Fixed network	Mobile core	Mobile access	Fixed core	Fixed access	Other services
<b>Fixed Network Categories</b>												
ACF001	Man distribution frame	-	25,000	25,000	-	-	25,000	-	-	-	25,000	-
ACF002	Remote switching unit	-	25,000	25,000	-	-	25,000	-	-	10,000	10,000	-
ACF003	Digital local exchange	-	25,000	25,000	-	-	25,000	-	-	7,500	7,500	-
ACF004	Digital tandem exchange	-	25,000	25,000	-	-	25,000	-	-	25,000	-	-
ACF005	International switch system	-	25,000	25,000	-	-	25,000	-	-	25,000	-	-
ACF006	VOIP soft switch or media gateway	-	25,000	25,000	-	-	25,000	-	-	25,000	-	-
ACF007	Network management system	-	25,000	25,000	-	-	25,000	-	-	25,000	-	-
ACF008	Intelligent network platform	-	25,000	25,000	-	-	25,000	-	-	25,000	-	-
ACF009	Coupler cable	-	25,000	25,000	-	-	25,000	-	-	-	25,000	-
ACF010	Twisted pair cable	-	25,000	25,000	-	-	25,000	-	-	-	25,000	-
ACF011	Access line	-	25,000	25,000	-	-	25,000	-	-	-	25,000	-
ACF012	IPF optical node	-	25,000	25,000	-	-	25,000	-	-	-	25,000	-
ACF013	Point to point wireless	-	25,000	25,000	-	-	25,000	-	-	-	25,000	-
ACF014	Point to multi-point wireless	-	25,000	25,000	-	-	25,000	-	-	-	25,000	-
ACF015	Provision of client premises and BSL line installation	-	25,000	25,000	-	-	25,000	-	-	-	25,000	-
ACF016	DGLAM	-	25,000	25,000	-	-	25,000	-	-	25,000	-	-
ACF017	MISAM	-	25,000	25,000	-	-	25,000	-	-	15,000	5,000	-
ACF018	Cable headend equipment - television broadcast	-	25,000	25,000	-	-	25,000	-	-	25,000	-	-
ACF019	Cable headend equipment - DSSS receive	-	25,000	25,000	-	-	25,000	-	-	15,000	5,000	-
ACF020	Cable headend equipment - Telephony	-	25,000	25,000	-	-	25,000	-	-	25,000	-	-
ACF021	Packet switched aggregation node	-	25,000	25,000	-	-	25,000	-	-	25,000	-	-
ACF022	Packet switched router	-	25,000	25,000	-	-	25,000	-	-	25,000	-	-
ACF023	Broadband receive access server	-	25,000	25,000	-	-	25,000	-	-	25,000	-	-
ACF024	Assets not used in T&T	-	25,000	25,000	-	-	25,000	-	-	-	-	25,000

Source: Frontier Economics

**'Marked up Cost By Category' sheet**

This sheet calculates the incremental cost plus mark up for all increments by cost category. This is undertaken by applying the mark ups to the incremental cost values for each cost category. (reported in the 'Incremental Cost By Category' sheet, discussed above).

**Figure 26:** Screen Shot of 'Marked up Cost By Category' sheet

LRIC Cost Category		Mobile access	Mobile core	Fixed network	Mobile network	Retail and other	Network	Total Business
ACM000	spare	-	-	-	-	-	-	-
<b>Network Infrastructure and Support Equipment</b>								
ACID01	Duct	-	-	-	-	-	-	-
ACID02	Local loop poles	-	-	-	-	-	-	-
ACID03	Signalling equipment	-	-	28,500	-	-	28,500	28,500
ACID04	Transmission Infrastructure	-	-	28,500	-	-	28,500	28,500
ACID05	Transmission equipment - SDH	-	-	28,500	-	-	28,500	28,500
ACID06	Transmission equipment - PDH	-	-	28,500	-	-	28,500	28,500
ACID07	Power equipment	7,125	16,625	4,750	23,750	-	28,500	28,500
ACID08	Network buildings	2,850	24,225	1,425	27,075	-	28,500	28,500
ACID09	Masts & towers	-	28,500	-	28,500	-	28,500	28,500
ACID10	Network land	2,850	24,225	1,425	27,075	-	28,500	28,500
ACID11	Motor vehicles - network	7,125	7,125	14,250	14,250	-	28,500	28,500
ACID12	Fibre cables (core)	-	-	28,500	-	-	28,500	28,500
ACID13	Microwave transmission equipment (core)	-	-	28,500	-	-	28,500	28,500
ACID14	Assets not used in T&T	-	-	-	-	28,500	-	28,500
ACID15	International subsea cables	-	-	28,500	-	-	28,500	28,500
ACID16	spare	-	-	-	-	-	-	-
ACID17	spare	-	-	-	-	-	-	-

Source: Frontier Economics

### *'Mark up by category' sheet*

This sheet, which is for information purposes only, shows the absolute mark up for each increment by subtracting the incremental cost for the increment from the incremental costs plus mark up for the increment.

### 3.2.7 Service costing worksheets

Within this modelling section, LRAIC cost estimates for each service are derived by allocating the incremental costs for each LRAIC cost category to the service provided by the concessionaire (i.e., based on the route factor information).

### *'Total usage by element' sheet*

This sheet derives the total usage of each network component. This is undertaken by multiplying the total volumes for each service with the routing factors of this service for each network component and then summing these up across all services.

**Figure 27:** Screen Shot of 'Total usage by element' sheet

Service volumes		Volume	FAC	FAM	MIS	NET	NOS	NET	IS	ISG	TRANS
Service Number	Service Description		Fixed access (calls)	Fixed access (minutes)	Revenue (access and service)	Revenue (access and service)	Local charge (calls/minutes)	Local charge (calls/minutes)	Fixed exchange	International gateway	Transmission EC
PC300	International call from fixed	1,000,000	-	1,000,000 £	-	1,000,000 £	-	1,000,000 £	1,000,000 £	1,000,000 £	1,000,000 £
PC304	Call to domestic mobile from fixed	1,000,000	-	1,000,000 £	-	1,000,000 £	-	1,000,000 £	1,000,000 £	-	1,000,000 £
PC305	Dial up internet access from fixed	-	-	-	-	-	-	-	-	-	-
PC306	Other retail calls from fixed	-	-	-	-	-	-	-	-	-	-
PC307	Wholesale domestic fixed call origination	-	-	-	-	-	-	-	-	-	-
PC308	Wholesale international fixed call origination	-	-	-	-	-	-	-	-	-	-
PC309	Domestic fixed call termination	1,000,000	-	1,000,000 £	-	1,000,000 £	-	1,000,000 £	1,000,000 £	-	1,000,000 £
PC310	International fixed call termination	1,000,000	-	1,000,000 £	-	1,000,000 £	-	1,000,000 £	1,000,000 £	-	1,000,000 £
PC311	Transit between domestic operators	1,000,000	-	-	-	-	-	-	1,000,000 £	-	-
PC312	Transit from international to domestic	1,000,000	-	-	-	-	-	-	1,000,000 £	1,000,000 £	-
PC313	Transit from domestic to international	-	-	-	-	-	-	-	-	-	-
PC314	Spam	-	-	-	-	-	-	-	-	-	-
PC315	Spam	-	-	-	-	-	-	-	-	-	-
PC316	Spam	-	-	-	-	-	-	-	-	-	-
PC317	Spam	-	-	-	-	-	-	-	-	-	-
PC318	Spam	-	-	-	-	-	-	-	-	-	-
PC319	Spam	-	-	-	-	-	-	-	-	-	-
PC320	Spam	-	-	-	-	-	-	-	-	-	-
MIS01	Mobile subscribers (active)	100,000	-	-	-	-	-	-	-	-	-
MIS02	Mobile to mobile voice calls - on-net	100,000,000	-	-	-	-	-	-	-	-	-
MIS03	Mobile to mobile voice calls - domestic off-net	100,000,000	-	-	-	-	-	-	-	-	-

Source: Frontier Economics

**'Network Element Costing' sheet**

This sheet derives the total cost of each network element defined within the LRAIC model. This is undertaken by multiplying the directly allocated costs of each network element with the capacity and distance related domestic transmission network capacity. The sheet further presents unit costs for each network element based on the total network element costs above and the relevant traffic volumes.

**Figure 28:** Screen Shot of 'Network Element Costing' sheet

Network Element				Total	Usage	Unit cost
Element abbreviation	Network Element Description	Transmission domestic (capacity)	Transmission domestic (length)	Total cost	Total volume	LRAIC
TR-B2-B3	Transmission B2-B3	-	-	-	-	-
TR-B3-B4	Transmission B3-B4	-	-	-	-	-
TR-LL	Transmission leased lines	-	-	-	-	-
TR-IX	Transmission interconnection links	141	64	205	500,000,000	0.0000
TR-INT	Transmission international	141	64	303	200,000,000	0.0000
BSS	Base station subsystem	-	-	708	922,163,934	0.0000
MSC	Mobile switching centre	-	-	217	1,075,382,514	0.0000
MPD	Mobile packet data network	-	-	217	2,000,000	0.0001
M-LR	Mobile location registers	-	-	217	100,000	0.0022
SMS	SMS messaging centre	-	-	217	200,000,000	0.0000
TR-BSS	BSS transmission	141	64	205	900,306,011	0.0000
TR-BSS-M	BSS-MSC transmission	141	64	205	900,306,011	0.0000
TR-MSC-M	MSC-MSC transmission	141	64	205	275,076,503	0.0000
TR-MPD	MPD transmission	141	64	205	2,000,000	0.0001
TR-TV	Television transmission	-	-	-	-	-
TR-Ethernet	Ethernet transmission	-	-	-	-	-
FAB	Fixed access (shared access - broadband)	-	-	-	-	-
TV	Television broadcast	-	-	-	-	-
<b>Total</b>		<b>647</b>	<b>383</b>	<b>1,229</b>		

Source: Frontier Economics

**'Service Cost' sheet**

This sheet presents the main outputs of the LRAIC model: unit cost estimates for each service provided by the relevant concessionaire. These unit costs per service are derived by combining the unit cost per network component with the routing factor information for each service.

**Figure 29.** Screen shot of 'Service Cost' sheet

Service volumes		TR-IX	TR-INT	BSS	MSC	MPD	M-LR	SMS	TR-BSS	TR-BSS-M	TR-MSC	TR-MPD
Service Identifier	Service Description	Transmission interconnection links	Transmission international	Base station subsystem	Mobile switching centre	Mobile packet data network	Mobile location registers	SMS messaging centre	BSS transmission	BSS-MSC transmission	MSC-MSC transmission	MPD transmission
<b>Mobile services</b>												
MOB01	Mobile subscribers (active)	-	-	-	-	-	0.0022	-	-	-	-	-
MOB02	Mobile to mobile voice calls - on-net	-	-	0.0000	0.0000	-	-	-	0.0000	0.0000	0.0000	-
MOB03	Mobile to mobile voice calls - domestic off-net	0.0000	-	0.0000	0.0000	-	-	-	0.0000	0.0000	0.0000	-
MOB04	Mobile to fixed calls - domestic	0.0000	-	0.0000	0.0000	-	-	-	0.0000	0.0000	0.0000	-
MOB05	Mobile to international calls	-	0.0000	0.0000	0.0000	-	-	-	0.0000	0.0000	0.0000	-
MOB06	Wholesale mobile call origination - domestic	0.0000	-	0.0000	0.0000	-	-	-	0.0000	0.0000	0.0000	-
MOB07	Wholesale mobile call origination - international	0.0000	-	0.0000	0.0000	-	-	-	0.0000	0.0000	0.0000	-
MOB08	Domestic mobile call termination	0.0000	-	0.0000	0.0000	-	-	-	0.0000	0.0000	0.0000	-
MOB09	International call termination	-	0.0000	0.0000	0.0000	-	-	-	0.0000	0.0000	0.0000	-
MOB10	SMS - originated	-	-	0.0000	0.0000	-	-	0.0000	0.0000	0.0000	0.0000	-
MOB11	SMS - terminated	-	-	0.0000	0.0000	-	-	0.0000	0.0000	0.0000	0.0000	-
MOB12	MMS - originated	-	-	-	-	-	-	-	-	-	-	-
MOB13	MMS - termination	-	-	-	-	-	-	-	-	-	-	-
MOB14	Packet switched data (GPRS)	-	-	0.0000	-	0.0001	-	-	-	-	-	0.0001
MOB15	Packet switched data (EVDO)	-	-	0.0000	-	0.0001	-	-	-	-	-	0.0001
MOB16	Spine	-	-	-	-	-	-	-	-	-	-	-
MOB17	Spine	-	-	-	-	-	-	-	-	-	-	-
MOB18	Spine	-	-	-	-	-	-	-	-	-	-	-
MOB19	Spine	-	-	-	-	-	-	-	-	-	-	-
MOB20	Spine	-	-	-	-	-	-	-	-	-	-	-
<b>Total</b>		<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0001</b>	<b>0.0022</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0000</b>	<b>0.0001</b>

Source: Frontier Economics

