



**DRAFT DECISION
APA VTS Australia
Gas access arrangement
2018 to 2022**

Attachment 2 – Capital base

July 2017

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Note

This attachment forms part of the AER's draft decision on the access arrangement for APA VTS Australia for 2018-22. It should be read with all other parts of the draft decision.

The draft decision includes the following documents:

Overview

Attachment 1 - Services covered by the access arrangement

Attachment 2 - Capital base

Attachment 3 - Rate of return

Attachment 4 - Value of imputation credits

Attachment 5 - Regulatory depreciation

Attachment 6 - Capital expenditure

Attachment 7 - Operating expenditure

Attachment 8 - Corporate income tax

Attachment 9 - Efficiency carryover mechanism

Attachment 10 - Reference tariff setting

Attachment 11 - Reference tariff variation mechanism

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Shortened forms

Shortened form	Extended form
AER	Australian Energy Regulator
ATO	Australian Tax Office
capex	capital expenditure
CAPM	capital asset pricing model
CPI	consumer price index
DRP	debt risk premium
ECM	(Opex) Efficiency Carryover Mechanism
ERP	equity risk premium
Expenditure Guideline	Expenditure Forecast Assessment Guideline
gamma	Value of Imputation Credits
MRP	market risk premium
NGL	National Gas Law
NGO	national gas objective
NGR	National Gas Rules
NPV	net present value
opex	operating expenditure
PTRM	post-tax revenue model
RBA	Reserve Bank of Australia
RFM	roll forward model
RIN	regulatory information notice
RPP	revenue and pricing principles
SLCAPM	Sharpe-Lintner capital asset pricing model
STTM	Short Term Trading Market
TAB	Tax asset base
UAFG	Unaccounted for gas
WACC	weighted average cost of capital
WPI	Wage Price Index

2 Capital base

The capital base roll forward accounts for the value of APA VTS's (APA) regulated assets over the access arrangement period. The opening capital base value for a regulatory year within the access arrangement period is rolled forward by indexing it for inflation, adding any conforming capex, and subtracting depreciation and other possible factors (for example, disposals or customer contributions).¹ Following this process, we arrive at a closing value of the capital base at the end of the relevant year. The opening value of the capital base is used to determine the return of capital (regulatory depreciation) and return on capital building block allowances.

This attachment sets out our draft decision on APA's opening capital base as at 1 January 2018 for the 2018–22 access arrangement period. It also sets out our draft decision on APA's projected capital base for the 2018–22 access arrangement period.

2.1 Draft decision

We do not approve APA's proposed opening capital base of \$1008.5 million (\$ nominal) as at 1 January 2018.² This is because:

- we do not accept APA's proposal to use forecast inflation as an input to roll forward the capital base over the 2013–17 access arrangement period
- we have made several amendments to other proposed inputs for the capital base roll forward model (RFM)
- we have substituted our latest version of the RFM to correct a numbers of errors in the proposed RFM.

We determine an opening capital base of \$985.5 million (\$nominal) as at 1 January 2018, which is \$23.0 million (\$ nominal) lower than that proposed by APA, a reduction of 2.3 per cent.

Table 2.1 summarises our draft decision on the roll forward of APA's capital base during the 2013–17 access arrangement period.

¹ The term 'rolled forward' means the process of carrying over the value of the capital base from one regulatory year to the next.

² Proposal figures in this attachment are based on APA's revised PTRM, which reflects updates and changes after the initial access arrangement revision proposal was submitted. *APA VTS - B4 - APA Post Tax Revenue Model revised with WORM (includes 3 March 2017 updates for inflation in response to AER information request IR003) - 16 May 2017.*

Table 2.1 AER draft decision on APA's capital base roll forward for the 2013–17 access arrangement period (\$million, nominal)

	2013	2014	2015	2016	2017
Opening capital base	634.0	649.8	762.5	842.7	931.7
Net capex	15.9	127.9	97.4	108.1	65.0
Indexation of capital base	12.3	11.2	12.9	12.4	18.6
Less: straight-line depreciation	12.4	26.4	30.2	31.6	29.8
Closing capital base	649.8	762.5	842.7	931.7	985.5
Opening capital base as at 1 January 2018					985.5^a

Source: AER analysis.

- (a) The adjustment to account for any difference between actual and estimated capex in the final 'year' of the previous access arrangement period (in this case, 1 January 2012 to 31 December 2012 and the additional six months from 1 January 2013 to 30 June 2013) is not required for APA because actual capex was included in APA's 2013 approved opening capital base. This occurred as part of the amendments to the 2013–17 access arrangement that followed a decision by the Australian Competition Tribunal.

We do not approve APA's proposed roll forward of its projected capital base over the 2018–22 access arrangement period, and do not approve its closing capital base at 31 December 2022 of \$1176.8 million (\$ nominal).³ This is because:

- we amended APA's proposed inputs to the projected capital base roll forward, specifically the opening capital base (section 2.4.1), forecast depreciation (attachment 5), expected inflation (attachment 3), and forecast capex (attachment 6)
- we do not accept APA's proposal to use lagged actual inflation (annually updated) in the roll forward of its projected capital base (attachment 3).

Based on our revised amounts for these inputs, we determine a projected closing capital base of \$1138.7 million (\$ nominal) as at 31 December 2022. This is \$38.2 million (\$ nominal) less than that proposed by APA, a reduction of 3.2 per cent.

Table 2.2 sets out the projected roll forward of the capital base during the 2018–22 access arrangement period.

³ APA VTS - B4 - APA Post Tax Revenue Model revised with WORM (includes 3 March 2017 updates for inflation in response to AER information request IR003) - 16 May 2017.

Table 2.2 AER's draft decision on APA's projected capital base roll forward for the 2018–22 access arrangement period (\$million, nominal)

	2018	2019	2020	2021	2022
Opening capital base	985.5	1037.6	1084.1	1147.3	1143.2
Net capex	63.6	60.7	79.0	15.4	12.5
Indexation of capital base	24.1	25.4	26.6	28.1	28.0
Less: straight-line depreciation	35.7	39.6	42.4	47.6	45.0
Closing capital base	1037.6	1084.1	1147.3	1143.2	1138.7

Source: AER analysis.

We accept APA's proposal to establish the opening capital base as at 1 January 2023 using the approved depreciation schedules based on forecast capex over the 2018–22 access arrangement period.⁴ These depreciation schedules will be adjusted for actual inflation outcomes over this period.

2.2 APA's proposal

APA's proposal outlined its opening capital base at 1 January 2018, projected capital base over the 2018–22 access arrangement period, and the depreciation approach for determining the opening capital base at 1 January 2023 for the next access arrangement review.

2.2.1 Opening capital base as at 1 January 2018

APA proposed an opening capital base as at 1 January 2018 of \$1008.5 million (\$ nominal).⁵ This amount is calculated by:

1. rolling forward the opening capital base as at 1 July 2013 of \$635.9 million (\$nominal) by adding the forecast net capex, removing approved forecast depreciation,⁶ and adding inflation indexation on the opening capital base in each

⁴ APA, *VTS Revision Proposal submission*, 3 January 2017, p. 212. The amount of the forecast depreciation to be used for rolling forward the capital base at the next access arrangement review will be set out in our final decision for APA's 2023–27 access arrangement period.

⁵ APA VTS, *B4 - APA Post Tax Revenue Model revised with WORM (includes 3 March 2017 updates for inflation in response to AER information request IR003)*, 16 May 2017. The proposed roll forward of the capital base used capex recognised on an "as incurred" basis.

⁶ The use of forecast depreciation in the roll forward of the capital base in the 2013–17 access arrangement period is determined in the final decision for the 2013–17 access arrangement. AER, *Access arrangement final decision APA GasNet Australia (Operations) Pty Ltd 2013–17 Part 2: Attachments*, March 2013, p. 39.

year of the 2013–17 access arrangement period calculated using the forecast inflation rate⁷

2. adding to the capital base calculated in the first stage, the difference between the actual and forecast capex, and the inflation indexation on that difference calculated using actual inflation rates.

APA's proposed capital base roll forward during the 2013–17 access arrangement period is shown in Table 2.3.

Table 2.3 APA's proposed capital base roll forward for the 2013–17 access arrangement period (\$millions, nominal)

	2013	2014	2015	2016	2017
Opening capital base	635.9	646.9	763.8	849.6	944.7
Net capex	15.9	127.1	97.5	108.5	71.2
Indexation of capital base	7.9	16.2	18.9	20.1	22.7
Less: straight-line depreciation	12.8	26.5	30.5	33.6	30.1
Closing capital base	646.9	763.8	849.6	944.7	1008.5
Opening capital base as at 1 January 2018					1008.5^a

Source: APA VTS - B4 - APA Post Tax Revenue Model revised with WORM (includes 3 March 2017 updates for inflation in response to AER information request IR003) - 16 May 2017.

- (a) The adjustment to account for any difference between actual and estimated capex in the final 'year' of the previous access arrangement period (in this case, 1 January 2012 to 31 December 2012 and the additional six months from 1 January 2013 to 30 June 2013) is not required for APA because actual capex was included in APA's 2013 approved opening capital base. This occurred as part of the amendments to the 2013–17 access arrangement that followed a decision by the Australian Competition Tribunal.

2.2.2 Projected capital base over the 2018–22 access arrangement period

APA proposed a projected closing capital base as at 31 December 2022 of \$1176.8 million (\$ nominal). APA determined this value by adjusting the opening value as at 1 January 2018 for depreciation (attachment 5), forecast net capex (attachment 6) and expected inflation (attachment 3). APA also proposed that the projected capital base roll forward—within the post-tax revenue model (PTRM)—would be annually updated within the 2018–22 access arrangement period to account for lagged actual inflation. The projected roll forward of the capital base during the 2018–22 access arrangement period is shown in Table 2.4.

⁷ The forecast capex and forecast inflation are the approved amounts from the amended final decision for the 2013–17 access arrangement period. AER, *Amended APA GasNet Australia (Operations) Pty Ltd 2013–17 access arrangement decision*, November 2013.

Table 2.4 APA's proposed projected capital base roll forward for the 2018–22 access arrangement period (\$million, nominal)

	2018	2019	2020	2021	2022
Opening capital base	1008.5	1073.1	1130.5	1189.3	1183.6
Net capex	81.5	77.0	80.5	19.8	16.9
Indexation of capital base	20.2	21.5	22.6	23.8	23.7
Less: straight-line depreciation	37.1	41.0	44.3	49.4	47.3
Closing capital base	1073.1	1130.5	1189.3	1183.6	1176.8

Source: APA VTS - B4 - APA Post Tax Revenue Model revised with WORM (includes 3 March 2017 updates for inflation in response to AER information request IR003) - 16 May 2017.

2.2.3 Capital base at the commencement of the 2023–27 access arrangement period

APA proposed to use the depreciation schedule based on forecast capital expenditure to establish the opening capital base as at 1 January 2023.⁸ APA proposed that it would use actual inflation across the 2018–22 access arrangement period to establish this opening capital base.

2.2.4 Inflation treatment across PTRM and RFM

APA's proposal raised significant issues with inflation treatment across the PTRM and RFM. APA's underlying concern was that the standard AER inflation treatment entailed a 'mismatch' between the regulatory depreciation calculations at different stages in the regulatory process.⁹ APA submitted that this resulted in under-compensation for the service provider across the 2013–17 access arrangement period, and increased the likelihood of under or over recovery in future access arrangement periods.

APA's identification of a 'mismatch' relates particularly to the inflation adjustment included in the depreciation calculation used to roll forward the capital base across an access arrangement period.¹⁰ At a high level, there are three possible approaches to this inflation adjustment that we have considered in our assessment of APA's proposal:

1. use forecast inflation in the PTRM, but actual inflation in the RFM
2. use forecast inflation in the PTRM, and forecast inflation in the RFM

⁸ APA, *VTS Revision Proposal submission*, 3 January 2017, p. 212.

⁹ APA, *VTS Revision Proposal submission*, 3 January 2017, pp. 118–119.

¹⁰ This roll forward occurs in projected terms in the PTRM (for the 2018–22 access arrangement period), and in actual terms in the RFM (for the 2013–17 access arrangement period that will soon be concluded).

3. use actual inflation in the PTRM, and actual inflation in the RFM.¹¹

The first approach is our standard approach, and was used for APA VTS in the 2008–12 access arrangement period. As noted above, APA's current proposal is to use the second approach for the 2013–17 period, and the third approach for the 2018–22 access arrangement period.¹² APA submitted that its core aim is to align the inflation treatment of regulatory depreciation across the PTRM and RFM, whether this is in forecast inflation (2013–17) or actual inflation (2018–22) terms.¹³

2.3 Assessment approach

Our approach to assessing APA's projected capital base is consistent with that adopted in previous gas transmission decisions made under the NGR.¹⁴ In accordance with rule 77(2) and rule 78 of the NGR, we applied three steps to calculate the projected capital base:

- First, we confirm the value of the opening capital base for the first year of the 2013–17 access arrangement period (in this case, 1 July 2013).¹⁵ Typically, this includes making an adjustment to account for any difference between actual and estimated capex in the final year of the previous access arrangement period (in this case, 1 January 2012 to 31 December 2012).¹⁶ This adjustment must also remove any benefit or penalty associated with any difference between the estimated and actual capex for that year.¹⁷ We note that this adjustment is subject to any changes made in our assessment of conforming capex for that year.
- Second, the opening capital base as at 1 July 2013 is rolled forward to determine the closing capital base as at 31 December 2017. This closing capital base is also used as the value of the opening capital base for the access arrangement period as at 1 January 2018. This involves:¹⁸

¹¹ This is a simplification—since actual inflation is not known in advance, APA's proposal is to use annually updated lagged actual inflation in the PTRM. Actual inflation is used in the RFM, which is completed after the end of the access arrangement period when actual inflation values are known (noting that there is still a need to true up the final year estimate of inflation). Finally, the standard RFM uses a 'partially-lagged' approach where some components use (un-lagged) actual inflation and others use one year lagged actual inflation.

¹² Although APA's current proposal is to use approach 2 for the 2013–17 roll forward, the 2013 decision on the 2013–17 access arrangement revision proposal stated that approach 1 would be used.

¹³ APA, *Victorian transmission system, Access arrangement submission*, 3 January 2017, pp. 120–121; APA, *APA VTS response to AER information request #IR003*, 3 March 2017, pp. 1, 4, 6.

¹⁴ AER, *Access arrangement final decision APA GasNet Australia (Operations) Pty Ltd 2013–17 Part 2: Attachments*, March 2013; AER, *Final decision Amadeus Gas Pipeline Access Arrangement - Attachment 2 - Capital Base*, May 2016.

¹⁵ The AER released its amended decision on the APA Pipeline on 21 November 2013. The AER's amended decision approved the current access arrangement period, which runs from 1 July 2013 to 31 December 2017. AER, *Amended decision – APA GasNet 2013–17 access arrangement*, 21 November 2013, p. 6.

¹⁶ This is not required for APA because actual 2012 capex was included in APA's 2013 approved opening capital base. This occurred as part of the amendments to the 2013–17 access arrangement that followed a decision by the Australian Competition Tribunal.

¹⁷ NGR, r. 77(2)(a).

¹⁸ NGR, r. 77(2).

- adding conforming actual capex for each year—this requires assessing the capex and determining that it is consistent with the provisions of the 2013–17 access arrangement and data from the audited reset regulatory information notice, as well as the definition of 'conforming capital expenditure' in the NGR¹⁹
- removing depreciation for each year based on the approach approved for the 2013–17 access arrangement
- removing any capital contributions during the 2013–17 access arrangement period
- adding any speculative capex or redundant assets that will be reused during the 2018–22 access arrangement period
- removing any redundant assets and disposals during the 2013–17 access arrangement period
- indexing the roll forward each year for actual inflation.
- Third, the capital base is projected over the 2018–22 access arrangement period by rolling forward the opening capital base as at 1 January 2018 to 31 December 2022. This involves performing the following on the opening capital base:²⁰
 - adding forecast conforming capex for each year
 - removing forecast depreciation for each year
 - removing the forecast value of assets to be disposed of during the 2018–22 access arrangement period
 - indexing the capital base of the roll forward each year for expected inflation.

2.3.1 Interrelationships

The level of the capital base substantially impacts the service provider's revenue and the price consumers pay. It is an input into the determination of the return on capital and depreciation (return of capital) allowances.²¹ Factors that influence the capital base will therefore flow through to these building block components and the annual building block revenue requirement. Other things being equal, a higher capital base increases both the return on capital and depreciation allowances. In turn, it increases the service provider's revenue, and prices for its services.

The capital base is determined by various factors, including;

- the opening capital base (meaning the value of existing assets at the beginning of the access arrangement period)

¹⁹ NGR, r. 79.

²⁰ NGR, r. 78.

²¹ The size of the capital base also impacts the benchmark debt raising cost allowance. However, this amount is usually relatively small and therefore not a significant determinant of revenues overall.

- net capex²²
- depreciation
- indexation adjustment – so the capital base is presented in nominal terms, consistent with the rate of return.

The opening capital base depends on the value of existing assets as well as actual conforming net capex, actual inflation outcomes and depreciation in the past.

The capital base when projected to the end of the access arrangement period may increase due to forecast new capex and the indexation adjustment. The size of the indexation adjustment depends on expected inflation (which also affects the nominal rate of return or WACC) and the size of the capital base at the start of each year.

Depreciation reduces the capital base. The depreciation allowance depends on the size of the opening capital base, the forecast net capex and depreciation schedules applied to the assets.

We maintain the capital base in real terms by indexing for inflation. A nominal rate of return (WACC) is multiplied by the opening capital base to produce the return on capital building block.²³ By convention, the indexation adjustment is offset against depreciation to prevent double counting of inflation in the capital base and WACC, which are both presented in nominal terms. This reduces the apparent size of the depreciation building block that feeds into the annual building block model for setting revenue.²⁴ The implications of our approach to indexing the value of the capital base on revenues are discussed further in attachment 5.

Figure 2.1 shows the key drivers of the change in the capital base over the 2018–22 access arrangement period as proposed by APA. Overall, the closing capital base at the end of the 2018–22 access arrangement period would be 16.7 per cent higher than the opening capital base at the start of that period based on the proposal, in nominal terms. The proposed forecast net capex increases the capital base by about 27 per cent, while expected inflation increases it by about 11 per cent. Forecast depreciation, on the other hand, reduces the capital base by about 22 per cent.

The capital base would reduce by about 0.4 per cent in real terms over the 2018–22 access arrangement period based on APA's proposal. The depreciation amount also

²² Net capex is gross capex less disposals and capital contributions. The rate of return or WACC also influences the size of the capex, which is assumed to be incurred in the middle of the year. This is because capex is not depreciated in the year it is first incurred, but added to the capital base at the end of the year. As a result, the capex amount is escalated by half a WACC to arrive at an end of year value. It then begins depreciating the following year.

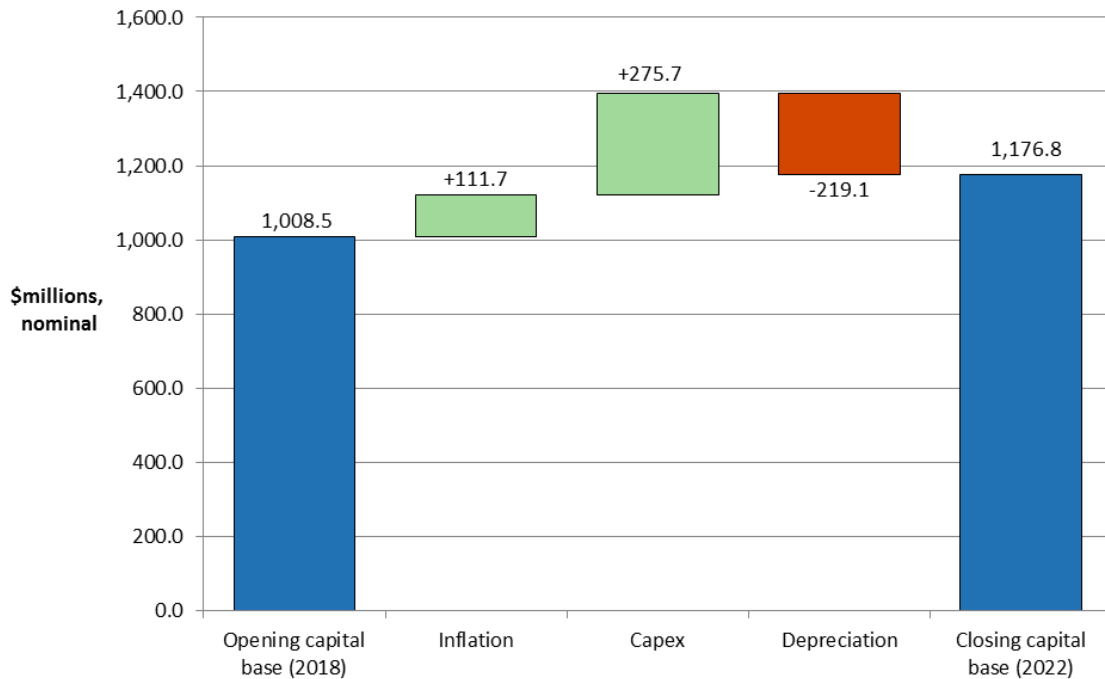
²³ NGR, r. 87.

²⁴ If the asset lives are extremely long, such that the capital base depreciation rate is lower than the inflation rate, then negative regulatory depreciation can emerge. The indexation adjustment is greater than the capital base depreciation in such circumstances. Refer to section 5.3.1 of attachment 5 of this draft decision for further explanation of the offsetting adjustment to the depreciation.

largely depends on the opening capital base (which in turn depends on capex). Figure 2.1 shows forecast net capex is the largest driver of the increase in the capital base. Refer to attachment 6 for the discussion on forecast capex.

A ten per cent increase in the opening capital base causes revenues to increase by about eight per cent. However, the impact on revenues of the annual change in capital base depends on the source of the capital base change, as some drivers affect more than one building block cost.²⁵

Figure 2.1 Key drivers of changes in the capital base (\$ million, nominal)



Source: AER analysis.

2.4 Reasons for draft decision

We do not approve APA's proposed opening capital base of \$1008.5 million (\$ nominal) as at 1 January 2018.²⁶ We have instead determined an opening capital base value of \$985.5 million (\$ nominal) as at 1 January 2018, a reduction of \$23.0 million (\$ nominal) (or 2.3 per cent). This is due to the amendments we made to the inputs to APA's proposed RFM as well as a numbers of corrections we made to the

²⁵ If capex causes the capital base increase, then return on capital, depreciation, and debt raising costs will all increase too. If a reduction in depreciation causes the capital base increase, revenue could increase or decrease. In this case, the higher return on capital is offset (perhaps more than offset) by the reduction in depreciation allowance. Inflation naturally increases the capital base in nominal terms. However, the real impact from changing the inflation forecast is inconsequential as revenues are updated annually by actual inflation and the X factor, which is generally unaffected by the assumed forecast inflation rate.

²⁶ APA VTS - B4 - APA Post Tax Revenue Model revised with WORM (includes 3 March 2017 updates for inflation in response to AER information request IR003) - 16 May 2017.

proposed model. It reflects our decision on APA's conforming capex over the period of 2013–17, and our decision to use actual inflation (instead of APA's proposed forecast inflation) over this period.

We do not approve APA's projected closing capital base of \$1176.8 million (\$ nominal) as at 31 December 2022.²⁷ We instead determine a closing capital base of \$1138.7 million (\$ nominal) as at 31 December 2022, a reduction of \$38.2 million (\$ nominal) or 3.2 per cent from the proposed value. The main reasons for the reduction are our adjustments to the opening capital base as at 1 January 2018 (section 2.4.1), expected inflation (attachment 3), depreciation (attachment 5) and forecast net capex (attachment 6). It also reflects our decision to use expected inflation (attachment 3) instead of annually updated lagged actual inflation.

We are satisfied each of these amendments is necessary having regard to the requirements of the NGR. The reasons for our decision are discussed below.

2.4.1 Roll forward of the capital base during the 2013–17 access arrangement period

To determine the opening capital base as at 1 January 2018, we have assessed APA's proposed roll forward of its capital base over the 2013–17 access arrangement period.

As part of this assessment, we reviewed the following key inputs to the capital base roll forward:

- conforming capex in the 2013–17 access arrangement period
- depreciation amounts in the 2013–17 access arrangement period
- actual inflation from 2013 to 2016 and forecast inflation for 2017.

We do not approve the opening capital base value of \$1008.5 million (\$ nominal) as at 1 January 2018 proposed by APA.²⁸ Instead, we determined an opening capital base value as at 1 January 2018 of \$985.5 million (\$ nominal).²⁹ This is because we amended several inputs used by APA to roll forward the capital base over the 2013–17 access arrangement period including:

- the inflation rate used to calculate the inflation indexation for the capital base roll forward

²⁷ APA VTS - B4 - APA Post Tax Revenue Model revised with WORM (includes 3 March 2017 updates for inflation in response to AER information request IR003) - 16 May 2017

²⁸ The RFM inputs require the opening capital base at the commencement of the 2013–17 access arrangement period that is based on both the as-incurred and as-commissioned approaches for recognising capex. The \$1008.5 million (nominal) value is the opening capital base proposed by APA that recognises capex on an as-incurred capex basis. APA's proposed RFM did not set out an opening capital base as at 1 January 2018 that recognises capex on an as-commissioned basis.

²⁹ Our draft decision for the opening capital base as at 1 January 2018 that uses as-commissioned capex is \$963.6 million (nominal).

- the conforming capex amounts for the 2013–17 access arrangement period.

We have also completed a capital base roll forward using actual conforming capex that is recognised on an as-commissioned basis to establish the opening capital base at 1 January 2018.

In addition to correcting these inputs, we also identified a number of formulae errors in APA's proposed RFM. To correct these formulae errors, we substituted our latest version of the RFM for this draft decision.³⁰ The current version 3 of the RFM represents the latest approach to the roll forward of a transmission network service provider's capital base and was subject to industry consultation.³¹ Therefore, we implemented the new version of the RFM to calculate the value of the capital base for APA. Our adjustments to APA's proposed roll forward of the capital base are discussed in turn below.

2.4.1.1 Conforming capital expenditure in the 2013–17 access arrangement period

Our assessment of conforming capex is set out in capex attachment 6. In determining the opening capital base as at 1 January 2018, we assessed whether APA's proposed capex amounts for the 2013–17 access arrangement period are properly accounted for in the capital base roll forward.

We approve \$402.3 million (\$ 2017) of APA's proposed total net capex of \$408.3 million (\$ 2017) for the 2013–17 access arrangement period as conforming capex.³² Therefore, our draft decision is to use the approved conforming capex amounts in the capital base roll forward consistent with the requirements of the NGR.³³

We note that the proposed capex for 2016 and 2017 are estimates. Therefore the 'approved' capex in this draft decision for 2016 and 2017 are placeholder amounts. We expect APA will provide actual capex for 2016 in its revised proposal and the 2017 capex estimates may be revised based on more up to date information. We will assess whether the actual capex for 2016 is conforming capex in our final decision. We will undertake the assessment of whether the 2017 amount is conforming capex as part of the next access arrangement review.

³⁰ AER, *Appendix A - Transmission roll forward model - Version 3*, October 2015.

³¹ The AER initiated proposed amendments to the roll forward model (transmission) in July 2015. We received one submission from AusNet Services. We published our final decision on version 3 of the roll forward model and amendments in October 2015.

³² The capex amount presented here does not include the half year WACC adjustment applied in the PTRM to account for the capex timing assumption.

³³ NGR, r. 77(2)(b).

2.4.1.2 As-commissioned and as-incurred capital expenditure for the capital base roll forward

There are two ways to recognise the actual conforming capex used in the capital base roll forward. The 'as-incurred' capex approach recognises capex in any one year based on expenditure incurred in that year regardless of whether the asset related to that expenditure has been commissioned or not. The 'as-commissioned' capex approach recognises expenditure at the time when the asset related to that expenditure has been commissioned, whereby the construction period of the capex may span more than one year. In our PTRM for the 2013–17 access arrangement decision, the projected capital base is rolled forward on both the as-incurred and as-commissioned bases over the access arrangement period.³⁴ The reason for rolling forward the capital base using two capex profiles is that the as-incurred capital base is used to calculate the return on capital allowance, while the as-commissioned capital base is used to calculate the return of capital (depreciation) allowance.

We note that APA proposed to roll forward the capital base over the 2013–17 access arrangement period using capex that is recognised on an as-incurred basis only. This is inconsistent with the method applied in the decision for the 2013–17 access arrangement. APA did not present any reason for adopting a different approach. In our PTRM for the 2013–17 access arrangement decision, the projected capital base is rolled forward using two capex profiles (as-incurred and as-commissioned). We consider the capital base roll forward for this access arrangement review should also use two capex profiles, consistent with the 2013–17 access arrangement decision.³⁵ This provides continuity that capex is recognised on both the as-incurred and as-commissioned bases for the next access arrangement period. We note that APA's projected roll forward of the capital base over the 2018–22 access arrangement period uses both forecast as-incurred and as-commissioned capex. For these reasons, our draft decision is to use actual conforming capex on both the as-incurred and as-commissioned bases to roll forward the capital base over the 2013–17 access arrangement period. We are satisfied that the opening capital base values at 1 January 2018 rolled forward under this approach have been arrived at on a reasonable basis.

2.4.1.3 Depreciation used in the 2013–17 access arrangement period

We do not accept APA's proposal to roll forward the capital base to 1 January 2018 using forecast depreciation (straight-line method) but adjusted using forecast inflation. In particular, we do not accept the use of forecast inflation instead of actual inflation. Our draft decision is to use forecast depreciation (straight-line method) adjusted for actual inflation to roll forward the capital base.³⁶

³⁴ AER, *Amended decision – APA GasNet 2013–17 access arrangement PTRM*, 21 November 2013.

³⁵ AER, *Amended decision – APA GasNet 2013–17 access arrangement PTRM*, 21 November 2013.

³⁶ AER, *Access arrangement final decision APA GasNet Australia (Operations) Pty Ltd 2013–17 Part 2: Attachments*, March 2013, p. 39.

Section 2.5 sets out our reasons for not accepting APA's proposed inflation approach for the 2013–17 capital base roll forward.³⁷

The total amount of forecast straight-line depreciation approved in this draft decision is subtracted from the capital base over the 2013–17 access arrangement period. Under the NGR, we are to subtract from the capital base depreciation calculated in accordance with the relevant access arrangement.³⁸

2.4.2 Projected capital base during the 2018–22 access arrangement period

We forecast APA's projected capital base at 31 December 2022 to be \$1138.7 million (\$ nominal), a reduction of \$38.2 million (\$nominal) or 3.2 per cent from APA's proposal. This results from our draft decision on the inputs to the determination of the projected capital base. We have amended the inputs in the following ways:

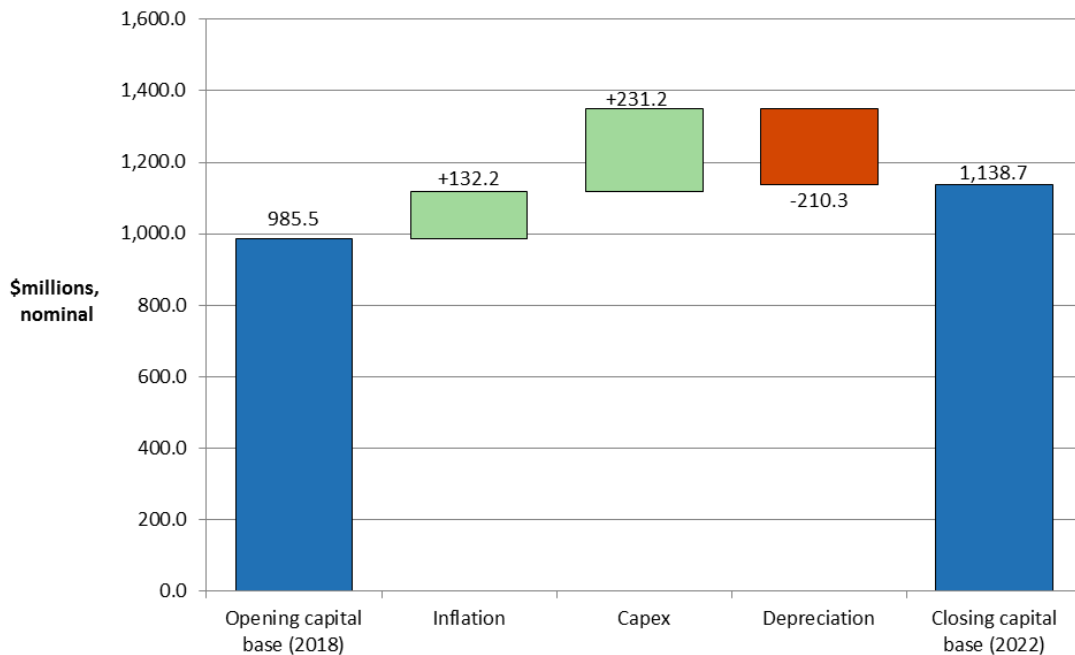
- Reduced APA's opening capital base as at 1 January 2018 by \$23.0 million (\$ nominal) or 2.3 per cent to reflect the changes required in this attachment.
- Reduced APA's proposed forecast net capex for the 2018–22 access arrangement period by \$41.1 million (\$ 2017) or 16 per cent. Our assessment of the proposed forecast capex is set out in attachment 6.
- Reduced APA's proposed forecast regulatory depreciation allowance for the 2018–22 access arrangement period by \$29.3 million (\$nominal) or 27.3 per cent. Our assessment of the proposed forecast depreciation is set out in attachment 5.
- Increased APA's proposed estimate of expected inflation for the 2018–22 access arrangement period from 2.00 per cent to 2.45 per cent, noting that this change occurs in conjunction with several other changes to inflation treatment discussed below. Our assessment of the best estimate of expected inflation is set out in attachment 3.

Figure 2.2 shows the key drivers of the change in APA's capital base over the 2018–22 access arrangement period for this draft decision. Overall, the closing capital base at the end of the 2018–22 access arrangement period is forecast to be 15.5 per cent higher than the opening capital base at the start of that period, in nominal terms. The approved forecast net capex increases the capital base by about 23.5 per cent, while expected inflation increases it by about 13.4 per cent. Forecast depreciation, on the other hand, reduces the capital base by about 21.3 per cent.

³⁷ These reasons are linked to our decision not to accept APA's proposed inflation approach for the projected roll forward of the 2018–22 capital base. This is because we have not accepted APA's common framework for assessing inflation effects, which underlies both proposed inflation changes.

³⁸ NGR, r. 77(2)(d).

Figure 2.2 Key drivers of changes in the capital base (\$ million, nominal)



Source: AER analysis.

The values shown above reflect our draft decision on the projected capital base for the 2018–22 access arrangement period. APA proposed that, as part of its changes to inflation treatment, the capital base would be re-projected each year within this period. Lagged actual inflation would be applied in this annual update to those areas of the PTRM relating to the capital base, and the X factors for all remaining years in the access arrangement period recalculated.³⁹

We do not accept APA's proposal to use lagged actual inflation (annually updated) in the roll forward of its projected capital base during the 2018–22 access arrangement period. Section 2.5 sets out our reasons.⁴⁰

³⁹ The annually updated inflation series would be applied to all areas of the PTRM except the (direct) return on capital building block calculation. Note that the exact areas within the PTRM linked to the annually updating inflation series changed after APA submitted its initial access arrangement revision proposal. APA, *Victorian transmission system, Access arrangement submission*, 3 January 2017, pp. 118–125, 127–129 and 251–254; APA, *APA VTS response to AER information request #IR003*, 3 March 2017.

⁴⁰ These reasons are linked to our decision not to accept APA's proposed inflation approach for the roll forward of the 2013–17 capital base. This is because we have not accepted APA's common framework for assessing inflation effects, which underlies both proposed inflation changes.

2.4.3 Capital base at the commencement of the 2023–27 access arrangement period

The capital base at the commencement of the 2023–27 access arrangement period will be subject to adjustments consistent with the NGR. The adjustments for APA include (but are not limited to) actual inflation and approved depreciation over the 2018–22 access arrangement period.

We accept APA's proposal to establish the opening capital base as at 1 January 2023 using the depreciation schedules based on forecast capex over the 2018–22 access arrangement period.⁴¹ This is consistent with the requirement in clause 3.8 of its current access arrangement which requires that depreciation be based on forecast capex. We approved such an approach in our recent gas decisions.⁴² This approach is also consistent with the approach outlined in our *Access Arrangement Guideline*.⁴³ The amount of the forecast depreciation is to be approved by us in the final decision for the 2018–22 access arrangement period.

We consider the access arrangement should further provide for the capital base as at 1 January 2023 is to be established using the approved depreciation schedules (straight-line) based on forecast capex at the asset class level.⁴⁴ Having regard to the capital base as determined in the preceding access arrangement, we consider this will provide for a forecast of depreciation over the 2018–22 access arrangement period that provides for continuity and consistency in determining depreciation from one access arrangement period to the next.⁴⁵

2.5 Inflation treatment across PTRM, annual pricing and RFM

We do not accept APA's proposed changes to inflation treatment, in either the RFM (for the 2013–17 access arrangement period) or the PTRM (for the 2018–22 access arrangement period).

Given the information currently available to us, we do not agree with APA that there is an inflation 'mismatch'. We therefore do not accept that APA's proposed solutions—one for the 2013–17 access arrangement period (use of forecast inflation instead of actual inflation), and another for the 2018–22 access arrangement period (use of annually updated lagged actual inflation instead of forecast inflation) are required. We consider that APA has not sufficiently supported its proposal to adopt either of these

⁴¹ APA, *VTS Revision Proposal submission*, 3 January 2017, p. 212. The amount of the forecast depreciation to be used for rolling forward the capital base at the next access arrangement review will be set out in our final decision for APA's 2023–27 access arrangement period.

⁴² AER, *Final Decision Amadeus Gas Pipeline, Attachment 2 – Capital base*, May 2016, p. 11; AER, *Final Decision Australian Gas Networks, Attachment 2 – Capital base*, May 2016, p. 11.

⁴³ AER, *Final access arrangement guideline*, March 2009, pp. 61–62.

⁴⁴ NGR, r. 90.

⁴⁵ NGL, s. 24(4) and s. 28(2)(a)(i).

solutions. We are not satisfied that APA has established that, when actual inflation differs from expected inflation, it is likely to lead to over or under recovery of a service provider's investment in its pipeline system as described by APA. Nor has APA provided sufficient evidence to reasonably conclude that APA's proposed changes would minimise under or over recovery relative to the standard approach.

As we explain in section 2.5.1 below, our assessment of APA's proposal reveals that APA's framework for assessing the revenue impact when inflation outcomes differ from expected has several limitations. It does not take into account the relationships between different building block components. We also set out additional reasons, in section 2.5.2, as to why we do not accept the change to inflation treatment in the 2013–17 RFM. Our reasons should be read in conjunction with our discussion of the best estimate of expected inflation in attachment 3.

It is important to note that we are currently conducting a broader industry-wide review of our method for estimating expected inflation and the treatment of inflation in our regulatory models. That review is yet to be finalised and so findings from the review cannot therefore be included in this decision.⁴⁶

The discussion set out here is necessarily based on the information available to us at the time of making this determination. In the context of that wider industry review, we expect we will have additional submissions and more complete analyses available to us. Our conclusions set out here therefore do not indicate the result of the review we are currently undertaking.

That said, for the purposes of this determination, on the basis of the information currently available to us, we consider the treatment of inflation in the regulatory models released with this draft decision:

- is a recognised method for dealing with the effects of inflation, including the effect of inflation on the recovery of the capital base through depreciation⁴⁷
- provides the service provider with a reasonable opportunity to recover at least its efficient costs⁴⁸
- when paired with our method for estimating expected inflation (detailed in attachment 3), is consistent with the objective of a rate of return commensurate with the efficient financing costs of a benchmark efficient service provider⁴⁹
- contributes to the achievement of the National Gas Objective.⁵⁰

⁴⁶ The initial discussion paper and stakeholder submissions to date are available at <https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/review-of-expected-inflation-2017>.

⁴⁷ NGR rr. 73, 89.

⁴⁸ Incurred in providing reference services; and complying with a regulatory obligation or requirement or making a regulatory payment. NGL s. 24(2).

⁴⁹ With a similar degree of risk as that which applies to the service provider in the provision of reference services. NGR r. 73(3).

⁵⁰ NGL, s. 23.

2.5.1 Assessing inflation outcomes

The reasoning in this section relates to the inflation 'mismatch' referred to by APA and is applicable to both its proposal for the 2013–17 RFM and the 2018–22 PTRM.

2.5.1.1 APA's framework for analysing inflation outcomes

We do not consider that APA has set out the correct framework for assessing over or under recovery when inflation outcomes differ from expected inflation. There are three (related) limitations with its assessment framework:

- APA's view that there is a 'mismatch' arises from a narrow perspective that looks at just one inflation effect in isolation. In other words, APA's comparison does not consider all the relevant inflation interrelationships across the PTRM, RFM and annual pricing processes (under the 'CPI-X' mechanism). The inflation relationship between the return on capital and return of capital is particularly important, since the inflation adjustment included in the regulatory depreciation building block occurs as a direct offset to the inflation component included in the return on capital building block.
- APA's proposal does not address whether the proposed changes are compatible with the current rate of return framework. It is not necessary to provide an *ex post* inflation adjustment if appropriate compensation has already been provided *ex ante* in the return on equity. APA's proposed changes would appear to materially alter its exposure to inflation and so it is necessary to consider the implications for the regulated rate of return. However, APA's proposal does not address this issue at all.
- APA's perspective appears to be that the annualised estimate of expected inflation over a ten year horizon (that is, the estimate of expected inflation rate used in the PTRM) should align with outturn inflation in a particular year within that ten year period. These are separate inflation concepts; *ex post* inflation outcomes do not invalidate (or validate) the *ex ante* inflation forecast, and the difference between the two is not automatically an error requiring compensation.

The 'mismatch' referred to by APA relates to the indexation of the opening capital base each year, which reflects the annual increase in the value of the capital base due to inflation. As described in section 2.3 above, this indexation occurs as part of the roll forward of the capital base on two separate occasions. The capital base is rolled forward in projected terms in the PTRM prior to the start of the access arrangement period; then the capital base is rolled forward in actual terms in the RFM for the same access arrangement period at the next access arrangement review.⁵¹ The projected roll forward in the PTRM, conducted in advance when inflation outcomes are not yet known, uses forecast inflation (more specifically, the estimate of expected inflation).

⁵¹ Although the RFM rolls forward the capital base in actual terms, the depreciation component may be set (as is the case for APA) with regard to forecast capital expenditure. Note that even where forecast depreciation is used, actual capex is still added to the capital base as part of the roll forward.

The roll forward in the RFM, conducted after the event when inflation outcomes are known, uses actual inflation. This roll forward is then the basis for the opening capital base of the following access arrangement period. However, the projected capital base within the PTRM is used to calculate building block revenues for the access arrangement period. The regulatory depreciation building block represents the change in the value of the capital base, and is calculated as the net total of indexation (which increases the capital base) and straight-line depreciation (which decreases the capital base).⁵² Hence, regulatory depreciation can be understood as the net change in value of the capital base in a given year.

We agree with APA that, when actual inflation differs from the estimate of expected inflation (forecast inflation), the indexation of the opening capital base in the PTRM will differ from the indexation of the opening capital base in the RFM. This is the inflation effect that APA identified as a 'mismatch' directly responsible for under or over compensation. APA's proposal stated that aligning these two components is both necessary and sufficient to minimise the under or over compensation arising when actual inflation differs from expected.

Based on the information in APA's proposal, we consider that APA's framework for assessing inflation effects appears to overlook:

- The effect of inflation on other building blocks within the PTRM.
- The effect of annual pricing adjustments within the access arrangement period, which effectively remove the forecast inflation used in the PTRM and apply actual inflation each year.⁵³
- The alignment between the inflation received in the return *on* capital building block with the inflation deducted from the return *of* capital building block under the current approach. This alignment occurs both in projected terms (within the PTRM) and in actual terms (after considering the combined effect of annual pricing and the RFM). This is crucial because the inflation adjustment included in regulatory depreciation is directly linked to the method used to calculate the return on capital building block (that is, using a nominal WACC times the indexed capital base).
- Consideration of the effect of these inflation changes on the rate of return. In effect, APA's proposal would appear to target the service provider receiving a fixed nominal rate of return (for the 2013–17 access arrangement period) and an annually updated real rate of return (for the 2018–22 access arrangement period).⁵⁴ Such a fundamental change requires consideration of the overall compensation package (including *ex ante* compensation included in the rate of return) against the

⁵² This is the usual outcome, but in the event of deflation then the indexation adjustment will decrease the capital base. Separately, it is possible for negative regulatory depreciation to occur if the rate of increase from inflation is of a larger magnitude than the rate of decrease due to nominal straight-line depreciation, and so the net effect is that the capital base increases in value.

⁵³ We describe the operation of APA's annual pricing mechanism in more detail below.

⁵⁴ Note that APA's framework considers only the inflation effects in the PTRM and RFM; the inflation treatment applied in the annual pricing process is integral to whether or not these targeted returns would be achieved.

allowed rate of return objective under the NGR. APA's framework as presented in its proposal does not address this.

- The implementation lags that would interfere with the alignment of its chosen components. That is, for the 2018–22 access arrangement period, a lagged actual inflation update in the PTRM would not align with the actual inflation used in APA's pricing mechanism or some elements of the RFM.⁵⁵ Hence, it is not clear exactly how we would implement APA's proposal (for either the 2013–17 or 2018–22 access arrangement periods) in order to remove the inflation 'mismatch'.
- Consideration of the total revenue received by the service provider after accounting for all inflation effects.

Given the limitations of APA's framework for analysing inflation outcomes, we do not consider that it provides a sound and reasonable basis on which it can be established that the proposed changes would minimise under or over recovery relative to the standard approach. We have instead applied the AER framework for analysing inflation outcomes. This is detailed below in a section 2.5.1.2.

Finally, we discuss in section 2.5.2.2 below our modelling analysis of APA's proposed changes to the 2013–17 RFM. This analysis relates primarily to the proposed use of forecast inflation in the RFM, because the underlying spreadsheet (developed as part of another review) is not configured to model APA's proposed PTRM changes. However, that analysis also suggests that APA's framework for assessing inflation effects is incomplete. APA's position is that aligning the two inflation components (in the PTRM and RFM) is necessary to minimise over or under recovery over the long term. Instead, the analysis shows that aligning these components (through the use of forecast inflation in the RFM) substantially increases the likelihood of over or under recovery, contrary to APA's proposal.

2.5.1.2 AER's framework for analysing inflation outcomes

We consider that the different inflation treatments should be assessed by estimating the overall revenue impact of differences between expected and actual inflation. This means considering the complex interactions between:

- different regulatory processes—that is, the inflation effects throughout the PTRM, annual pricing adjustments and RFM
- multiple access arrangement periods—that is, where lagged series are used and overcompensation in one period will be offset by under-compensation in the next

⁵⁵ In response to an information request, APA indicated that the AER's standard 'partially lagged' approach would be applied in the 2018–22 RFM. This approach uses un-lagged actual inflation for some RFM components (calculating the half WACC return on real capex, and indexation of the opening capital base) and lagged actual inflation for others (converting new capex to real terms, and converting real straight line depreciation to nominal terms).

- the allowed rate of return and direct inflation adjustments—that is, compensation for inflation can be provided via an *ex ante* risk premium or an *ex post* adjustment to cash flows.

The AER's framework takes into account the operation of the PTRM, RFM and annual pricing processes; the inflation interactions between these three components of the regulatory system; and the link between the rate of return and the system of inflation compensation.⁵⁶ The central objective is the delivery of a nominal rate of return that reflects the *ex ante* real return (derived from the initial nominal WACC and estimate of expected inflation) and actual inflation outcomes, over the total capital base.

Consistent with this, when assessing the revenue impact of inflation effects, we:

- express all cashflows in real terms; rather than comparing nominal cashflows that incorporate different inflation figures
- include cashflows relating to both the return *on* and return *of* capital; rather than limiting the calculation to one component of the return of capital
- calculate the NPV of these real cashflows using the initial implied real WACC; rather than the initial nominal WACC or a time varying (annual) real WACC.

We consider it appropriate and reasonable, given the advantages of the AER's approach over that proposed by APA and the lack of any supporting evidence in APA's proposal to substantiate its reasons to apply a different approach, to apply the standard approach in this draft decision. The standard approach (use of actual inflation in the RFM, and forecast inflation in the PTRM) has been applied to the VTS in its earlier access arrangement periods. It has also been applied to all other electricity and gas service providers. Importantly, the approach factors in the interrelationships of the constituent components of the building block model.

2.5.2 Additional reasons relating to the 2013–17 roll forward

In this section, we set out additional reasons (to the general reasons applying to both RFM and PTRM) for why we do not accept APA's proposal to use forecast inflation in the 2013–17 RFM:

- Allowing a service provider *ex post* selection between alternative inflation approaches may enable systematic overcompensation.
- The available evidence suggests the use of forecast inflation in the RFM would increase the likelihood of over or under recovery of revenue over the long term.

We discuss each of these in turn below. First, we include additional background on the 2013–17 access arrangement decision.

⁵⁶ Further information is available on the webpage for our inflation review - <https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/review-of-expected-inflation-2017>. See AER, *Regulatory treatment of inflation, Discussion paper*, April 2017, pp. 9–13, 20–22 and 33–43.

Each access arrangement must contain provisions that specify the basis for the calculation of depreciation for establishing the opening capital base for the subsequent access arrangement period.⁵⁷ These provisions are then implemented when calculating the opening capital base of the subsequent access arrangement period.⁵⁸ The 2013–17 access arrangement provides, in clause 3.8:

The depreciation schedule for establishing the Opening Capital Base at 1 January 2018 will be based on forecast capital expenditure.⁵⁹

APA stated in its proposal:

Consistent with the provisions of the earlier access arrangement, APA VTS has rolled forward the capital base using the previous forecast depreciation, rather than actual depreciation calculated on actual capital expenditure.⁶⁰

The term ‘forecast depreciation’ is commonly used as shorthand for ‘depreciation calculated using forecast capital expenditure’ and we understand this to be the meaning adopted by APA. We accept that the use of forecast depreciation calculated using forecast capital expenditure is consistent with the APA’s current access arrangement to that extent.⁶¹ However, APA’s above statement does not address its use of forecast inflation in combination with forecast depreciation.

In our 2013–17 access arrangement final decision, we specifically approved forecast depreciation in combination with actual inflation:

The capital base at the commencement of the 2018–22 access arrangement period will be subject to adjustments under the NGR. These adjustments are not limited to, but include:

- the difference between actual and estimated capex for 2012 (the final year of the 2008–12 access arrangement period)
- actual inflation and approved forecast depreciation over the 2013–17 access arrangement period. The AER accepts APA GasNet’s proposal to use forecast depreciation to roll forward the capital base at the next access arrangement review.⁶²

⁵⁷ NGR, r. 90.

⁵⁸ NGR, r. 77(2)(d).

⁵⁹ APA GasNet Australia (Operations) Pty Ltd (AER amended), *Access arrangement, Effective 1 July 2013 to 31 December 2017, Remade to give effect to the decision of the Australian Competition Tribunal No. 2 of 2013*, November 2013, p. 8.

⁶⁰ APA, *VTS Revision Proposal submission*, 3 January 2017, p. 118.

⁶¹ However, if the reference to ‘forecast depreciation’ is intended to refer to depreciation calculated using forecast capital expenditure and forecast inflation, then we do not consider that this can be characterised as ‘in accordance with the provisions of the earlier access arrangement’.

⁶² AER, *Access arrangement final decision, APA GasNet Australia (Operations) Pty Ltd, 2013–17, Part 2: Attachments*, March 2013, pp. 28–29.

We consider the use of 'forecast capital expenditure' when rolling forward the capital base, as referred to in clause 3.8, is therefore to be applied using actual inflation. This is the standard approach we use for other service providers.

2.5.2.1 *Ex post* selection produces systematic overcompensation

We consider that the use of forecast inflation in the 2013–17 capital base roll forward may constitute *ex post* selection. Allowing *ex post* selection in this manner may lead to overcompensation for the service provider. We do not consider that allowing this potential for over compensation would be in the long term interest of consumers.

Ex post selection occurs where a party is allowed to choose from a pool of alternative approaches, and that selection is applied to some historical period. At the time of making the selection the party has knowledge of revenue outcomes under each alternative approach. Further, the approach applied to future periods of time will be chosen at a point in the future where those outcomes of those future periods are then known. Acting rationally, the party is expected to choose the approach that benefits itself over other parties involved in the transaction.

Actual inflation across the 2013–17 access arrangement period was below forecast inflation—that is, the estimate of expected inflation set in the 2013 access arrangement decision.⁶³ This means we know that applying forecast inflation in the 2013–17 RFM instead of actual inflation will increase revenue for the service provider. This increased revenue occurs as a result of a higher opening capital base at the start of the 2018–22 access arrangement period. Using actual inflation in the RFM would result in a regulatory depreciation building block of \$69.3 million, instead of \$53.6 million if forecast inflation was used.⁶⁴ Since regulatory depreciation is deducted from the capital base in the RFM, this means that APA's VTS opening capital base at 1 January 2018 would be \$15.7 million higher if forecast inflation was used in the RFM instead of actual inflation.

APA's proposal is to apply forecast inflation in the RFM for one retrospective period (2013–17), before switching back to actual inflation.⁶⁵ We therefore consider that APA's proposal to use forecast inflation for the 2013–17 access arrangement period may constitute *ex post* selection. Allowing this type of *ex post* selection may enable a

⁶³ There is still some uncertainty around the 2017 inflation outcome; but it would require an abrupt, large change in inflation conditions to bring the average inflation above the forecast inflation rate (2.50 per cent).

⁶⁴ These figures are different from those included in the APA proposal because we have updated and corrected the actual inflation series used in their calculation; other than this change we have adopted their calculation method (but only to illustrate the magnitude of the 'mismatch' effect).

⁶⁵ APA's 2013 access arrangement revision proposal sought to apply an unindexed capital base approach, which entailed no inflation adjustment in the 2013–17 RFM. However, as noted above, our 2013 final decision did not accept this proposal. We instead adopted (as per our standard approach) the use of actual inflation in the 2013–17 RFM. See APA GasNet Australia (Operations Pty Limited (APA GasNet), *Access arrangement revised proposal submission, effective 1 January 2013 – 31 December 2017*, November 2012, pp. 72–74; and AER, *Access arrangement final decision, APA GasNet Australia (Operations) Pty Ltd, 2013–17, Part 2: Attachments*, March 2013, pp. 28–29.

service provider to systematically bias outcomes in its favour.⁶⁶ This is because the service provider is able to choose the highest revenue outcome each time; switching between the available approaches based on their (known) outcomes. This systematic bias is possible even if each of the alternative approaches is unbiased over the long term.⁶⁷ All that is required is that the alternative approaches have differing short term outcomes.

Systematically biasing revenue outcomes in favour of the service provider would mean revenue above the efficient cost of providing reference services and so would not be in the long term interest of consumers.⁶⁸

2.5.2.2 Likelihood of over or under recovery

We do not consider that the use of forecast inflation in the RFM would minimise the likelihood of over or under recovery, as submitted in APA's proposal. Rather, the available evidence suggests that it would increase the likelihood of over or under recovery across multiple access arrangement periods.

We set out in section 2.5.1 above our framework for assessing the overall revenue impact of differences between forecast and actual inflation. We have already published a spreadsheet that undertakes this type of analysis, and which is able to assess APA's proposed change to use forecast inflation (instead of actual inflation) in the RFM.⁶⁹

This spreadsheet was developed and published as part of our consultation on the 2016 update to our electricity distribution RFM template.⁷⁰ The spreadsheet models the key aspects of the PTRM, annual pricing adjustment and RFM across a period of 50 years, split into ten five-year periods. The model is simplified in that it only models those aspects of the regulatory process directly related to the capital base and inflation.⁷¹ Most importantly, the user is able to define exactly which inflation approach (for instance, forecast inflation or actual inflation) will be used in each indexation step within the RFM.

⁶⁶ Conversely, if consumer groups were allowed *ex post* selection from the pool of available approaches, this would allow them to systematically bias outcomes in their favour.

⁶⁷ For example, consider the case where approach A causes over compensation in period one but under-compensation in period two; and approach B causes under-compensation in period one but over compensation in period two. Either approach, if followed consistently across both periods, would result in no net over or under-compensation. However, choosing (after the fact) to follow approach A in period one and approach B in period two would result in net over compensation.

⁶⁸ NGL, s. 23.

⁶⁹ The spreadsheet is not configured to model APA's proposed changes to the treatment of inflation in the PTRM (applying lagged actual inflation to specific PTRM components) without modification. This is because the spreadsheet was developed in the context of our RFM review.

⁷⁰ The spreadsheet is available at <https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/roll-forward-model-distribution-december-2016-amendment/initiation>.

⁷¹ For more technical details on the specification of the model, see AER, *Explanatory statement, Proposed amendment, Electricity distribution network service providers, Roll forward model (version 2)*, 31 August 2016, pp. 15–19, 26–28.

The user is also able to define what inflation approach will be used for annual pricing updates within an access arrangement period. This is important because APA's tariff variation mechanism embodies some different inflation treatment to the standard approach adopted by most other electricity and gas service providers. Under the standard approach:

- first year revenue is set in nominal terms, which means forecast inflation from the PTRM is applied
- for all subsequent years in the access arrangement period, revenue is calculated by using a one-year lagged actual inflation series to adjust the previous year's revenue.

However, under APA's approach:

- first year revenue is set in nominal terms, which means forecast inflation from the PTRM is applied—but only as a placeholder
- for all subsequent years in the access arrangement period:
 - the real value of the previous year's nominal revenue is calculated using actual inflation for the previous year
 - the real value of the current year's nominal revenue is calculated using an updated actual inflation figure that is not yet final (since the current year is not yet complete)
 - revenue for the upcoming year is calculated with regard to the real value of all prior years within the access arrangement period, with a placeholder inflation forecast for the upcoming year (which will be corrected, in turn, in later years).

While it requires a two year delay, the net effect is that actual (un-lagged) inflation is applied to revenue each year within the access arrangement period.⁷²

The key output from the spreadsheet model is the net present value (NPV) of the cash flows spent and received by the service provider across the life of the assets. Ideally, the NPV should be zero, which indicates that outward cash flows (capex incurred by the service provider) are exactly equal to inward cash flows (revenue received by the service provider) plus the appropriate return on those funds (the return on capital or weighted average cost of capital, WACC). Adopting APA's terms, over-recovery will mean a positive NPV, and under-recovery will mean a negative NPV.

⁷² As an example, the final true up for 2018 revenue will be reflected in 2020 prices—a two year delay. We will set 2020 prices in October 2019, when the available inflation figures will be: (a) 'final' actual inflation for the year-to-December-2018; (b) 'placeholder' actual inflation for 2019, which will be the inflation for the year-to-September-2019; and (c) updated forecast of inflation for 2020, which will use the 2019 placeholder inflation as well. Note that the 2018 inflation outcome was not yet known in October 2018, when 2019 prices were set. Similarly, the 2019 inflation outcome is not yet known in October 2019, but the placeholder will use the latest available CPI figure (year-to-September-2019), and then this will be updated one year later.

This spreadsheet is therefore able to test APA's submission that aligning forecast inflation in the PTRM and the RFM will reduce the likelihood of under or over recovery. This requires the following steps:

- The annual pricing process can be set to use actual inflation (instead of forecast inflation in year 1, and lagged actual inflation in years 2–5, as per the AER's standard approach).
- All RFM indexation steps can be set to use forecast inflation (instead of lagged/un-lagged actual inflation as in the AER's standard approach).

We then run a Monte Carlo simulation, which means we run the model over a large number of times with different, randomly-generated inflation inputs each time.⁷³ This allows us to assess how a given approach (for instance, use of actual inflation or forecast inflation in the RFM) will perform under different inflation scenarios. The aggregate performance across all these scenarios can be assessed in three different ways:⁷⁴

- The first is the average NPV received by the service provider. This metric identifies the net impact of the inflation approach on total revenue. As an average, positive results in some scenarios (overcompensation for the service provider) will net off against negative results in other scenarios (under-compensation for the service provider). Hence, this metric identifies any systematic bias in total revenue.
- The second is the average absolute value of NPV received by the service provider. This calculation will not net off negative and positive outcomes, so the magnitude of distortion (above or below zero) present in any particular scenario will be apparent. Relative to the third approach (below), this metric has the advantage that it can be interpreted as a percentage of the initial investment.
- The third is the average square of NPV received by the service provider. As with the second approach, this metric avoids netting off negative and positive scenarios so that the magnitude of distortion in either direction is assessed. Relative to the second approach, this calculation more heavily penalises larger NPV distortions, which might be a desirable utility function.

Table 2.5 shows the results of the Monte Carlo simulation. For this analysis, the total capital expenditure (and therefore the total initial value of assets) was \$2000.⁷⁵

⁷³ The random inflation inputs are drawn from a probability distribution based on observed real world inflation outcomes. For more information, see AER, *Explanatory statement, Proposed amendment, Electricity distribution network service providers, Roll forward model (version 2)*, 31 August 2016, p. 26.

⁷⁴ AER, *Explanatory statement, Proposed amendment, Electricity distribution network service providers, Roll forward model (version 2)*, 31 August 2016, p. 27.

⁷⁵ Split as \$1000 in year 0 and \$100 every year from 1 to 10 (inclusive). The capex has an asset life of 30 years.

Table 2.5 Results of Monte Carlo simulation (n = 5000) using three alternative approaches to inflation treatment suggested by the APA VTS proposal (\$real year 0)

Approach	Average NPV (% of initial investment)	Average absolute NPV (% of initial investment)	Average squared NPV
Standard approach	\$0.08 (0.00%)	\$4.25 (0.25%)	\$28.42
Standard approach with VTS pricing	-\$0.13 (-0.01%)	\$2.92 (0.17%)	\$13.41
Standard approach with VTS pricing and forecast inflation in the RFM	\$1.32 (0.08%)	\$26.75 (1.59%)	\$1127.84

Source: AER analysis.

Three different metrics are presented in the table. The first is the average NPV across all scenarios for each approach, which tells us if there is any systematic bias introduced by the specified inflation treatment. Under the first two approaches, the NPV is very close to zero: +\$0.08 for the standard approach, -\$0.13 if we adjust for APA’s unique annual pricing adjustment (but keep all other aspects standard). We would expect some minor deviation from zero arising as part of the nature of the Monte Carlo study, so these results suggest there is no systematic bias (under or over compensation) arising from these two approaches. The bottom row of the table shows that if we then alter the RFM to use forecast inflation, instead of actual inflation, the average NPV is further from zero, at +\$1.32. While this is more problematic than the first two approaches, given the nature of a Monte Carlo study it is unlikely to cause significant concern. The table also shows that when compared to the initial investment (\$2000 over the years 0 to 10) the average NPV outcomes are a very small percentage under all three approaches. The largest deviation occurs when forecast inflation is used in the RFM, which results in a deviation of just 0.08 per cent of the initial investment.⁷⁶

The second (average absolute value of NPV) and third (average square of NPV) metrics tell us about the magnitude of deviation from (targeted) zero NPV, if we do not allow negative and positive NPVs to offset each other. The pattern of results is similar across both metrics. It appears that the AER’s standard approach (row one) and the standard approach with VTS’ unique pricing mechanism (row two) perform roughly the same. However, the use of forecast inflation in the RFM (bottom row) appears to perform relatively worse than either of the approaches using actual inflation in the RFM.⁷⁷

⁷⁶ This calculation is performed in NPV terms; adjusting the initial investment for the time value of money.

⁷⁷ While caution should be observed when comparing two separate Monte Carlo studies, it is instructive to compare these results against those in the initial RFM discussion paper. There, the absolute error of NPV of the standard approach was 4.17, and the un-lagged approach was 2.93. We described these as roughly similar. However, the

For example, row two shows that if the standard approach (actual inflation in the RFM) is used together with VTS's pricing mechanism, the average absolute value of NPV is \$2.92. In other words, this suggests that the average impact of inflation deviations is around \$3, either above or below the ideal revenue (which would generate an NPV of \$0). This \$3 impact is the cumulative effect across the life of assets with initial value of \$2000 and is just 0.16 per cent of the initial investment (in NPV terms). Further, as demonstrated by the first metric, outcomes of +\$3 and -\$3 are equally likely (there is no systematic over or under-compensation). However, if forecast inflation is used in the RFM, the revenue impact increases by roughly nine times to \$26.75, which represents 1.59 per cent of the initial investment.⁷⁸ This pattern of results is also observed using the third metric (squared NPV), with a significantly larger departure from the target (\$0) when forecast inflation is used in the RFM (average squared NPV of \$1127) than under either approach using actual inflation in the RFM (average squared NPV of \$28 or \$13).

The nature of a Monte Carlo simulation means that it is possible to generate different outcomes, even with the same inputs.⁷⁹ Nonetheless, the available analysis appears to suggest that the use of forecast inflation in the RFM (instead of actual inflation) would increase, not decrease, the likelihood of over or under recovery.

all-lagged approach performed worse, with absolute average value of NPV of 10.24. AER, *Explanatory statement, Proposed amendment, Electricity distribution network service providers, Roll forward model (version 2)*, 31 August 2016, p. 27.

⁷⁸ Compared to roughly six times the NPV under the standard approach (but without VTS pricing).

⁷⁹ That is, setting the same user inputs for WACC and capex, but still allowing the generation of random inflation outcomes each scenario.

2.6 Revisions

We require the following revisions to make the access arrangement proposal acceptable:

Revision 2.1:	Make all necessary amendments to reflect this draft decision on the roll forward of the capital base over the 2013–17 access arrangement period, as set out in Table 2.1.
Revision 2.2:	Make all necessary amendments to reflect this draft decision on the roll forward of the capital base over the 2018–22 access arrangement period, as set out in Table 2.2.
Revision 2.3:	<p>Update the access arrangement (section 3.8) to set out the depreciation schedule used for rolling forward the capital base at the commencement of the 2023–27 access arrangement period as follows:</p> <p>The depreciation schedule (straight-line) for establishing the opening capital base at 1 January 2023 will be based on forecast capital expenditure at the asset class level.</p>
