



Proposed amendment

**Electricity transmission network service
providers
Post-tax revenue model handbook**

October 2014

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AER reference: 55444

Amendment record

Handbook version	Model version	Date	Pages
1	1	September 2007	24
2	2	December 2010	29
3	3	October 2014 (draft)	30

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Shortened forms

Shortened form	Extended form
ABBRR	annual building block revenue requirement
AER	Australian Energy Regulator
ATO	Australian Tax Office
capex	capital expenditure
CPI	consumer price index
IRR	internal rate of return
MAR	maximum allowed revenue
NEL	National Electricity Law
NER	National Electricity Rules
NPV	net present value
opex	operating expenditure
PTRM	post-tax revenue model
PV	present value
RAB	regulatory asset base
RFM	roll forward model
TAB	tax asset base
TNSP	transmission network service provider
WACC	weighted average cost of capital

1 Nature and Authority

1.1 Introduction

This handbook sets out the Australian Energy Regulator's (AER) post-tax revenue model (PTRM) for electricity transmission network service providers (TNSPs). The PTRM is a series of Microsoft Excel spreadsheets developed in accordance with the requirements of clause 6A.5.1 of the National Electricity Rules (NER).

1.2 Authority

Clause 6A.5.2(a) of the NER requires the AER to develop and publish the PTRM, in accordance with the transmission consultation procedures.

1.3 Role of the Model

The PTRM is used by the AER to determine the TNSP's annual building block revenue requirement (ABBRR) and maximum allowed revenue (MAR) for each regulatory year of a regulatory control period. The TNSP uses the MAR to calculate the transmission prices to be paid by network users at each connection point in its network.

1.4 Confidentiality

The AER's obligations regarding confidentiality and the disclosure of information provided to it by a TNSP are governed by the *Competition and Consumer Act 2010* (Cth), the National Electricity Law (NEL) and the NER.

1.5 Process 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 in clause 6A.20 of the NER. **The AER will publish a revised version of this handbook to accompany each new version of the PTRM it amends or replaces in the future.**

1.6 Version history and effective date

A version 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 that perform iterative calculations to derive the ABRR, MAR and X factors for each regulatory year of the regulatory control period from a given set of inputs.¹ The PTRM allows the user to vary the inputs to assess their impact on output data such as the MAR, X factors and other derived parameters.

The PTRM is configured to:

- perform interim calculations automatically whenever an input is recorded
- perform revenue smoothing calculations and equity raising cost updates manually via buttons that will trigger built in macros.

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 sheets. Values should be entered into each cell that has light blue shading. This sheet comprises of the following sections:

- opening regulatory asset base (RAB) and opening tax asset base (TAB)
- forecast real capital expenditure (capex)—as-incurred
- forecast real asset disposals—as-incurred
- forecast real net capex—as-incurred
- forecast real capex—as commissioned
- forecast real asset disposals—as-de-commissioned
- forecast real net capex—as-commissioned
- forecast real operating expenditure (opex)
- revenue adjustments from other use of prescribed transmission assets
- expected taxation rate
- cost of capital
- debt and equity raising costs—transaction costs
- MAR for the current year
- energy delivered forecast.

Some inputs may need to be specified outside of the **Input** sheet to capture a specific situation (e.g. tax loss carried forward in the **Analysis** sheet or selection of X factors in the **X factors** sheet). These cells are also marked with light blue shading and are addressed when they arise.

¹ The set of Microsoft Excel spreadsheets which constitute the PTRM were created in Microsoft Excel 2007. The AER recommends this or a later version of Microsoft Excel be used in applying these spreadsheets.

Figure 1 and Figure 2 provide examples of the Input sheet.

Figure 1 Input sheet–first screenshot

Asset Class Name	Opening Asset Value (Partially As Incurred)	Opening Asset Value (As Commissioned)	Average Remaining Life (Year)	Standard Life (Year)	Opening Tax Asset Value	Average Tax Remaining Life (Year)	Tax Standard Life (Year)	Base Regulatory Year	Length of Regulatory Control Period (Year)
Asset Class 1	1000.00	1000.00	24.3	50.0	300.00	21.5	45.0	2009-10	5.0
Asset Class 2	800.00	850.00	28.3	40.0	700.00	24.2	35.0		
Asset Class 3	700.00	650.00	n/s	n/s	600.00	n/s	n/s		
Asset Class 4									
Asset Class 5									
Asset Class 6									
Asset Class 7									
Asset Class 8									
Asset Class 9									
Asset Class 10									
Asset Class 11									
Asset Class 12									
Asset Class 13									
Asset Class 14									
Asset Class 15									
Asset Class 16									
Asset Class 17									
Asset Class 18									
Asset Class 19									
Asset Class 20									
Asset Class 21									
Asset Class 22									
Asset Class 23									
Asset Class 24									
Asset Class 25									
Asset Class 26									
Asset Class 27									
Asset Class 28									
Asset Class 29									
Asset Class 30									
Asset Class 50									
Equity raising costs	5.00	5.00	15.0	15.0	3.00	3.0	5.0		
Total	2,505.00	2,595.00			2,203.00				

Figure 2 Input sheet–second screenshot

Year	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Forecast Operating Expenditure (\$m Real 2008-09)										
Controlable opex	10.00	10.00	50.00	70.00	70.00					
Corporate costs	20.00	20.00	20.00	20.00	20.00					
Other										
Efficiency carryover amounts	5.00	4.00	2.00	-	1.00					
Debt raising costs	0.15	0.15	0.16	0.17	0.18					
Total	35.15	34.15	72.16	90.17	89.18					
Revenue Adjustments from Other Use of Prescribed Transmission Assets (\$m Real 2008-09)										
Decrease from shared assets - 6A.5.4(i)(5A)	3.00	3.00	3.00	3.00	3.00					
Total	3.00	3.00	3.00	3.00	3.00					
Expected Taxation Rate (per cent)										
Corporate Tax Rate	30.00%									
Cost of Capital										
Inflation Rate	f	2.50%								
Return on Equity	Re	8.90%								
Utilization of Imputation (Franking) Credits	y	50%								
Proportion of Debt Funding	DV	60%								
Trailing Average Portfolio Return on Debt		7.50%	7.80%							
Debt and Equity Raising Costs - Transaction Costs (per cent)										
Imputation Credit Payout Ratio	PR	70.00%								
Subsequent Equity Raising Cost	SE	3.00%								
Dividend Reinvestment Plan Cost	DRPC	1.00%								
Dividend Reinvestment Plan Take Up	DRPT	30.00%								
Debt Raising Cost	DR	0.00%								
Maximum Allowed Revenue for 2008-09 (\$m Nominal)										
Current Maximum Allowed Revenue	Value	360.00								
Energy Delivered Forecast (MWh)										
Energy	35,000,000	34,300,000	34,800,000	34,700,000	34,600,000	34,500,000				

The PTRM can accommodate input data for up to a 10-year regulatory control period. Input cells outside of the relevant regulatory control period should be left blank.

The PTRM is configured to use the straight-line method as the default position for calculating depreciation for regulatory and tax purposes. After consultation with the AER, TNSPs may propose that depreciation profiles other than the straight-line method be accommodated within the PTRM as part of pre-lodgement discussions and subject to satisfying the requirements at clause 6A.6.3(b) and 6A.6.4 of the NER respectively.

The PTRM is also configured to recognise capex on a partially as-incurred (hybrid) approach.² As such, two RABs determined on the basis of as-incurred capex and as-commissioned capex are required to calculate the return on capital and the return of capital respectively.

2.1.1 Opening regulatory asset base and opening tax base

The opening RAB is the value of assets on which a return will be earned. The opening TAB is used to calculate depreciation for tax purposes. The **Input** sheet requires values for the opening RAB (broken into asset classes in rows 7 to 56) and opening TAB at the start of the first year of the next regulatory control period.³ The RAB and TAB will differ each year to reflect forecast capex (as-incurred for the RAB or as-commissioned for the TAB), asset disposals and regulatory depreciation (for the RAB) or tax depreciation (for the TAB).

The recorded input values are linked to the **Assets** sheet, which also calculates depreciation for the next regulatory control period. Notes have also been included for various cells with specific comments and explanations about the relevance of the inputs.

Asset class name

The asset classes/names are recorded in column G. 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 50 asset classes.⁴ The number of asset classes used in the PTRM will vary between businesses.⁵ However, for each business the number of asset classes used in the PTRM must be consistent with that used in the AER's roll forward model (RFM) to allow the closing RAB values determined in the RFM to be used as inputs to the opening RAB values in the PTRM. **RAB values by asset class derived from the RFM may be aggregated or disaggregated when forming inputs for the PTRM where this demonstrably improves the accuracy or administrative convenience of asset calculations.**

Opening asset value (partially as-incurred)

The opening asset values for each asset class are recorded in column J and are manually sourced from the closing asset values (partially as-incurred) for each asset class determined in the RFM.

Opening asset value (as commissioned)

The opening asset values for each asset class are recorded in column K and are manually sourced from the closing asset values (as-commissioned) for each asset class determined in the RFM.

Average remaining life

The average remaining lives of each asset class are recorded in column L, based on the economic lives of the assets, and are manually sourced from the closing remaining lives for each asset class determined in the RFM (using a weighted average method).

² The partially as-incurred method for recognising capex calculates the return on capital based on an as-incurred approach and the return of capital (regulatory depreciation) is based on an as-commissioned approach.

³ **The button at the left of row 56 may be pressed to display/hide rows 37 to 55 (asset classes 31 to 49).**

⁴ The PTRM can be expanded to accommodate additional asset classes, when necessary.

⁵ **The 50th asset class is designed to be used only with the 'Equity raising costs' asset class. Several defined name ranges use this asset class to implement the iterative equity raising cost update when smoothing total revenue.**

Standard life

The standard lives of each asset class are recorded in column M and measure how long the infrastructure would physically last had it just been built.

Opening tax asset value

The opening tax asset values for each asset class are manually sourced from the closing tax asset values which have been determined in the RFM and are recorded in column N.

Average tax remaining life

The average tax remaining lives of each asset class for taxation purposes are recorded in column O based on the tax lives specified by the Australian Tax Office (ATO) for the category of assets and commissioning dates.

Tax standard life

The tax standard lives of each asset class are recorded in column P.

Base regulatory year

The regulatory year for the start of the next regulatory control period is recorded in cell Q7.

Length of regulatory control period

The number of years in the next regulatory control period is recorded in cell R7.

2.1.2 Forecast real capital expenditure—as-incurred

The forecast capex (as-incurred) values for the next regulatory control period are recorded for each year in rows 61 to 110 (by asset class).⁶ Capex is rolled into the RAB when spending is incurred. Generally, capex falls into three broad categories:

- asset augmentation (e.g. works to enlarge a network or to increase the capability of a network)
- asset replacement (e.g. replacing assets that have passed their useful lives)
- non-network asset (e.g. support the business expenditure)

These inputs must be reported in real terms based on start of year one dollar terms.

2.1.3 Forecast real asset disposals—as-incurred

The forecast asset disposal (as-incurred) values are recorded for the year in which the disposal is expected to take place, in rows 115 to 164 (by asset class). These inputs must be reported in real terms based on start of year one dollar terms.

2.1.4 Forecast real net capital expenditure—as-incurred

This section on forecast net capex does not require inputs to be recorded. For each asset class, forecast net capex is calculated based on the recorded forecast capex less forecast asset disposals. Forecast net capex (as-incurred) values are displayed in rows 169 to 218 and form part of the roll

⁶ Row 110 (asset class 50) is designed to be used for equity raising costs only.

forward of projecting the RAB in the **Assets** sheet. These inputs are assumed to be in real terms based on start of year one dollar terms.

2.1.5 Forecast real capital expenditure—as-commissioned

The forecast capex (as-commissioned) values are recorded for each year in rows 223 to 272 (by asset class). These inputs must be reported in real terms based on start of year one dollar terms.

2.1.6 Forecast real asset disposals—as de-commissioned

The forecast de-commissioned asset disposal values are recorded for each year in rows 277 to 326 (by asset class). These inputs must be reported in real terms based on start of year one dollar terms.

2.1.7 Forecast real net capital expenditure—as-commissioned

This section on forecast net capex does not require inputs to be recorded. For each asset class, forecast net capex is calculated based on the recorded forecast capex less the value of de-commissioned assets. Forecast net capex (as-commissioned) values are displayed in rows 331 to 380 and are used to calculate depreciation in the **Assets** sheet. These inputs are assumed to be in real terms based on start of year one dollar terms.

2.1.8 Forecast real operating 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 opex values for each year are recorded in rows 385 to 389, including any carryover amounts determined according to the efficiency benefit sharing scheme developed by the AER. Row 390 displays benchmark debt raising cost and does not require inputs to be recorded because the calculation is formula-driven, and is based on the practice of treating the allowance as an opex line item. Additional opex inputs can be recorded by adding rows to this section—click on the button labelled 'Insert new opex row'.

These inputs must be reported in real terms based on start of year one dollar terms.

The forecast total opex values (row 391) are linked to the **Analysis** sheet to calculate the ABBRR.

2.1.9 Revenue adjustments from other use of prescribed transmission assets

Any revenue (decrement) adjustments from the shared use of prescribed transmission services assets are recorded in rows 395 to 397.⁷ These are linked to the intermediate building block revenue total in the **Analysis** sheet and affect the tax calculations.

2.1.10 Expected taxation rate

The expected corporate tax rates are recorded for each year in row 402. The tax rates are linked to the **WACC** sheet to calculate the average tax rate and to the **Analysis** sheet to estimate the tax payable, as part of calculating the ABBRR.

2.1.11 Cost of capital

The cost of capital section (rows 406 to 409 and row 412) records the following parameters:

⁷ There is also a button which allows new rows to be inserted.

- inflation rate⁸
- return on equity
- gamma—value of imputation (franking) credits
- proportion of debt funding
- trailing average portfolio return on debt for each year of the regulatory control period.

Each of these parameters is linked to the **WACC** sheet to calculate the weighted average cost of capital (WACC). The approach or method for determining each parameter is specified in clause 6A.6.2 of the NER or the AER *Rate of return guideline*.⁹ Rows 413 to 414 contain content driven help which will display cautions or guidance based on input to this sheet and the **X factors** sheet.

2.1.12 Debt and equity raising costs—transaction costs

The transaction cost of financing section (rows 419 to 423) records the following parameters:

- imputation credit payout ratio
- subsequent equity raising cost
- dividend reinvestment plan cost
- dividend reinvestment plan take up
- debt raising cost.

The values for the imputation credit payout ratio, equity raising and dividend reinvestment costs, and the dividend reinvestment take up are linked to the **Equity raising cost** sheet to calculate the allowance for benchmark equity raising costs associated with capex. The debt raising cost value represents the unit allowance and is linked to row 390 of the **Input** sheet to calculate the overall benchmark debt raising costs to be included in the opex allowance.

2.1.13 Maximum allowed revenue for the current year

Cell G427 records the current MAR for a TNSP. It is linked to the **X factors** and **Revenue summary** sheets, and helps provide historical comparisons for forecast revenues over the next regulatory control period.

2.1.14 Energy delivered forecast

The energy delivered forecast values are recorded in row 431 and are linked to the **X factors** and **Revenue summary** sheets. Energy delivered forecasts may be obtained from the most recent Australian Energy Market Operator's *National electricity forecasting report*, a TNSP's annual planning report or other relevant industry sources.

⁸ Clause 6A.5.3(b)(1) of the NER requires the AER to specify in the PTRM a methodology that is likely to result in the best estimate of expected inflation. The AER uses an approach that calculates the geometric average based on the inflation forecasts for two years sourced from the latest available Reserve Bank of Australia's (RBA's) *Statement of monetary policy* and the mid-point of the RBA's target inflation band for eight years (see AER, *Final decision, TransGrid transmission determination 2009–10 to 2013–14*, 28 April 2009, pp. 60–64).

⁹ AER, *Better regulation: Rate of return guideline*, December 2013.

2.2 WACC sheet

The **WACC** sheet determines for each year of the next regulatory control period the required return on equity, return on debt and the WACC using the relevant cost of capital parameters from the **Input** sheet. **Some of these will be constant across the regulatory control period, the return on debt (and therefore the overall WACC) may now vary year-by-year.**

The effective tax rates derived from the cash-flow analysis are also reported in the **WACC** sheet, including various measures of the WACC calculated from the forecast cash-flows in the Analysis sheet. The nominal pre-tax return on debt (row 15) and the nominal post-tax cost of equity (row 12) are multiplied by the debt and equity components of the RAB (partially as-incurred) to determine the return on capital building block.¹⁰

In addition, there is a button labelled 'Set Te and Td' which is linked to a macro that should be pressed after all inputs have been finalised for establishing the ABBRR at the start of the next regulatory control period. This will copy the cash-flow derived effective tax rates for equity and debt from the **Analysis** sheet to the appropriate location in the **WACC** sheet (cells G28 and G29). The cash-flow derived rates shown in column R are designed as checks to ensure certain parameters are internally consistent with those derived by formula at the time of the final decision. Because the cash-flow derived rates are based on the use of a constant WACC, there is no need to press the 'Set Te and Td' button again as part of the annual return on debt update process during the regulatory control period. This process is discussed further in chapter 3.

Figure 3 provides an example of the **WACC** sheet.

Figure 3 WACC sheet

	A	B	C	D	E	F	G	H	I	J	K	Q	R	S	T
1															
2		Cost of Capital Parameters - TNSP PTRM - version 3 (draft)													
3															
4							2009-10	2010-11	2011-12	2012-13	2013-14		Final decision checks		
5															
6		Inflation Rate	f	Constant	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%				
7		Utilisation of Imputation (Franking) Credits	g	Constant	50%	50%	50%	50%	50%	50%	50%				
8		Proportion of Equity Funding	E/V	Constant	40%	40%	40%	40%	40%	40%	40%				
9		Proportion of Debt Funding	D/V	Constant	60%	60%	60%	60%	60%	60%	60%				
10		Post-tax Nominal Return on Equity (unrounded)		Constant	8.90%	8.90%	8.90%	8.90%	8.90%	8.90%	8.90%				
11		Post-tax Nominal Return on Equity (rounded)	Re	Constant	8.9%	8.9%	8.9%	8.9%	8.9%	8.9%	8.9%		8.90%		
12		Post-tax Real Return on Equity	Rre	Constant	6.24%	6.24%	6.24%	6.24%	6.24%	6.24%	6.24%		6.24%		
13															
14		Corporate Tax Rate	T	Varying	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%				
15		Nominal Pre-tax Return on Debt	Rd	Varying	7.50%	7.80%	7.80%	7.80%	7.80%	7.80%	7.80%				
16		Real Pre-tax Return on Debt	Rrd	Varying	4.88%	5.17%	5.17%	5.17%	5.17%	5.17%	5.17%				
17															
18					Formula approximations of WACC							Cashflow derivations of WACC			
19		Nominal Vanilla WACC		Varying	8.06%	8.24%	8.24%	8.24%	8.24%	8.24%	8.24%		8.23%		
20		Real Vanilla WACC		Varying	5.42%	5.60%	5.60%	5.60%	5.60%	5.60%	5.60%		5.59%		
21		Post-tax Nominal WACC		Varying	6.38%	6.50%	6.50%	6.50%	6.50%	6.50%	6.50%		7.88%		
22		Post-tax Real WACC		Varying	3.78%	3.90%	3.90%	3.90%	3.90%	3.90%	3.90%		5.25%		
23		Pre-tax Nominal WACC		Varying	8.40%	8.58%	8.58%	8.58%	8.58%	8.58%	8.58%		8.57%		
24		Pre-tax Real WACC		Varying	5.75%	5.93%	5.93%	5.93%	5.93%	5.93%	5.93%		5.92%		
25		Nominal Tax Allowance		Varying	0.34%	0.34%	0.34%	0.34%	0.34%	0.34%	0.34%		0.34%		
26		Real Tax Allowance		Varying	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%		0.33%		
27															
28		Effective Tax Rate for Equity (from relevant cashflows)	Te		17.26%	17.26%	17.26%	17.26%	17.26%	17.26%	17.26%		17.26%		
29		Effective Tax Rate for Debt (effective debt shield)	Td		29.96%	29.96%	29.96%	29.96%	29.96%	29.96%	29.96%		29.96%		
30															
31															
32															
33															
34															
35															
36															

At the start of the regulatory control period, use this button to copy across the cashflow-calculated Te and Td. However, these calculations presume a constant WACC so Te/Td should not be updated during a regulatory control period when annually updating the return on debt - just use the same Te/Td from the final decision.

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 year of the next regulatory control period in real (start of year one) and nominal dollar terms. It also calculates both regulatory and tax

¹⁰ See rows 24 to 27 in the **Analysis** sheet, which calculate the return on capital and provide a breakdown of the return on equity and return on debt.

depreciation. The **Assets** sheet displays 55 years of data so that the effective tax rate can be estimated.

Figure 4 provides an example of the **Assets** sheet.

Figure 4 Assets sheet

Year	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Inflation Assumption (CPI % increase)	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Cumulative Inflation Index (CPI end period)	100.00%	102.50%	105.06%	107.63%	110.38%	113.14%	115.91%	118.87%	121.84%	124.83%	128.01%	131.21%	134.43%
Opening Regulatory Asset Base (RAB)	2,505.00												
Real Net Capital Expenditure (capex)		207.81	207.58	258.36	258.36	258.36	-	-	-	-	-	-	-
Nominal Net Capex		213.01	218.09	278.87	285.84	292.99	-	-	-	-	-	-	-
Asset Values (\$m Real 2008-09)													
Real Straight-line Depreciation		72.433	76.550	80.584	85.645	90.71	95.77	95.77	95.77	95.77	95.77	95.77	95.77
Real Residual RAB (end period)	2,505.00	2,640.32	2,771.35	2,943.72	3,123.04	3,291.29	3,195.53	3,099.76	3,003.99	2,908.23	2,812.46	2,716.69	2,620.93
Real Residual RAB (start period)	-	2,505.00	2,640.32	2,771.35	2,943.72	3,123.04	3,291.29	3,195.53	3,099.76	3,003.99	2,908.23	2,812.46	2,716.69
Asset Values (\$m Nominal)													
Inflation on Opening RAB		62.63	67.66	72.79	79.41	86.18	93.09	92.65	92.12	91.50	90.80	90.00	89.11
Nominal Straight-line Depreciation		74.31	80.43	86.78	94.54	102.63	111.06	113.84	116.68	119.60	122.59	125.65	128.80
Nominal Regulatory Depreciation		11.68	12.77	13.99	15.12	16.44	17.87	21.19	24.57	28.10	31.79	35.65	39.68
Nominal Residual RAB (end period)	2,505.00	2,706.33	2,911.65	3,176.53	3,447.25	3,723.80	3,705.93	3,684.84	3,660.07	3,631.96	3,600.19	3,564.54	3,524.95
Inflated Nominal Residual RAB (start period)	-	2,567.63	2,773.39	2,984.44	3,255.34	3,533.43	3,816.89	3,798.48	3,776.76	3,751.58	3,722.78	3,690.19	3,653.65
Tax Values (\$m Nominal)													
Tax Depreciation		71.01	75.60	80.22	85.15	91.23	97.47	97.38	97.38	97.38	97.38	97.38	97.38
Residual Tax Value (end period)	2,203.00	2,333.44	2,476.06	2,667.22	2,860.23	3,054.11	2,956.64	2,859.26	2,761.88	2,664.43	2,567.11	2,469.72	2,372.34
Summary of Asset Roll Forward (\$m Nom)													
Opening RAB		2,505.00	2,706.33	2,911.65	3,176.53	3,447.25	-	-	-	-	-	-	-
Net Capex		213.01	218.09	278.87	285.84	292.99	-	-	-	-	-	-	-
Straight-line Depreciation		74.31	80.43	86.78	94.54	102.63	-	-	-	-	-	-	-
Inflation on Opening RAB		62.63	67.66	72.79	79.41	86.18	-	-	-	-	-	-	-
Closing RAB		2,706.33	2,911.65	3,176.53	3,447.25	3,723.80	-	-	-	-	-	-	-
Check		ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok

2.3.1 Rolling forward the RAB and depreciation

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

The opening RAB (cell F9) and real forecast net capex (rows 10 to 60) values displayed in this sheet are sourced from the **Input** sheet. Nominal forecast net capex values are displayed in rows 61 to 111. The modelling of capex in the PTRM is based on a partially as-incurred approach. Under this approach the return on capital is calculated based on as-incurred forecast net capex and the return of capital (depreciation) is calculated based on as-commissioned forecast net capex.

Capex is assumed to be incurred evenly throughout the regulatory year and therefore a timing assumption is adopted that on average places capex half-way through the year. However, the PTRM calculates the return on capital based on the opening RAB for each year and capex is not added to the RAB until the end of the year in which the expenditure on the asset is incurred. To address this timing difference in modelling the real capex, a half-real vanilla WACC is provided (capitalised and recovered over the life of the assets) to compensate for the six-month period before capex is included in the RAB (rows 11 to 60).¹¹ This is calculated using the specific half-real vanilla WACC applying to the year in which the expenditure is incurred.

Real asset values are displayed in rows 115 to 767. Real straight-line depreciation is calculated in rows 115 to 765. It uses the opening RAB, forecast capex (as-commissioned) values and asset lives from the **Input** sheet. The individual depreciation profiles for each asset class can be viewed by

¹¹ The half-real vanilla WACC is calculated as the square root of (1 + real vanilla WACC) – 1 to account for the compounding effect on an annual rate.

expanding rows 116 to 765. The roll forward of the closing RAB in real dollar terms (start of year one) for each year is calculated in row 766.

Nominal asset values are displayed in rows 771 to 775. To compensate the TNSP for inflation, the residual value of the RAB at the end of each year is adjusted upwards for the amount of expected inflation in that year. This adjustment is calculated in row 771. The change in the nominal value of the RAB from year to year in nominal dollar terms is calculated by adjusting the closing RAB (row 774) for forecast net capex (as-incurred) and the regulatory depreciation allowance. Regulatory depreciation (row 773) is calculated as the nominal straight-line depreciation (row 772), less the inflation adjustment on the opening RAB (row 771).

Depreciation for tax purposes and the tax asset value over time is calculated in rows 779 to 1430 based on the tax asset values, net capex (as-commissioned) values and tax asset lives from the **Input** sheet. The individual tax depreciation profiles for each asset class can be viewed by expanding rows 780 to 1429. Tax depreciation is calculated separately because asset values and asset lives for tax purposes generally differ from those for regulatory purposes.

A summary of the roll forward of the RAB is set out in rows 1434 to 1438.

2.4 Analysis sheet

The **Analysis** sheet itemises the basic costs, or building blocks of the TNSP, which are then added together to calculate the ABBRR. In other words, the **Analysis** sheet is where the data from the **Input** sheet is combined with the calculations in the **Assets** and **WACC** sheets to estimate a TNSP's revenue requirement. The **Analysis** sheet displays 55 years of data so that the effective tax rate can be estimated.

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

Figure 5 and Figure 6 provide examples of the **Analysis** sheet.

Figure 5 Analysis sheet–first screenshot

Year	2002-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Cash Flow Analysis - TNSP PTRM - version 3 (draft)											
Inflation Assumption (CPI % increase)		2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Cumulative Inflation Index (CPI end period)	100.00%	102.50%	105.06%	107.63%	110.38%	113.14%	115.91%	118.67%	121.44%	124.20%	126.96%
Time Varying WACC											
Time Varying Return on Debt		7.50%	7.80%	7.80%	7.80%	7.80%	7.80%	7.80%	7.80%	7.80%	7.80%
Time Varying Nominal Vsnulls WACC		8.06%	8.24%	8.24%	8.24%	8.24%	8.24%	8.24%	8.24%	8.24%	8.24%
Cumulative Discount Factor	100.0%	108.1%	117.0%	126.6%	137.0%	148.3%	160.5%	173.8%	188.1%	203.6%	220.4%
Inverse Cumulative Discount Factor	100.0%	92.5%	85.5%	79.0%	73.0%	67.4%	62.3%	57.5%	53.2%	49.1%	45.4%
Annual Building Blocks (\$m Nominal)											
RAB (start period)		2,505.00	2,706.33	2,911.65	3,176.53	3,447.25	3,723.80	3,705.83	3,684.64	3,660.07	3,631.98
- Equity	40.00%	1,002.00	1,082.53	1,164.66	1,270.61	1,378.90	1,489.52	1,482.33	1,473.86	1,464.03	1,452.79
- Debt	60.00%	1,503.00	1,623.80	1,746.99	1,905.92	2,068.35	2,234.28	2,223.50	2,210.78	2,196.04	2,179.19
Revenue Building Blocks											
Nominal Vsnulls WACC		201.90	223.00	239.92	261.75	284.05	306.84	305.36	303.61	301.53	299.27
Return on Asset		89.18	96.35	103.65	113.08	122.72	132.57	131.93	131.17	130.30	129.50
- Return on Equity	8.90%	112.73	126.66	136.27	148.66	161.33	174.27	173.43	172.44	171.29	169.98
- Return on Debt											
Return of Asset (regulatory depreciation)		11.68	12.77	13.99	15.12	16.44	17.97	21.19	24.57	28.10	31.79
Operating Expenditure (includes EBSS carryover amounts)		97.53	98.92	77.71	99.53	100.30	-	-	-	-	-
Tax Payable		9.45	10.71	12.07	14.03	15.72	18.73	19.67	20.60	21.53	22.48
Less Value of Imputation Credits	50.00%	(4.72)	(5.36)	(6.03)	(7.01)	(7.86)	(9.36)	(9.84)	(10.30)	(10.77)	(11.24)
Building Block Subtotal		315.83	340.05	337.65	383.42	409.26	334.17	336.39	338.48	340.45	342.31
Additional Tax Income											
- Revenue Adjustments for Shared Assets		(3.08)	(3.15)	(3.23)	(3.31)	(3.39)	-	-	-	-	-
Tax Expenses											
- Dpex		97.53	98.92	77.71	99.53	100.30	-	-	-	-	-
- Tax Depreciation		71.01	75.60	80.22	85.15	91.23	97.47	97.38	97.38	97.38	97.38
- Interest		112.73	126.66	136.27	148.66	161.33	174.27	173.43	172.44	171.29	169.98
Total Tax Expenses		281.27	301.18	294.20	333.35	353.47	271.74	270.82	269.83	268.68	267.36
Tax Calculation											
Corporate Tax Rate		30.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%
Taxable Income		314.9	35.72	40.22	46.76	52.40	62.43	65.57	68.65	71.78	74.95
- Pre-tax Income		314.9	35.72	40.22	46.76	52.40	62.43	65.57	68.65	71.78	74.95
- Tax Loss Carried Forward		-	-	-	-	-	-	-	-	-	-
Tax Payable		9.45	10.71	12.07	14.03	15.72	18.73	19.67	20.60	21.53	22.48
Value of Imputation Credits	50.00%	4.72	5.36	6.03	7.01	7.86	9.36	9.84	10.30	10.77	11.24
(intermediate tax calculation)		9.45	10.71	12.07	14.03	15.72	18.73	19.67	20.60	21.53	22.48

Figure 6 Analysis sheet—second screenshot

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
55	Cash Flow Analysis Below This Line (\$m Nominal)															
56																
57		Net Present Values														
58	RAB (start period)															
59	PV For Returns on and of Asset Only															
60	PV For Capex Only															
61																
62		Nominal Cash Flow Analysis														
63	Capital Expenditure															
64	Interest Payments															
65	Repayment of Debt															
66																
67		Nominal Cash Flow to Equity Holders														
68	- Pre-tax															
69	- Post-tax															
70	- Post-tax + Value of Imputation Credits															
71																
72		Real Cash Flow to Equity														
73	- Pre-tax															
74	- Post-tax															
75	- Post-tax + Value of Imputation Credits															
76																
77		Net Cash Flow to Debt														
78	Cash Flow to Debt before Tax Calculation															
79	Deduction Utilized to Reduce Tax															
80	Utilised Deductions Carried Forward															
81	Net Cash Flow to Debt															
82																
83		Nominal Cash Flows to Assets														
84	Cashflow to Asset															
85	Cashflow to Asset Post-tax															
86	Cashflow to Asset Real															
87	Cashflow to Asset Real Post-tax															
88	Check on Vanilla WACC Cash Flow (nominal)															
89	Check on Vanilla WACC Cash Flow (real)															
90																
91		Further Dissection of Cash Flows														
92																
93																
94																
95																
96																
97																
98																
99																
100																
101																
102																
103		Regulatory Control Period Analysis (\$m Nominal)														
104																
105	Revenue															
106	Less Opex															
107	Less Interest															
108	Less Tax															
109	Plus Imputation Credits															
110	Less Capex															
111	Less Loan Repayments															
112	RAB Residual Value															
113	Post-tax Return on Equity															
114																
115	IPR (during regulatory control period)															
116	Target (during regulatory control period)															
117																
118		Additional Disaggregation														
119																
120	Return on Capital															
121	Opex (excluding EBSS carryover)															
122	EBSS Carryover															
123	Revenue Adjustments 1															
124	Carryover and Adjustments															
125	Return of Capital															
126	Net Tax Costs															
127	Building Block Total															
128																
129	Revenue Forecasts in Absence of Corporate Tax															
130																

2.4.1 Building block approach to deriving cash flows

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

The key building blocks are:

- the return on capital comprising (row 23) :
 - the post-tax return on equity (row 25)
 - the return on debt (or the interest payments incurred) required to service borrowings (row 26)
- the regulatory depreciation or return of capital (row 28)
- opex including carry-over amounts (row 30)
- net tax liabilities payable—the figure is net in the sense that it is the annual tax payable by the TNSP (row 32) less the value of imputation credits available to investing shareholders (row 33).

The costs are determined for each year of the next regulatory control period to derive the building block subtotal (row 35). **There is an additional adjustment to reflect the taxation implications of revenue adjustments for shared assets (row 38).** Because the costs can fluctuate from year to year, the ABBRR (which includes the additional revenue adjustments) is smoothed over the next regulatory control period to give the MAR (see section 2.5).

As a result of the PTRM's particular timing assumptions, i.e. all cash flows with exception of capex are assumed to occur at the end of each regulatory year, there is no need to provide TNSPs an allowance for working capital in the modelling.¹²

2.4.2 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 41 to 43).

Spreadsheet calculations

Tax payable by the TNSP for each year is calculated in rows 35 to 53, in three steps:

- Pre-tax income (row 49) is calculated as the building block subtotal plus the additional tax income (row 38) less the estimated total tax expense (row 44).
- Tax loss carried forward is calculated (row 50).
- Taxable income (row 48) is then the sum of the above.

The tax costs (rows 41 to 43) used in calculating the pre-tax income for the year are the same as those in the building blocks (rows 26 and 30) with the exception of depreciation. In the case of the revenue building blocks, regulatory depreciation (row 28) is calculated based on the economic life of the asset (see rows 115 to 765 and 771 to 773 of the **Assets** sheet). Tax depreciation is generally based on a much shorter tax life or calculated in a different way (see rows 779 to 1429 of the **Assets** sheet).

The tax payable is recognised as a building block cost and added to the revenue building blocks (row 35). 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 33 and 52.

2.4.3 Cash flow analysis

Calculations in the cash flow analysis section provide a comprehensive check on the validity of revenue determinations to ensure that the outcomes are consistent with the assumptions forming the basis of the building block approach. The **Analysis** sheet is designed to check the desired rate of return on equity that can be expected from the regulated revenue stream.

Net present values

The total returns on and of capital (comprising the RAB and capex) is calculated in row 59. The present value (PV) for these cash flows at the start of the first year of the next regulatory control period is calculated in cell F59. The PV for capex is calculated in cell F60. The PV can be used to show that the PTRM is providing the correct returns to the asset. The project net present value (NPV)

¹² The timing of the capex cash flow is assumed to be mid-year.

check (cell F58) for the RAB should be equal to zero, which indicates that the asset is receiving the correct returns.

Net cash flows available to equity holders

Net nominal pre-tax cash flows to equity holders (row 68) 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 69) is obtained by further deducting the tax expense of the business. Row 70 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). The determined r_e should be validated by the estimated cash flows (row 70).

The corresponding real cash flows and the respective IRRs are calculated in rows 72 to 74.

The difference in the IRR applying to pre-tax and post-tax cash flows to equity allows the effective rate of tax ($T_e = 1 - r_{\text{post}}/r_{\text{pre}}$) to be calculated (cell D68). 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, T_e is substantially below the corporate tax rate for assets that 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 76) 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.

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 76 to 79. That part of interest expense used to defer tax is calculated in each year (row 77) and the unused part carried forward is embodied in the tax loss carried forward calculation (row 78). This allows the net cost to the firm of paying debt holders, after taking account of the tax concession, to be calculated.

The IRR calculation (cell E79) 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 IRRs 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.

Regulatory control period analysis

Rows 105 to 113 provide an additional analysis of the cash flow to equity holders over a regulatory control period.

The purpose of this section is to confirm that the desired re target remains over the next regulatory control period. Rows 105 to 113 are essentially an expansion of the calculations used to derive row 70—that is, cash flow to equity holders inclusive of the value of imputation credits.

Additional disaggregation

Rows 120 to 129 provide additional breakdown of revenue by components in accordance with the categories listed in the NER. These values are referred to in the **X factors, Revenue summary and Chart 3—Building blocks** sheets.

2.5 X factors sheet

It is common for the revenue stream resulting from the building block approach to be lumpy over the regulatory control period (e.g. because of a lumpy capex profile). The lumpy revenues, designed to deliver expected cost recovery, is regarded as undesirable because it can lead to price shocks for 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.

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

The **X factors** sheet applies the smoothing methodology to the unsmoothed nominal forecast revenues—that is, the ABBRR. The ABBRR (rows 35 and 39) is sourced from the **Analysis** sheet. Under this approach, revenues are increased annually by CPI-X where the smoothing X factor is set so that the NPV of the smoothed revenue stream is equivalent to the NPV of the unsmoothed revenue stream. This allows some of the cost recovery to be diverted to adjacent years within the regulatory control period.

A TNSP may nominate the X factor to apply for each year (inputs at row 47) of the next regulatory control period. These X factors may differ from year to year subject to satisfying the requirements of the NER.

Clause 6A.6.8 requires X factors to be set such that:

1. The NPV of the expected smoothed MAR (cell R44) must equal the NPV of the expected ABBRR (cell R39).

2. The expected smoothed MAR for the final year of the regulatory control period must be as close as reasonably possible to the ABBRR for that year.¹³

When smoothing across the regulatory control period, it is necessary to iteratively update equity raising costs as well. This is because the estimate of equity raising costs is dependent on the smoothed revenue (MAR) profile, but in turn the MAR is dependent on the estimate of equity raising costs. Hence, there are a number of macros built into the PTRM which jointly smooth revenues while iteratively updating equity raising costs. It is possible to stop the automatic updating of equity raising costs using the drop down menu in cell G16.

The first macro has been set up to automatically calculate the default smoothing path. First, this entails setting the smoothed MAR for the first year equal to the ABBRR for that year (this will show as a change to the X factor in year 1, sometimes referred to as P_0). Next, the macro calculates the single (constant) X factor which can be applied to all remaining years of the next regulatory control period so that the NPV of smoothed (MAR) and unsmoothed (ABBRR) revenue is the same. To implement this macro, click on the button labelled 'Apply default smoothing'. After the calculation is completed, the required X factors will show in row 47.

Alternatively, it might be necessary (including during the annual debt update) to adjust the X factor for a specific year only. The buttons at rows 49 to 50 can be used to ensure that the NPVs of the smoothed and unsmoothed revenue streams are equal—that is, the difference between the NPVs is zero (cell R49). These buttons will iteratively update equity raising costs while smoothing (unless this default option is turned off, as noted above). The nominal smoothed MAR, based on either employing the default smoothing that uses a single constant X factor or nominated set of X factors, is displayed in row 44. The difference between the final year ABBRR and MAR is presented in cells R41 (nominal dollars) and R42 (percentage of unsmoothed revenue).

All NPV calculations in this sheet now reflect the time varying WACC (row 7) which arises as a result of the return on debt (potentially) varying each year. The cumulative discount rate is calculated in row 8. When the return on debt is updated within the regulatory control period, these discount rates will change as a result, and so too will the NPV of the ABBRR and MAR.¹⁴

The process for annually updating the return on debt is described further in chapter 3. There is a drop down menu in cell F21 which allows the user to input the year of the annual return on debt update. This drop down menu will not affect underlying calculations, but instead drives the presentation of content-sensitive help in this sheet (and in the **Input** sheet). Rows 23 to 26, and row 51, will display caution notes/guidance based on logical tests of the PTRM.

Figure 7 provides an example of the **X factors** sheet.

¹³ The AER in its regulatory determinations has considered a divergence of up to 3 per cent between the expected MAR and ABBR for the final year of the regulatory control period to be reasonable if this can achieve smoother price changes for customers over the regulatory control period.

¹⁴ This is not the only change that flows from a change to the return on debt – the return on capital and return of capital building blocks will change, and therefore so will the tax building block.

Figure 7 X factors sheet

VEC	D	E	F	G	H	I	J	K	Q	R	S
1	X Factor Calculations - TNSP PTRM - version 3 (draft)										
4	Year	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14				
5	Discount Rates										
7	Nominal Vanilla WACC (ranging)		8.06%	8.24%	8.24%	8.24%	8.24%				
8	Cumulative Discount Rate	1.00	1.08	1.17	1.27	1.37	1.48				
10	Inflation Assumption (CPI % increase) (constant)		2.50%	2.50%	2.50%	2.50%	2.50%				
11	Cumulative Inflation Index (CPI end period)	1.00	1.03	1.05	1.08	1.10	1.13				
14	Instructions and Warnings										
15	The buttons below the row of X factors will smooth total revenue, while also iteratively updating equity raising costs.										
16	If you do not intend to update equity raising costs, use this drop down menu: <input type="button" value="update ERC when smoothing (default)"/>										
18	The "Default Smooth" option will set year 1 smoothed revenue equal to year 1 unsmoothed revenue, and then determine the constant X factor for all remaining years so that total NPV(smoothed) = NPV (unsmoothed)										
19	Hence, it should only be used at the start of the regulatory period - adjust the X factor for individual years when updating the return on debt within a period										
21	Select year of update for annual cost of debt	<input type="text" value="2009-10"/> This option only affects which cautions are displayed (shown in this section, the sections below and on the input page)									
23	Cautions This section is blank because no cautions are active.										
27	Building Block Components (\$m, nominal)										
30	Return on Capital		201.90	223.00	239.92	261.75	284.05				
31	Return of Capital (regulatory depreciation)		11.68	12.77	13.39	15.12	16.44				
32	Operating Expenditure		32.40	34.72	35.56	39.53	40.03				
33	EBSS Carryover and Other Adjustments		2.05	1.05	1.08	3.31	4.53				
34	Net Tax Allowance		4.72	5.36	6.03	7.01	7.86				
35	Annual Building Block Revenue Requirement (unsmoothed)		312.76	336.90	334.42	380.10	405.87				
37	(\$m Nominal)										
38	Unsmoothed - Annual Building Block Revenue Req	\$60.00	312.76	336.90	334.42	380.10	405.87	NPV			
39			0.00	First year difference (\$m)				-5.60	Final year difference (\$m)		
40			0.00%	First year difference (%)				-2.12%	Final year difference (%)		
42	Smoothed - Maximum Allowed Revenue	\$60.00	312.76	332.03	352.49	374.20	397.26	1,332.63			
43	X Factors	positive P0, X imply real decrease in revenue constraint	P_0	X_02	X_03	X_04	X_05				
44			15.24%	-3.51%	-3.51%	-3.51%	-3.51%				
46		<input type="button" value="Apply default smoothing"/>	<input type="button" value="Set P0 (X1)"/>	<input type="button" value="Set X2"/>	<input type="button" value="Set X3"/>	<input type="button" value="Set X4"/>	<input type="button" value="Set X5"/>	-0.00	NPV difference (smoothed vs unsmoothed)		
53	SMOOTHING REVENUE BASED ON BUILDING BLOCK MODEL										
54	Under the building block approach significant year to year variations in costs and/or forecast volumes can lead to undesirable implications in calculated pricing designed to deliver the expected cost recovery.										
55	To minimise price shock, the revenue can be smoothed <u>within a regulator control period</u> while maintaining the key principle of cost recovery under the building block approach. This is done by allowing some cost recovery to be diverted to adjacent years within the regulatory control period.										
57	The National Electricity Rules (clause 6A.6.8) require that X factors must be set such that:										
60	1) the NPV of the expected smoothed MAR (cell R43) must equal the NPV of the expected annual building block revenue requirement (cell R38), and										
61	2) the expected MAR for the final year of the regulatory control period must be as close as reasonably possible to the annual building block revenue requirement for that year (see cells R40:R41).										
62	The TNSP may nominate the X factors (in row 46) to apply for each year of the regulatory control period, and these X factors must satisfy the requirements of clause 6A.6.8.										

2.6 Revenue summary sheet

The **Revenue summary** sheet outlines the various building blocks, the unsmoothed (ABBRR) and smoothed (MAR) nominal forecast revenues for the next regulatory control period. The building blocks and unsmoothed ABBRR are summarised in rows 7 to 12. The smoothed MAR and the X factors for the next regulatory control period are summarised in rows 16 and 17 respectively. The equivalent building blocks, unsmoothed and smoothed revenues, and X factors for the next regulatory control period in real dollar terms (start of year one) are also summarised in rows 21 to 31. All this information is sourced from the **Analysis** and **X factors** sheets.

The **Price Path Analysis** section presents summary values for the forecast price path, derived from consideration of both forecast energy demand and revenue. These are broad indicators provided for illustrative purposes only.¹⁵ Rows 38 to 43 present values in nominal dollar terms, and rows 50 to 55 present equivalent values in real dollar terms (start of year one). In each section, the forecast energy consumption is presented (sourced from the **Input** sheet), together with the MAR (in nominal or real dollar terms, respectively). Total revenue divided by forecast energy demand provides the indicative price path. There are also calculations showing the percentage change year-on-year (again, in nominal or real dollar terms) and the average yearly change across the regulatory control period.¹⁶

¹⁵ These price paths are also presented for comparability with the distribution PTRM, where they relate to additional alternative forms of control (specifically, the weighted average price cap and revenue yield cap) which are available to DNSPs but not TNSPs.

¹⁶ The average yearly change is calculated as the geometric mean (not the arithmetic mean), and therefore reflects the cumulative impact of year-on-year percentage changes across the regulatory control period. In other words, the value shown in cells S40, S43, S52 and S55 is the percentage change that, if applied to every year in the regulatory control period, would arrive at the total cumulative change across the period.

Figure 8 provides an example of the Revenue summary sheet.

Figure 8 Revenue summary sheet

AEC	D	E	F	G	H	I	J	K	Q	R	S	T	U
1	Revenue and Price Summary - TNSP PTRM - version 3 (draft)												
4	Year	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Total					
5	Building Block Components (\$m Nominal)												
7	Return on Capital		201.90	223.00	239.92	261.75	284.05	1,210.62					
8	Return of Capital (regulatory depreciation)		11.68	12.77	13.99	15.12	16.44	70.00					
9	Operating Expenditure		92.40	94.72	75.56	99.53	102.03	464.24					
10	EBSS Carryover and Other Adjustments		2.05	1.05	1.08	3.31	4.53	5.81					
11	Net Tax Allowance		4.72	5.36	6.03	7.01	7.86	30.99					
12	Annual Building Block Revenue Requirement (unsmoothed)	366.66	312.76	336.90	334.42	380.10	405.87	1,770.04			1,392.63	NPV	
14	Revenue Smoothing (\$m Nominal)												
16	Maximum Allowed Revenue (smoothed)	366.66	312.76	332.03	352.49	374.20	397.26	1,768.74			1,392.63	NPV	
17	X Factors		15.24%	-3.57%	-3.57%	-3.57%	-3.57%	-3.57%					
19	Building Block Components (\$m Real 2008-09)												
20	Return on Capital		196.98	212.26	222.79	237.13	251.06	1,120.21					
22	Return of Capital (regulatory depreciation)		11.40	12.15	12.99	13.70	14.53	64.77					
23	Operating Expenditure		90.15	90.15	70.16	90.17	90.18	430.82					
24	EBSS Carryover and Other Adjustments		2.00	1.00	1.00	3.00	4.00	5.00					
25	Net Tax Allowance		4.61	5.10	5.60	6.35	6.95	28.61					
26	Annual Building Block Revenue Requirement (unsmoothed)	366.66	308.13	323.66	313.54	347.36	361.73	1,654.42					
28	Revenue Smoothing (\$m Real 2008-09)												
29	Maximum Allowed Revenue (smoothed)	366.66	305.13	316.03	327.32	339.01	351.12	1,638.61					
31	X Factors		15.24%	-3.57%	-3.57%	-3.57%	-3.57%	-3.57%					
33	Price Path Analysis (\$ Nominal)												
35	The National Electricity Rules require the AER to determine the Maximum Allowed Revenue for TNSPs and not transmission charges. For illustrative purposes, this section provides an indication of the impact that the AER's revenue determination will have on transmission charges.												
38	Forecast Energy (GWh)	55,000	54,900	54,800	54,700	54,600	54,500						
39	Maximum Allowed Revenue (\$m)	366.66	312.8	332.0	352.5	374.2	397.3				10.35%	Total cumulative change	
40	Annual Percentage Impact on Revenues		-13.12%	6.16%	6.16%	6.16%	6.16%				1.99%	Average yearly change	
42	Price Path (\$/MWh)	6.55	5.70	6.08	6.44	6.85	7.29				11.36%	Total cumulative change	
43	Annual Percentage Impact on Prices		-12.96%	6.36%	6.36%	6.36%	6.36%				2.18%	Average yearly change	
45	Price Path Analysis (\$ Real 2008-09)												
47	The National Electricity Rules require the AER to determine the Maximum Allowed Revenue for TNSPs and not transmission charges. For illustrative purposes, this section provides an indication of the impact that the AER's revenue determination will have on transmission charges.												
50	Forecast Energy (GWh)	55,000	54,900	54,800	54,700	54,600	54,500						
51	Maximum Allowed Revenue (\$m)	366.66	305	316	327	339	351				-2.47%	Total cumulative change	
52	Annual Percentage Impact on Revenues		-15.24%	3.57%	3.57%	3.57%	3.57%				-0.50%	Average yearly change	
54	Price Path (\$/MWh)	6.55	5.56	5.77	5.98	6.21	6.44				-1.57%	Total cumulative change	
55	Annual Percentage Impact on Prices		-15.09%	3.76%	3.76%	3.76%	3.76%				-0.32%	Average yearly change	

2.7 Equity raising cost sheet

In raising new equity capital a business may incur costs such as legal fees, brokerage fees, marketing costs and other transaction costs. These are upfront expenses, with little or no ongoing costs over the life of the equity. While the majority of the equity a firm will raise is typically obtained at its inception, there may be points in the life of a firm—for example, during significant capital expansions—where it chooses additional external equity funding (instead of debt or internal funding) as a source of equity capital, and accordingly may incur equity raising costs.

The benchmark cash flow analysis applied by the AER to determine the extent to which equity raising associated with capex is required has been discussed in detail in previous transmission determinations.¹⁷ Broadly, the analysis uses the PTRM cash flows to calculate the amount of retained earnings (taking account of cash flows such as revenue, opex, interest payment, tax payment dividends, and dividend reinvestment plans). The amount of retained earnings is deducted from the equity component of forecast capex (while maintaining the benchmark level of gearing) to determine any external equity requirement. The **Equity raising cost** sheet sets out the benchmark cash flow analysis.

The opening RAB and capex values (rows 7 and 8) are sourced from the **Assets** sheet. Based on this information the capex rate is calculated and displayed in row 9. The capex rate indicates the

¹⁷ AER, *Final decision, Powerlink transmission determination 2012–13 to 2016–17*, April 2012, pp. 145–147.

proportion of the capex relative to the opening RAB but does not affect the calculation of equity raising costs by itself.

The tax payable values (row 13) are sourced from the **Analysis** sheet and are used in combination with parameters (such as the corporate tax rate and imputation credit payout ratio) from the **Inputs** sheet to calculate the dividends payable (row 14). A proportion of dividends that are paid out to investors are assumed to be reinvested in the business. The amount of dividends reinvested by investors is displayed at row 16 and is used in the benchmark cash flow analysis to determine retained cash flows.

The benchmark cash flow analysis set out in rows 19 to 34 are undertaken in nominal dollar terms and is used to determine the equity raising costs as follows:

- The revenues (row 19) sourced from the **X factors** sheet less expenses such as opex, interest payments, tax payable and other revenue adjustments (rows 20 to 23) sourced from the **Analysis** sheet provides the internal cash flow (row 24).
- The internal cash flow less dividends paid out to shareholders (row 25) provides the retained cash flow (row 26).
- The capex funding requirement (row 30) is sourced from row 8, adjusted to remove the gross-up for the WACC provided in the PTRM to account for the assumed timing of the incurrence of capex, which is not relevant for financing purposes. The debt component (row 31) represents the increase in debt funding and is sourced from the **Analysis** sheet, whereby to maintain the benchmark level of gearing, the level of debt must equal 60 per cent of the RAB rather than capex. The residual of capex funding requirement less the increase in debt funding gives the equity component (row 32), which represents the amount of capex that must be funded through retained earnings and then new equity.
- The equity component less retained cash flow (row 33), where it is insufficient, indicates the additional equity requirement (row 34).¹⁸

Rows 38 to 40 displays the equity component, retained cash flow and additional equity requirement in real dollar terms (based on start of year one) by converting the nominal dollar equivalents set out in rows 32 to 34. Dividend reinvestment also in real dollar terms is displayed in row 42 by converting the nominal dollar equivalent as set out in row 15.

If the total equity requirement over the next regulatory control period is above zero, cell Q46 calculates the total dividend reinvestment plan requirement based on the total amount set out at Q42. The total external equity requirement over the next regulatory control period is calculated at cell Q47 by taking the difference between the total equity requirement and the total dividend reinvestment. Cell Q48 displays the sum of the total dividend reinvestment plan requirement and the total external equity requirement. This is the total equity requirement.

Based on the total amount of dividends reinvested (cell Q46) and the external equity requirement (cell Q47) the cost for each of these component (sourced from the **Input** sheet) is calculated in cells Q50 and Q51 respectively. The sum of these components provides the total equity raising costs in real dollar terms (start of year one) and is displayed at cell Q52. A positive value for the total equity raising

¹⁸ Where there is sufficient retained cash flow to cover the equity component of capex, the amounts shown in row 34 would be negative.

costs over the next regulatory control period indicates that the calculated benchmark equity raising costs should be allowed and recovered by the TNSPs.

The equity raising cost calculations must be performed iteratively because they are both an input to and an output from the building block calculation.¹⁹ In other words, a change in the equity raising cost will change the ABBRR and MAR, which in turn changes the equity raising cost. Further, the equity raising cost calculation depends on both unsmoothed building block components (for instance, the outgoing cash flows each year) and the smoothed total revenue (for instance, the available revenue each year). Accordingly, changes to the smoothed revenue profile (the MAR) can change the required equity raising cost, starting the cycle again.

By default, the smoothing macros in the **X factors** sheet perform these iterative calculations for equity raising costs at the same time. However, this function can be disabled using the drop-down menu in cell G16 of the **X factors** sheet.²⁰

Figure 9 provides an example of the **Equity raising cost** sheet.

¹⁹ This does not mean that the calculation method for the entire workbook needs to be set to manual or iterative (under Options -> Formulas -> Calculation options). The implementation in the PTRM is such that direct values are entered on the **Input** sheet, so there is no circular reference, and the iterative updates are managed via macros when smoothing. Hence, the calculation option can be left as automatic, without iteration.

²⁰ In that case, the equity raising cost entered (in two places) in the **Input** sheet will not be updated to reflect the calculation in the **Equity raising cost** sheet. A caution will appear in the **X factors** sheet (cell D26) when the relevant values do not align.

Figure 9 Equity raising cost sheet

	F	G	H	I	J	K	L	M	N	O	P	Q
1	Equity Raising Cost - TNSP PTRM - version 3 (draft)											
2												
3												
4	Year	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Total
5	RAB and Capex (\$m Nominal)											
6												
7	Opening RAB	2,505.00	2,706.33	2,911.65	3,176.53	3,447.25	-	-	-	-	-	14,746.76
8	Capex	213.01	218.09	278.87	285.84	292.99	-	-	-	-	-	1,288.80
9	Capex Rate	8.50%	8.06%	9.58%	9.00%	8.50%	0.00%	0.00%	0.00%	0.00%	0.00%	8.74%
10												
11	Dividend Assessment (\$m Nominal)											
12												
13	Tax Payable	9.45	10.71	12.07	14.03	15.72	-	-	-	-	-	61.98
14	Dividends	15.43	17.50	19.71	22.91	25.68	-	-	-	-	-	101.23
15	Dividend Reinvestment	4.63	5.25	5.91	6.87	7.70	-	-	-	-	-	30.37
16												
17	Benchmark Cash Flows (\$m Nominal)											
18												
19	Revenue (smoothed)	312.76	332.03	352.49	374.20	397.26	-	-	-	-	-	1,768.74
20	Opex	92.40	94.72	75.56	99.53	102.03	-	-	-	-	-	464.24
21	Interest Payment	112.73	126.66	136.27	148.66	161.33	-	-	-	-	-	685.64
22	Revenue Adjustments	3.08	3.15	3.23	3.31	3.39	-	-	-	-	-	16.16
23	Tax Payable	9.45	10.71	12.07	14.03	15.72	-	-	-	-	-	61.98
24	Internal Cash Flow	101.26	103.09	131.83	115.29	121.57	-	-	-	-	-	573.04
25	Dividends	15.43	17.50	19.71	22.91	25.68	-	-	-	-	-	101.23
26	Retained Cash Flow (excl. dividend reinvestment)	85.83	85.59	112.12	92.38	95.90	-	-	-	-	-	471.81
27												
28	Benchmark Capex Funding (\$m Nominal)											
29												
30	Capex Funding Requirement	204.91	209.62	268.05	274.75	281.62	-	-	-	-	-	1,238.94
31	Debt Component	120.80	123.19	158.93	162.43	165.93	-	-	-	-	-	731.28
32	Equity Component	84.11	86.43	109.12	112.32	115.69	-	-	-	-	-	507.67
33	Retained Cash Flow (excl. dividend reinvestment)	85.83	85.59	112.12	92.38	95.90	-	-	-	-	-	471.81
34	Equity Requirement (SEO)	1.71	0.84	3.00	19.93	19.79	-	-	-	-	-	35.85
35												
36	Benchmark Capex Funding (\$m Real 2008-09)											
37												
38	Equity Component	82.06	82.27	101.33	101.75	102.25	-	-	-	-	-	469.66
39	Retained Cash Flow (excl. dividend reinvestment)	83.73	81.47	104.11	83.69	84.76	-	-	-	-	-	437.76
40	Equity Requirement	1.67	0.80	2.79	18.06	17.50	-	-	-	-	-	31.89
41												
42	Dividend Reinvestment	4.52	5.00	5.49	6.23	6.81	-	-	-	-	-	28.04
43												
44	Equity Raising Costs (\$m Real 2008-09)											
45												
46	Dividend Reinvestment Plan Requirement											28.04
47	External Equity (SEO) Requirement											3.85
48	Total Equity Requirement											31.89
49												
50	Dividend Reinvestment Plan Cost											0.28
51	External Equity Raising (SEO) Cost											0.12
52	Total Equity Raising Cost											0.40
53												

2.8 Chart 1—Revenue

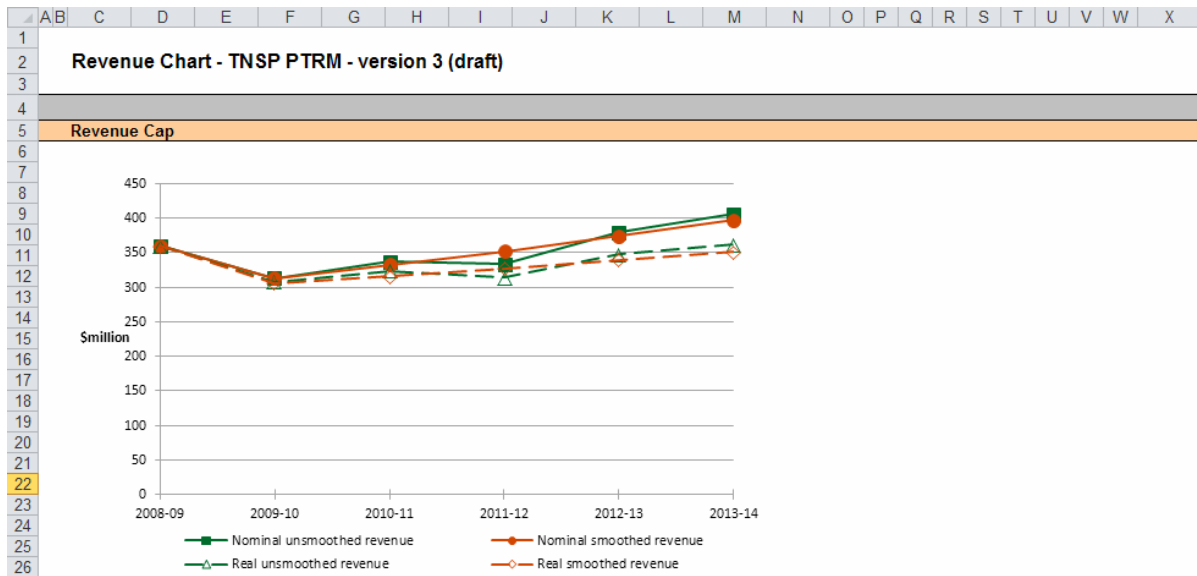
The **Chart 1—Revenue** sheet displays a chart that incorporates the:

- nominal and real ABBRR
- nominal and real MAR derived under the revenue cap

This information is sourced from the **Revenue summary** sheet.

Figure 10 Chart 1—Revenue sheet provides an example of the **Chart 1—Revenue** sheet.

Figure 10 Chart 1–Revenue sheet



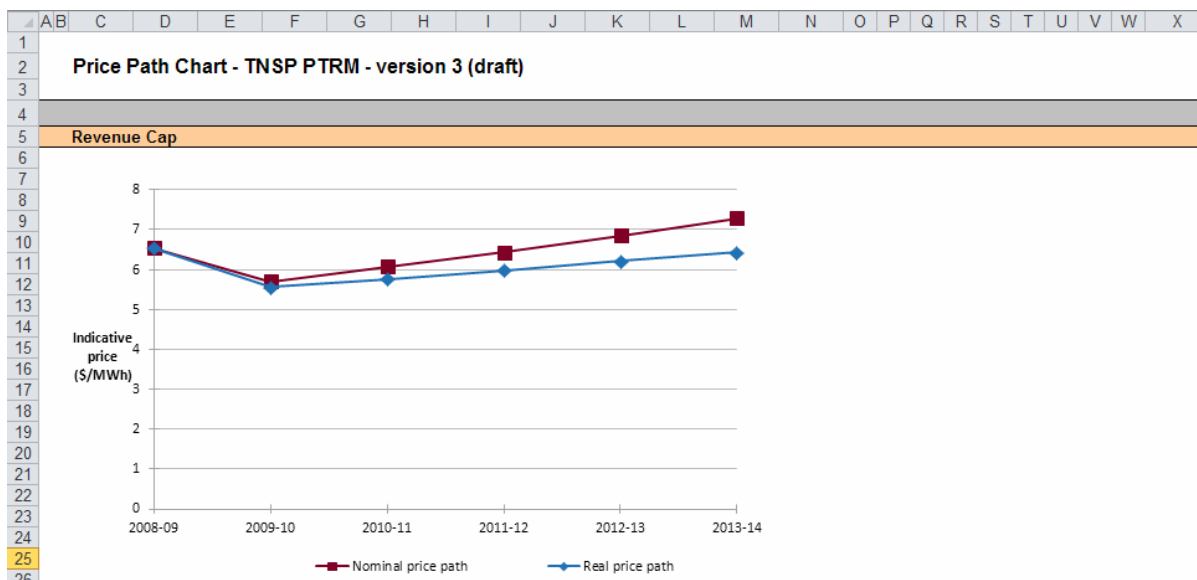
2.9 Chart 2—Price path

The **Chart 2–Price path** sheet displays a chart that presents the indicative price path (approximated by total revenues divided by total energy demand forecast) in nominal and real dollar terms (start of year one).

This information is sourced from the **Revenue summary** sheet.

Figure 11 provides an example of the **Chart 2–Price path** sheet.

Figure 11 Chart 2–Price path sheet



2.10 Chart 3—Building blocks

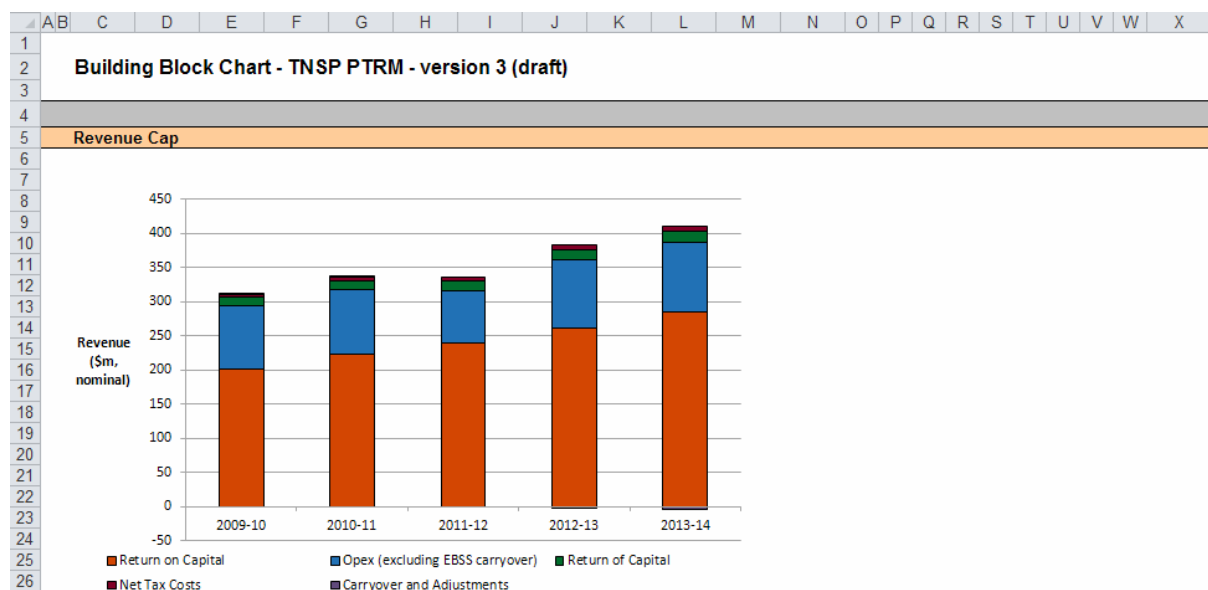
The **Chart 3—Building blocks** sheet displays the various building block cost components making up the ABBRR:

- return on capital
- regulatory depreciation
- opex (excluding any carry-over amounts)
- net tax costs
- carry-over and other revenue adjustments.

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

Figure 12 provides an example of the **Chart 3—Building blocks** sheet.

Figure 12 Chart 3—Building blocks sheet



3 Process for annual return on debt update

This section sets out the default process to set X factors at the time of the final decision, and the default process for annual updates of the return on debt. Some aspects of this approach will be guided by policy decisions to be made during individual determinations. However, following the process set out below will likely result in the basis for calculations that is consistent with the requirements of clauses 6A.6.2(h)–(l) of the NER.

3.1 Setting X factors for the final decision before the start of the regulatory control period

1. Complete all inputs in the **Input** sheet. This requires a trailing average portfolio return on debt value only in G412.²¹ By default, the PTRM approach adopts the most recent trailing average portfolio return on debt that is entered, where there is no further forecast values entered for other years in the regulatory control period. Accordingly, it is not necessary to enter the cost of debt for later years in the regulatory control period at this stage.²²
2. In the **X factors** sheet, ensure that the equity raising cost update option (cell G16) is set to 'update ERC when smoothing (default)'. This will ensure that the equity raising cost calculations are iteratively updated as part of setting the X factors.²³
3. In the **X factors** sheet, check that cell F21 is set to the first year of the next regulatory control period. This will ensure the correct checks and warnings operate for the model.
4. In the **X factors** sheet, apply revenue smoothing:
 - a. If applying the default X factor path (year 1 ABBRR = year 1 MAR; $X_2=X_3=X_4=X_5$; $NPV(ABBRR) = NPV(MAR)$), press the button labelled 'Apply default smoothing'.
 - b. If applying an alternative smoothing path, manually enter values for all X factors (cells G47:P47) except one, then press the relevant button to calculate the final remaining X factor (so that $NPV(ABBRR) = NPV(MAR)$). This final X factor can be any of the X factors in the regulatory control period (including the first year, which is also labelled as 'P0')
 - c. In either case, it is necessary to consider the resulting difference between the final year ABBRR and MAR (shown in cells R41 and R42). If this difference would not meet the requirements of NER clause 6A.6.8, return to step (b) and manually adjust one or more X factors again (ensuring that the final X factor adjustment uses the relevant button so as to jointly smooth the revenue and equity raising cost calculations).
5. In the **WACC** sheet, press the 'Set Te and Td' button to copy the cash-flow derived effective tax rates for equity and debt from the **Analysis** sheet to the appropriate cells in the **WACC** sheet.

²¹ Also, the year-by-year tax rates (row 402) only require the first year (cell G402) to be entered; the PTRM will apply this tax rate to later years where there is no explicit tax rate entered.

²² The PTRM will use the return on debt for a given year if entered, so if forecasts were entered for later years in the regulatory control period (and these values differ from the year 1 return on debt), this will be reflected in the building block calculations. However, this is not intended to be the default operation of the PTRM. If a TNSP was to propose (at the time of making the final decision) return on debt forecasts for year 2 onwards this would need to be assessed as part of an individual determination.

²³ The 'do NOT update ERC when smoothing' option can be selected for certain analysis that seeks to isolate the impact of equity raising cost from the revenue requirement.

3.2 Updating X factors to incorporate the annual update to the trailing average portfolio return on debt

1. In the **X factors** sheet, select the relevant year of update in cell F21.
2. In the **Input** sheet (row 412), enter the trailing average portfolio return on debt values up to and including the relevant year of update, consistent with that selected in cell F21 of the **X factors** sheet.²⁴ Caution notes will appear in rows 413 to 414 of the **Input** sheet to show which inputs are necessary. No other inputs should be changed.
3. In the **X factors** sheet, ensure that the equity raising cost update option (cell G16) is set to 'update ERC when smoothing (default)'.²⁵
4. In the **X factors** sheet, apply smoothing to recalculate the X factor using the button for the relevant year as identified in step 1. The correct year for update will be identified by a caution note in row 51 under the smoothing X factor buttons. It is important that the X factors for past years in the regulatory control period are not altered, since these X factors reflect the revenue (and price) outcomes from those years. Further, the default approach is that only the X factor for the year of update should be altered (rather than multiple X factors, for this year and remaining years within the regulatory control period).²⁵ This means that the impact of increases/decrease in that year's return on debt will be fully reflected in price changes in that year. For example, to re-smooth for a return on debt update in year 2 the button labelled 'Set X2' would be used, and all other X factors as determined during the final decision process would remain unaltered.

²⁴ By default, the PTRM will use the most recent return on debt value as the forecast for later years (where the return on debt is not yet known). Hence, at each annual update the forecast for the remaining years in the regulatory control period will be updated.

²⁵ If a TNSP was to propose an alternative approach (for instance, where multiple X factors were changed in response to a given year's annual return on debt update) this would need to be assessed as part of an individual determination and approved as part of the final decision