AER AUSTRALIAN ENERGY REGULATOR

First Proposed

Electricity Transmission Network Service Providers

Post–Tax Revenue Model

Handbook

Version No: 01

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AMENDMENT RECORD

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1   Nature and authority

1.1   Introduction

This handbook sets out the Australian Energy Regulator's (AER) First Proposed Post-Tax Revenue Model (PTRM). The PTRM is a series of Microsoft Excel spreadsheets (attached), developed in accordance with the requirements of clause 6A.5 of the National Electricity Rules (NER).

1.2   Authority

Clause 6A.5 of the NER requires the AER to develop the PTRM, in accordance with the transmission consultation procedures.

1.3   Role of the model

The AER uses the PTRM to determine the maximum allowed revenue (MAR) to be earned by each regulated transmission network service provider (TNSP). Each regulated TNSP uses the MAR to determine their fees and charges for connection to and use of their transmission networks.

1.4   Confidentiality

The AER's obligations regarding confidentiality and the disclosure of information provided to it by a TNSP are governed by the *Trade Practices Act 1974*, the National Electricity Law (NEL) and the NER.

1.5   Definitions and interpretation

(a)   In this handbook, the words and phrases presented in italics *such as this* are defined in the glossary in section 3 of this handbook and have the meaning given to them in that section.

(b)   Words and phrases not defined in the glossary have the meaning, if any, given to them in the NER.

(c)   Explanations in this handbook about why certain information is required are provided for guidance only.

1.6   Processes for revision

The AER may amend or replace the PTRM from time to time in accordance with clause 6A.5.2(b) of the NER and the transmission consultation procedures. A subsequent version of this handbook will accompany each subsequent version of the PTRM.

1.7   Version history and effective date

An issue number and an effective date of issue will identify each version of this handbook.

2 The model

The PTRM is a set of Microsoft Excel spreadsheets which perform iterative calculations to derive a MAR, from a given set of inputs. The PTRM allows the user to vary the inputs in order to assess their impact on MAR, and other derived parameters.

Before using the PTRM, Excel's iteration mode of calculations needs to be selected. To do so, select <u>Options</u> from the <u>Tools</u> menu in Excel, then select the <u>Calculations</u> tab. Make sure that <u>Manual</u> (rather than <u>Automatic</u>) is selected and tick the iteration box.

To run the 'Fix_Te' and 'Smooth' macros manually, select <u>Macro</u> from the <u>Tools</u> menu, and then select <u>Macros</u>. To operate 'Fix_Te', highlight it and click on <u>Run.</u> To operate 'Smooth', highlight it and click on <u>Run</u>.

2.1 Input sheet

The **Input** sheet provides for key input variables to be entered in the PTRM. They are automatically linked to corresponding cells in the relevant worksheets. Values should be entered into each cell with light blue shading. The input variables have been split into eight categories:

- opening regulated asset base

- *capital expenditure* (*capex*) – as incurred

- asset disposals – as incurred

- net *capex* – as incurred

- *capex* – as commissioned

- asset disposals – as de-commissioned

- net *capex* – as commissioned

- *operating and maintenance expenditure* (*opex*)

- cost of capital

- energy delivered forecast

- MAR for current year.

The input data to be recorded in the PTRM must be in a consistent format as the input data collected from TNSPs in accordance with the AER's submission guidelines.

Figure 1 shows the input sheet.

There is scope for making inputs into the other worksheets. There are a few items which may need to be specified outside of this **Input** sheet to capture a specific situation (for example, tax loss carried forward in the **Analysis** sheet). These situations are addressed where they arise.

The PTRM allows the input variables to be recorded for a regulatory period up to 10 years in length.

Figure 1: Input sheet

Input Variables

Opening Regulated Asset Base for 2008-09 ($m Nominal)

	Category Title	Opening Asset Value	Assets Under Construction	Remaining Life	Standard Life	Historical Tax Value	Tax Remaining Life	Tax Standard Life	Base Financial Year
Asset Class 1	Transmission lines	1,000.00	50	30.0	50.0	900.00	30.0	47.5	2008-09
Asset Class 2	Substations	800.00	20	30.0	50.0	700.00	30.0	47.5	
Asset Class 3	Easements	300.00	10	n/a	n/a	200.00	n/a	n/a	
Asset Class 4				n/a	n/a		n/a	n/a	
		$ 2,180.00	$ 80.00			$ 1,800.00			

Capital Expenditure – As Incurred ($m Real 2007-08)

Year	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	
Transmission lines	50.00	50.00	40.00	40.00	50.00						
Substations	50.00	50.00	40.00	40.00	50.00						
Easements	10.00	10.00	5.00	5.00	10.00						
	$ 110.00	$ 110.00	$ 85.00	$ 85.00	$ 110.00						$ 500.00

Asset Disposal – As Incurred ($m Real 2007-08)

Year	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	
Transmission lines	5.00	5.00	5.00	5.00	5.00						
Substations	5.00	5.00	5.00	5.00	5.00						
Easements	2.00	2.00	2.00	2.00	2.00						
	$ 12.00	$ 12.00	$ 12.00	$ 12.00	$ 12.00						$ 60.00

Net Capital Expenditure – As Incurred ($m Real 2007-08)

Year	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	
Transmission lines	45.00	45.00	35.00	35.00	45.00	-	-	-	-	-	
Substations	45.00	45.00	35.00	35.00	45.00	-	-	-	-	-	
Easements	8.00	8.00	3.00	3.00	8.00	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	
	$ 98.00	$ 98.00	$ 73.00	$ 73.00	$ 98.00						$ 440.00

Capital Expenditure – As Commissioned ($m Real 2007-08)

Year	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	
Transmission lines	45.00	45.00	35.00	35.00	45.00						
Substations	45.00	45.00	35.00	35.00	45.00						
Easements	7.00	7.00	5.00	5.00	7.00						
	$ 97.00	$ 97.00	$ 75.00	$ 75.00	$ 97.00						$ 441.00

Asset Disposal – As De-Commissioned ($m Real 2007-08)

Year	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	
Transmission lines	3.00	3.00	3.00	3.00	3.00						
Substations	3.00	3.00	3.00	3.00	3.00						
Easements	2.00	2.00	2.00	2.00	2.00						
	$ 8.00	$ 8.00	$ 8.00	$ 8.00	$ 8.00						$ 40.00

Net Capital Expenditure – As Commissioned ($m Real 2007-08)

Year	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	
Transmission lines	42.00	42.00	32.00	32.00	42.00	-	-	-	-	-	
Substations	42.00	42.00	32.00	32.00	42.00	-	-	-	-	-	
Easements	5.00	5.00	3.00	3.00	5.00	-	-	-	-	-	
	-	-	-	-	-	-	-	-	-	-	
	$ 89.00	$ 89.00	$ 67.00	$ 67.00	$ 89.00						$ 401.00

Operating and Maintenance Expenditure ($m Real 2007-08)

Year	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	
Controllable opex	50.00	50.00	50.00	50.00	50.00						
Corporate	10.00	10.00	10.00	10.00	10.00						
Debt raising costs	1.04	1.06	1.08	1.08	1.09						
Efficiency carryover	2.00	2.00	2.00	2.00	2.00						
	$ 63.04	$ 63.06	$ 63.08	$ 63.08	$ 63.09						$ 315.34

Cost of Capital

		Value
Nominal Risk Free Rate	Rf	5.00%
Real Risk Free Rate	Rrf	2.90%
Cost of Debt Margin	Dm	1.10%
Market Risk Premium	MRP	6.00%
Proportion of Franking Credits Attributed Value by Shareholders γ		50.00%
Proportion of Equity Funding E/V		40.00%
Debt Beta	βd	0.00
Asset Beta	βa	0.00

Energy Delivered Forecast (MWh)

Year	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Energy	26,000,000	27,000,000	28,000,000	29,000,000	30,000,000	31,000,000				

Maximum Allowed Revenue for 2007-08 ($m Nominal)

	Value
Current MAR	$ 250.00

Opening regulated asset base

The opening *regulated asset base* (*RAB)* is the value of assets on which a return will be earned. The **Input** sheet requires a value for the opening *RAB* (broken into asset classes) at the start of year one. The *RAB* will fluctuate each year to reflect new *capex*, asset disposals and depreciation. In the PTRM, forecast *capex* and asset disposals are rolled into the *RAB* within the regulatory period on an 'as incurred' basis, whereas depreciation is calculated on an 'as commissioned' basis.[1]

The recorded values are linked to the **Assets** sheet which also calculates depreciation.

Category title

The asset classes/names are recorded in column C. It is important that the number of asset classes recorded in the *RAB* section matches the number of asset classes identified in the *capex* section. This allows the PTRM to model consistent depreciation across the asset classes.

The PTRM is configured to accommodate up to 20 asset classes.[2] The number of asset classes used in the PTRM will vary between businesses. However, for each business, the number of asset classes used in the PTRM must be consistent with that used in the roll-forward model.

Opening asset value

The opening asset values for each asset class are recorded in column F.

Assets under construction

The value of *assets under construction*, for each asset class is recorded in column G. These values are sourced from the roll-forward model contained in the TNSP's previous transmission determination, which the PTRM assumes recorded *capex* on an as-commissioned basis. In the PTRM, the total value of all *assets under construction* as at the start of the first year of the regulatory period (cell G27) is rolled into the opening *RAB*.

Remaining life

The remaining life of the asset classes are recorded in column H, based on the economic life of the assets.

Standard life

The standard life of the assets is recorded in column I and measures how long the infrastructure would physically last if it had just been built.

Historical tax value

The historical tax value of the assets is recorded in column J.

Tax remaining life

The remaining life of assets for taxation purposes are set (in column K), based on the tax life specified by the Australian Tax Office (ATO) for the category of assets and commissioning date.

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[1] In common terminology, the PTRM is referred to as a 'hybrid' model.
[2] The PTRM can be expanded to accommodate additional asset classes, when necessary.

Handbook: Post–tax revenue model

Tax standard life

The tax standard life of the assets is recorded in column L.

Base financial year

The financial year for the start of the regulatory period (year one) is recorded in cell M7.

Capital expenditure – as incurred

Forecast *capex* is rolled into the *RAB* when spending is incurred. Generally, *capex* falls into three broad categories:

- asset augmentation (works to enlarge a network or to increase the capability of a network).
- asset replacement (replacing assets that have passed their useful lives)
- asset refurbishment (prolonging the life of an asset)

Asset disposals – as incurred

Forecast asset disposals are recorded in the period in which the disposal is expected to take place.

Net capital expenditure – as incurred

Forecast net *capex* as incurred is calculated as *capex* (as incurred) less asset disposals (as incurred). Forecast net *capex* as incurred is rolled into the *RAB* in the **Assets** sheet.

Capital expenditure – as commissioned

Forecast *capex* on an as commissioned basis is used to calculate depreciation.

Asset disposals – as de-commissioned

The as-commissioned value of asset disposals is recorded in which the asset is expected to be de-commissioned.

Net capital expenditure – as commissioned

Forecast net *capex* as commissioned is calculated as *capex* (as commissioned) less asset disposals (as de-commissioned). Forecast net *capex* as commissioned is used to calculate depreciation in the **Assets** sheet.

Operating and maintenance expenditure

Opex typically includes items such as wages and salaries, leasing costs, costs associated with maintaining transmission assets, input costs and other service contract expenses paid to third parties. The forecast values are recorded in the *opex* section for each year, including any carryover amounts determined in accordance with the efficiency benefit sharing scheme as developed by the AER.

The forecast total *opex* data is linked to the **Analysis** sheet.

Cost of capital

The cost of capital section records the following parameters:

- nominal risk free rate
- real risk free rate
- debt margin over the risk free rate
- market risk premium
- gamma (proportion of franking credits used)
- gearing ratio
- debt beta
- asset beta.

Each of the above parameters are linked to the **WACC** sheet. The value of each of the parameters is specified in clause 6A.6.2 of the NER.

Energy delivered forecast

The energy delivered forecast section records electricity demand information, which will be linked to the **Price Path** sheet. Energy delivered forecasts may be obtained from the most recent *NEMMCO* statement of opportunities, TNSPs' annual planning report, or other relevant industry sources.

Maximum allowed revenue for the current year

This input records the current MAR for a TNSP. It will be linked to the **Price Path** sheet and helps provide historical comparison to forecast revenues over the regulatory period.

2.2   WACC sheet

The **WACC** sheet calculates the required return on equity, cost of debt, inflation forecast and the *weighted average cost of capital* (WACC) using the relevant cost of capital parameters from the **Input** sheet. Figure 2 shows the WACC sheet.

The effective tax rates derived from the cash–flow analysis are also reported in the **WACC** sheet, including various measures of WACC calculated from the forecast cash–flows in the basic building block model.

Figure 2: WACC sheet

			Input Data & Calculated Inputs	Basic Building Block Model
Cost of Capital Parameters				
Nominal Risk Free Rate	Rf		5.00%	
Real Risk Free Rate	Rrf		2.90%	
Inflation Rate	f		2.04%	
Cost of Debt Margin over rf	Dm		1.10%	
Nominal pre-tax cost of debt	Rd		6.10%	
Real pre-tax cost of debt	Rrd		3.98%	
Market Risk Premium	MRP		6.00%	
Corporate Tax Rate	T		30.00%	
Effective Tax Rate for Equity (from Relevant Cashflows)	Te		23.27%	23.27%
Effective Tax Rate for Debt (Effective Debt Shield)	Td		30.00%	30.00%
Proportion of Franking Credits Attributed Value by Shareholders	γ		50.00%	
Proportion of Equity Funding	E/V		40.00%	
Proportion of Debt Funding	D/V		60.00%	
Debt Beta	βd		0.00	
Asset Beta	βa		0.00	
Equity Beta (uses Te)	βe		1.00	

WACC Analysis

	Formula Approximation	
Post-tax Nominal Return on Equity(pre-imp)	11.00%	11.00%
Post-tax Real Return on Equity(pre-imp)	8.78%	8.78%
Nominal Vanilla WACC	**8.06%**	**8.06%**
Real Vanilla WACC	5.90%	5.90%
Post-Tax Nominal WACC	6.38%	7.45%
Post-Tax Real WACC	4.25%	5.30%
Pre-Tax Nominal WACC	8.64%	8.66%
Pre-Tax Real WACC	6.47%	6.48%
Nominal Tax Allowance	0.58%	0.60%
Real Tax Allowance	0.57%	0.58%

Numbers in White cells are calculated on this sheet from input parameters.
Numbers in Orange cells are transferred from relevant sheets

2.3 Assets sheet

The **Assets** sheet calculates the value of the *RAB* for each period in real and nominal terms (see figure 3). It also calculates both regulatory and tax depreciation.

Figure 3: Assets sheet

	B	C	D	E	F	G	H	I	J	K
1										
2	**Asset Roll Forward**									
3										
4	**Year**				2007-08	2008-09	2009-010	2010-11	2011-12	2012-13
5										
6	Inflation Assumption (CPI % increase)		2.04%			2.04%	2.04%	2.04%	2.04%	2.04%
7	Cumulative Inflation Index (CPI end period)				100%	102.0%	104.1%	106.2%	108.4%	110.6%
8										
9	Opening Regulated Asset Base				2,180					
10	Real Capex					100.8	100.8	75.1	75.1	100.8
11	Nominal Capex					102.9	105.0	79.8	81.4	111.6
12										
13	**Real Asset Values**									
14										
15	Real Straight-line Depreciation					60.0	61.7	63.5	64.8	66.1
28		*Transmission lines*				*33.3*	*34.2*	*35.1*	*35.7*	*36.4*
41		*Substations*				*26.7*	*27.5*	*28.4*	*29.1*	*29.7*
54		*Easements*				-	-	-	-	-
67						-	-	-	-	-
80		*0*				-	-	-	-	-
93		*0*				-	-	-	-	-
106		*0*				-	-	-	-	-
119		*0*				-	-	-	-	-
132		*0*				-	-	-	-	-
145		*0*				-	-	-	-	-
158		*0*				-	-	-	-	-
171		*0*				-	-	-	-	-
184		*0*				-	-	-	-	-
197		*0*				-	-	-	-	-
210		*0*				-	-	-	-	-
223		*0*				-	-	-	-	-
236		*0*				-	-	-	-	-
249		*0*				-	-	-	-	-
262		*0*				-	-	-	-	-
275		*0*				-	-	-	-	-
276	Real Residual RAB (end period)				2,180	2,220.8	2,260.0	2,271.6	2,282.0	2,316.7
277	Real Residual RAB (start period)				-	2,180.0	2,220.8	2,260.0	2,271.6	2,282.0
278										
279	**Nominal Asset Values**									
280										
281	Inflation on Opening RAB					44.49	46.25	48.02	49.26	50.49
282	Nominal Straight-line Depreciation					61.22	64.27	67.42	70.23	73.12
283	Nominal Depreciation (economic)					16.7	18.0	19.4	21.0	22.6
284	Nominal Residual RAB (end period)				2,180	2,266.2	2,353.2	2,413.6	2,474.0	2,563.0
285	Inflated Nominal Residual RAB (start period)				-	2,224.5	2,312.4	2,401.2	2,462.8	2,524.5
286										
287	**Tax Values**									
288										
289	Tax Depreciation					53.3	55.1	57.0	58.4	59.9
302		*Transmission lines*				*30.0*	*30.9*	*31.8*	*32.5*	*33.3*
315		*Substations*				*23.3*	*24.2*	*25.2*	*25.9*	*26.6*
328		*Easements*				-	-	-	-	-
341						-	-	-	-	-
354		*0*				-	-	-	-	-
367		*0*				-	-	-	-	-
380		*0*				-	-	-	-	-
393		*0*				-	-	-	-	-
406		*0*				-	-	-	-	-
419		*0*				-	-	-	-	-
432		*0*				-	-	-	-	-
445		*0*				-	-	-	-	-
458		*0*				-	-	-	-	-
471		*0*				-	-	-	-	-
484		*0*				-	-	-	-	-
497		*0*				-	-	-	-	-
510		*0*				-	-	-	-	-
523		*0*				-	-	-	-	-
536		*0*				-	-	-	-	-
549		*0*				-	-	-	-	-
550	Residual Tax Value (end period)				1,800	1,845.6	1,891.4	1,911.1	1,931.0	1,978.4
551										

Rolling forward the *RAB* and depreciation

For consistency, the depreciation in a period must equal the difference between the *RAB* at the start and end of the period. Further, as depreciation is intended to represent the return of *capex* over the life of the asset, accumulated depreciation should not exceed the initial actual capital cost of the infrastructure.

The *RAB* and *capex* data for this sheet (rows 9 and 10) is sourced from the **Input** sheet. The modelling of *capex* is based on a 'hybrid' approach. Under this approach, return on capital is calculated on forecast net *capex* as incurred, whereas return of capital (depreciation) is calculated on forecast net *capex* as commissioned. This *capex* data is sourced from the **Input** sheet.

The PTRM calculates the return on capital based on the opening *RAB*, and *capex* as incurred (recognised the year after it is incurred and capitalised) from the **Input** sheet. Actual *capex* is incurred evenly throughout the year, so a reasonable assumption is that *capex* on average takes place half–way through the year. Therefore, to address the timing difference of modelling *capex*, a half year real vanilla WACC is provided (capitalised and recovered over the life of the assets) to compensate for the 6 month period before *capex* is included in the *RAB* (row 10).[3]

Real straight–line depreciation is calculated in rows 15 to 275. It uses the *RAB* values and lives, and *capex* as commissioned data from the **Input** sheet. The individual depreciation profiles for twenty asset classes can be viewed by expanding rows 15 to 275. The real closing *RAB* is calculated in row 276.

Nominal asset values are depicted in rows 284 to 285. To compensate the investor for inflation the residual value of the *RAB* at the end of each year (row 276) is adjusted upwards for the amount of expected inflation in that year. The change in the nominal value of the *RAB* from period to period can also be also be calculating by adjusting the nominal closing *RAB* for the (economic) depreciation allowance used in the building block framework. Economic depreciation (row 283) is calculated as nominal straight-line depreciation (row 282) less the inflation adjustment on the opening *RAB* (row 281).

Depreciation for tax purposes is calculated in rows 287 to 547, based on historical tax values and *capex* as commissioned. Tax depreciation is calculated separately because asset values and asset lives for tax purposes may differ from that for regulatory purposes.

2.4   Analysis sheet

The **Analysis** sheet itemises the basic costs, or building blocks, of the TNSP which are then summed together to calculate the Annual Building Block Revenue Requirement (ABBRR). To put it another way, the **Analysis** sheet is where the data from the **Input** sheet is combined with the calculations in the **Assets** and **WACC** sheets to estimate the TNSP's revenue requirement (see figure 4).

The **Analysis** sheet also includes an analysis of the forecast cash flows. This analysis provides rate of return measures estimated from forecast revenues and costs,

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3   The half year real vanilla WACC is calculated by the square root of (1 + real vanilla WACC) to account for the compounding effect on an annual rate.

including: expected post and pre–tax returns on equity, effective tax rates, the effective cost of debt and selected measures of the WACC.

Figure 4 below provides an example of the **Analysis** sheet.

Figure 4: Analysis sheet

Post-Tax Building Block Cash Flow Model
Cash Flow Analysis

Item	Param	2007-08	2008-09	2009-010	2010-11	2011-12	2012-13
Year		2007-08	2008-09	2009-010	2010-11	2011-12	2012-13
Inflation Assumption (CPI % increase)			2.04%	2.04%	2.04%	2.04%	2.04%
Cumulative Inflation Index (CPI end period)		100.0%	102.0%	104.1%	106.2%	108.4%	110.6%
RAB (start period)	Nominal value		2,180.0	2,266.2	2,353.2	2,413.6	2,474.0
- Equity	40.00%		872.0	906.5	941.3	965.4	989.6
- Debt	60.00%		1,308.0	1,359.7	1,411.9	1,448.1	1,484.4
Revenue Building Blocks							
Nominal Vanilla WACC	8.06%						
Return on Asset							
- Return on Equity	11.00%		95.9	99.7	103.5	106.2	108.9
- Return on Debt	6.10%		79.8	82.9	86.1	88.3	90.6
Return of Asset (economic depreciation)			16.73	18.03	19.40	20.97	22.63
Opex			64.3	65.7	67.0	68.4	69.8
Tax Payable			20.94	22.09	23.28	24.27	25.28
Less Value of Imputation Credits	50.00%		(10.5)	(11.0)	(11.6)	(12.1)	(12.6)
Annual Building Block Revenue Requirement			267.24	277.38	287.72	296.03	304.46
Tax Expenses							
- Opex			64.3	65.7	67.0	68.4	69.8
- Tax Depreciation			53.3	55.1	57.0	58.4	59.9
- Interest			79.8	82.9	86.1	88.3	90.6
Total Tax Expenses			197.4	203.7	210.1	215.1	220.2
Tax Calculation							
Taxable Income			69.8	73.6	77.6	80.9	84.3
- Pre-tax income			69.8	73.6	77.6	80.9	84.3
- Tax loss carried forward		0.00	-	-	-	-	-
Tax payable	30.00%		20.9	22.1	23.3	24.3	25.3
Value of Imputation Credits	50.00%		10.5	11.0	11.6	12.1	12.6
(intermediate tax calculation)			20.9	22.1	23.3	24.3	25.3
Cash Flow Analysis Below This Line							
Net Present Values							
RAB (start period)	Project NPV Check	(18.9)	2,180.0	2,266.2	2,353.2	2,413.6	2,474.0
PV for Returns on and of Asset only		2,545.0	192.4	200.7	209.1	215.5	222.0
PV for Capex only		383.9	102.9	105.0	79.8	81.4	111.6
Nominal Cash Flow Analysis							
Capital Expenditure		2,180	102.9	105.0	79.8	81.4	111.6
Interest Payments			79.8	82.9	86.1	88.3	90.6
Repayment of Debt		(1,308) -	51.7 -	52.2 -	36.3 -	36.3 -	53.4
Nominal Cash Flow to Equity Holders	Te = 22.97%						
- Pre-tax	12.40%	(872)	71.9	76.0	91.0	94.1	85.9
- Post-tax	9.55%	(872)	51.0	53.9	67.7	69.9	60.6
- Post-tax + val of Imputation Credits	11.00%	(872)	61.5	64.9	79.4	82.0	73.3
Real Cash Flow to Equity							
- Pre-tax	10.15%	(872)	70.5	73.0	85.7	86.8	77.7
- Post-tax	7.36%	(872)	50.0	51.7	63.7	64.4	54.8
- Post-tax + val of Imputation Credits	8.78%	(872)	60.2	62.3	74.7	75.6	66.2
Net Cash Flow to Debt							
Deduction Utilised to Reduce Tax			79.8	82.9	86.1	88.3	90.6
Unutilised Deductions Carried Forward			-	-	-	-	-
Net Cash Flow to Debt	Td = 30.00% / 4.27%	(1,308)	4.1	5.9	24.0	25.6	10.0
Nominal Cash Flows to Assets							
Cashflow to Asset	8.65%	(2,180)	100.0	106.7	140.9	146.2	123.1
Cashflow to Asset Post-tax	7.47%	(2,180)	79.1	84.6	117.6	121.9	97.8
Cashflow to Asset Real	6.47%	(2,180)	98.0	102.5	132.6	134.8	111.3
Cashflow to Asset Real Post-tax	5.32%	(2,180)	77.5	81.3	110.7	112.5	88.4
Check on Vanilla WACC Cash Flow(nom)	8.06%	(2,180)	89.5	95.7	129.2	134.1	110.5
Check on Vanilla WACC Cash Flow(real)	5.90%	(2,180)	87.7	91.9	121.6	123.7	99.9
Further Dissection of Cash Flows							
Return on Equity							
CF with Imputation			61.5	64.9	79.4	82.0	73.3
add back Capex			102.9	105.0	79.8	81.4	111.6
less Nominal Deprec of RAB			(16.7)	(18.0)	(19.4)	(21.0)	(22.6)
plus Debt Repayment			(51.7)	(52.2)	(36.3)	(36.3)	(53.4)
less Net Pre-tax Allowance for Tax (if any)			-	-	-	-	-
gives Nominal Return to Equity			95.9	99.7	103.5	106.2	108.9
less Inflation in Equity Component			(17.8)	(18.5)	(19.2)	(19.7)	(20.2)
gives Real Return to Equity			78.1	81.2	84.3	86.5	88.7
%ROE (1 year)			11.00%	11.00%	11.00%	11.00%	11.00%
%real ROE (1 year)			8.78%	8.78%	8.78%	8.78%	8.78%
Equity at Start of Period			872.0	906.5	941.3	965.4	989.6
True Equity			872.0	906.5	941.3	965.4	989.6
5 Year Analysis							
Revenue		-	267.2	277.4	287.7	296.0	304.5
less Opex		-	(64.3)	(65.7)	(67.0)	(68.4)	(69.8)
less Interest			(79.8)	(82.9)	(86.1)	(88.3)	(90.6)
less Tax		-	(20.9)	(22.1)	(23.3)	(24.3)	(25.3)
plus Imputation Credits			10.5	11.0	11.6	12.1	12.6
less Capex		(2,180.0)	(102.9)	(105.0)	(79.8)	(81.4)	(111.6)
less Loan Repayments		1,308.0	51.7	52.2	36.3	36.3	53.4
RAB Residual Value							1,025.2
Post-tax Return on Equity		(872.0)	61.5	64.9	79.4	82.0	1,098.5
IRR (over 5 years)	11.00%						
Target (over 5 years)	11.00%						

Building block approach to deriving cash flows

Clause 6A.5.4 of the NER requires the AER to apply the building block approach to assessing the revenues required by a TNSP to recover the full cost of providing the regulated (prescribed) service. The revenue requirement includes a commercial return on its investment.

The key building blocks are:

- the post tax return on equity (row 17)

- the cost of debt (or the interest payments incurred) required to service borrowings (row 18)

- depreciation or return of capital (row 20)

- *Opex* (row 22)

- net tax liabilities payable (the figure is net in the sense that it is the annual tax payable by the TNSP (row 24) less the value of imputation credits available to investing shareholders (row 25)).

The costs are determined for each year of the period under review to derive the ABBRR (row 27). As costs can fluctuate from year to year, the revenue requirement is smoothed over time to give the MAR (see **Smoothing** sheet in section 2.5 for more detail).

Taxation and related costs and benefits

Tax is payable on revenue less tax costs recognised by the ATO. Tax–deductible costs include interest or debt servicing, depreciation allowances and *opex* (rows 30 to 32).

Spreadsheet calculations

Tax payable by the TNSP in each period is calculated in rows 30 to 39, in three steps:

1. Pre–tax income is calculated as ABBRR less the estimated total tax expense (row 37).

2. Tax loss carried forward is calculated (row 38).

3. Taxable income (row 36) is then the sum of the above.

The tax costs (rows 30 to 32) used in calculating the pre–tax income in the period are the same as those in the building blocks (rows 18 and 22) with the exception of depreciation. In the case of the building blocks, depreciation (row 20) is calculated on the economic life of the asset (see rows 15 to 275 of the **Assets** sheet). Tax depreciation is generally based on a much shorter tax life or calculated in a different way (see rows 289 to 549 of the **Assets** sheet).

The tax payable is recognised as a building block cost and added to the revenue building blocks (row 24). Offsetting this tax cost is the benefit shareholders receive from imputation credits (gamma). This offsetting benefit is equal to gamma multiplied by the tax payable and is recorded in rows 25 and 40.

Cash flow analysis

Cash flow analysis is fundamental to the AER's transmission determinations. It provides a comprehensive check on the validity of transmission determinations to ensure that the outcomes are consistent with the assumptions forming the basis of the transmission determination. The **Analysis** sheet is designed to check that the desired rate of return on equity can be expected from the regulated revenue stream.

Net Present Values

The total returns on and of the *RAB* is calculated in Row 47. The PV for these cash flows at the start of Year 1 is calculated in cell F47. The PV for *capex* is calculated in cell F48. The PV can be used to show that the PTRM is providing the correct returns to the asset. The project net present value (*NPV*) check (cell F46) for the *RAB* should be equal to zero which indicates that the asset is receiving the correct returns. Note that the *NPV* check on the returns is only relevant for depreciable assets (i.e. not applicable to easements).

Net cash flows available to equity holders

Net nominal pre–tax cash flows to equity holders (row 56) are represented by nominal revenues less:

- *Opex*
- *Capex*
- interest payments
- any repayment of debt in the period.

Net nominal post–tax cash flow to equity holders (row 57) is obtained by further deducting the tax expense of the business. Row 58 adds back the value of imputation credits to calculate the net post–tax benefits available to equity holders in a period.

The *internal rate of return* (*IRR*) of the net cash flows over the life of the assets is calculated in column E. The key *IRR* is the net post–tax returns to equity holders inclusive of imputation credits (r_e), as that is conceptually the return indicated by the CAPM calculation. The CAPM–determined r_e should be validated by the estimated cash flows (row 58).

The corresponding real cash flows and the respective *IRR*s are calculated in rows 60 to 62.

The difference in the *IRR* applying to pre–tax and post–tax cash flows to equity allows the effective rate of tax (Te = 1 – rpost / rpre) to be calculated (cell D56). This can then be used as an input to the formula based WACC calculations.

It is important to note that the formula based WACC calculations will only provide an approximation of the actual WACC outcomes implied by the cash flow calculations. In practice, Te is substantially below the corporate tax rate for assets which can be depreciated at a faster rate for tax purposes.

Net cash flows necessary to service debt and the effective debt shield

The cost of debt is reduced by the value of the 'debt shield' (row 64) in calculating tax liabilities. Where the interest expense in a year reduces taxable income by a

corresponding amount, the net cost of debt for investors is reduced by the corporate tax rate (T).

However, where the taxable income is so low that the full interest deduction is not required to reduce tax liabilities to zero, the value of the debt shield benefit is deferred to a later period. This effect is analysed in rows 64 to 66. That part of interest expense used to defer tax is calculated in each period (row 64) and the unused part carried forward is embodied in the tax loss carried forward calculation (row 65). This allows the net cost to the firm of paying debt holders, after taking account of the tax concession, to be calculated.

The *IRR* calculated (cell E66) represents the effective cost of debt, which is generally well below the nominal cost of debt based on the current interest rates.

Nominal cash flows to assets and calculation of WACC estimates

The cash flows to the different sources of capital (debt and equity) have been presented above, but the cash flows to the assets as a whole are of interest since these aggregate numbers characterise the nature of the regulated business.

The *IRR*s from these cash flows are the WACC estimates expected from the application of the regulatory framework and have greater validity than any formula based approximations. They are summarised in the **WACC** sheet along with the formula based approximations. It should be noted that the WACC outcomes are calculated for reporting purposes only. They are not required for setting revenues since the modelling already provides the requisite revenue forecasts.

Five year analysis

Rows 94 to 105 provide an additional analysis of the cash flow to equity holders over a period of five years, the typical regulatory period.

The purpose of this section is to confirm that the desired r_e target remains over one regulatory period. Rows 94 to 105 are essentially an expansion of the calculations used to derive row 58; that is, cash flow to equity holders inclusive of the value of imputation credits.

2.5   Smoothing sheet

It is common for the revenue stream resulting from the building block approach to be volatile over the regulatory period (for example, due to the lumpiness of *capex*). The volatility associated with the calculated revenues, designed to deliver expected cost recovery, is regarded as undesirable as it can lead to correspondingly volatile prices to end users. Accordingly, chapter 6A of the NER requires the AER to smooth the time profile of revenues by constraining it to follow a *CPI–X* path to prevent volatility in the revenues.

The smoothing X factor is simply a price adjustment mechanism. It does not relate to actual productivity improvements in operations. However, this does not mean the AER ignores productivity improvements when assessing a TNSP's revenue requirements. Instead, the AER includes any expectation of productivity gains directly into the forecasts of costs.

The **Smoothing** sheet applies the smoothing methodology to the 'unsmoothed' forecast revenues (see figure 5). Under this approach, revenues are increased annually by *CPI–X* where the smoothing X-factor is set such that the *NPV* of the smoothed revenues is equivalent to the *NPV* of the unsmoothed revenue stream. This allows some cost recovery to be diverted to adjacent years within the regulatory period.

Figure 5: Smoothing sheet

			2007-08	2008-09	2009-010	2010-11	2011-12	2012-13	2013-14			
Revenue Smoothing												
Year			2007-08	2008-09	2009-010	2010-11	2011-12	2012-13	2013-14			
			Current MAR								**NPV**	
Annual Building Block Revenue Requirement ($m)				$ 267.24	$ 277.38	$ 287.72	$ 296.03	$ 304.46	-		$1,136.62	
Maximum Allowed Revenue - Smoothed ($m)			$ 250.00	$ 267.24	$ 276.61	$ 286.31	$ 296.35	$ 306.74	-		$1,136.62	
X Factor				-4.76%	-1.44%	-1.44%	-1.44%	-1.44%				
	Difference between NPVs:		0									

The **Smoothing** sheet adopts the smoothing methodology as specified in clause 6A.6.8 of the NER, which requires X-factors to be set such that:

1) the NPV of the expected smoothed MAR (cell P9) must equal the NPV of the expected annual building block revenue requirement (cell P7), and

2) the expected MAR for the final year of the regulatory period must be as close as reasonably possible to the annual building block revenue requirement for that year.

The TNSP may nominate the X-factor to apply for each year (inputs at row 11), and these X-factors may differ from year to year.

The unsmoothed revenue forecasts (row 7) are sourced from the **Analysis** sheet. The TNSPs' nominated X-factors (row 11) then automatically smooth this revenue stream over the regulatory period (row 9). The *NPV*s for the unsmoothed and smoothed revenues (in cells P7 and P9 respectively) must be equal. For illustrative purposes only, in Figure 5 the X-factor in the first year of the regulatory control period is set so as to maintain *NPV* equivalence (see cell D14).

2.6 Price Path sheet

The NER requires the AER to set the MAR for TNSPs but does not require it to set or administer transmission prices. Therefore, the **Price Path** sheet is for illustrative purposes only (see figure 6). It aims to provide an indication of the impact that the AER's transmission determination may have on transmission prices.

In row 10, the annual percentage impact on revenues is calculated to show how much transmission revenues are expected to change each year during the regulatory period.

The energy delivered forecasts are sourced from the **Input** sheet and the smoothed revenues are sourced from the **Smoothing** sheet. They are displayed in rows 6 and 8.

The average transmission price path is calculated as the smoothed revenue divided by energy delivered forecast (row 12 = row 8/row 6). In row 14, the annual percentage impact on prices is calculated to approximately show how much transmission pricing is expected to change each year during the regulatory period. The network pricing

provisions of the NER are a more complex set of calculations and details on pricing outcomes should be sought from individual TNSPs.
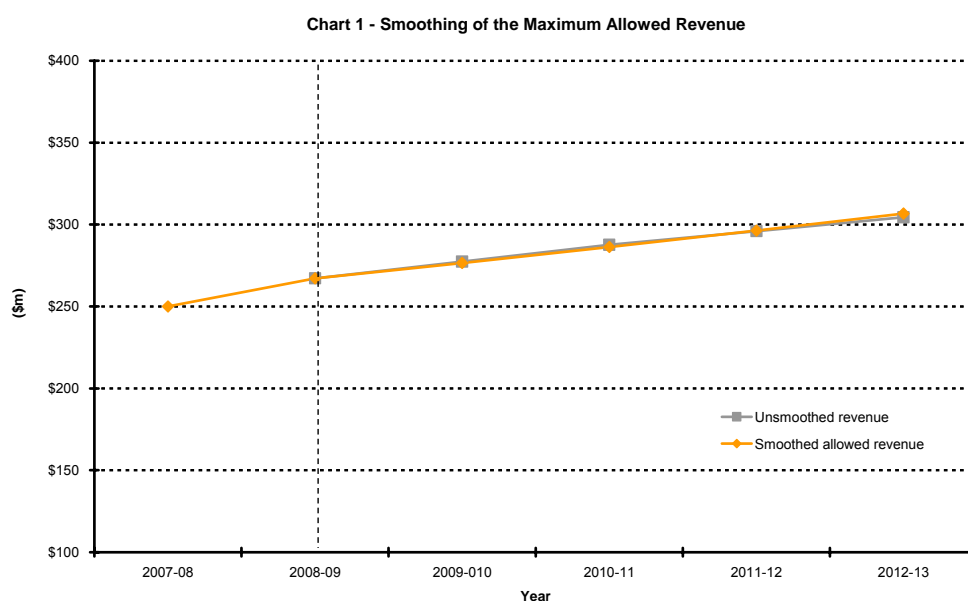
Figure 6: Price path sheet

	2007-08	2008-09	2009-010	2010-11	2011-12	2012-13	2013-14		
Price Path Analysis									
Year	**2007-08**	**2008-09**	**2009-010**	**2010-11**	**2011-12**	**2012-13**	**2013-14**		
Energy (MWh)	26,000,000	27,000,000	28,000,000	29,000,000	30,000,000	31,000,000	-		
Smoothed Revenue ($m)	250,000,000	267,235,955	276,608,260	286,309,263	296,350,493	306,743,881	-		
Annual Percentage Impact on Revenues		6.89%	3.51%	3.51%	3.51%	3.51%	-	Total	20.92%
								Average	4.18%
Price Path ($/MWh)	$ 9.62	$ 9.90	$ 9.88	$ 9.87	$ 9.88	$ 9.89	-		
Annual Percentage Impact on Prices		2.94%	-0.19%	-0.06%	0.06%	0.17%	-	Total	2.91%
								Average	0.58%

2.7   Chart 1 – MAR sheet

The **Chart 1 – MAR** sheet displays a chart which incorporates (see figure 7):

▪   the unsmoothed revenues ($m, nominal) from the **Smoothing** sheet

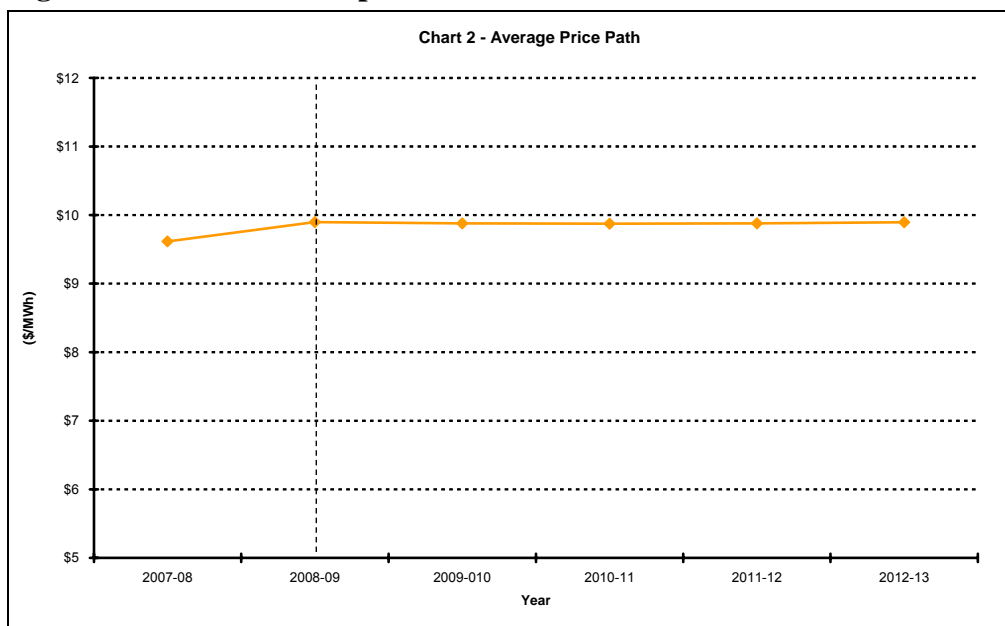▪   the smoothed revenues ($m, nominal) from the **Smoothing** sheet.

Figure 7: Chart 1 – MAR

2.8   Chart 2 – Price Path sheet

The **Chart 2 – Price Path** sheet displays a chart which incorporates the average transmission price path ($/MWh) from the **Price Path** sheet (see figure 8).

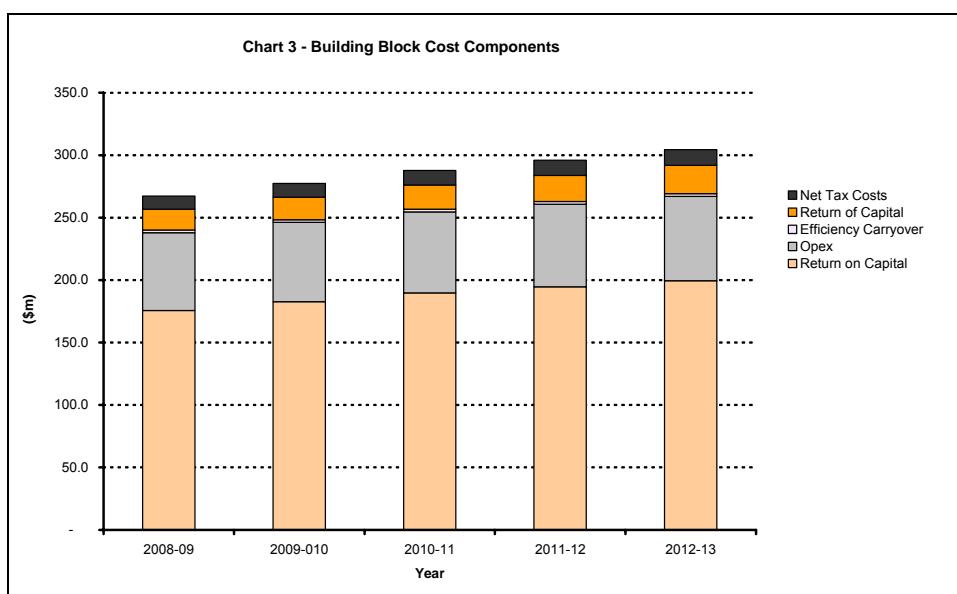**Figure 8: Chart 2 – Price path**

2.9 Chart 3 – Building Blocks sheet

The **Chart 3 – Building Blocks** sheet displays the ABBRR and the various building block cost components, including:

- net tax costs
- regulatory depreciation
- *Opex*
- return on capital.

This information is sourced from the **Analysis** sheet.

Figure 9: Chart 3 – Building block cost components

3   Glossary

This handbook uses the following definitions:

Assets under construction means the value of capex on assets not yet commissioned

Capex means capital expenditure

CAPM means the capital asset pricing model

CPI means the Consumer Price Index

IRR means the internal rate of return

MWh means megawatt hour

NEMMCO means the National Electricity Market Management Company

NPV means net present value

Opex means operating and maintenance expenditure

PV means present value

RAB means the regulatory asset base of a TNSP