ACCC Fixed Line Services Model – Version 1.2

29 May 2013

Contents

1 Introduction

1.1 Purpose of this document

This document is an operations handbook for the ACCC's Fixed Line Services Model (FLSM). The purposes of this document are:

- to provide some brief background to the model;

- to explain the workings and structure of the model;

- to provide guidance to facilitate operation of the model by users.

This document does *not* set out to justify the structure of the model.

The FLSM is a revised version of the previous building block model (initially called the OVUM BBM) which was used to estimate prices in the September 2010 *Review of the 1997 telecommunications access pricing principles for fixed line services*. The ACCC has made substantial revisions to the initial model in response to submissions and further information received since September 2010.

On 9 March 2011, the ACCC engaged Marsden Jacob Associates Pty Ltd (MJA) to undertake the following tasks:

- check the FLSM to ensure that all formulas were working as intended

- remove any redundant code that had no impact on the function of the model, and

- ensure a consistent approach in the presentation of the FLSM inputs and outputs.

MJA delivered the checked model and updated user manual to the ACCC on 23 March 2011.

This document is best read with the model open before the reader. The Model Operation chapter of this document is laid out in the same order as the model is implemented in the Excel workbook. Note that a user need not have detailed Excel skills or knowledge to use the model, but a basic knowledge is expected. If the intention is to modify the model or to investigate the algorithms used, then some advanced Excel skills may be required to understand the details of how data is processed.

FLSM Version 1.1 reflected the final access determinations for fixed line services released in July 2011. This manual is available on the ACCC's website.[1]

FLSM Version 1.2 is based on FLSM Version 1.1, but reflects the ACCC's modifications in order to estimate prices for wholesale ADSL.

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[1] http://www.accc.gov.au/content/index.phtml?itemId=1044279.

1.2 Purpose of the Model

The ACCC's Fixed Line Services Model has been designed to facilitate the application of a building block approach to set prices for declared fixed access services. The ACCC intends to release Version 1.2 of the model for comment by the telecommunications industry.
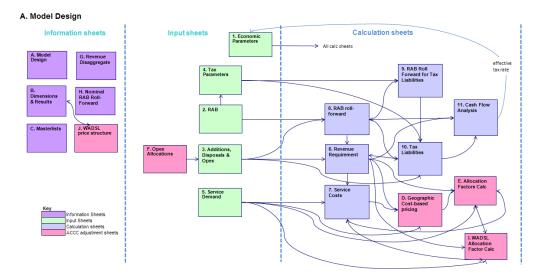
2 Model Design

The model has been developed using a standard software package, namely Microsoft® Excel. However, total functionality cannot be guaranteed for users with a version older than Microsoft® Excel 2003. Furthermore, compatibility issues cannot be completely ruled-out for versions of Microsoft® Excel newer than 2003. No extra add-ins to Excel are required to run the model. In addition, all other options should be set to default. In particular, the option for 'Workbook Calculations' must be set to Automatic.

2.1　Model schematic

An overview of the model is illustrated in Figure 2.1 below.

Figure 2.1: High-level structure of the model

Each box depicted in Figure 2.1 represents a separate worksheet in the model. The main flows of information between the worksheets are shown with arrows. The contents and calculations performed in each worksheet are as follows:

Figure 2.2: Model worksheets

Worksheet	Purpose
Cover	Title, date and other identifying information.
A. Model Design	Schematic of model for easy reference.
B. Dimensions & Results	Presents summary of results and includes a control panel for setting a number of relevant study parameters.
C. Masterlists	Input sheet for master lists used in model.
D. Geo Cost-based pricing	Separates revenues and costs into bands according to geographic location.
E. Allocation Factors Calc	Presents the calculations to derive the FLSM cost allocation factors.
F. Opex Allocations	Displays the opex forecasts and the allocation of opex to each of the asset classes.
G. Revenue Disaggregate	To disaggregate the revenue requirement into individual building blocks for each declared service.
H. Nominal RAB Roll-Forward	Rolls the regulatory asset base forward, in nominal terms.
I. WADSL Allocation Factor Calc	Presents the calculations to derive the wholesale ADSL cost allocation factors.
J. WADSL price structure	Outlines the calculations necessary to derive the port price and AGVC/VLAN price and the port prices in each of the zones for wholesale ADSL.
1. Economic Parameters	Input sheet for WACC parameters.
2. RAB	Input sheet for Opening RAB and RAB parameters.
3. Additions, Disposals & Opex	Input sheet for capital additions and disposals each year and annual operating costs and overheads.
4. Tax Parameters	Input sheet for Opening RAB for tax purposes, RAB tax parameters, and customer contributions for tax purposes.
5. Service Demand	Input sheet for annual demands for each service.
6. Revenue Requirement	Calculates the revenue requirement (RR).
7. Service Costs	Calculates the costs allocated to each service and the unit prices for each service.
8. RAB Roll-Forward	Calculates the RAB at the beginning and end of each year; and regulatory depreciation.
9. RAB Roll-Forward for Tax	Calculates the RAB for tax purposes at the beginning and end of each year; and tax depreciation.
10. Tax Liabilities	Calculates the tax payable.

Worksheet	Purpose
11. Cash Flow Analysis	Calculates effective tax rate for equity from pre- and post-tax cash flows.

The model has used colour coding to ensure cells are easily identified. The styles used are shown in the diagram below.

Figure 2.3: Styles used in the model

Model Conventions

Red writing	User inputs
Black writing	All other cells
Grey with white writing	Header and start of table

NB: all cost values are in Australian Dollars (AUD) unless otherwise stated.

These styles can be summarised as follows:

- Red writing indicates an input. The user may enter a value or replace a value.

- Black writing indicates a calculation or provides information on the structure or type of data.

- Grey with white writing indicates a header and start of table. Each worksheet has areas ("tables") that relate to a type of calculation or processing of data. These areas are separated from each other by a header row.

Use of the auditing toolbar functions is highly recommended to understand the model workings. Due to the model's sophistication, it is not possible to describe details of all functions in the documentation.

Each sheet is divided into a number of sections. Tables are numbered 1, 2, 3, etc, one below the other within each section. Table numbering reflects the sheet number and section number as well as the table e.g., 3.1.1, 3.1.2, etc. This means that some worksheets can have many functions and many rows, but the functional areas are still clearly delineated.

2.2 Model overview

The model has a building block design to allocate capital charges and operating costs and overheads to services and hence calculate prices for declared wholesale services. The ACCC's 'Review of the 1997 telecommunications access pricing principles for fixed line services, Draft report', released in September 2010,

describes the way the building block model is to be implemented.[2] See section 4.5 of the September 2010 Draft Report for a description of the building block framework applied to the FLSM. Chapter 4 of the ACCC's April 2011 Discussion Paper describes the transition to a building block model in greater detail.[3]

The model is designed to calculate the revenue requirement and then estimate prices, for a list of declared wholesale services. The default list of **Services** is:

- Unconditioned Local Loop Service (ULLS);

- Wholesale Line Rental (WLR);

- PSTN Originating & Terminating Access (PSTN);

- Local Carriage Service (LCS);

- Line Sharing Service (LSS); and

- Wholesale ADSL (WADSL).

The model makes provision for up to 7 services (that is, there is provision for an extra service).

Calculations in the model are primarily undertaken in real terms, i.e., at the price level for the first year of the estimation period (the base year), except for the calculation of tax liabilities and cashflows, which must be undertaken in nominal terms.[4] Real price estimates are inflated by the assumed inflation index to produce nominal prices.

Also, land is treated differently to other assets as it is an appreciating asset. After being added to the current year's opening RAB value, land is indexed by inflation before it is rolled into the next regulatory year's opening RAB.

The calculation of the revenue requirement begins from an opening Regulatory Asset Base (**RAB**). The assets in the RAB are divided into assets for the Customer Access Network (**CAN**) and assets for the Core network (**Core**).

CAN and Core assets are each divided into Asset Classes. An **Asset Class** is a group of related and similar assets. Examples of typical Core Asset Classes are:

- Switching Equipment – Local;

- Switching Equipment – Trunk;

- Switching Equipment – Other;

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[2]   This report is available on the ACCC's website at the following link:
      http://www.accc.gov.au/content/index.phtml/itemId/904344.

[3]   The ACCC's April 2011 Discussion Paper and July 2011 Final Report are
      available on the ACCC's website at the following link:
      http://www.accc.gov.au/content/index.phtml/itemId/1044279.

[4]   Worksheet *H. Nominal RAB Roll-Forward* also uses nominal values.

- Inter-exchange Cables;

- Transmission Equipment;

- Radio Bearer Equipment.

There is the facility to add extra classes, up to a maximum of 20 in each of the CAN and Core. However, the model does not automatically generate the required formula and linkages for new asset classes. These must be generated by the user. For this reason, particular care must be exercised if further asset classes are added.

The model assumes that all capital assets have the same real Weighted Average Cost of Capital (**WACC**) throughout the period under study.[5] That is, the model assumes only one real WACC value. The real vanilla WACC is the particular WACC applied in the model.

The **Opening RAB** specifies the depreciated regulatory value of the assets in each asset class at the end the previous financial year (that is, at 30 June of the relevant year).

Additions to each asset class (through investments and asset acquisitions) and **Disposals** from each asset class may occur each year. The model works with **Net Additions** (Additions less Disposals), since additions and disposals are assumed to occur evenly through the year. This is included in the model as occurring at the same point in time. The model therefore assumes that additions and disposals occur in the middle of the financial year (that is, on 1 January of the relevant year). A half-year WACC adjustment is made to compensate for the loss of return for the half year period before a return on capital expenditure is provided. The regulatory value for an asset class at the beginning of a financial year is the value from the end of the previous year.

The assets are then depreciated over the year; the depreciation is subtracted to provide the regulatory value of each asset class at the end of the financial year. This procedure is called **Rolling Forward the RAB**. It can be repeated for as many years as required. The model makes provision for 12 years of roll-forward.

Depreciation charges are calculated for each asset class. The straight-line method for depreciation is used throughout the FLSM. However, there is an option to use the diminishing value method for tax depreciation of new assets.

The model assumes that all new Core asset classes use the same depreciation type; and similarly that all new CAN asset classes use the same depreciation type.

Operating costs and **Overheads** are also incurred during the year. These costs must be specified for each specific asset class through the model inputs.

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[5] Note, however, that the WACC has been updated (from the WACC used for the July 2011 FADs) for all Core asset classes for the purpose of estimating prices for the wholesale ADSL draft FAD. As a result, a second WACC table has been added to the model to apply to the relevant asset classes in the relevant years.

The revenue requirement generated from an asset class in a given financial year is taken to be the sum of the following items:

- The capital cost of the assets at the beginning of the year (that is, the regulatory value multiplied by the WACC);

- The depreciation charge for the asset class during the year;

- The operating costs and overheads allocated to the asset class in the year; and

- A proportion of the tax incurred in the year.

The revenue requirement is allocated to services using **Allocation Factors**. An Allocation Factor is the proportion of the revenue requirement for a specific asset class to be allocated to a service. That is, for each service there is an allocation factor (which is a fraction between 0 and 1, inclusive) for each asset class that specifies how much of the revenue requirement for that asset class is to be allocated to the service.

For each service, the sum of the revenue requirement allocations from each asset class is the revenue requirement for that service.

The **Service Price** (whether real or nominal) can then be calculated by dividing the revenue requirement allocation for the service by the **Annual Demand** for that service. The annual demand is specified as an input. The model assumes that there is an annual demand for each service in each year.

For the *Local Carriage Service*, it is assumed that the annual demand is in minutes. The model converts the price per minute for this service to a price per call by multiplying the price per minute by the **Average Call Duration**. The model assumes that the average call duration is specified by the user for each year.

The price structure for the wholesale ADSL service is estimated in a new worksheet, *J. WADSL price structure*, which converts the estimated wholesale ADSL service price into a separate port price and an AGVC/VLAN[6] charge (per megabit per second (Mbps)).

2.3 Using the model

The user must provide a complete dataset in order for the model to provide correct results. The amount of data required depends on the choices the user makes in the *B. Dimensions & Results* worksheet. The aim of this section is to guide the user through an initial use of the model and a first exploration of the results. The user will then find that they can make more changes and examine other options. The detailed descriptions of the operation of the model are deferred to chapter 3.

The user should track any changes to the model and utilise version control as appropriate. As a minimum it is recommended that the user keep a master copy of

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[6]   Aggregating Virtual Circuit/Virtual Local Area Network.

the original model so that it is always available in case changes are made that cannot be corrected or if the files are accidentally deleted.

The user should avoid using "drag and drop" to move input data, since this may corrupt the flow of data in the model. Other than that, changing the input values has no damaging effect on the workings of the model. However, changes to the data can make the results misleading or incorrect. Inputting inappropriate values, e.g. inputting text in place of numbers, can also cause errors in the calculations, giving #VALUE! and #DIV/0! errors. Altering formulae is more serious and should only be done with care and after due study.

Changing the names of named arrays, named cells or the names of worksheets is not recommended as this is very likely to give errors.

Note that the model uses Data Grouping to allow collapsed / expanded views of the data. To alter the view you need to click on the + or – symbol for the relevant rows.

Initial choices

In the first instance, the user should make appropriate choices in worksheet *B. Dimensions & Results*. Once these choices are made, conditional formatting of the input worksheets will help guide the user as to which inputs are required. The choices are listed in the block labelled "B.1 Dimensions". They are as follows:

- **Period**: this is the number of years for which the calculations are to be performed. (The base year is set in the input data for the RAB.)

- **Depreciation method**: Regulatory depreciation is limited to the straight-line method. However, the user can select the method by which tax depreciation for new assets is calculated for each of the CAN (Customer Access Network) and Core (Core Network) assets. The user should choose from the drop-down list. There are three choices:

  - *Straight-line*: straight-line depreciation is used

  - *Diminishing value 150%*

  - *Diminishing value 200%*

  All existing assets use straight-line depreciation only.

- **Number of asset classes**: the current model uses 10 CAN asset classes and 12 Core asset classes (with the addition of one asset class, 'Data Equipment', for estimating wholesale ADSL prices). If the user changes the number of asset classes used, these numbers must also be adjusted.

Once these choices have been made, the user will be guided by the formatting in the input worksheets in filling out (or modifying) the input data.

In general, inputs are only required in cells where the text colour is red.

Entering (or modifying) data

Economic parameters

In tables **1.1 WACC parameters** and **1.2 WACC parameters for WADSL** in worksheet *1. Economic Parameters*, the real vanilla WACC is calculated at the bottom of each table from the input numbers listed above.

The user may make changes to the Nominal Risk Free Rate, Debt ratio, Nominal Debt Risk Premium, Debt Raising Costs, Equity issuance costs, Nominal Market Risk Premium, Utilisation of Imputation (Franking) Credits, Expected inflation, Corporate Tax Rate and Equity Beta.

These inputs are grouped here to encourage consistency between estimates. It is up to the user to ensure this consistency and the plausibility of the estimates.

Data for rolling forward the RAB

The user may then turn to the **Opening RAB** in worksheet *2. RAB*. In **table 2.1 Regulatory Asset Base – Opening Value and Parameters** the user will find the depreciated regulatory values for a number of asset classes for each of CAN and Core assets at a particular date (financial year end). At the top of the table there is an option to change the valuation year: this value sets the dates used in the model. The default value is 2009, indicating 2008/2009.

The date chosen should be the base year for calculations.

The user may then enter the depreciated regulatory values (**Depreciated Value**) in table 2.1. The depreciated regulatory values should be in million AUD. The user must also specify an **Average Asset Life** and **Remaining Asset Life** for each asset class.

The user may then complete the capital additions and disposals and operating costs (and overheads) in worksheet *3. Additions, Disposals & Opex*. Data is required for each year and all values should be in million AUD.

The allocation of operating costs (and overheads) to individual asset classes in table **3.1 Operating Cost and Overheads specified for each Asset Class** is linked to table **F.2 Allocation of indirect and direct operating expenditure to asset classes** in worksheet *F. Opex Allocations*.

In order to change operating expenses and overheads the user should consult this worksheet. In table **F.1.1 Direct opex** the user can insert direct operating expenses for the major category CAN and Core and specifically for the LSS. Overhead costs are calculated using a mark-up specified in table **F.1.2 Mark-up for indirect opex (overheads)**. Operating expenses related to LSS are inclusive of overheads; the totals in table F.1.3 make adjustments to take this into account. The totals in table F.1.3 are allocated to asset classes in table F.2. Here the user has the option to change the allocation factors used. An alternative to changing input values in worksheet *F. Opex Allocations* is to override the formulas in table 3.1 and input values directly. However, action of this type is generally not recommended as the model may be corrupted.

Operating expenditure for the data equipment asset class—which is used to supply wholesale ADSL, but was not in version 1.2 of the FLSM—has been entered directly into table F.2. The ACCC's methodology for calculating this value is described in chapter 4 of the March 2013 draft report for the wholesale ADSL FAD.

Once changes have been made to operating expenses and overheads, the user must give values for capital additions to and disposals from each asset class in each year. This is done in tables **3.2 Asset Class Additions** and **3.3 Asset Class Disposals**. All values should be in million AUD. The user can choose to enter just net additions in table 3.2 and leave table 3.3 blank if there are no asset class disposals.

At this point, all the data required to roll forward the RAB has been specified.

Tax Parameters

Worksheet *4. Tax Parameters* is used to enter values to be used for the tax calculations. Values for Opening tax value must be input by the user. The values for tax asset lives and remaining tax lives are linked to table 2.1. The user may change these values by inputting alternative values over each cell reference. Note, this action cannot be undone. Users should retain a copy of the original spreadsheet to revert to the default approach.

Any tax losses carried forward can be specified in table 4.2 as **Tax Loss Carried Forward**. Any tax losses should be entered as negative numbers.

Table **4.3 Additional taxable income** is used to enter any additional customer contributions that add to the income assessed for tax purposes. It may not be necessary in the first instance.

At this point, all the data required for the tax calculations has been specified.

Services

The user can then turn to services. If the default list is not adequate, the user should edit the list of **Services** in worksheet *C. Masterlists*.

In worksheet *5. Service Demand*, the user should specify the annual demand for each service. This is done in table **5.1 Annual Demand for each Service**. The units of demand will normally be *Lines, SIOs, Calls* or *Minutes*. For *Local Carriage Service*, the user must complete table **5.2 Average Call Duration for Local Carriage Service** for each relevant year. Years not used are shaded out.

This completes the initial dataset required for the model.

Model results

The user will see the results in terms of **Service Prices** displayed in worksheet *B. Dimensions & Results*. The calculated prices are given in both real and nominal terms. More details of the results may be found in worksheet *7. Service Costs*, table **7.2 Calculation of Service Revenues and Prices**.

When changing the choices in worksheet *B. Dimensions & Results*, the user should ensure that the relevant data has been entered in all sheets above.

Layout

To aid understanding, the worksheets are laid out consistently. In particular, values for a specific financial year generally appear in the same column in every sheet. Years that are not used are shaded out. This and other model conventions are further specified in worksheet *A. Model Design*.

Each of the calculation worksheets has several sections. The top section is labelled "Purpose". In general, calculations proceed down the page. In some cases data from other worksheets to be used in the calculations may be summarised at the top of the worksheet. In addition, some worksheets will have summary tables at the end.

3 Model Operation

3.1 Introduction

This chapter describes the way the model operates and provides a detailed description of the calculations performed in each worksheet.

The model has a number of specific conventions to assist the user.

Input cells where data is to be provided by the user have **red** fonts; all other cells have **black** fonts. Cells that are not used due to user selection are greyed out.

All asset values and operating costs (and overheads) are input in million Australian Dollars (AUD) in the base year's dollar value (i.e. real terms). Service prices are expressed in Australian dollars (or cents) per unit. These are also converted to nominal prices using the input inflation rate.

The model is comprised of a number of worksheets in a single Excel workbook. The purpose, operation and output of each sheet are explained in the following sections.

The recommended approach to gaining an understanding of the model is to work through each sheet in turn, starting with inputs, moving to calculations and then results. In the following sections, each worksheet is described in turn.

3.2 Worksheet Cover

The worksheet identifies the model name, version and date.

3.3 Worksheet A. Model Design

This worksheet provides a block diagram of the model design (*cf.* Figure 2.1) and a list of model conventions.

3.4 Worksheet B. Dimensions & Results

This worksheet provides broad user choices and is used to view the final model results.

The user controls are located in a block labelled "Dimensions". The meaning of these controls is as follows.

Period

Select model calculation period (years)
The user may select a period between one and twelve years. This is the number of years that the RAB will be rolled forward and for which results will be provided. In the input worksheets and calculation worksheets, years that

are not used are shaded out. Note, if the figure is changed the user must ensure that all inputs are available for the period.

Tax Depreciation method

Select Depreciation method for new CAN Asset Classes
Select Depreciation method for new Core Asset Classes
The user may choose a method from the drop-down list in each case. The choices are:

- o *Straight-line*: straight-line depreciation is used in rolling forward the RAB

- o *Diminishing value 150% (allows for accelerated depreciation for new assets)*

- o *Diminishing value 200% (allows for accelerated depreciation for new assets)*

For all existing assets*, straight-line depreciation* is the only option.

The five blocks labelled "Fixed Line Access Services" display the model calculated results in terms of service prices. The service prices are given in both real and nominal terms. The values are linked in from tables 7.2.2, 7.2.3, D.6.2, D.6.3, J.2.2 and J.3.2.

3.5 Worksheet C. Masterlists

The following master lists are maintained in this worksheet:

- CAN Asset Classes – the names of the CAN asset classes. The model provides for up to 20 CAN Asset Classes.

- Core Asset Classes – the names of the Core asset classes. The model provides for up to 20 Core Asset Classes.

- Services – the list of services for which service prices are to be calculated. The model provides for up to 7 Services.

- Years – the list of financial years used in the model. This list is calculated from the date entered in table 2.1. The model provides for up to 12 financial years (as specified in worksheet *B. Dimensions & Results*).

- Depreciation methods – the list of different depreciation methods available for new asset additions.

The user may change the CAN Asset Classes, Core Asset Classes and Services, if necessary. Note that changing the asset classes requires significant editing of inputs and formulae and should only be done with care and after due study of the model. In particular, the user should ensure that the relationship between an asset class and allocation factor remains correct.

3.6 Worksheet D. Geo Cost-based pricing

This worksheet outlines the calculations necessary to derive the cost of ducts and pipes and copper cables by band and determine the costs for ULLS and WLR in each of the four bands.

Table D.1 Demand forecasts and band proportions

Table D.1.1 contains the proportion of ULLS and WLR in each band. This is input for year 1.

Table D.1.2 splits the demand for ULLS, WLR, residual and total SIOs into the four bands. ULLS and WLR demands are obtained from worksheet *5. Service Demand*. Total SIOs are assumed to be unchanged. It is further assumed that the demand proportions remain unchanged in subsequent years, i.e. year 1 input from table D.1.1 is used in all years.

Table D.2 Cost relativities of each band to the Average

Table D.2.1 contains the cost relativities in each band. These are obtained from the Analysys cost model price relativities. When multiplied by the SIO proportions the relativities result in a weighted average of 1.

Table D.3 Ducts and pipes cost per band

This table calculates the cost of ducts and pipes for each band and the allocation factor used to allocate duct and pipes costs to services.

Table D.3.1 calculates the average annual revenue per line by taking the total revenue requirement for ducts and pipes (from worksheet *6. Revenue Requirement*) and dividing by the total number of SIOs (from D.1.2).

The monthly cost per band is calculated in Table D.3.2 by taking the relativities in table D.2.1 multiplied by the average annual revenue per line divided by 12.

Tables D.3.3 and D.3.4 calculate, for each year, ULLS and WLR's share of total revenue. These proportions are used in worksheet *7. Service Costs* to allocate ducts and pipes costs to services.

Table D.3.6 ensures that the cost per band multiplied by total demand for each band is equal to the total revenue requirement for ducts and pipes and the average revenue per line is equal to table D.3.1.

Table D.4 Copper cables costs per band

This table calculates the cost of copper cables for each band. The steps undertaken are the same as table D.3 but are applied to copper cables revenue.

Table D.5 Monthly indirect costs

The monthly indirect costs are the costs that are constant for ULLS and WLR for all bands. These are the total costs of all other asset classes in the model except for ducts and pipes and copper cables.

Table D.6 Nominal monthly prices by band

This table displays the nominal price of the four bands for ULLS and WLR for each year and the interim and final access determination prices.[7]

3.7 Worksheet E. Allocation Factor Calc

This worksheet shows the step by step calculations undertaken to obtain the cost allocation factors used in worksheet 7. *Service Costs*. The calculations undertaken to obtain cost allocation factors for wholesale ADSL occur on worksheet *I. WADSL Allocation Factor Calc*.

Table E.1 Summary of Inputs for Calculations

Table E.1.1 contains the unadjusted cost allocation factors obtained from the Analysys Cost Model (ACM). These factors are used as a base to calculate the final FLSM allocation factors. Note, that the allocations for ULLS and WLR for "Ducts and pipes" and "Copper cables" do NOT derive from this input. These reflect calculations in worksheet *D. Geo Cost-based pricing* and are shown in Table E.2.

Table E.1.2 sums the total revenue requirement for the CAN and Core excluding network land, network buildings/support, indirect capital assets, LSS equipment and data equipment. This total represents the total revenue requirement for direct network assets.

Table E.1.3 displays the costs allocated to each service in 2009/2010 for the following services: ULLS, WLR, PSTN OTA and LCS.

Table E.2 Geographic costing adjustment

This table takes the revenue share of ULLS and WLR for each year obtained from the *D. Geo Cost-based pricing* worksheet.

Table E.3 PSTN OTA Switching equipment adjustment

The switching equipment in the Core network has been over provisioned with peak demand occurring in 2002/2003. The ACM is an optimised model without this over provisioning. The cost allocation factor obtained from the ACM has been adjusted to take into account the over provisioning in the current Core network by taking the FLSM forecast demands divided by the total demand in 2002/2003.

Table E.4 PSTN OTA Transmission equipment adjustment

This table adjusts the PSTN OTA Transmission Equipment cost allocation factor to reflect the current and forecast usage pattern in the transmission asset class. Total traffic over the transmission network is forecast over the regulatory period and

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[7]   The IAD averaging period is 2010/2011 and 2011/2012; the FAD averaging period is 2011/2012, 2012/2013 and 2013/2014.

voice traffic's share of traffic is taken. The movement in voice traffic's share is applied to the Analysys 2008/2009 PSTN OTA Transmission Equipment cost allocation factor (rebased for actual 2008/2009 PSTN OTA demand).

Table E.5 Forecast demand adjustment

The demand forecasts in the ACM for 2008/2009 are different to actual demands. Table E.5 accounts for the difference between Analysys forecasts and actual demands for the asset classes and services not adjusted in tables E.2 to E.4.

Subsequent years of allocation factors are adjusted by the year to year percentage change in demand. This ensures that the underlying cost per unit of service is not affected by changes in demand.

Table E.6 Land and Buildings/support allocation factor

This table calculates the allocation factors for network land and network buildings/support asset classes. For the CAN the allocation factor has been obtained from the ACM and adjusted by the same forecast demand adjustment used in table E.5.

There are no Analysys cost allocation factors for land and buildings/support for the Core. This table calculates the proportion of each Core service's direct revenue requirement as a percentage of the total direct revenue requirement for the Core which is calculated in tables E.1.2 and E.1.3.

Table E.7 Indirect capital asset adjustment

The indirect capital asset class uses the same calculations as network land and network buildings/support using the figures from tables E.1.2 and E.1.3.

Table E.8 Other communications plant & equipment

This table calculates the allocation factors for other communications plant and equipment for the CAN and Core. For the CAN the proportional make up of the asset types within other communications plant and equipment is calculated and a weighted average of the asset types is used to derive a cost allocation factor.

Note that the CAN Proportion that is CAN Radio equipment and the Core Proportion that is Network building are both input figures.

For the Core since the other communications plant and equipment is made up of network buildings assets, the network buildings/support cost allocation factor is applied.

Table E.9 FLSM Cost allocation factors

Table E.9 collates all the adjusted cost allocation factors, including the cost allocation factors for wholesale ADSL which are calculated on worksheet *I. WADSL Allocation Factor Calc*. This table is the source data for the allocation factors used in the *7. Service Costs* worksheet.

3.8 Worksheet F. Opex allocations

This worksheet contains inputs for operating expenses and allocates forecast operating expenses to asset classes.

Table F.1 Opex forecasts

Table F.1.1 displays the direct operating expenditure for the CAN, Core and LSS.

Table F.1.2 contains a mark-up for indirect operating expenditure (overheads).

Table F.1.3 displays the total operating expenditure after adding in a mark-up for corporate overheads. Since LSS costs are made up entirely of corporate overheads, the total direct and indirect operating expenditure for the CAN and Core is reduced by LSS operating expenditure. This removes the effect of double counting LSS operating expenditure. The amount of LSS operating expenditure to be deducted from the CAN and Core is based on the CAN and Core proportion of total operating expenditure.

Table F.2 Allocation of indirect and direct operating expenditure to asset classes

Each year's operating expenditure is the proportion of each asset class multiplied by the total operating expenditure for the CAN and Core.

The proportion percentages are obtained by taking the undepreciated values of each asset class as a proportion of the total undepreciated RAB excluding indirect capital assets.

Operating expenditure for the Data Equipment asset class is entered directly into table F.2, rather than being calculated using the values in table F.1 and operating expenditure allocation factors. The ACCC's methodology for estimating operating expenditure for Data Equipment is explained in more detail in chapter 4 of the March 2013 draft report for the wholesale ADSL FAD.

3.9 Worksheet G. Revenue Disaggregate

This worksheet calculates individual cost blocks for each declared service.

Table G.1 Summary of inputs for calculations

Tables G.1.1 to G.1.4 summarise the building blocks forming the overall revenue requirement for fixed line services and reproduce parts 1 to 4 of table 6.1.

Table G.2 Calculation of Revenue Requirement by Service

Table G.2 provides a summary of the building blocks and revenue requirement for each service.

Table G.2.1 summarises the components of the revenue requirement for each declared service from the information in tables G.3.7 to G.3.12.

Table G.2.2 provides a summary of the overall revenue requirement from the detailed information contained in tables G.1.1 to G.1.4.

Table G.2.3 calculates each cost block for other regulated and unregulated services by subtracting the values in table G.2.1 from the values in table G.2.2.

Table G.3 Detailed Revenue Requirement Calculations

Tables G.3.1 to G.3.6 show the allocation factors calculated in worksheet *E. Allocation Factors Calc* and worksheet *I. WADSL Allocation Factor Calc*, but present them in a slightly different format (each table is for one service, rather than for one year).

Tables G.3.7 to G.3.12 use the allocation factors in tables G.3.1 to G.3.6 and the total cost blocks in tables G.1.1 to G.1.4 to calculate the revenue requirement for each asset class for each service (per year).

3.10 Worksheet H. Nominal RAB Roll-Forward

This worksheet rolls the regulatory asset base forward, in nominal terms.

Table H.1 Summary of inputs for calculations

Table H.1.1 shows the rolled forward regulatory asset base, reproducing the totals from table H.2.1.

Table H.1.2 reproduces the opening RAB information from table 2.1.

In table H.1.3, the user is required to input annual inflation rates.

Table H.1.4 calculates a cumulative inflation index from the values in table H.1.3.

Table H.1.5 calculates nominal capital expenditure, in the following year's dollars. It multiplies capital expenditure (with the half WACC adjustment) from table 8.2.1 by the cumulative inflation index in table H.1.4.

Table H.2 Roll-Forward of Nominal Regulatory Asset Base

Table H.2.1 reports the nominal opening RAB for each year. This is simply the nominal closing RAB from the previous year, which is reported in table H.2.3.

Table H.2.2 reports nominal depreciation for each year. The values in the table are the sum of the values of nominal depreciation from tables H.3.1 to H.3.13.

Table H.2.3 calculates the closing nominal RAB for each year. It adds nominal capital expenditure and subtracts nominal depreciation from the nominal opening RAB for that year.

Table H.3 Detailed Roll-Forward Calculations (Nominal)

Table H.3.1 rolls forward the initial RAB value. Note that this table is identical to table 8.3.1.

Tables H.3.2 to H.3.13 roll forward nominal capital net additions for each year from 2009/2010 to 2020/2021. The opening value is simply the nominal capital expenditure from the previous year, from table H.1.5. Depreciation is calculated using the straight line method, based on the initial value of capital expenditure

(plus the half WACC adjustment). The closing value subtracts depreciation from the opening value.

3.11 Worksheet I. WADSL Allocation Factor Calc

This worksheet shows the step by step calculations undertaken to obtain the cost allocation factors for wholesale ADSL. The cost allocation factors calculated in this worksheet are displayed in table E.9 in worksheet *E. Allocation Factors Calc*.

Table I.1 Summary of Inputs for Calculations

Table I.1.1 contains the unadjusted cost allocation factors for wholesale ADSL obtained from the ACM. These allocation factors are used as a base to calculate the final FLSM allocation factors.

Table I.1.2 sums the 2012/2013 total revenue requirement for the CAN and Core excluding other communications plant and equipment, network land, network buildings/support, LSS equipment and indirect capital assets. This total represents the total revenue requirement for direct network assets.

Table I.1.3 displays the costs allocated to wholesale ADSL in 2012/2013 for the asset classes in table I.1.2.

Table I.2 WADSL Transmission equipment adjustment

This table adjusts the wholesale ADSL Transmission Equipment cost allocation factor to reflect the current and forecast usage pattern in the transmission asset class. Total traffic over the transmission network is forecast over the regulatory period and data traffic's share of traffic is taken. The movement in data traffic's share is applied to the Analysys 2008/2009 wholesale ADSL Transmission Equipment cost allocation factor (rebased for actual 2008/2009 wholesale ADSL demand).

Table I.3 Forecast demand adjustment

The demand forecasts in the ACM for 2008/2009 are different to actual demand in that year. Table I.3 accounts for the difference between Analysys forecasts and 2008/2009 actual demand by adjusting the cost allocation factors for most asset classes.

The cost allocation factors in this table are adjusted in subsequent years by the year to year percentage change in demand. This ensures that the underlying cost per unit of service is not affected by changes in demand.

Table I.4 Land and Buildings/support allocation factor

This table calculates the allocation factors for the network land and network buildings/support asset classes. There are no Analysys cost allocation factors for land and buildings/support for the Core. Therefore, this table calculates the proportion of wholesale ADSL's direct revenue requirement as a percentage of the

total direct revenue requirement for the Core which is calculated in tables I.1.2 and I.1.3.

Table I.5 Indirect capital asset adjustment

The indirect capital asset class uses the same calculations as network land and network buildings/support using the figures from tables I.1.2 and I.1.3.

Table I.6 Other communications plant & equipment

Since the Core other communications plant and equipment asset class is made up of network buildings assets, the network buildings cost allocation factor, as calculated in table I.4, is applied.

3.12 Worksheet J. WADSL price structure

This worksheet calculates the port and AGVC/VLAN prices from the model's estimated revenue requirement per SIO. AGVC/VLAN prices are determined on a 'per Mbps' basis; port prices are determined on a geographic zone basis.

Table J.1 Calculation of port and AGVC/VLAN prices (per SIO)

Table J.1.1 contains the estimated nominal service price (or revenue requirement per SIO), copied from worksheet *B. Dimensions and Results*.

Table J.1.2 contains the relativities from the wholesale ADSL IAD.

Table J.1.3 calculates the port and AGVC/VLAN prices (per SIO) from the information in tables J.1.1 and J.1.2.

Table J.2 Calculation of AGVC/VLAN charge (per Mbps)

Table J.2.1 contains actual and forecast usage per average ADSL SIO. The table contains both year-end and yearly average values.

Table J.2.2 calculates the AGVC/VLAN price per Mbps per month using the information in tables J.1.3 and J.2.1.

Table J.3 Calculation of monthly port prices in each zone

Table J.3.1 contains the relativities from the wholesale ADSL IAD.

Table J.3.2 calculates the monthly wholesale ADSL prices by zone using the information in tables J.1.3 and J.3.1.

3.13 Worksheet 1. Economic Parameters

This is an input worksheet to provide economic parameters to be used by the model.

Table 1.1 WACC parameters

In this table, the user enters the relevant WACC parameters in order to calculate the real vanilla WACC. All the parameters in the Input values column of **table 1.1 WACC parameters** are required. From these values, a real vanilla WACC is calculated for use in the model's regulatory calculations.

The full list of input parameters is the following:

- Nominal Risk Free Rate – rate of return with close-to-zero default risk and zero liquidity risk (e.g. freely traded investment-grade government bonds);

- Real Risk Free Rate – the risk free rate in real terms. Calculated from the nominal risk free rate and expected inflation (Fisher equation);

- Debt ratio – portion of total capital financed by debt;

- Equity ratio (calculated) – portion of total capital financed by equity. (This value is automatically calculated from the Debt ratio input to ensure both values add to 100%.);

- Nominal Debt Risk Premium – the margin above the risk-free rate that a particular company must offer in order to attract debt funding, in nominal terms;

- Debt Raising Costs – costs of raising debt;

- Equity issuance costs – costs associated with issuing equity;

- Nominal Market Risk Premium – the expected rate of return for the national stock market as a whole minus the risk-free rate;

- Utilisation of Imputation (Franking) Credits – portion of company tax paid by a service provider that is reimbursed to investors through imputation credits attached to dividends;

- Expected inflation – the expected inflation rate. The current value is set using the RBA's inflation figures and the mid-point of its target band where forecasts are not available. This inflation rate is used to convert nominal input parameters into real values;

- Corporate Tax Rate – company tax rate in Australia (currently 30%);

- Equity Beta – measures the risk associated with a particular stock compared with the market as a whole, taking into account leveraging and the effect of financial risk;

- IAD Real vanilla WACC – the real vanilla WACC used in calculating IAD prices.

Below the table of input parameters is the table with the calculations for the real vanilla WACC. It calculates the following parameters:

- Real Risk Free Rate – the risk free rate in real terms;

- Nominal Cost of debt – rate of return on debt in nominal terms;

- Real cost of debt – rate of return on debt in real terms;

- Effective tax rate for equity (calculated) – percentage difference between pre-tax and post-tax cash flows;

- Debt/Equity ratio – ratio of debt to the company value;

- Nominal cost of equity – rate of return on equity in nominal terms;

- Real cost of equity – rate of return on equity in real terms;

- Nominal vanilla WACC – the weighted average cost of capital without accounting for inflation, with the interest tax shield and imputation tax credits included in the cash flow;

- Real vanilla WACC – the weighted average cost of capital accounting for inflation, with the interest tax shield and imputation tax credits included in the cash flow.

Table 1.2 WACC parameters for WADSL

This table is identical to table 1.1, except that certain WACC parameters have been updated, as discussed in Chapter 4 of the ACCC's March 2013 draft report for the wholesale ADSL FAD.

3.14   Worksheet 2. RAB

The full title of this worksheet is "Regulatory Asset Base". It is an input worksheet to provide the values for the Opening RAB and the depreciation parameters for each asset class in the RAB.

Table 2.1 Regulatory Asset Base – Opening Value and Parameters

Table 2.1 is used to enter the opening regulatory values for the Regulatory Asset Base (RAB) and related parameters.

At the top of table 2.1 the user should enter the applicable valuation year of the RAB: the model assumes that the valuation is at 30 June of the entered year (that is, at the end of the Australian financial year). All the dates in the model are set from this date.

The main body of the table is used to input for each asset class:

- The **Depreciated** (regulatory) **Value** at the specified date (in million AUD);

- **Average Asset Life**: the average of the (regulatory) economic asset lives for the assets in the asset class;

- **Remaining Asset Life**: the remaining average asset life for the assets in the asset class at the specified date.

In the last column of the table, the **Depreciated proportion** of the asset class at the specified valuation year is calculated.

3.15   Worksheet 3. Additions, Disposals & Opex

The full title of this worksheet is "Operating costs, overheads and capital expenditure". It is an input worksheet to provide the capital additions and disposals in the RAB for each year.

Table 3.1 Operating Cost and Overheads specified for each Asset Class

Table 3.1 shows operating cost and overheads (in million AUD) that occur during each financial year for each asset class. These costs and overheads are sourced from worksheet *F. Opex allocations*.

Table 3.2 Asset Class Additions

Table 3.2 requires inputs for the capital additions (in million AUD) for each asset class in each financial year. It indicates what new investments are made for the RAB each year. A half WACC adjustment has been applied in table 8.2.1.

Table 3.3 Asset Class Disposals

Table 3.3 requires inputs for the capital disposals (in million AUD) for each asset class in each financial year. A half WACC adjustment has been applied in table 8.2.1.

Since the model assumes that the additions and disposals occur at the same point in time, the model uses net additions (additions less disposals). Hence, the user could enter net additions in table 3.2 and leave table 3.3 blank.

3.16   Worksheet 4. Tax Parameters

This is an input worksheet to provide the values for the Opening Tax Value and the tax depreciation parameters for each asset class in the RAB. The tax values may be different from the regulatory values.

The valuation date is 30 June of the year specified by the user in table **2.1 Regulatory Asset Base – Opening Tax Value and Parameters**. This is the valuation date for the RAB regulatory values.

Table 4.1 Regulatory Asset Base -- Opening Tax Value and Parameters

Values for Opening tax value must be input by the user. The values for tax asset lives and remaining tax lives are linked to table 2.1. The user may change these values by inputting alternative values over each cell reference, but automatic reversion to the ACCC assumption is not possible. Users should keep an original version of the model to enable this reversion.

Table 4.2 Tax Losses Carried Forward

In this table the user specifies the tax loss at the **Valuation year** – i.e. the end of the opening financial year – to be carried forward to the next year. A loss should be entered as a negative number.

Table 4.3 Additional Taxable Income

In this table the user specifies for each asset class the additional contributions (in million AUD) in each year to be added to the income for tax purposes.

3.17 Worksheet 5. Service Demand

This is an input worksheet to provide the annual service demand levels by which the revenue requirement allocated to a service may be turned into a service price per unit.

Table 5.1 Annual Demand for each Service

In table 5.1 the user inputs the annual demand level in relevant units for each service.

Table 5.2 Average Call Duration for Local Carriage Service

In table 5.2 the user inputs the average call duration in minutes for the *Local Carriage Service* for each year of the estimation period. This input is used in table 7.2.2 to calculate the service price per call instead of per minute.

3.18 Worksheet 6. Revenue Requirement

This worksheet calculates the revenue requirement to be generated from each asset class in each year.

For each asset class, the revenue requirement to be generated in any year is the sum of the following:

- The annual return on the capital base at the beginning of the year;

- The depreciation (return of capital) on the assets during the year;

- The operating cost and overheads allocated to each asset class: this may be directly allocated by the user or may be allocated by the model (see details below); and

- The tax payable allocated by the model to the asset class.

The model allocates all these components to asset classes because the allocation factors used to allocate the revenue requirement to services are also specified by asset class. This has the effect of allocating common costs (such as taxes) to services by a weighted average of the allocation factors for the service.

Table 6.1 Annual Revenue Requirement

This table calculates the annual return on capital and allocates operating costs and overheads, depreciation and tax to each asset class. There are four parts to the calculation:

- **Part 1: Return on capital**. This part calculates the annual return on the cost of the capital investment in each asset class at the beginning of the year. It is just the opening RAB value multiplied by the weighted average cost of capital.

- **Part 2: Operating Costs and Overheads allocated to each Asset Class**. This part looks up values from table 3.1. Similar to table 4.1, the user may input these costs directly.

- **Part 3: Return of capital (Depreciation).** This part looks up the depreciation for each asset class and in each financial year from table 8.2.3*.

- **Part 4: Tax payable less value of imputation credits (real).** In this part, the tax payable (less the value of imputation credits) is allocated to asset classes. The table uses the tax allowance to be included in the revenue requirement for the CAN and Core asset categories in each financial year, calculated in worksheet *10. Tax Liabilities*. Because the tax allowance values are in nominal terms, they are converted to real terms by dividing by the cumulative inflation index. The calculation is performed separately for CAN and Core asset classes. The taxes are allocated to the asset classes in proportion to the returns on capital amounts calculated in part 1. This is achieved by marking up the return on capital for each asset class by a fixed percentage. The percentage is the value of the tax allowance as a proportion of the total return on capital. If there are no return on capital amounts for the CAN or Core in a particular year, the taxes are allocated equally to all asset classes.

Table 6.2 Revenue Requirement (excluding Tax)

This table adds the results from parts 1, 2 and 3 of table 6.1.

Table 6.3 Revenue Requirement (including Tax)

This table adds the results from parts 1, 2, 3 and 4 of table 6.1.

3.19   Worksheet 7. Service Costs

The full title of this worksheet is "Service Costs and Prices". It allocates the revenue requirement for each asset class to services to give the revenue requirement for each service. It then turns the service revenue requirements into a (maximum) service price per unit of demand for the service.

Table 7.1 Summary of inputs for calculations

This table section collects information from various worksheets in the model. No additional calculations are performed in this section.

Table 7.1.1 Revenue Requirement reports the results of the calculations from table 6.3. The values are the revenue requirement that can be generated from each asset class in each year.

Table 7.1.2 Annual Demand for each Service reports the inputs on annual demand for each service from table 5.1.

Table 7.1.3 Average Call Duration for Local Carriage Service reports the inputs on average call duration for Local Carriage Service from table 5.2.

Table 7.2 Calculation of Service Revenues and Prices

Table 7.2.1 Revenue Requirement Allocated to Services shows the results of the detailed allocation calculations in the section below (from table 7.3.2). The values are the revenue requirement for each service in each year. The units are million AUD.

Table 7.2.2 Service Prices calculates the maximum service price for each service by dividing the values in table 7.2.1 by the annual demand figures from table 7.1.2. While the values in table 7.2.1 are in million AUD, the prices in table 7.2.2 are given in AUD per unit of demand.

In Table 7.2.3 Service Prices (adjusted for inflation) the values from table 7.2.2 are adjusted for inflation. The prices are given in AUD per unit of demand.

Table 7.3 Detailed Allocation Calculations

This section shows the detailed allocations of the revenue requirement to each service in each year.

In Table 7.3.1 Allocation of RR to each service there is a calculation for each year in this table. The calculations follow the same structure for each year.

For the relevant year, allocation factors are located to the right of the main table. The RR, or revenue requirement, values from table 7.1.1 are multiplied by these allocation factors to give the revenue requirement contribution from each asset class to the revenue requirement of the service. The total of these contributions, shown at the top of the table for each year, is the revenue requirement for the service.

Table 7.3.2 Summary of cost allocation summarises the total revenue requirement allocated to each service in table 7.3.1.

3.20 Worksheet 8. RAB Roll-Forward

The full title of this worksheet is "Regulatory Asset Base Roll-Forward". It calculates the RAB (regulatory) value in each asset class at the beginning of each financial year and the depreciation charges for the asset class during the year.

The basic roll-forward calculation has the following steps:

1. The RAB value at the beginning of the financial year is the value at the end of the previous financial year.

2. The depreciation charge for each asset class is calculated.

3. The RAB value at the end of the financial year is the value at the end of the previous year less the depreciation charge plus net additions.

The RAB can be rolled forward for as many years as required (up to the model limit of 12 years).

Table 8.1 Summary of Inputs for Calculations

In this section information from various worksheets in the model is collected. No additional calculations are performed in this section.

Table 8.1.1 Opening Regulatory Asset Base reports the opening RAB values from table 2.1.

Table 8.1.2 Asset Class Additions reports the inputs on asset class additions from table 3.2.

Table 8.1.3 Asset Class Disposals reports the inputs on asset class disposals from table 3.3.

Table 8.2 Roll-Forward of Regulatory Asset Base

In this section, the main calculation to roll forward the RAB occurs.

In Table 8.2.1 Net Additions the net additions are calculated by subtracting the values in table 8.1.3 from the values in table 8.1.2 before being multiplied by the half-WACC adjustment factor. The IAD WACC is applied to the first two years of the model; all other years apply the FAD WACC.

The half-WACC adjustment is made to net additions so that when included in the RAB roll-forward process, an appropriate return on capital is calculated from the assumption that net additions are incurred in the middle of the year.

Table 8.2.2 Opening RAB by asset class calculates the RAB value for each asset class at the beginning of each year. The value is the closing RAB value at the end of the previous year (calculated in table 8.2.4 below).

Table 8.2.3 Regulatory Depreciation reports the results of the detailed depreciation calculations that occur in the following section. The values are the depreciation charges for each asset class in each year. They are the sum of the deprecation charges from the assets in the opening RAB and from the net additions in each year.

Table 8.2.4 Closing RAB by asset class calculates the RAB value for each asset class at the end of each year. The value is the RAB value at the beginning of the year from table 8.2.2 less the depreciation charge from table 8.2.3 plus net additions from table 8.2.1.

The starting point (**Y00**) in table 8.2.4 is the opening RAB values from table 8.1.1.

Table 8.3 Detailed Roll-Forward Calculations

In this section, each set of assets is rolled forward in time. This exhibits the details of the contributions to the total depreciation charge for each asset class in each year.

There is a table for the opening RAB and for the net additions in each year. The tables all follow the same structure.

Table 8.3.1 Roll-Forward of Opening RAB

This table rolls forward the asset values in the initial opening RAB. The table has three parts:

- **Regulatory Value at Beginning of Year**. This is just the regulatory value at the end of the previous year.

- **Regulatory Value at End of Year**. This is just the regulatory value at the beginning of the year less the depreciation. The starting point (**Y00**) is the initial opening RAB values from table 8.1.1.

- **Depreciation**. This calculates depreciation.

The series of 12 tables (8.3.2 to 8.3.13) is used for rolling forward the net additions to the asset classes made in the relevant year. All assets except land are depreciated each year. Land appreciates by the inflation rate for that year.

The model makes provision for 12 years but only the years for the period specified by the user provide useful results; the calculations for later years should be ignored.

Each table has the same structure, with three parts:

- **Regulatory Value at Beginning of Year**. For the initial year, this is zero. For later years the value is simply the net additions during the previous year from table 8.2.1.

- **Regulatory Value at End of Year**. This is the closing regulatory value from the previous year minus depreciation.

- **Depreciation**. This calculates depreciation.

3.21 Worksheet 9. RAB Roll-Forward for Tax

The full title of this worksheet is "Regulatory Asset Base Roll-Forward for Tax". It calculates the RAB tax value in each asset class at the beginning of each financial year and the tax depreciation charges for the asset class during the year. It is the equivalent of worksheet *8. RAB Roll-Forward* for tax values.

The basic roll-forward calculation has the following steps:

1. The RAB value at the beginning of the year is the value at the end of the previous year.

2. The depreciation charge for each asset class is calculated.

3. The RAB value at the end of the year is the value at the end of the previous year plus net additions minus the depreciation charge.

The RAB can be rolled forward for as many years as required (up to the model limit of 12 years).

Table 9.1 Summary of inputs for calculation

Table 9.1.1 Opening Tax Value and Parameters reports the initial RAB tax values from table 4.1. No additional calculation is performed in this table.

Table 9.1.2 Inflation calculates the cumulative inflation index.

Table 9.1.3 Net Additions reports the net additions to asset classes calculated in table 8.2.1. The real value is escalated by the inflation index (in table 9.1.2) to reflect the fact that tax depreciation is based on actual, or nominal, expenditure.

Table 9.2 Roll-Forward of Regulatory Asset Base for Tax

In this section, the main calculation to roll forward the tax asset value occurs.

Table 9.2.1 Opening RAB by asset class (tax purposes) calculates the RAB tax value for each asset class at the beginning of each year. The value is the closing RAB value at the end of the previous year (calculated in table 9.2.3 below).

Table 9.2.2 Tax Depreciation reports the results of the detailed depreciation calculations that occur in the following section. The values are the depreciation charges for each asset class in each year. They are the sum of the depreciation charges from the assets in the opening RAB and from the net additions in each year.

Table 9.2.3 Closing RAB by asset class (tax purposes) calculates the RAB tax value for each asset class at the end of each year. The value is the RAB value at the end of the previous year plus net additions from table 9.1.3 less the depreciation charge from table 9.2.2.

The starting point (Y00) in table 9.2.3 is the opening RAB values from table 9.1.1.

Table 9.3 Detailed Roll-Forward Calculations for Tax

In this section, each set of assets is rolled forward in time. This exhibits the details of the contributions to the total depreciation charge for each asset class in each year.

There is a table for the opening RAB and for the net additions in each year. The tables all follow the same structure.

Table 9.3.1 Roll-Forward of Opening Tax Value rolls forward the asset tax values in the initial opening RAB. The table has 3 parts:

- **Tax Value at Beginning of Year**. This is just the tax value at the end of the previous year (from the third part below).

- **Tax Depreciation**. This is the calculation of depreciation for the assets each year. The **Life** column shows the tax remaining asset lives from table 9.1.1. The straight-line depreciation charge is the tax value at the beginning of the year divided by the remaining asset life in that year.

- **Tax Value at End of Year**. This is just the tax value at the beginning of the year less the depreciation charge. The starting point (**Y00**) is the initial opening RAB tax values from table 9.1.1.

The series of 12 tables (9.3.2 to 9.3.13) is used for rolling forward the net additions to the asset classes made in the relevant year. The model makes provision for 12 years but only the years for the period specified by the user provide useful results; the calculations for later years should be ignored.

Each table has the same structure, with 3 parts:

- **Tax Value at Beginning of Year**. For the initial year, this is zero. For later years it is simply the residual value at the end of the previous year.

- **Tax Depreciation**. This is the calculation of depreciation for the assets each year. The **Life** column shows the tax standard asset lives from table 9.1.1. The straight-line depreciation charge is the tax value at the beginning of the year divided by the remaining asset life in that year. The diminishing value method is the straight-line rate (as a percentage) multiplied by the accelerator factor (150% or 200% depending on the option chosen).

- **Tax Value at End of Year**. This is just the tax value at the beginning of the year less the depreciation charge.

3.22   Worksheet 10. Tax Liabilities

This worksheet calculates the tax values payable in the CAN and Core for each financial year. The taxes are added to the revenue requirement (excluding tax) in worksheet *6. Revenue Requirement*. All calculations in this worksheet are performed with nominal values.

The basic tax calculation has the following steps:

1. The nominal profit is calculated from the revenues (i.e. the Revenue Requirement) less operating costs and overheads less tax depreciation less interest payments.

2. Tax is calculated on the profit adjusted for any tax loss carried forward or any additional taxable income.

3. The tax payable is reduced by the value of imputation credits. Under a vanilla WACC framework the value of imputation credits is included in the cash flows. Excluding imputation credits from the cash flow building blocks would require an adjustment to the WACC under a post-tax framework.

The tax liabilities can be calculated for as many years as required (up to the model limit of 12 years).

The tax calculations do not depend on asset classes. Hence, the calculations in this sheet are performed only on the total values related to CAN and Core asset categories.

Table 10.1 Summary of inputs for calculations

Table 10.1.1 Inflation indices reports the inflation indices used to convert real values into nominal values.

Table 10.1.2 RAB (regulatory values) at Beginning of Year calculates the nominal values of the total RAB regulatory values for CAN and Core asset categories at the beginning of each year from table 8.2.2. These values are used to calculate interest payments below.

Table 10.1.3 Revenue Requirement calculates the nominal values of the total RR, using real values (including tax) from table 6.3.

Table 10.1.4 Revenue Requirement (excluding Tax) calculates the nominal values of the total RR, using real values (excluding tax) from table 6.2.

Table 10.1.5 Operating Cost and Overheads specified for each Asset Class calculates the nominal values of the total operating costs and overheads from table 3.1.

Table 10.1.6 Return of Capital (Tax Depreciation) calculates the nominal values of the total tax depreciation charges in each year from table 9.2.2.

Table 10.1.7 Additional tax income calculates the nominal values of the additional taxable income for each year from table 4.3.

Table 10.2 Calculation of Tax Expenses

In this section the tax payable in each year is calculated.

Table 10.2.1 Debt calculates total debt by multiplying the opening RAB by the Debt ratio.

Table 10.2.2 Tax Expenses calculates the tax-related expenses in nominal terms to be used for the tax calculation. There are four parts:

- **Part 1: Operating Costs and Overheads (nominal)**. This part transfers 10.1.5.

- **Part 2: Tax Depreciation (nominal)**. This part repeats the tax depreciation values from table 9.2.2.

- **Part 3: Interest (nominal)**. This part calculates the interest payable on debt. The debt from table 10.2.1 is multiplied by the **nominal cost of debt** to give the interest payable.

- **Part 4: Total tax expenses (sum of parts 1, 2 & 3)**. This part, the total tax expenses, is the sum of the values in the other 3 parts.

Table 10.2.3 Pre-tax Income (excludes carry-over amounts) calculates the pre-tax income, which is the revenue requirement from table 10.1.3 plus any additional income from table 10.1.7 less the total expenses from table 10.2.2, part 4.

Table 10.2.4 Tax Loss Carried Forward calculates any tax losses to be carried forward to the next year. The values for the initial year (**Y00**) are those reported in table 4.2. For subsequent years, the tax losses are any negative values generated in table 10.2.3.

Table 10.2.5 Taxable Income (includes carry-over amounts) calculates the taxable income, which is the pre-tax income from table 10.2.3 plus any tax loss (a negative number) carried forward from the previous year from table 10.2.4.

Table 10.2.6 Tax Payable calculates the tax payable. If the taxable income in table 10.2.5 is positive, then the tax payable is the taxable income multiplied by the **Corporate Tax Rate**. If the taxable income is 0 or negative, no tax is payable.

If table 10.2.6 were used directly to calculate the revenue requirement including tax, it would create a circular calculation: the tax would be included in the revenue requirement, which would then be used to calculate the tax. In order to avoid this, the model performs an alternative calculation in tables 10.2.7, 10.2.8 and 10.2.9 to derive the tax allowance that should be included in the revenue requirement.

Table 10.2.7 Intermediate Tax Calculation calculates the tax payable in an alternative way. It uses income without tax: the RR, or revenue requirement, excluding tax from table 10.1.4 plus any additional taxable income from table 10.1.7 plus any tax loss (a negative number) carried forward in table 10.2.4 less tax expenses from table 10.2.2, part 4. It multiplies this result by a factor depending on the **Corporate Tax Rate** and the **Value of Imputation Credits** to give the tax payable. Tax is only payable on positive amounts.

This calculation will yield the same tax payable as in table 10.2.6.

Table 10.2.8 Total Value of Imputation Credits calculates the total value of imputation credits by multiplying the tax payable from table 10.2.7 (the intermediate tax calculation) by the **Value of Imputation Credits**.

Table 10.2.9 Tax Allowance in RR (Intermediate Tax Calculation less Total Value of Imputation Credits) calculates the tax allowance to be included in the revenue requirement. The tax allowance is the tax payable from table 10.2.7 (the intermediate tax calculation) less the total value of imputation credits from table 10.2.8.

The values calculated in this table are used to add tax to the revenue requirement. They are reported in table 6.1.4 (where they are converted to real values) for use in worksheet *6. Revenue Requirement.*

3.23   Worksheet 11. Cash Flow Analysis

The main purpose of the cash flow analysis in this worksheet is to confirm the internal consistency of the model. That is to check that the cash flows indicated by the revenue requirement would actually deliver investors with the rate of return

assumed by the inputs of the model specified in the *1. Economic Parameters* worksheet.

This worksheet is used to calculate the internal rate of return for the pre-tax and post-tax cash flows.

All calculations in this worksheet are performed on nominal values.

Table 11.1 Summary of Inputs for Calculations

Table 11.1.1 Inflation indices reports the inflation indices.

Table 11.1.2 Regulatory Asset Base (end of year) calculates the nominal values of the total RAB regulatory values for CAN and Core asset categories at the end of each year from table 8.2.4.

Table 11.1.3 Net Additions calculates the nominal values of the total net capital additions for each year from the difference between asset class additions in table 8.1.2 and asset class disposals in table 8.1.3. This difference is the net additions which are then adjusted for inflation to arrive at nominal values.

Table 11.1.4 Revenues (RR including tax) calculates the nominal values of the RR, or revenue requirement, including tax from table 6.3. This is the nominal revenue.

Table 11.1.5 Operating Costs and Overheads reports the total operating costs and overheads calculated in table 10.2.2, part 1. These values, because they come from worksheet *10. Tax Liabilities*, are already in nominal terms.

Table 11.1.6 Tax Payable reports the total tax payable calculated in table 10.2.6 Tax Payable. These values, because they come from worksheet *10. Tax Liabilities*, are already in nominal terms.

Table 11.1.7 Interest reports the interest payable on debt from table 10.2.2, part 3. These values, because they come from worksheet *10. Tax Liabilities*, are already in nominal terms.

Table 11.1.8 Debt (end year) reports the value of debt which is given by the end of year RAB from table 11.1.2 multiplied by the debt ratio.

Table 11.2 Equity Cash Flow Analysis

Table 11.2.1 Capital Expenditure shows the capital expenditures in nominal terms. For the initial year (Y00), the values are the total capital values from table 11.1.2. For subsequent years, the values are the net additions from table 11.1.3.

Table 11.2.2 Repayment of Debt calculates the differences in debt levels between years from table 11.1.8.

Table 11.2.3 Residual Value of Equity calculates a residual value to be added to the cash flows for the calculations of internal rate of return in tables 11.2.4 and 11.2.5.

The value for the equity remaining at the end of the period is calculated from the closing RAB value at the end of the period (in table 11.1.2) multiplied by the **Equity ratio** (or 1 minus the **Debt ratio**). This is the residual value to be added to the cash flows. It is shown in table 11.2.3 at the end of the last year.

Table 11.2.4 Pre-tax Cash Flows calculates the pre-tax cash flows. The pre-tax cash flow is the revenue (table 11.1.4) less the operating costs and overheads (table 11.1.5) less the interest payments (table 11.1.7) less capital expenditures (table 11.2.1) less debt repayments (table 11.2.2). The first part of table 11.2.4 performs this calculation.

Table 11.2.4 lays out the cash flows to be used in the IRR calculation in table 11.2.8 in the row *Pre-tax cash flows + residual*. This is just the pre-tax cash flows calculated above with the residual value of equity added to the cash flow in the last year. For any years beyond the last year, the cash flow is zero.

Table 11.2.5 Post-tax Cash Flows (excludes Value of Imputation Credits) calculates the post-tax cash flows from the pre-tax cash flows. The calculation is the pre-tax cash flows from table 11.2.4 less the tax payable from table 11.1.6.

Table 11.2.5 lays out the cash flows to be used in the IRR calculation in table 11.2.8 in the row *Post-tax cash flows + residual*. This is just the post-tax cash flows calculated above with the residual value of equity added to the cash flow in the last year. For any years beyond the last year, the cash flow is 0.

Table 11.2.6 Post-tax Cash Flows including Imputation Credits plus residual (nominal) calculates the sum of the post-tax cash flows given in Table 11.2.5 and the value of attached imputation credits. The value of the imputation credits is given as the tax payable multiplied by the specified value for gamma. The residual value of equity is added to the cash flow in the last year to calculate the total plus residual.

Table 11.2.7 Post-tax Cash Flows including Imputation Credits plus residual (real) converts table 11.2.6 into real terms.

Table 11.2.8 Effective Tax Rate for Equity calculates the effective tax rate for equity. It uses the Excel function **_IRR_** to calculate the internal rate of return of the pre-tax and post-tax cash flows.

The IRR of the pre-tax cash flows (plus residual value of equity) is calculated from the cash flows in table 11.2.4. The IRR of the post-tax cash flows (plus residual value of equity) is calculated from the cash flows in table 11.2.5. The results of these calculations are reported in the *Calculated* column.

The **Nominal effective tax rate for equity** is then one minus the ratio of the IRR post-tax to IRR pre-tax. This is shown in the *Used* column. The result of this calculation is reported also in tables 1.1.2 and 1.2.2 as *effective tax rate for equity (calculated)*.

Table 11.2.9 Integrity check ensures that the internal rate of return calculated from the cash flows in tables 11.2.6 and 11.2.7 are equal to the nominal and real return on equity inputs in table 1.1.2.

The cash flow returns on equity and the CAPM will not be consistent unless land appreciation is turned off. Land appreciation may be turned off by setting cell E186 to false.