Regulatory treatment of inflation

Final position

December 2017

AUSTRALIAN ENERGY REGULATOR

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Contents

Shortened forms and glossary

Shortened Form	Extended Form
ABS	Australian Bureau of Statistics
AER	Australian Energy Regulator
Annual pricing mechanism	Refers to the 'Consumer Price Index minus X' mechanism to determine the revenue level that feeds into the adjustment of prices from year to year.
Asset base	Refers to a regulatory asset base for electricity service providers as prescribed in the National Electricity Rules, or a capital base for gas service providers as prescribed in the National Gas Rules
CEG	Competition Economists Group
CGS	Commonwealth Government Securities, also known as Australian Government Securities
CPI	Consumer Price Index
Energy network	Refers to a network through which a service provider provides electricity network and gas pipeline services
Network services	Refers to electricity distribution, electricity transmission, and/or gas pipeline services
RBA	Reserve Bank of Australia
Regulatory period	Refers to a regulatory control period (for electricity service providers) and/or an access arrangement period (for gas service providers)
Regulatory proposal	Refers to a regulatory proposal, revised regulatory proposal, revenue proposal, revised revenue proposal, access arrangement proposal, or revised access arrangement proposal
Service provider	Refers to an electricity distribution network service provider, electricity transmission network services provider, and/or gas pipeline operator

1 Introduction

This is our final position paper on our review of the regulatory treatment of inflation in our determination of revenues and prices for electricity and gas network services.

The method for estimating expected inflation has been the subject of debate in recent regulatory determinations. We chose to conduct an industry-wide review before making any changes given the widespread use of our post-tax revenue model (PTRM) and asset base roll forward model (RFM), and the requirements set out in the National Electricity Rules (NER) for consultation. Moreover, the general inflation rate is applicable across the economy, and therefore our treatment of inflation applies uniformly across all our determinations.

We acknowledge the positive engagement and insights from all stakeholder groups which included the Consumer Challenge Panel, Energy Consumers Australia, the electricity and gas network business and infrastructure asset investors.

Beginning with our April 2017 discussion paper, we undertook an extensive stakeholder consultation process. This included a public forum on the discussion paper and receiving written submissions. Moreover, to fill an identified need for more education and engagement on technical matters, we held numerous staff-level meetings and a technical workshop. This workshop allowed stakeholders and us to concurrently engage on technical matters. We derived a common understanding in many areas and clarified other issues for further analysis.

We then published our preliminary position paper on 13 October 2017. This preliminary position was arrived after our consideration of all the diverse views and material put to us. We also set out our reasoning on why we decided on a particular position. Given the large number of diverse views on a complex and technical matter that we had to analyse and consider, we held a post preliminary position interactive workshop. At that workshop, we heard from stakeholders on whether we had taken into account the evidence and materials that were submitted to us. We also provided stakeholders and opportunity to provide fresh insights and material that we should consider in finalising our position.[1]

Our final position, after carefully considering the submissions and the further material submitted to us is to not depart from our preliminary position. That is, we will continue our current approach to the regulatory treatment of inflation in our determination of revenues and prices for electricity and gas network services. Based on the material before us at this time, we therefore do not propose any amendments to the PTRM or RFM.

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[1] A workshop summary report is available at : https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/review-of-expected-inflation-2017/aer-position

Sections 3 and 4 of this paper discuss key concepts and the process, respectively. The process section briefly sets out the development history of the current regulatory treatment of inflation approach, the extensive stakeholder engagement undertaken for this review and advice we have received from experts we engaged.

We assess each of the alternative methods for estimating expected inflation in depth in section 5. We assess the current approach to target the initial real rate of return when setting revenues in the PTRM, and the delivery of this target when actual inflation flows through the annual pricing process and RFM in section 6.

2 Final position overview

We have undertaken this comprehensive review of our regulatory treatment of inflation in order to test whether our inflation approach remained appropriate. Prior to the commencement of this review, a number of service providers questioned our approach to inflation. Some submitted that our method for estimating expected inflation was incorrect, and so we were incorrectly setting their revenue allowances. Others submitted that our approach to inflation did not deliver the returns that were expected based on our regulatory determination. The review allowed us to address these submissions, as well as submissions from other stakeholders.

2.1 Outline of our current approach

Inflation is a general measure of an increase in prices and fall in the purchasing value of money. Inflation refers to changes in the general or overall price level, rather than prices for particular products. The most common measure of inflation is the Consumer Price Index (CPI) published by the Australian Bureau of Statistics (ABS). The treatment of inflation is an important component of our regulatory framework.

Under our framework, we set the maximum revenue that service providers can recover from customers. We do this in a regulatory determination process in consultation with a wide range of stakeholders. We set the maximum revenue allowance broadly in a two-step process:

- **Step one** - we set target revenue for each year of the five year regulatory period so everyone has an initial indication of the prices that will be charged for the next five years.[2] We seek to establish a smooth trend in revenue across the five year period by setting an X factor for each year. The target revenue is made up of a number of components including operating and maintenance expenditure, a rate of return on the capital supplied by investors and a return of capital to investors to account for depreciation of assets. Step one uses our PTRM.

  The target revenue anticipates expected inflation over the five year period so the target is sufficient to meet expected changes in purchasing power. In this way, the target revenue reflects the amount that the network businesses need to undertake a program of works to operate and maintain the network, and to attract capital from investors.

- **Step two** - as we progress through the five year regulatory period we update the revenue allowance each year by the value of actual inflation. If actual inflation in step two is different from the estimate of inflation we used in step one then the actual revenue being recovered over the five year period will be different to the initial target revenue we set in step one. However, the actual revenue recovered from customers through the period will reflect actual movements in inflation, and

[2] A regulatory period can be longer or shorter than five years; but we focus on the five year base case for simplicity.

the purchasing power of the network businesses and their investors is preserved. Step two uses both our RFM and the annual pricing process.

This type of regulatory framework is referred to as 'CPI minus X' incentive regulation.

It is important to note that our target revenue for the five year period is only ever used at the time of our determination to provide everyone with an indication of the prices that will occur over the regulatory period. Once we commence the regulatory period we start with our target revenue in the first year and then escalate this each year with actual inflation less the X factors we set in step one. This is the CPI minus X mechanism in action.

The consequence of this approach is that as we progress through the regulatory period we effectively displace the estimate of expected inflation that was built into our target revenue with the actual inflation outcome in each year as it becomes known. From the customer perspective, purchasing power is preserved under this approach. In step one, they receive an estimate of the bills they will receive across the five year period. During the period, if actual inflation differs from the initial estimate of inflation, the bills they will receive may be higher or lower than initially expected. This preservation of purchasing power applies equally to the rate of return that is incorporated in our target revenue. This approach means that service providers and their investors ultimately receive a revenue allowance with the same purchasing power as initially targeted. This is known as a real rate of return and we describe this overall approach as targeting the initial real rate of return on capital.

This description helps make clear why a CPI minus X incentive regime that targets the real rate of return is desirable. Having revenue move with CPI preserves the purchasing power of the service provider and its investors, no matter the inflation outcome. Similarly, consumers pay prices that are constant in real terms and so their purchasing power is preserved as well.

2.2 Our consultation

In response to the submissions we received on the treatment of inflation we initiated a full scale review of the treatment of inflation in our regulatory framework. This review has traversed a wide spectrum of issues as we have pursued the range of issues put to us by stakeholders. In general, stakeholders have put diverse positions to us. Different service providers have put forward different statements of the problem and different proposed solutions. However, in broad terms, we have distilled the review into two lines of inquiry:

1. What method should we use to estimate expected inflation (**Issue 1**)?
2. Does the regulatory framework deliver appropriate compensation for inflation (**Issue 2**)? There are two sub-issues here:
   (a) Does the regulatory framework achieve the currently targeted real rate of return outcome?
   (b) Should the regulatory framework instead target a different rate of return outcome?

These issues are complex and require a good level of knowledge of our regulatory framework including the financial models we employ, the annual pricing process and the technical financial details of estimating expected inflation. To provide the best opportunity for stakeholders to engage with the issues we have undertaken an extensive consultation process as outlined in the introduction. Our experience has been that it has taken stakeholders and ourselves quite some time to clearly identify the key concerns and then identify potential solutions.

We turn now to the two key issues we have identified.

2.3 Issue 1: What method should we use to estimate expected inflation?

This issue was identified quite early in the process. In step 1 of our regulatory process we employ an estimate of expected inflation to derive the target revenue for the five year regulatory period. Because we then use actual inflation to determine actual revenues throughout the five year period there can be a discrepancy between the target and actual revenues if actual inflation is different to expected inflation. To minimise the potential for this discrepancy we use the best available estimate of inflation. Some service providers have submitted that the approach we employ is not the best estimate and we should use a different approach.

The approach we currently use is relatively simple and transparent and has been employed in all of our decisions since 2008. We use forecasts of inflation published by the Reserve Bank of Australia (RBA) for the next two years, which is the limit of this forecast series. We combine these two values with the mid-point of the RBA's target band for inflation (currently 2.5 per cent) to extend the series out to ten years. The estimate of expected annual inflation is then the average of these ten yearly figures. We adopted this approach in 2008 after service providers proposed it as the best method for estimating inflation.

In broad terms, there are four potential approaches for estimating inflation:

1. Our current approach - known as the RBA method
2. Deriving an estimate from inflation linked bonds - known as the bond breakeven inflation rate (BBIR) approach
3. Deriving an estimate from swaps - known as the swaps method, and
4. Deriving an estimate from surveys.

Each approach has its strengths and weaknesses and clearly no forecast will be precisely correct (except by chance).

The preliminary position was that our current approach has the greatest strengths and fewest weaknesses and therefore provides the best estimate of expected inflation. Briefly:

1. The RBA method is simple and transparent and can be replicated easily by stakeholders. The RBA is highly respected and has been generally successful in its inflation targeting. The ACCC/AER working paper ranked this method highest of

the four potential approaches and a number of stakeholders (including consumer groups) have supported the current approach.

2. The bond breakeven approach is the method we used to estimate inflation prior to 2008. In 2008, service providers identified a range of problems with this approach and persuaded us to move to the RBA approach. On its face, this method offers the advantage of deriving the estimate of expected inflation using market data. However, upon closer examination, the method suffers from a range of deficiencies including a number of biases and premiums which are significant and time varying. Evidence of these deficiencies is present for the US and UK markets (more mature and liquid than the Australian market), as well as for the Australian market. Many of these deficiencies were identified by service providers in 2008 and persist. The RBA in its letter to us said that this method is probably unviable.[3]
3. The swaps method has a number of positive attributes. Estimates of expected inflation using swaps are simple to calculate, can give daily estimates and the biases are arguably smaller than bond breakeven approach. Although there are these positive attributes, we do not prefer the inflation swaps method over the current method. The estimates produced using the inflation swaps methods are likely to incorporate biases and distortions (due to hedging costs, liquidity premium and other premiums) and these biases and distortions are likely time-varying. Additionally, the RBA in its letter to us said that this method is probably unviable.[4]
4. Surveys have the potential to rank highly as an approach. However, long term survey estimates are proprietary. Survey companies sell the inflation estimates derived from their surveys. If we used a survey estimate in our regulatory process we would have to publish this figure, which would undermine the business case of the survey company.

We carefully reviewed the submissions on our preliminary position. We, in particular, reconsidered the evidence in light of submissions that we had not fully addressed previous submissions and had drawn conclusions that were not supported by evidence. We are satisfied that on the evidence before us, our current approach has the greatest strengths and fewest weaknesses and therefore provides the best estimate of expected inflation.

Some submissions by stakeholders to our discussion paper proposed using a glide path approach. A glide path method involves a gradual movement from the RBA's short term inflation forecasts to the mid-point of its target range. The glide path method is based on the proposition that it may take a number of years for inflation to return to the mid-point of the RBA's target band following a disturbance. Some stakeholders submitted this may occur in the current global environment.[5] The Commerce Commission of New Zealand uses an equivalent version using Reserve Bank of New Zealand (RBNZ) forecasts.

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3 RBA, *Letter re: Regulatory treatment of inflation - Inflation expectations*, 5 July 2017, p. 1.

4 RBA, *Letter re: Regulatory treatment of inflation - Inflation expectations*, 5 July 2017, p. 1.

5 CEPA, *Best Estimate of Inflation Expectations: Assessment of Approaches*, 28 June 2017, p. 31.

In coming to our preliminary position, we reviewed the available evidence on the rate of reversion to the mid-point of the target band. This evidence suggested that reversion is relatively rapid in Australia - within one to two years. Further, the evidence suggested that the mid-point of the target band is the best estimate of expected inflation beyond two years. A glide path approach would therefore not provide the best estimate of expected inflation.

Consideration of a glide path approach had arisen fairly close to our preliminary position and was not discussed in the ACCC/AER working paper or the discussion paper. Considering the positives and negatives, in our preliminary position we were not satisfied that there was enough evidence to change from the current approach to a glide path approach. We encouraged stakeholders to provide more evidence on this issue in submissions on our preliminary position paper. In particular, we were interested in hearing whether there is other evidence on the speed of reversion of inflation expectations.

Some stakeholders submitted that in extreme circumstances (disturbances) it may take a number of years for inflation expectations to return to the midpoint of the RBA's target band. However, there was no new evidence submitted on how long it takes for inflation to revert to the mid-point after a disturbance. Nor was there new evidence on how to define these disturbances, identify the occurrence of these (if any) in the past which led to a delay beyond two years, or robustly forecast such a disturbance and if so, the time lag.

We have since completed our own research on how long it takes inflation expectations to return to the mid-point, using Consensus Economics' survey data. We looked at expected inflation for each year over a ten year horizon, and grouped the data based on the expected inflation in year one. This allowed us to identify the average path of inflation expectations when there were 'extreme' circumstances (that is, expected inflation above 3.5 per cent or below 1.5 per cent in year one).[6] Figure 1 shows the results; this analysis is discussed in detail in appendix C.

[6] These groups were chosen to reflect the thresholds for extreme circumstances described in stakeholder submissions.

Figure 1: Average forward rates of expected inflation, with groups based on expected inflation in year one

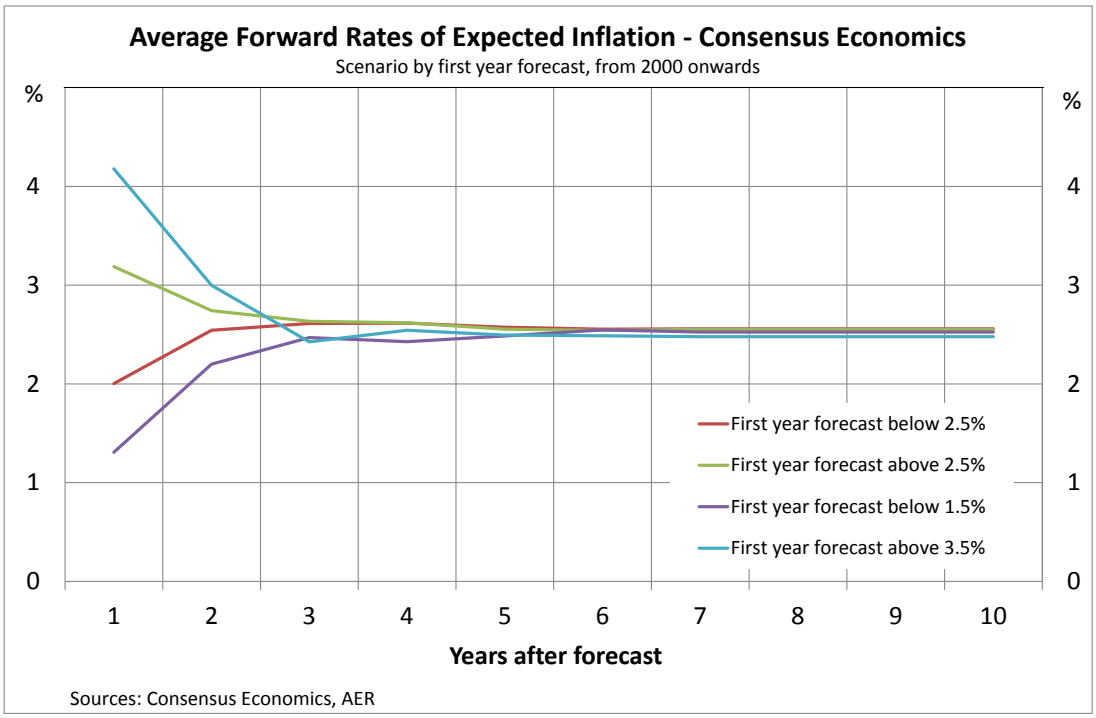

Figure 1 suggests that expected inflation does not take a long time to revert to the mid-point. For example, consider all occasions where expected inflation in year one was below 1.5 per cent (the purple line). For this group, inflation in year one was expected to be around 1.3 per cent on average. However, inflation was expected to rise to 2.2 per cent in year two and then arrive at 2.5 per cent in year three.

Further, regardless of whether expected inflation was high or low in year one, it was expected to return to the mid-point of the RBA's target band by year three. This suggests that the adoption of a glide path that delayed the return to the mid-point of the RBA target band beyond year three would not reflect underlying inflation expectations.

For this final position, we continue to hold the view that a glide path approach would not provide the best estimate of expected inflation

2.4 Issue 2: Does the regulatory framework deliver appropriate compensation for inflation?

During our consultation, it became clear that there was considerable confusion about the operation of the regulatory framework.

A foundational question was raised about what type of return to investors is required under the NER. We have reviewed the electricity rules carefully and consider that targeting a real rate of return is consistent with the NER. It is also consistent with the NGR. We have consistently employed a common approach across the gas and electricity sectors to avoid investment distortion between the two sectors.

Having settled the question of the approach that is consistent with the rules, we then turn to the question of whether our approach delivers a real return to investors. Initially, there was considerable diversity among stakeholders about whether our approach does achieve a real return. We spent considerable time discussing this issue with stakeholders in advance of our technical workshop. We asked stakeholders to model a range of base scenarios to test the operation of our approach. At the technical workshop before we published our preliminary position, there was a broad consensus that our approach does deliver a real return as required in the electricity rules. There are a few aspects within our approach that can cause minor deviations from a real return, but these deviations are minor and symmetrical and so do not affect our overall conclusion. Submissions in response to our preliminary position paper were broadly consistent with this finding.[7]

This then leads to a third question of whether our approach (and the rules) should target a different type of return for investors? Three alternatives have been suggested:

1. Maintain our current approach of an overall real rate of return.
2. Apply our target revenues from our determination without fixing the real return (this approach is known as targeting a nominal return).
3. Split our approach between debt and equity and provide a nominal return to debt and a real return to equity.

Some stakeholders submitted that we should change to option 2 or option 3 because of errors embedded in the current approach. We do not consider that this analysis is correct:

- For the nominal rate of return, we do not agree with APA's submission that there is a 'mismatch' in inflation compensation causing under or over recovery.[8] We assess all the relevant inflation interrelationships in the building blocks and demonstrate below that the current approach delivers the targeted rate of return.
- For the real return on equity (and nominal return on debt), we do not agree with Spark's submission that there is currently uncompensated inflation risk for equity holders.[9] We assessed the relevant risk and its impact on equity holders, and the total inflation compensation package appears correct. We do not agree that the 2013 changes to our debt approach (from on-the-day to trailing average portfolio) created an imbalance that introduced net additional risk:

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[7] The exceptions were the APA and Spark submissions; we discuss these submissions in more detail in sections 6.2.2 and 6.3.

[8] APA, *Regulatory treatment of inflation, APA submission in response to AER consultation*, 29 June 2017, pp. 3–4; APA, Submission in response to AER preliminary position paper, Regulatory treatment of inflation, 7 November 2017.

[9] Spark, *Letter re: Submission to the AER's discussion paper on the regulatory treatment of inflation*, 29 June 2017, p. 6., Spark, Submission to the AER's Preliminary position on the regulatory treatment of inflation, 9 November 2017

- The primary inflation exposure occurs under both the old approach to debt and the new approach.[10]
- Even if the change in debt approach does increase inflation exposure, this would need to be weighed against the non-inflation benefits of our new approach to debt. We moved to the debt portfolio because it better aligned the regulatory debt allowance with incurred debt costs, and so reduced both interest rate risk and refinancing risk.
- We expect that in current circumstances, equity investors are less exposed to risk in total than before the change to the debt approach.

Although we find no support for the position that the current target approach is flawed, we nonetheless consider whether either of the alternatives is preferable. Whether we then seek to target a different type of return for investors is a complex question which would potentially require a change to the rules. We consider there are strong grounds for maintaining our target as the real return on capital, which provides stable real returns to investors (in aggregate) and stable real prices to customers.[11] Targeting the nominal return on capital would deliver neither of these. Targeting the real return on equity would improve stability in real returns for one type of investor (shareholders), but worsen stability in real outcomes for customers.

This question goes to the balance of risks between network businesses, their investors and customers. A change in approach has the potential to impact the balance of these risks and the ultimate level of compensation required. If we are going to change our approach, these effects need to be considered carefully. Submissions on our preliminary position did not provide any evidence that a change in this balance of risk is warranted. Indeed, the material we received suggested that the current approach is the appropriate allocation of risks between these groups.

We continue to think the current return target performs well and that the overall package of inflation compensation is appropriate. Overall, for this final position we do not consider that the evidence before us indicates that the current approach needs to be changed.

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[10] The trailing average portfolio includes an additional pathway for inflation related change in equity returns (identified in the consultant report released with our Preliminary position). The magnitude and direction of any such departure is unclear. Depending on the circumstances, there could be an increase or decrease in the overall inflation exposure.

[11] We refer here only to the impact of inflation on the delivery of stable real returns/prices; these outcomes will also be influenced by non-inflation-related factors beyond the scope of this review.

3 Key concepts

3.1 What is inflation?

Inflation is a general measure of an increase in prices and fall in the purchasing value of money. Inflation refers to changes in the general or overall price level, rather than prices for particular products. For example, over a period of time the price of oil may increase and the price of bread may decrease, but there may be no change to the overall price level in the economy.

The opposite of inflation is deflation: a decrease in the general price level. The NER and NGR refer to inflation,[12] but do not expressly refer to deflation. We consider that the term 'inflation' in the rules includes deflation as a negative amount of inflation.

The presence of inflation within the economy makes it difficult to compare prices across different time periods. In order to account for inflation, the terms real and nominal are used. The real value of a good has been adjusted for inflation and can therefore be used to compare prices over different periods. Conversely, the nominal value has not been adjusted for inflation.

In economics, the Fisher equation estimates the relationship between real and nominal returns with regard to inflation:

$$(1 + interest\ rate_{nominal}) = (1 + interest\ rate_{real}) \times (1 + inflation\ rate)$$

This equation shows that when inflation is positive the nominal return is greater than the real return.

Real returns (or real prices) are important to use because they are able to illustrate the purchasing power of a return regardless of what happens to price levels in the future. In essence, a real return removes the effects of inflation and allows the value to be seen in terms of the current period's purchasing power.

3.1.1 Actual inflation measures

There are a number of different measures of actual inflation. The most widely known and used measure is the CPI. The CPI is a measure of changes in the price level of a 'basket' of consumer goods and services purchased by households. The ABS monitors changes in the CPI and results are published quarterly.

Other measures of inflation may differ in the types of products and prices that are tracked over time. For example, commodity price indices measure changes in prices of specific commodities such as gold and iron ore. Core price indices may exclude certain goods and services whose prices are relatively more volatile (due to supply and

[12] NER, Chapter 6; NGR, Part 9.

demand factors in those specific markets), and this volatility may make it more difficult to track underlying trends in the overall price level. Producer price indices measure changes in price from the seller's perspective and the 'basket' of producer goods and services can be further classified by industries. Another common measure is the GDP deflator. It is a measure of inflation across all final goods and services produced within the economy during the period. Unlike some price indices (like CPI) the GDP deflator is not based on a fixed basket of goods and services, instead the basket is able to change with people's consumption and investment behaviours.

3.1.2 Why use the CPI as the measure of actual inflation?

The choice of which actual inflation measure is most suitable involves balancing timeliness, stability and simplicity. Despite being somewhat narrower in scope than other options available, the CPI is the most suitable method for measuring inflation due to its simplicity, relative timeliness and high degree of credibility and familiarity. The ABS describes the principal purpose and uses of CPI in the following terms:[13]

> The Consumer Price Index (CPI) is an important economic indicator. It provides a general measure of changes in prices of consumer goods and services purchased by Australian households. The CPI is used for a variety of purposes, such as in the development and analysis of government economic policy, the adjustment of some government benefits and in individual contracts. Because of this, the CPI directly or indirectly affects all Australians.

The ABS describes the role of CPI in monetary policy:[14]

> A major use of the CPI is to assist government economists in conducting general economic policy, especially monetary policy. Since 1993, Australian monetary policy has been conducted with the aim of meeting a medium-term inflationary target. Since the introduction of the 13th series CPI in the September quarter 1998, that target has been the inflation rate as measured by the CPI.

The CPI is also widely used in industry price determinations:[15]

> The CPI, or one of its components, is also widely used in indexation arrangements in both the private and public sectors. These include indexing pension and superannuation payments, taxes and charges, some governmental bonds, and business contracts.

Other measures of actual inflation are subject to limitations which make them a less appropriate measure compared to the CPI. The GDP deflator offers a broad coverage

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13 ABS Cat 6440.0, *A Guide to the Consumer Price Index: 16th series,* 2011, Chapter 1, available at http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/6440.0Main+Features102011.

14 ABS Cat 6461.0 - *Consumer Price Index: Concepts, Sources and Methods*, 2016, Chapter 2, available at http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/6461.0Main%20Features22016?opendocument&tabname=Summary&prodno=6461.0&issue=2016&num=&view.

15 ABS Cat 6461.0 - *Consumer Price Index: Concepts, Sources and Methods*, 2016, Chapter 2.

of prices in the entire economy producing economy wide inflation, instead of just the narrow consumer basket used by CPI. However, it is not a practical option for use in industry regulatory determinations given its longer publication lag and frequent revisions. Producer price indices offer the potential of greater alignment with the industry subject to regulation, but in practice it may be difficult to find a close match of the regulated networks. Also, there is a concern whether producer prices appropriately incorporate productivity improvements to the same extent as consumer or retail prices.

The CPI is therefore the most appropriate measure of actual inflation because of its timeliness, stability and simplicity. It is widely used as the primary measure of inflation by regulators and government agencies across Australia.

Additionally, the NER provides that the revenue or prices for regulated electricity network services are to apply a 'CPI minus X' control mechanism.[16] The NER also provides that the value of a regulated electricity network's asset base is to be adjusted from one period to the next by increasing it for actual inflation, and that the measure of inflation is to be consistent with that used in the control mechanism (that is, CPI).[17]

The NGR does not mandate the use of CPI when determining prices or asset values, but rather provides that financial information must be based on some recognised basis for dealing with the effects of inflation.[18] We consider that CPI is a well-recognised measure of inflation, and is the most appropriate measure for the reasons outlined above.

3.1.3 Monetary policy

As a measure of the overall change in prices, inflation is often considered as a loss of value of currency. That is, inflation from 1 January 2015 to 1 January 2016 means that one dollar could be used to buy more goods and services on the 1st of January 2015 than one dollar could be used to buy on the 1st of January 2016. As fewer goods and services could be bought with a single dollar, the relative value of the dollar has decreased.

Similar to any other product, changes in the value of money (that is, inflation) may be affected by changes in the supply of and demand for money. The RBA is tasked with conducting monetary policy to control inflation through increasing or decreasing the money supply (or by slowing or accelerating growth in the money supply). The RBA

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16 This is the transmission requirement. The distribution requirement is that standard control services are to be controlled by a prospective CPI minus X mechanisms, or some incentive-based variant of CPI minus X. NER, cll. 6.2.6(a) and 6A.5.2(c)(3).

17 NER cl. 6.5.1(e)(3).

18 NGR r. 73(1).

Governor and the Federal Treasurer have agreed that the appropriate target for monetary policy is an inflation rate of 2 to 3 per cent per annum.[19]

3.2 Best estimate of expected inflation

3.2.1 Expectations, forecasts, and outcomes

We are required to estimate expected inflation in our regulatory framework, but the inflation outcome may turn out to be different to the original expectation. A difference between an initial expectation and the ultimate outcome does not necessarily mean that the expectation was not the best possible expectation available at the time.

The Competition Economics Group (CEG) submitted that expectations involve consideration of the probability of all possible outcomes, and may not simply reflect the most likely outcome.[20]

3.2.2 What is 'best'?

The NER states that the PTRM for electricity distribution and transmission must specify: 'a methodology that the AER determines is likely to result in the best estimates of expected inflation.'[21] The NGR states that an estimate must be arrived at on a reasonable basis and must represent the best forecast or estimate possible in the circumstances.[22]

We, in conjunction with the development of the ACCC/AER working paper #11, consider that there are four approaches that could be employed to derive the best estimates of expected inflation:

- The AER's current approach, which is a 10 year geometric annualised average of the RBA's forecast headline rate for 1 and 2 years ahead[23] and the mid-point of the RBA target inflation band of 2 to 3 per cent for years 3 to 10
- The 10 year bond breakeven inflation rate (BBIR) implied by the difference between the yields-to-maturity on nominal and indexed CGS
- The 10 year expected inflation rate implied from zero coupon inflation swaps, and
- Survey-based approaches of expected inflation.

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19 On average, over the business cycle. See: Australian Government and RBA, *Statement on the Conduct of Monetary Policy*, 19 September 2016, available at https://www.rba.gov.au/monetary-policy/framework/stmt-conduct-mp-7-2016-09-19.html.

20 That is, the mean, median, and modal outcomes may not equate. Competition Economists Group, *Best estimate of expected inflation*, September 2016, page 9.

21 NER, cll. 6.4.2(b)(1) and 6A.5.3(b)(1).

22 NGR, r. 74.

23 Where the RBA forecast headline inflation rate one and two years ahead is a range, the midpoint of the range is used.

The ACCC/AER working paper #11 ranks the four approaches with respect to best estimates of expected inflation informed by five assessment criteria:

- relative congruence with the market-expected inflation rate (whether estimates of a particular approach more closely correspond to the market-expected inflation rate)
- robustness
- transparency
- replicability
- simplicity.

These issues are also relevant to the reasonableness of the basis upon which an estimate is arrived at.

We have used the criteria to help us assess which method is likely to result in the best estimate of expected inflation in line with clauses 6.4.2(b)(1) and 6A.5.3(b)(1) in the NER and rule 74 in the NGR.

3.3 An efficient allowed rate of return

We incorporate inflation in the PTRM, annual pricing process and the RFM. Inflation also affects many of the inputs to these models. These effects are individually accounted for in the current methodology. This section explores the current methodology and the issue of appropriately accounting for inflation, correct compensation for inflation risk and the term of the inflation expectations used.

3.3.1 Appropriately accounting for inflation

Inflation has an effect on revenues, costs faced and asset values of the networks. Inflation also impacts the inputs and outputs of the PTRM and RFM models. After adjusting for these considerations, the current models set a real rate of return over the total of the regulated asset base.

The NER and NGR require use of a nominal rate of return (that is, a nominal weighted average cost of capital or WACC) in setting total annual revenues.[24] The NER also requires the RAB to be indexed and maintained in real terms.[25] The NGR requires the capital base to be depreciated in a manner that ensures that an asset is depreciated only once and that asset values are adjusted for inflation.[26] Inflation is thus accounted for in both returns on and of capital.[27] To avoid double compensation for inflation we adjust by removing the indexation of asset base amount from total revenue.[28] We subtract this amount from the depreciation building block. The approach provides for

[24] NER, cll. 6.5.2(d) and 6A.6.2(d); NGR, r. 87.
[25] NER, cll. S6.2.3(c)(4) and S6A.2.4(c)(4).
[26] If the accounting method approved by the AER permits. See NGR, r. 89(d).
[27] NER, cll. 6.5.2(d) and 6A.6.2(d).
[28] NER, cll. 6.4.3(b)(1) and 6A.5.4(b)(1).

the same total annual revenue and asset base as if a real rate of return is used in combination with an indexed asset base.

3.3.2 Risk and return

The networks expect to receive a set real rate of return on the overall regulated asset base, but inflation-related risks may still be present.[29] However, service providers are likely to be compensated for these risks through our current approach to setting the rate of return.

The equity beta calculated for the benchmark efficient entity (BEE) (part of the return on equity) is based on equity returns of Australian energy utility firms we consider reasonably comparable to the BEE.[30] We will consider historical share market data for these firms, in some cases going back many years. However, the current inflation approach has applied to these firms across the relevant time period (more than fifteen years). If inflation risk arising from our regulatory treatment of inflation meant that the networks faced increased (or decreased) systematic risk, then the calculated betas in the CAPM would be higher (or lower) than otherwise.[31] The service providers are therefore likely to be compensated for their current levels of inflation risk.

The calculations for the appropriate return on debt are also sensitive to the networks' current level of risk. This is due to the BEE's credit rating being based on the networks' observed credit ratings. If inflation risk was significant and did change the networks' probability of defaulting on debt, then we would expect it to be captured in the networks' credit ratings. As with equity beta, given that the current inflation approach has been applied consistently for a number of years, the service providers are therefore likely to be compensated for their current levels of inflation risk.

3.3.3 Investment term

The number of years considered in inflation expectations is an important consideration as inflation expectations can vary depending on the number of years included. In choosing the duration for inflation expectations we match the term for the return on capital determined in our most recent *Rate of return guideline*, which is 10 years.[32] In turn, this sets the duration of the nominal risk free rate used in the nominal vanilla return on capital calculations.[33] The nominal risk free rate used in the calculation of the

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29 These inflation-related risks include the first year pricing effect and inflation lags (see section 6.2.2) and (for equity holders) the effect fixed nominal debt issuance (see section 6.3.3).

30 AER, *Better Regulation, Rate of Return Guideline*, December 2013, p. 15.

31 Under the CAPM, non-systematic risk (diversifiable risk) will not require compensation because the well-diversified investor will have no net exposure to this risk across their portfolio.

32 AER, *Rate of return guideline, Better regulation*, December 2013, pp. 15, 19.

33 AER, *Final Decision: SP AusNet transmission determination 2008–09 to 2013–14*, 31 January 2008, p. 107; AER, *Revised access arrangement by GasNet Australia (Operations) for the Principal Transmission System*, 30 April 2008, p. 66.

return on debt and the return on equity is the 10 year CGS rate. We therefore use 10 year expected inflation estimates.

Debt contracts (and therefore our return on debt calculations) are based on prices investors are willing to pay. These prices reflect investor expectations of the risk free rate, debt risk premium and inflation over their investment horizon at the time they raise this debt. Service providers, have in the past agreed that this horizon (or term) for the return on debt is 10 years. Therefore, while debt contracts may fix the nominal cost of debt, this cost incorporates investor expectations of inflation over the next 10 years. The term in these inflation expectations is what we want to match.

3.3.4 Model operations

We included detailed descriptions of the operation of the PTRM, RFM and annual pricing process in our April 2017 discussion paper.[34] We can summarise the key inflation aspects of the current regulatory framework as follows:

- In the PTRM:
    - Include expected inflation (embedded in the nominal rate of return) in the return on capital building block
    - Deduct expected inflation from the return of capital building block
    - Include expected inflation in the projected RAB roll forward (consistent with the deduction from the return of capital building block)
    - Generate first year nominal revenue and X factors consistent with the estimate of expected inflation, where the NPV of unsmoothed revenues equate to the NPV of smoothed revenues.[35]
- In the annual pricing process:
    - Adjust smoothed revenue to reflect actual inflation (CPI outcomes) within the regulatory period—effectively replacing the estimate of expected inflation for within-one regulatory period cashflows.[36]
- In the RFM:
    - Include actual inflation in the RAB roll forward—effectively replacing the estimate of expected inflation for all subsequent regulatory period cashflows.

Combined, this framework:

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[34] AER, *Regulatory treatment of inflation, Discussion paper*, April 2017, pp. 9–16.

[35] The X factors can be interpreted as the change in real revenue each year—that is, before the adjustment of revenue for inflation. They are expressed in negative terms by convention (so a negative X factor results in a real revenue increase).

[36] This describes the 'complete' pricing adjustment (implemented for APA VTS); the standard approach introduces a first year pricing effect (discussed in section 6.2.2 below).

- derives an initial real rate of return from the initial nominal rate of return and estimate of expected inflation[37]
- delivers the initial real rate of return plus ex post inflation outcomes.

When we calculate revenues in the PTRM, we must use an estimate of expected inflation as actual inflation is not yet available. Debt and equity investors similarly must make assessment of expected inflation, and seek nominal returns that recover expected inflation on top of their required real returns. We set our ex ante estimates of nominal rate of return and expected inflation to align with these investor expectations.

Then, as the regulatory period progresses and actual inflation becomes known, it replaces the estimate of expected inflation used in the PTRM. During the annual pricing process, tariffs are varied using actual inflation to set the allowed revenue for the coming year. In this way the prices faced by consumers and the revenues received by the networks change by actual inflation, but are constant in real terms (while ignoring other non-inflation factors).

At the end of the regulatory period, the RFM process rolls forward the regulated asset base using actual inflation. In effect the service provider has its revenue adjusted by actual inflation in each annual revenue adjustment and its asset base is adjusted only at the end of each regulatory period.

Investors receive the initial real rate of return, derived from the initial nominal rate of return and the estimate of expected inflation, plus actual inflation outcomes.

[37] In other words, the initial real rate of return is the expected (*ex ante*) real rate of return on equity at the start of the regulatory period.

4 Process

We have undertaken an extensive consultation process as part of this inflation review. Our intent was to be proactive in reaching out to stakeholders and to engage in genuine dialogue with them. This process helped us make better decisions and so serves the long term interests of consumers.

The positive outcomes from the consultation reflect the constructive attitude of a diverse range of stakeholders, including consumer groups and service providers. The material provided has been helpful to us. In many cases, it served to help us understand the perspectives of the stakeholders. Stakeholder feedback to us has also emphasised how productive the consultation has been, including where stakeholders have benefitted from engagement with other stakeholders and alternative perspectives on inflation issues.

In response to stakeholder concerns, we departed from our initial consultation schedule and added an additional consultation phase prior to the release of our preliminary position paper. This reflects our commitment to a dynamic engagement strategy that adjusts to reflect stakeholder concerns. We publicly acknowledge the five different stakeholders who undertook to develop and publish models for the technical workshop. This work prompted productive discussions that helped to resolve and clarify several matters relating to 'Issue 2'.

We published our preliminary position paper on 13 October 2017,[38] and received significant feedback and interest. Further engagement was facilitated through an interactive workshop on 31 October 2017 where we invited key stakeholders to participate in a panel discussion on our preliminary position. We appreciate the contributions by everyone in attendance, and acknowledge the valuable insights provided. Our website includes the material that stakeholders have provided as part of this consultation, including written submissions, models, presentations and forum summaries.[39]

4.1 Developments before review

Prior to 2007 the AER (and the Australian Competition and Consumer Commission (ACCC) before it) had used the breakeven method to estimate expected inflation. The breakeven approach estimates expected inflation, using the Fisher equation, as the difference between yields on inflation-indexed Commonwealth government securities (CGS) and nominal (not indexed) CGS.

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[38] See https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/review-of-expected-inflation-2017/aer-position, AER - *Preliminary position paper - Regulatory treatment of inflation* - 13 October 2017

[39] Available at https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/review-of-expected-inflation-2017.

In 2007, during our review of AusNet Services' Victorian electricity transmission determination, a consultant for AusNet Services submitted that there were issues of illiquidity in the indexed CGS market. AusNet Services submitted that these liquidity issues were impacting on the yields for those bonds, distorting the breakeven inflation estimate. After investigation, the AER decided to estimate expected inflation using the RBA forecasts and target band approach, rather than the breakeven approach, in its 31 January 2008 final decision for AusNet Services. This approach has since been set out the PTRM and applied by us consistently for all subsequent determinations.

In June 2015, a consultant on behalf of SA Power Networks (SAPN) and United Energy submitted that the AER should once again use the 10 year bond-breakeven inflation rate as an estimator of expected inflation.[40] The consultant noted that the supply of indexed CGS has increased by over 400 per cent[41] and the number of different maturity dates more than doubled from 3 to 7[42] (4 of the 7 outstanding securities have a maturity of approximately 10 years or less). This led the consultant to conclude that the shortage in the supply of indexed CGS is no longer a material concern.

Expected inflation became a contentious issue following SAPN's revised proposal in July 2015. Since then, we have received regulatory proposals from 20 businesses and 13 of these have proposed a change to our approach to estimating expected inflation.[43] These proposals submitted that the RBA forecasts and target band approach is, in the current market conditions, resulting in an estimate of inflation that is upwardly biased, and that the breakeven method would provide a better estimate.[44]

In our October 2015 final decisions for Energex, Ergon Energy, and SAPN, we stated that we could not change the method for estimating inflation as it is set out in the PTRM and the PTRM is binding on both service providers and the AER.[45] Any changes to the PTRM must follow the legislated consultation process. We were not in a position to fully evaluate the merits of the RBA forecasts and target band approach, the breakeven approach, or any other methods, in any case. Our decision to apply the

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40 Competition Economics Group (CEG), *Measuring expected inflation for the PTRM*, June 2015.

41 From 30 June 2007 to 30 June 2017, indexed CGS by outstanding issue value has increased by over 550 per cent. Australian Office of Financial Management, *Table H13: Government securities on issue at 30 June 1983 to 2017*, 2017, accessed 25 September 2017, https://cdn.tspace.gov.au/uploads/sites/31/2013/07/Table-H13.pdf.

42 In 2007-08 there were 3 outstanding tenors of indexed CGS. Currently (2017) there are 8 outstanding tenors of indexed CGS. Australian Office of Financial Management, *Treasury Indexed Bonds*, 2017, accessed 25 September 2017, http://aofm.gov.au/ags/treasury-indexed-bonds/.

43 Of those, AusNet Services (Gas), Multinet Gas, ElectraNet, Australian Gas Networks (Victoria & Albury), SA Power Networks, CitiPower, Powercor, Jemena Electricity Networks, AusNet Services (distribution), United Energy, ActewAGL Gas, Australian Gas Networks and AusNet Services (transmission) criticised our current approach to estimating expected inflation, while APTNT, APTPPL, Powerlink, TasNetworks, APA VTS, Murraylink and TransGrid did not.

44 See for example, Australian Gas Networks, *Final Plan Attachment 9.2*, December 2016, p. 12.

45 AER, *Final decision Energex distribution determination - Overview*, October 2015, p. 23.

approach set out in the PTRM was upheld by the Australian Competition Tribunal (Tribunal) in its October 2016 decision.[46]

In May 2016 we published final decisions for the Victorian electricity distributors, ActewAGL Gas Distribution, APTNT, and Australian Gas Networks' SA distribution network. In our decisions for the Victorian electricity distributors, we maintained that we could not change the method for estimating expected inflation due to the binding effect of the PTRM.[47] For gas businesses, while the PTRM was not binding, there needed to be sufficient consultation from the initial proposal on alternative methods of estimating expected inflation so that we could be satisfied that an alternative method resulted in an estimate that was made on a reasonable basis and was the best in the circumstances.[48] In each case, we also included a consideration of the relative merits of different methods for estimating expected inflation that had been put forward by service providers. This consideration was limited to the information available to us at the time and to the level of analysis that we could reasonably undertake in the time available. We found that there were a number of limitations with the breakeven approach that may cause it to produce biased estimates, and considered that overall the RBA forecasts and target band approach would better contribute to the National Gas and Electricity Objectives, particularly where alternatives had not been subjected to appropriate industry-wide consultation.[49]

United Energy and ActewAGL Gas Distribution filed applications for merits review by the Tribunal of the expected inflation decisions of our May 2016 determinations. United Energy withdrew its ground of review relating to expected inflation following the Tribunal's SAPN decision. In October 2017, the Tribunal upheld our decision to estimate expected inflation using the approach set out in the PTRM (our standard approach, known as the 'RBA method').[50]

In the course of undertaking revenue reset processes and our review of the RFM, we have received further submissions raising issues about our approach for estimating expected inflation. Even in the context of the RFM review, these submissions focused on the expected inflation method set out in the PTRM. These submissions also proposed several other potential mechanisms to adjust allowed revenue to account for differences between estimated expected inflation and actual inflation in previous

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46 SAPN appealed to the Federal Court for judicial review of other parts of this Tribunal decision, but did not appeal the expected inflation component of the decision. Australian Competition Tribunal, *Application by SA Power Networks [2016] ACompT 11*, October 2016, para. 139.

47 AER, *Final decision Jemena distribution determination - Overview*, May 2016, p. 20.

48 NGR, r. 74.

49 For example, for electricity distributors: AER, *Final decision Jemena distribution determination - Attachment 3 - Rate of return*, May 2016, pp. 151–162; and in reference to gas businesses: AER, *Final decision Australian Gas Networks Access Arrangement - Attachment 3 - Rate of return*, May 2016, pp. 149–160.

50 Australian Competition Tribunal, *Application by ActewAGL Distribution [2017] ACompT 2*, 17 October 2017, para 496; available at http://www.judgments.fedcourt.gov.au/judgments/Judgments/tribunals/acompt/2017/2017acompt0002.

periods.[51] Such mechanisms would attempt to address the issue of estimating expected inflation by removing the influence of expected inflation and result in a change to the regulatory framework of setting an annual real rate of return, instead of the fixed rate of return over a regulatory period.

The alternative approaches for addressing inflation that have been proposed over the past 12 months are not necessarily consistent with one another.

In April 2017, the ACCC and AER published a working paper considering the best estimates of expected inflation (ACCC/AER working paper # 11).[52] The paper ranked and compared four different approaches including:

1. RBA inflation forecasts and target band (our current method)
2. Bond breakeven inflation rate
3. Zero coupon inflation swaps
4. Surveys.

The ACCC/AER working paper concludes that the RBA inflation forecasts and target band method is the best approach to estimating expected inflation. This approach is the most simple, transparent and replicable. The working paper concludes that long-term inflation expectations are anchored within the inflation target band and are relatively stable, and is considered to be relatively congruent with the 10 year market-expected inflation rate.[53]

4.2 Stage one consultation

An industry-wide review is appropriate before making changes to our models given the widespread use of the PTRM and RFM, and the requirements set out in the NER for consultation.[54] The discussion paper, the resulting consultation and submissions was the first step of our review of the treatment of inflation in our determination of revenue and prices for electricity and gas network services.

Consultation on the first stage was extended in response to submissions received on our discussion paper. Details of the extended consultation step are in Section 4.3.

4.2.1 Discussion paper

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51 APTPPL, *Roma-Brisbane pipeline access arrangement submission*, September 2016, pp. 207–210; SA Power Networks / CitiPower / Powercor, *Letter re: proposed amendment to the Roll Forward Model*, 13 October 2016, pp. 7–8.

52 See ACCC/AER Working Paper #11, *Consideration of best estimates of expected inflation: comparing and ranking approaches*, April 2017.

53 ACCC/AER Working Paper #11, *Consideration of best estimates of expected inflation: comparing and ranking approaches*, April 2017, pp. 94-104.

54 NER, cll. 6.4.1(c), 6.5.1(b), 6A.5.2(b) and 6A.6.1(c).

The discussion paper described the issues relevant to whether or not we should investigate changes to our PTRM, RFM, and/or annual pricing mechanisms. The submissions on the paper then fed into our assessment of whether or not amendments to these models and mechanisms would be appropriate and the form of any potential amendments.

The discussion paper also provided further detail on how the inflation models and mechanisms used by the AER work. It also set out key concepts relevant to the consideration of inflation in the context of regulating revenues/prices of electricity and gas network services.

The AER provided a set of questions throughout the discussion paper. These were questions on which we were particularly interested in hearing the views of stakeholders.[55]

4.2.2 Inflation forum

On 14 June 2017, we held a public forum as part of the industry-wide consultation and review of the regulatory treatment of inflation. The forum gave stakeholders the opportunity to seek clarification of inflation-related issues in our previously published discussion paper and allowed the AER's project team to engage with stakeholders to understand their main concerns. The forum also provided the opportunity for all stakeholders to understand each other's issues, exchange views and concerns, and potential consequences of changing the AER's current approach to the treatment of inflation.[56]

The inflation forum was timed to allow discussion between stakeholders and the AER before stakeholders' submissions were due to be submitted.

4.2.3 Submissions

4.2.3.1 Issue 1

In response to the AER's discussion paper, we received 16 responses on 'Issue 1'. The majority of submissions from service providers recommended replacing the AER's current approach with the bond breakeven approach (Table 1). Conversely, consumer groups recommended continuing using the RBA inflation target approach. Below is a summary of the submissions.

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55 AER, *Regulatory Treatment of Inflation, Discussion Paper*, April 2017, pp. 44–45.

56 For more information on the discussion, see: https://www.aer.gov.au/system/files/AER%20Public%20Inflation%20Forum%20-%20Summary%20Report%20-%2014%20June%202017_0.docx

Table 1: Recommendations from submissions on 'Issue 1'

Submitter	Bond breakeven	RBA inflation target	Inflation swaps	Survey / Other
ActewAGL	X			
APA				Other
Ausgrid	X			
AusNet Services	X	X*		
CCP		X		
CEPA	X			
ECA		X**		
ENA	X			
Endeavour	X			
Jemena		X*		
MEU		X		
QTC	X			
Spark Infrastructure	X			
SA Power Networks, CitiPower, Powercor and AGN	X			
TransGrid		X		
Uniting Communities		X**		

Source: Discussion paper submissions, AER.

Notes:

X* AusNet and Jemena submit that if RBA approach remains it should be altered to adopt a glide path method. AusNet also suggests that we could use an average of RBA and break even approach.

X** ECA and Uniting Communities agree with the use of the RBA approach using the top of the RBA band.

Other APA proposes changes to PTRM estimate of inflation to overcome an alleged error.

Consumer groups' submissions

There were three submissions from consumer groups: the CCP, the ECA and Uniting Communities. Each recommended continued use of the AER's current approach. ECA and Uniting Church, however, requested that the expected inflation estimate for years three to ten be changed from 2.5 per cent to 3 per cent.

CCP

The CCP's submission is guided by the view that consistency and predictability are the key principles of good regulatory practice. Accordingly the 'bar' for change should be relatively high to ensure that any change is enduring and in the long-term interests of consumers.[57]

The CCP considered that the case for moving away from the AER's current approach has not been made. While actual inflation is currently below long term expectations, there is a lack of evidence to support that this will continue or that inflation expectations in the long term have moved outside the RBA target range.[58] CCP's primary concern with the use of the indexed bond yields is the potential size and volatility of the liquidity premium. For the CCP to be convinced of the change from the AER's current approach to using the bond breakeven inflation rate it would be necessary to show that potential biases in the market are currently low and will be persistently low.[59]

ECA and Uniting Communities

ECA emphasised that the treatment of expected inflation should eliminate regulatory risks to promote economic efficiency and result in current and future consumers paying no more than necessary. ECA supported the objective of seeking outcomes beneficial to both consumer and producer interests, not just a balancing of those interests, as the rationale for economic regulation.[60]

ECA commissioned two expert reports: Woollahra Partners (labelled Attachment A) and Professor John Quiggin (labelled Attachment B).

ECA submitted the appropriate estimate to use is the RBA target band, and that the proposal to base estimates of inflation on market indicators is inappropriate as it introduces unnecessary regulatory risk. ECA proposed that setting estimated inflation at the top of the RBA target band appropriately allocates inflation risk to investors.[61]

Uniting Communities agreed with ECA's perspective that the regulatory rate for inflation should be set at the upper end of the RBA target range as this will reduce inflation risk to consumers.

Service providers' submissions

Service providers' recommendations fit into three broad categories: no change to the AER's current approach, change the current approach to include a glide path, and change to bond breakeven inflation rate approach.

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57 CCP, *Response to AER discussion paper, Regulatory treatment of inflation*, 29 June 2017, p. 5.

58 CCP, *Response to AER discussion paper, Regulatory treatment of inflation*, 29 June 2017, pp. 26–27.

59 CCP, *Response to AER discussion paper, Regulatory treatment of inflation*, 29 June 2017, p. 20.

60 ECA, *Regulatory treatment of inflation, Response to AER discussion paper*, June 2017, pp. 4-6.

61 ECA, *Regulatory treatment of inflation, Response to AER discussion paper*, June 2017, p. 10.

Service providers' submissions in favour of a bond-breakeven approach

The majority of service providers' submissions recommended changing to a bond breakeven approach. These submissions mainly stated their support for the ENA submission which, in turn, relied on the CEPA submission. Some of the submissions also refer to other external reports used in previous regulatory determinations by Frontier Economics (ActewAGL) and CEG (Spark Infrastructure). A brief summary of the CEPA and CEG reports are below.

In its report, CEPA provided four assessment criteria:

- Congruence with regulatory framework
- Congruence with market expectations of inflation
- Objective and evidence based
- Transparency and replicability.

These criteria exclude the simplicity criterion used in the ACCC/AER working paper.

CEPA submitted the AER's current approach is not the best estimate of expected inflation and does not necessarily reflect the macroeconomic conditions that market based approaches take into account. CEPA preferred a breakeven inflation approach, without adjustment. It note that while the breakeven approach is subject to some distortions from bias and risk premium, evidence suggests these tend to 'average out' over time and on balance overestimate (rather than underestimate) inflation.

The 2016 CEG Report, Best Estimate of Expected Inflation compares the breakeven method with the AER's current approach and attempts to illustrate that the AER's method performed poorly. CEG stated that the breakeven method has advantages over the AER's current method, including:

- it is a direct measure of inflation expectations in the same bond market that the AER uses to set the nominal rate of return on equity
- it already reflects a probability weighted average of all possible inflation outcomes as perceived by bond investors
- it is available as a longer time series.[62]

Service providers' submissions in favour of a glide path approach

A glide path approach was discussed as a possible method in the AusNet Services, Jemena and CEPA submissions. A glide path would use the RBA's forecasts but would involve a linear ('glide') path between the RBA inflation forecasts for the first two years and the mid-point of the RBA's inflation target band of 2.5 per cent.

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[62] Spark, *Letter re: Submission to the AER's discussion paper on the regulatory treatment of inflation*, 29 June 2017, pp. 8–10.

Service providers' submissions on indifference to 'Issue 1'

Both TransGrid and APA do not wish to change from our current approach for estimating expected inflation. TransGrid noted that over the long run any mismatch between forecast and actual inflation should "equalise out". APA submitted that none of the three methods considered (the RBA inflation target method, the use of data from inflation swaps, and the bond breakeven method) appears to provide a better estimate of expected inflation as compared to the other two methods.

A more in depth coverage of submissions can be found in section 5 and Appendix B.

4.2.3.2 Issue 2

In response to the AER's discussion paper, we received a number of responses on 'Issue 2'. Below is a summary of the submissions.

Consumer groups' submissions

The CCP

In its submission the CCP considered the issues raised by APA, APGA and ElectraNet,[63] and identified their concerns are largely focused on the potential mismatch between the forecast and actual inflation arising from two potential errors:

- that the assumed inflation is higher or lower than the observable 'true' inflation expectations
- that actual, or outturn, inflation is different from the assumed inflation.[64]

The CCP considered it important that there is an agreed quantitative understanding of the impacts of the errors or risks on consumers and utilities, and undertook modelling to test the impact of these errors.[65] The preliminary findings are that:

> A lower inflation assumption at the start of the period can substantially increase prices and expected profits in real terms. Conversely, higher inflation assumption at the start of the period can substantially reduce prices and expected profits in real terms.
>
> Differences between actual and expected inflation during the period do not affect prices, revenues or profits in real terms.[66]

The CCP submitted that a common understanding of how the models work over the life of the assets of multiple time periods is important, and this should be facilitated through a further stakeholder workshop to systematically work through the models. The

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63 CCP, *Response to AER discussion paper, Regulatory treatment of inflation*, 29 June 2017, pp. 6–10.
64 CCP, *Response to AER discussion paper, Regulatory treatment of inflation*, 29 June 2017, p. 11.
65 CCP, *Response to AER discussion paper, Regulatory treatment of inflation*, 29 June 2017, pp. 11–12.
66 CCP, *Response to AER discussion paper, Regulatory treatment of inflation*, 29 June 2017, p. 11.

workshop should be confined to a small group of network representatives, consumers groups and others wishing to test and measure.[67]

We undertook a technical workshop that was similar to that recommended (see section 4.3.2).

ECA and Uniting Communities

ECA engaged Woollahra Partners to review the AER's modelling framework and assess the delivery of inflation under the current AER approach. Based on this advice, the ECA submitted (in regard to Issue 2) that:[68]

> The conclusion is that in the cases where real WACC is held constant, that is where what is modelled is the variation between estimated expected inflation and actual inflation, is relatively small and virtually symmetrical. Where the analysis considers the impact of estimated expected inflation deviating from the inflation inherent in the estimate of the WACC (i.e. where nominal WACC is held constant) then the variation is greater though again symmetrical for the same sized deviation.

In this aspect, the ECA agreed that the AER's regulatory framework was delivering the initial real rate of return (but not the initial nominal rate of return). This real rate of return was delivered (with small and symmetrical deviation) even where actual inflation differed from expected inflation.

Uniting Communities' submission on 'Issue 2' referred to Ofgem's consideration of similar network business revenue proposals at the same time which allows issues like inflation to be considered at once across all electricity distribution network businesses. Uniting Communities submitted that the AER consider a single inflation guideline to be applied across all regulated network businesses over an agreed period of time. The inflation guideline should be binding over a specified period e.g. three to five years. A binding inflation guideline would be efficient and provide greater stakeholder certainty.[69]

Service providers' submissions

Service providers' concerns in submissions on 'Issue 2' can be split into two broad categories:

(A) The regulatory framework does not achieve its intended target (initial real rate of return).

(B) The regulatory framework should target a different outcome.

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67 CCP, *Response to AER discussion paper, Regulatory treatment of inflation*, 29 June 2017, p. 16.

68 ECA, *Regulatory treatment of inflation, Response to AER discussion paper*, June 2017, p. 9.

69 Uniting Communities, *Submission to the AER on regulatory treatment of inflation*, 5 July 2017, pp. 2–3.

The range of initial stakeholder concerns reflected considerable confusion over what was happening in the regulatory models, as well as confusion over the intended target.

Many of the expressed concerns in category A (that the regulatory framework does not achieve its intended initial real rate of return) have been resolved as a result of the extensive engagement process (see section 4.3).

The additional consultation has clarified, but not resolved, many of the expressed concerns in category B (that the regulatory framework should target a different outcome). There are two alternative targets (in addition to the AER's current target) proposed by different stakeholders:

- The framework should target the initial nominal rate of return. This means that revenue received by service providers does not change when actual inflation outcomes are above or below expected inflation. Proponents for this include Ausgrid and APA.[70]
- The framework should target the initial real return on equity, and the initial nominal return on debt. Under this hybrid approach, the revenue relating to debt costs should not vary with inflation outcomes (and so conceptually align with fixed nominal debt issued by the benchmark entity). However, the residual revenue (after debt costs had been paid) would vary with inflation outcomes in order for equity holders to obtain the initial real return on equity. The primary proponent of this position is Spark Infrastructure.

With this background, the major stakeholder concerns can be summarised as follows:

- **NER requires the AER to target the initial nominal rate of return.** Ausgrid submitted that the NER reference to a nominal vanilla rate of return in cl. 6.5.3(d)(2) requires the AER to adopt this nominal rate of return target. This falls under category B above.
- **Mismatch in the regulatory depreciation building block.** APA submitted that the inflation indexation calculation in the PTRM for the return of capital building block does not align with the equivalent calculation in the RFM. This negative building block adjustment (that is, inflation increases the value of the RAB, and so decreases the regulatory depreciation building block) uses expected inflation in the PTRM but actual inflation in the RFM. This falls under category A above.[71]
- **Targeting the initial nominal rate of return is economically preferable.** APA and Ausgrid submitted that delivery of the initial nominal rate of return would align

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[70] APA and Ausgrid led discussion on this point at the technical workshop on 9 August 2017. See APA, *Regulatory treatment of inflation, APA submission in response to AER consultation*, 29 June 2017, p. 17 and Ausgrid, *Letter in response to the AER's regulatory treatment of inflation discussion paper*, 29 June 2017, pp. 3–4.

[71] At the August technical workshop, the APA representative stated that the regulatory framework 'probably' delivered the initial real WACC. However, subsequent communication from APA (including their RBP and VTS revised proposals) indicates that it still considers this 'mismatch' prevents delivery of the initial real WACC.

with the headline return on capital expected by investors (and potentially the basis on which our rate of return parameters are set). This falls under category B above.

An in depth coverage of the key issues arising from these submissions can be found in section 5.

Investor submission

Spark Infrastructure's submission, representing an investor's perspective, primarily addresses category B above. That is, the regulatory framework should target a different outcome. Spark Infrastructure's submission is summarised below:

- **In the presence of fixed nominal debt costs, a hybrid target of real equity/nominal debt is preferable.** Spark Infrastructure submitted that providing compensation for efficient costs means recognising the issuance of fixed nominal debt by a service provider. If we target the initial real rate of return, but debt costs are fixed in nominal terms, the equity holders (after paying the fixed interest rate on debt) will not receive the initial real return on equity whenever actual inflation differs from expected inflation. Hence, they propose changing the current framework.
- **Changes to the return on debt approach require we move to a hybrid target of real equity/nominal debt.** Building on the previous point, Spark Infrastructure submitted that the critical trigger is the AER's move to an annually updated trailing average portfolio return on debt approach in 2013. This perspective acknowledges the long history of the current inflation approach, but sees the 2013 change as introducing internal inconsistency into our framework. Under the post-2013 approach, we estimate the return on debt by assuming the benchmark entity issues fixed nominal debt each year. In depth discussion of Spark Infrastructure's submission can be found in section 6 below.

4.3 Extended stage one consultation

The submissions we received in response to the discussion paper revealed divergent views on the regulatory framework, particularly with regard to 'Issue 2'. In particular, stakeholders disagreed on whether or not:

(a) the current regulatory models achieved their intended real rate of return target

(b) the regulatory models should target a different rate of return outcome.

The divergence in views was apparent at the June 2017 public forum, and several stakeholders requested that the AER facilitate further engagement on these issues.

To explore these different perspectives and clarify the operation of the models, we extended the initial consultation to allow additional bilateral (AER-stakeholder) meetings and then a technical workshop. The small staff-level meetings were intended to build a foundation of shared understanding for the much larger technical workshop.

4.3.1 Small group meetings

AER staff offered to meet stakeholders in one-on-one sessions where it would be possible to look in detail at the models. This allowed:

- stakeholders to ask questions about the AER's models and inflation approach, and together examine the excel spreadsheets
- the AER to reflect its understanding of the stakeholders' written submissions, and then allow stakeholders to correct and/or clarify that understanding
- the AER to introduce its modelling of overall inflation effects, including across multiple regulatory periods.

Ten meetings were held with twelve different stakeholders.[72]

4.3.2 Technical workshop

We issued an open invitation for any stakeholders to present at the technical workshop, with the condition that presenters develop models to illustrate the inflation effects and provide them to all participants in advance of the meeting. We asked all presenters to address three core inflation scenarios in their modelling—where actual inflation outcomes were equal to, above or below expected inflation.

We held the technical workshop on the 9 August 2017 in Sydney with forty participants attending. There were six presentations:

- AER
- Consumer Challenge Panel
- Energy Consumers Australia (part of the Consumer Reference Group)[73]
- Jemena
- APA
- Spark Infrastructure.[74]

In each case, the presenters explained their approach to modelling inflation outcomes.

Broadly speaking, the extended consultation resolved the expressed stakeholder concerns around whether or not the current regulatory models achieved their intended rate of return target. At the end of the technical workshop there was consensus that the

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[72] Meetings were held with Ausgrid, the Consumer Challenge Panel, Endeavour Energy, Energy Consumers Australia (twice), South Australian Power Networks / CitiPower / Powercor / Australian Gas Networks (jointly), Essential Energy, AusNet Services, Spark Infrastructure and Jemena Limited.

[73] Woollahra Partners gave this presentation, acting as consultants to ECA.

[74] A section of this presentation was given by CEG, acting as consultants to Spark.

current regulatory framework targets the initial real rate of return, and that the models deliver this outcome with only minor variation around the target.[75]

The extended consultation clarified, but did not resolve, the different stakeholder concerns around the appropriate form of target. At the end of the technical workshop there were three distinct stakeholder perspectives—the framework should either:

(a) continue to target the initial real rate of return; or

(b) change to target the initial nominal rate of return; or

(c) change to target initial real return on equity and initial nominal return on debt.

All materials relating to the technical workshop (including models from all presenters and a summary of outcomes) are available on the AER website.[76]

4.4 Stage two consultation

With the release of our preliminary position paper, we proceeded into the second stage of our consultation process, consisting of a workshop and soliciting submissions in response to our preliminary position.

4.4.1 Preliminary position paper

On 13 October 2017, we released the preliminary position paper on the regulatory treatment of inflation. Taking into account all the submissions and insights we received from stakeholders at the workshops, our preliminary position was to maintain our current approach in respect to both issues 1 and 2.

In our preliminary position paper, we set out the framework through which we considered stakeholder submissions, and carefully evaluated each point in the greater context of this review. We concluded that at the time, there was insufficient evidence before us to justify a change in our current approach on either issue – however we acknowledged that there were some points that warranted further discussion. For issue 1 in particular, we proposed to monitor Consensus Economics' long term inflation expectations. Stakeholders were further invited to submit material addressing the use of a 'glide path' and the implications that go with it.

4.4.2 Interactive workshop

On 31 October 2017, we held an interactive workshop as part of the final stage of consultation before the release of our final position paper. This workshop was run as a pair of panel discussions, allowing stakeholders to discuss – with the AER, but also with each other – the key issues set out in the AER's preliminary position paper. This

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[75] The only exception to the consensus was APA, who agreed that the models probably delivered the initial real rate of return but wanted to further review the matter.

[76] See https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/review-of-expected-inflation-2017/initiation.

opportunity allowed stakeholders to respond to the reasoning set out in that paper, as well as to provide fresh insights and material prior to finalising our position.

The interactive workshop was timed to allow discussion between stakeholders and the AER before stakeholders' submissions were due to be submitted.[77]

4.4.3 Submissions

In response to our preliminary position paper, we received a further 8 submissions. Below is a brief summary of the key points on each submission; further discussion is available in sections 5, 6 and in the appendices.

Consumer groups' submissions

Both CCP[78] and the ECA[79] submissions support our preliminary position on both the best estimate of expected inflation and whether the regulatory framework appropriately compensates for inflation. Both submissions highlight their positions are guided by regulatory consistency and stability, hence the "hurdles for change" should be a high bar.

CCP submitted that it is open to considering a glide path on the basis that it has strict parameters and triggered only in extreme circumstances. It noted their willingness to further consult on research required to design a glide path.

ECA continued to maintain its proposal for setting expected inflation at the top of the RBA target band to nullify any inflation forecasting risk exposure to consumers. ECA further stated that a glide path is unnecessary, because if there is any persistent change to inflation, policy makers will move to keep inflation at the mid-point of their target band.

Service providers' submissions

Service providers' submissions covered three broad areas: continued support for the bond breakeven approach to estimating inflation; support for implementing a glide path mechanism and the appropriateness of targeting a real rate of return.

ENA[80], AusNet[81] and the joint submission from SAPN, CitiPower, Powercor and AGN[82] maintained their support for the bond breakeven approach as the best measure of

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77 For more information on the interactive workshop, please see https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/review-of-expected-inflation-2017/aer-position.

78 CCP – *Submission on AER preliminary position – Inflation review* – 6 November 2017

79 ECA – *Submission on AER preliminary position – Inflation review* – 6 November 2017

80 ENA – *Submission on AER preliminary position – Inflation review* – 6 November 2017 and ENA – *Submission on AER preliminary position – Inflation review – Attachment A* – 6 November 2017

81 AusNet Services – *Submission on AER preliminary position – Inflation review* – 3 November 2017

82 AGN, CitiPower, Powercor and SAPN - *Joint submission on AER preliminary position - Inflation review* - 7 November 2017

expected inflation. Each submission also noted areas in the AER's preliminary position paper that, in their view, did not provide enough compelling evidence to favour the current RBA approach over the bond breakeven approach. SAPN, CitiPower, Powercor and AGN further questioned the reasoning for an "all or nothing approach", instead proposing to bring in other sources of information and be given some weight. AusNet supported the AER's proposal to monitor Consensus Economics to assess deviation of long term inflation expectations from the RBA's mid-point target.

A number of providers submitted that we should undertake further analysis on implementing a glide path. APA's submission maintained its earlier position of there being a 'mismatch' in the regulatory depreciation building block thereby preventing the model from delivering appropriate compensation of inflation.[83]

Service providers have also pointed out areas in the AER's preliminary position paper requesting for further explanation and clarification on how the relevant conclusion was reached.

Investor submission

Spark Infrastructure's submission[84] does not support the AER's preliminary position and continued to focus on the appropriate compensation for inflation. The submission maintained the view that there is internal inconsistency that our trailing average portfolio uses fixed nominal debt costs, but our overall inflation approach provides a real return on capital. To address this, Spark infrastructure recommended that the AER amend the PTRM and RFM so that the result is equivalent to targeting a nominal return on debt and a real return on equity.

4.5 Expert advice

Leading up to and during the inflation review, the AER has obtained advice from experts to address the two broad issues with inflation that were raised by stakeholders. We provide a brief summary of their findings below.

4.5.1 ACCC/AER working paper advice

The ACCC and AER published a working paper considering the best estimates of expected inflation (ACCC/AER working paper # 11).[85] The paper ranked and compared four different approaches including:

1. RBA inflation forecasts and target band (our current method)
2. Bond breakeven inflation rate
3. Zero coupon inflation swaps

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[83] APA – *Submission on AER preliminary position – Inflation review* – 7 November 2017

[84] Spark Infrastructure – *Submission on AER preliminary position – Inflation review* – 9 November 2017

[85] See ACCC/AER Working Paper #11, *Consideration of best estimates of expected inflation: comparing and ranking approaches*, April 2017.

4. Surveys.

Five assessment criteria were used to rank the approaches:

- relative congruence with the market-expected inflation rate (whether estimates of a particular approach more closely correspond to the market-expected inflation rate)
- robustness
- transparency
- replicability
- simplicity.

The ACCC/AER working paper concludes that the RBA inflation forecasts and target band method is the best approach to estimating expected inflation for the AER. This approach is the simplest, most transparent and replicable. It also concludes that long-term inflation expectations are anchored within the inflation target band and are relatively stable, and the AER's current method is considered to be relatively congruent with the 10 year market-expected inflation rate.[86] Surveys were found to be least favourable, however that was primarily due to there being no public access to long term inflation expectations based on surveys.

4.5.2 RBA correspondence

On 9 June 2017, the AER sent a letter to the RBA seeking its views on the relative merits of the four different approaches discussed in the ACCC/AER working paper #11.

The RBA responded with a letter on 5 July 2017. The RBA stated:

> To summarise our response, none of these measures is perfect. The AER's current approach, while fairly transparent and simple, would not capture a change in long-term inflation expectations if that were to occur. Reserve Bank analysis suggests that surveys of professional forecasters can produce good estimates of long-term inflation expectations. However, relying on proprietary data from Consensus Economics may be at odds with the AER's stated aim of transparency. As noted in previous correspondence between the Bank and the AER, market-based measures of inflation expectations have several shortcomings that probably make them unviable alternatives to the current method.[87]

The full letter from the RBA was published on the AER website after receipt.[88]

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[86] ACCC/AER Working Paper #11, *Consideration of best estimates of expected inflation: comparing and ranking approaches*, April 2017, pp. 94-104.

[87] RBA, *Letter re: Regulatory treatment of inflation – Inflation expectations,* 5 July 2017.

[88] Available at https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/review-of-expected-inflation-2017/initiation (in the supporting information section).

On 6 November 2017 we again wrote to the RBA enclosing a copy of our preliminary position paper seeking their views, in particular, on the issue of speed of reversion to the mid-point of the RBA's target band for inflation.[89] In response, the RBA informed us that it had no further comment. [90]

4.5.3 Shaun Vahey's advice

We engaged Professor Shaun Vahey of the University of Warwick to provide advice on the findings in the ACCC/AER working paper, our discussion paper and the submissions. This advice focused solely on 'Issue 1', the evaluation of alternative methods for estimating expected inflation. This advice was received on 15 September 2017.

Professor Vahey's findings were largely consistent with the ACCC/AER working paper. He found that the working paper correctly identified the current methodology as the most appealing approach to meet the selection criteria. The other methodologies were also considered:

- The swaps method was found to be sensitive to the market turmoil associated with deflationary pressures in recessions.
- The bond breakeven approach was found to lack transparency, simplicity, as well as robustness. Risks of distortions to relative liquidity are also described as 'considerable'.
- Surveys were thought to add additional complexity for no particularly obvious advantages in terms of the selection criteria.

Professor Vahey also responded to Spark Infrastructure's submission on our preliminary position. This response report stated:

- Historical distributions over ten-year periods are not a good guide to the next ten-year period; fluctuations outside the inflation target are usual in Australia, however no evidence was presented in the initial report to suggest the errors have been “unusually” large.
- RBA target is defined in terms of “medium-term” average, hence short-term inflation fluctuations outside the target band is common in practice. This methodology is also underwritten by the credibility of the RBA.
- While 10-year periods are short-term and fluctuations will happen, the sample mean, the mode and the median based on the raw data are all at 2.5 per cent since inflation targeting began.[91]

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89 AER, *Letter to the RBA*, 6 November 2017.

90 RBA, *Email to the AER*, 7 December 2017.

91 Shaun Vahey, *Response to the Spark Infrastructure submission on the AER's preliminary position*, 7 December 2017.

4.5.4 Sapere Research Group report

We commissioned Sapere Research Group (Sapere) to provide advice on the discussion paper, written submissions and material presented at the technical workshop. This advice focused primarily on 'Issue 2', the operation of the regulatory framework (PTRM/RFM/annual pricing process) and the delivery of the intended rate of return target. This advice was received on 25 September 2017.

The Sapere report finds that:[92]

- It is an appropriate regulatory objective to target the delivery of the initial real rate of return on capital (plus ex post inflation outcomes). This target will align with the investor's opportunity cost of capital. It will fulfil the NPV=0 principle and support the national gas and electricity objectives.
- The current regulatory models (PTRM, RFM and annual pricing) are consistent with the regulatory objective. There is a small deviation from the target return for most service providers because of the first year pricing effect.
- If the regulatory objectives are to be met, it is necessary to avoid large or persistent errors (bias) in the AER's initial estimate of expected inflation. This sort of error will cause the estimated real rate of return to depart from the 'true' real rate of return.[93] There is no known framework that would avoid this problem and meet the regulatory objectives.
- Equity holders are exposed to inflation risk where they pay debt in fixed nominal terms, but revenue moves in line with inflation—as under the current approach where a real rate of return on capital is targeted. Leverage magnifies this risk. However, this exposure is already included in the allowed rate of return, through an equity beta estimated using observed data for companies subject to the current inflation approach.

To arrive at this conclusion, the Sapere report:

- reviewed the relevant legislative requirements and the economic rationale for inflation compensation
- derived algebraic equations to represent the operation of the AER's PTRM, RFM and annual pricing process
- undertook modelling (in excel spreadsheet form) of inflation interactions across multiple regulatory periods, including all regulatory components.

The Sapere report includes several sections looking in detail at the interactions between debt returns, equity returns and inflation. It derives equations for the exposure

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92 Sapere, *Efficient allocation and compensation for inflation risk, Report prepared for the Australian Energy Regulator*, 25 September 2017.

93 The Sapere report does not assess the merits of the alternative methods for estimating inflation (though this is undertaken in the ACCC/AER working paper and the Vahey report).

of equity holders to changes in inflation under a number of different debt frameworks. Under an approach that targets the real rate of return on capital, if expected inflation is 2 per cent but actual inflation is 1 per cent:[94]

- If debt costs are set in *real* terms, equity holders will receive real returns equal to their initial (targeted) real return. Nominal returns to equity holders will be 1 per cent below the initial nominal return, because inflation was lower than expected by 1 per cent.
- If debt costs are set in *nominal* terms, equity holders will receive real returns 1.5 per cent below their initial (targeted) real return.[95] Nominal returns to equity holders will be 2.5 per cent below the initial nominal return. This occurs because interest payments to debtholders take precedence over the return to equity holders. Revenue decreases in line with the reduction in revenue but there is no reduction in the fixed debt costs.

We asked Sapere to consider the submissions received in response to the preliminary position. Sapere's advice was that, having read and considered the material in these submissions, they find no reason to review or amend the original report.[96]

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94 This example also assumes that the 'true' estimate of expected inflation embedded in the return on debt is equal to 2 per cent (and so equal to the AER's estimate of expected inflation).

95 This calculation uses the benchmark gearing (60 per cent). Sapere, *Efficient allocation and compensation for inflation risk, Report prepared for the Australian Energy Regulator*, 25 September 2017, p. 20 (paragraph 107).

96 Sapere, *Letter to the AER*, 6 December 2017.

5 Analysis on methods for estimating expected inflation

5.1 Position and reasoning

The NGR requires forecasts and estimates to be arrived at on a reasonable basis and represent the best possible forecast or estimate possible in the circumstances.[97] We construct the expected inflation estimates in the PTRM and RFM so that they satisfy these NGR provisions in addition to requirements in the NER. As part of this process we used the five criteria in our discussion paper (congruence, robustness, transparency, replicability and simplicity) to determine the 'best' estimate of expected inflation.

Our final position is to continue using the current approach to estimate inflation expectations (the current estimate of expected inflation is a combination of the available RBA forecasts with the RBA's target band). The current method is preferred due to it being relatively congruent with long term inflation expectations (as compared to other methods considered), robust, simple to employ, transparent and easy to replicate.

We have carefully evaluated several submissions to the discussion paper and the preliminary position that suggested we should modify the RBA approach by adding a 'glide path' from the RBA's short term forecast to the midpoint of the target band. We consider that the empirical evidence currently before us does not support a glide path.

We also reconsidered the evidence and material we assessed in arriving at our preliminary position. In particular, we assessed the submissions that suggested we had not fully addressed previous submissions and had drawn conclusions that were not supported by evidence. Our detailed response to these submissions is in appendix C.

We agree with stakeholders' submissions that the RBA method is predicated on the use of the RBA's target band as an anchor for long term inflation expectations. The evidence before us does not indicate long term inflation expectations have de-anchored from the RBA's target band at present. We propose to add one additional monitoring process, which is to regularly review survey evidence on long term inflation expectations. If these deviate substantially from the mid-point of the RBA target band (used in the RBA method) we would seek advice from the RBA.

While surveys are good for the monitoring process, we find that they are inappropriate for use as the primary estimate. Inflation expectation surveys that were considered were either for too short a duration or were restrictively proprietary. Short term surveys are already considered by the RBA and information from them should already be in the first two years' forecasts under the current approach.

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[97] NGR, r.74(2).

Inflation expectation estimates based on swaps were also considered. We find that it is probably the best unadjusted market measure but it is not useful in our regulatory context due to the concerns about the infrequency of market trades. It is also possibly affected by a number of biases.

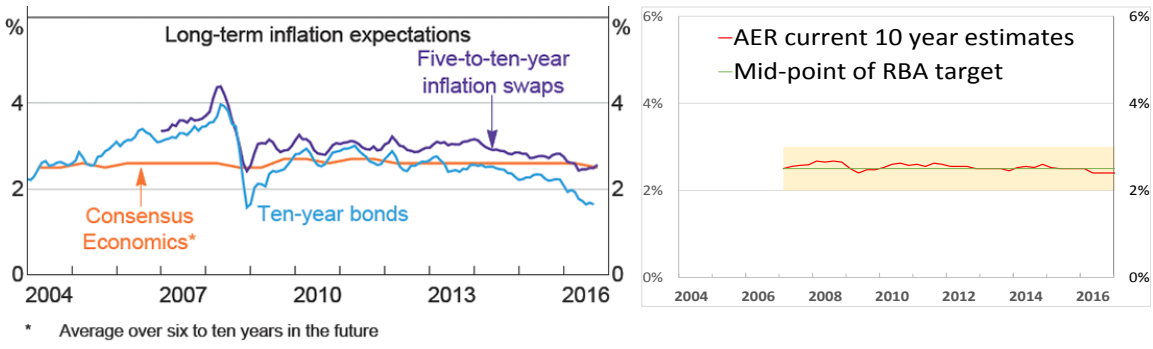
The bond breakeven approach was preferred by a number of stakeholders in the submission process. However, we find that it is affected by biases that are potentially time varying and is particularly volatile (see Figure 2). This leaves the method not particularly useful when unadjusted. There are some adjusted bond breakeven approaches. While they may provide a more accurate representation of inflation expectations than the unadjusted breakeven approach, they are not transparent or simple. The adjusted estimates are also likely to differ depending on the study parameters chosen and so are unlikely to produce robust estimates across adjustment approaches.

We assessed the alternative approach submitted that we should include evidence from a number of different inflation expectation estimates and give each some weight. We consider such an approach is not helpful as it will be a subjective and contentious exercise. The resulting method (if any) would be higher in complexity, lower predictability and lower transparency. We discuss this in detail in appendix C.

After considering stakeholder submissions, expert reports and other material presented to us as part of this process, we concluded the current method provides the best estimate of expected inflation for use in the regulatory framework.

The remainder of section 5 considers each of the methods in detail. Responses to submissions on the best estimate issue are also in appendix B for submissions on the discussion paper and appendix C for submissions to the preliminary position paper.

Figure 2: Four inflation expectation measures over time



Sources: LHS - RBA, Bulletin - December Quarter 2016 - Measures of Inflation Expectations in Australia, December 2016, 23-32, RHS - AER calculations.

5.2 Current method

The AER's current approach is a 10 year geometric annualised average of the RBA's headline rate forecasts for 1 and 2 years ahead[98] and the mid-point of the RBA's target inflation band of 2 to 3 per cent for years 3 to 10.

Discussions with, and submissions from, stakeholders and other parties raised a number of positives and faults with the current approach.

After consideration of the submissions from stakeholders and experts, we found the current approach remains the simplest to apply, most transparent and easily replicable. Estimates from this approach tend towards the mid-point of the RBA's inflation target band, and the ACCC/AER working paper (along with Professor Vahey) found that long-term inflation expectations are anchored to the RBA's target band and relatively stable over time. While the RBA's inflation targeting is perceived to be effective, and inflation expectations are anchored to the target band, this estimation method is likely to be unbiased.[99]

Some submissions stated that the current method is too stable over time. The ACCC/AER working paper #11 found that, overall, the academic literature supports the view that long-term inflation expectations are:[100]

- relatively stable over time
- anchored to the RBA's target band, and
- do not respond significantly to inflation surprises.

Correspondence with the RBA stated that market measures have several shortcomings that probably make them unviable alternatives to the current method, but that surveys of professional forecasters can produce good estimates of long-term inflation expectations.[101] The current method performs more consistently to the Consensus Economics approach than the other methods considered (see Table 2 below).

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98 Where the RBA forecast headline inflation rates for 1 and 2 years ahead is a range, the midpoint of the range is used.

99 ACCC/AER Working Paper # 11, *Consideration of best estimates of expected inflation: comparing and ranking approaches*, April 2017, paragraphs 201-204.

100 See ACCC/AER Working Paper # 11, *Consideration of best estimates of expected inflation: comparing and ranking approaches,* April 2017, paragraph 38. See also: Christian Gillitzer and John Simon (2015), 'Inflation Targeting: A Victim of Its Own Success?', RDP 2015-09, August, *Reserve Bank of Australia Discussion Paper*, pp. 1–27; Richard Finlay and Sebastian Wende (2011), 'Estimating Inflation Expectations with a Limited Number of Inflation-indexed Bonds', *Research Discussion Paper*, Reserve Bank of Australia, RDP 2011-01, March, pp. 1–35; Shawn Chen-Yu Leu and Jeffery Sheen (2006), 'Asymmetric Monetary Policy in Australia', *The Economic Record*, 82, Special Issue, September, pp. S85–S96; Jarkko Jaaskela and Rebecca McKibbin (2010), 'Learning in an Estimated Small Open Economy Model', RDP 2010-02, March, *Reserve Bank of Australia Discussion Paper*, pp. 1–45.

101 The RBA's finding in this regard is corroborated by other central bank and academic studies on survey-based estimates of long term inflation expectations. See pages 90–92 of ACCC/AER working paper.

Table 2: Maximum deviation from the midpoint of RBA target band—comparison of AER method, bond breakeven approach and swaps

Method of estimating 10 year inflation expectations	Maximum deviation from February 2007 to August 2017 (basis points)
Gillitzer and Simon's (2015) long term inflation expectations proxy	20*
AER's current method	17
Bond breakeven approach (unadjusted)	136
Swaps	144

* The sample period employed by Gillitzer and Simon is 1998 to 2013, whereas the AER's current method , bond breakeven and swaps estimates are considered from February 2007 to August 2017. Nonetheless, it is likely that long term inflation expectations have remained relatively stable since 2013. For example, Finlay and Wende extended their 10 year BBIR decomposition analysis to 2016 and find that 10 year inflation expectations appear relatively stable and close to the midpoint. Gillitzer and Simon's proxy for inflation expectations is a weighted average of a forward-looking measure of long term inflation expectations from Consensus Economics, and a backward-looking measure, lagged year-ended inflation. The weighting has trended to unity with the Consensus Economics expectations since inflation targeting began.

The current method, however, does have a potential flaw. If the RBA inflation targeting is (or becomes) perceived to have lost its effectiveness and expectations are not anchored within the target band, then estimates from the RBA inflation target method may not be the best estimates of expected inflation. There is potential, though, to minimise the risk of using the method when inflation expectations have become unanchored. This is discussed in section 5.2.1.

Some submissions to the preliminary position paper suggested that there was a difference in the level of scrutiny applied to the current approach and the bond breakeven approach. We do not agree with this assessment. We discuss this in detail in appendix C.

5.2.1 Use of Consensus Economics survey as check

The current method's primary potential imperfection, its vulnerability to sustained changes in expectations, can be partially addressed by the AER monitoring the Consensus Economics survey. The AER will monitor the series as a deviation of the series away from the RBA's target band would potentially indicate an unanchoring of inflation expectations.[102] If there is such an indication, at that time the AER would seek the advice of the RBA. Currently the Consensus Economics survey is inappropriate to use by itself (see section 5.4 for more information).

Submissions to this proposal were generally supportive of monitoring Consensus Economics survey information. Some suggested some further analysis we should undertake and that is discussed in appendix C.

[102] RBA, *Letter re: Regulatory treatment of inflation - Inflation expectations*, 5 July 2017.

5.3 Modifications to current approach

5.3.1 Glide path

Some submissions by stakeholders proposed using a glide path approach.

A glide path method involves a gradual movement from the RBA's short term inflation forecasts to the midpoint of its target range. It recognises a possible slower reversion to mid-point inflation target, which some stakeholders submit may occur in the current global environment.[103] The Commerce Commission of New Zealand uses an equivalent version using RBNZ forecasts.

A glide path approach was not discussed in the ACCC/AER working paper or the discussion paper. Below we describe some of the known positives and negatives of the approach at this time. Considering these, we are not satisfied that there is enough evidence to change from the current approach to a glide path approach. The remainder of this section covers evidence that was before us at the preliminary position. Further evidence and clarification in response to submissions are presented in appendix C.

Commerce Commission of New Zealand glide path

The Commerce Commission of New Zealand has used a glide path approach to inflation since 2012. Similar to the AER's current approach, the Commerce Commission's approach uses the RBNZ's forecasts and the mid-point (in New Zealand's case 2 per cent). However, the Commerce Commission's approach 'glides' in years 3 and 4 to the mid-point in the fifth year. An illustrative example can be seen in Table 3 below.

Table 3: Illustrative calculation of forecast CPI for regulatory period of five years for the New Zealand Commerce Commission

Regulatory period	Data source or calculation	Forecast change in CPI
Year 1	Reserve Bank forecast	3.0%
Year 2	Reserve Bank forecast	2.5%
Year 3	2.5%-(2.5%-2%)/3	2.33%
Year 4	2.33%-(2.5%-2%)/3	2.17%
Year 5	2.17%-(2.5-2%)/3	2.00%

Source: New Zealand Commerce Commission.

Notes: The RBNZ targets an inflation midpoint of 2.0 per cent (distinct from the 2.5 per cent targeted by the RBA).

[103] CEPA, *Best Estimate of Inflation Expectations: Assessment of Approaches*, 28 June 2017, p. 31.

The Commerce Commission's reasoning for the glide path is time taken for the transmission of monetary policy. The Commerce Commission states:[104]

> Evidence on the time it takes for a monetary policy change to have an effect is not conclusive but a 'rule of thumb' for the length of monetary policy transmission mechanism is between one and two years.

In Australia, transmission of monetary policy occurs at a lag but is typically shown to be one to two years.[105] This suggests that, if monetary policy is still effective, a glide would be between 0 year (as we have currently) and 2 years (as the Commerce Commission of New Zealand currently uses). This is because if deviations from the RBA's target are known at the time of the forecast then the RBA can implement monetary policy and the effect should occur before the third year (due to the transmission taking one to two years on average).

Other glide length evidence

There are many potential glide path candidates that could be used. It is difficult at this time to differentiate if a particular method is better than the others. Current evidence before us suggests that having no glide path, or a short glide path, would be more appropriate than a long glide path.

The current non-glide path approach is based on the consideration of the potentially rapid reversion of short term inflation expectations to the midpoint of the RBA inflation target band. Tulip and Wallace (2012) found that RBA's second year forecasts of inflation significantly outperform forecasts based on a random walk ($p = 0.03$) but did not significantly outperform forecasts based on the midpoint of the inflation target band.[106] Tulip and Wallace state that this reflects 'rapid reversion of headline inflation to the mean'. This outcome is consistent with the successful targeting of the inflation rate. Further, Tawadros finds that the RBA forecasts produce much lower forecasting errors than the forecasts made by the three other private sources.[107] If the relative accuracy of RBA short term forecasts inform and reflect short term market expectations of inflation, such relatively rapid reversion of short term inflation expectations to the midpoint indicates that a glide path may be unnecessary.

Research suggests that the inflation expectations in the past have been well anchored within the RBA target band.[108] Some approaches are consistent with this. The current approach, Consensus Economics survey and adjusted bond breakeven measures

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104 Commerce Commission New Zealand, *Specification and Amendment of Input Methodologies as Applicable to Default Price-Quality Paths,* 28 September 2012, p. 14.

105 Reserve Bank of Australia, *The Transmission of Monetary Policy*, p. 2.

106 Peter Tulip and Stephanie Wallace (2012), 'Estimates of Uncertainty around the RBA's Forecasts', *RBA Research Discussion Paper – November 2012*, RDP2012-07, pp. 11-12.

107 George Tawadros (2013), 'The information content of the Reserve Bank of Australia's inflation forecasts', *Applied Economics*, 45, pp. 626–627.

108 ACCC/AER Working Paper # 11, pp. 16–18.

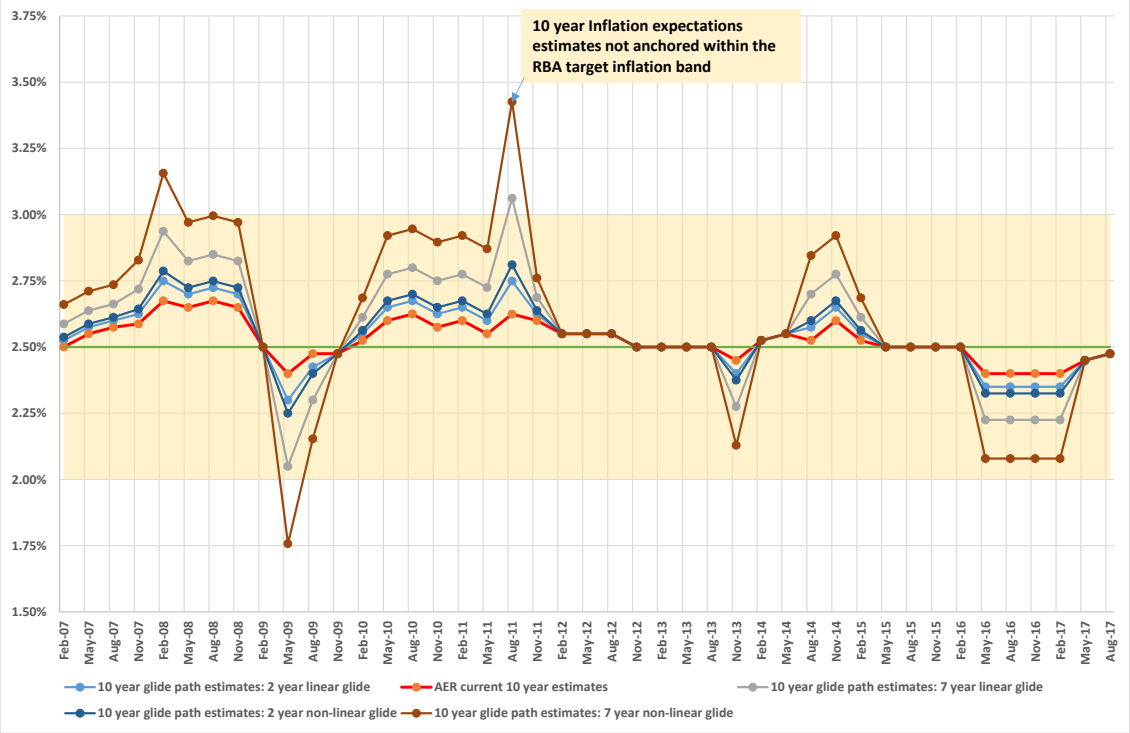
have not deviated from the midpoint of the target by large amounts. Long glide paths can deviate considerably.

In Figure 3, we graph a selection of glide path estimates over the past 10 years. These include:

1. A linear glide path with two transition years (similar to that used by the NZCC)
2. A non-linear glide path with two transition years (exponential decay)
3. A linear glide path with seven transition years (final year is the midpoint)
4. A non-linear glide path with two transition years (exponential decay with the final year the midpoint)
5. AER's current method (no transition years).

The figure shows the glide paths (both linear and non-linear) that include long 'glides' are the most volatile. Of note, high two-year ahead forecasts made in 2011 due to the introduction of the carbon tax would have led to estimates of inflation expectations of between 3 and 3.5 per cent for the next ten years. These were unlikely to be congruent with actual inflation expectations for the next ten years.

Figure 3: Glide path inflation expectations over time



Source: RBA, AER/ACCC.

In Table 4 we consider the maximum deviation from the mid-point in the past 10 years of select glide paths. Depending on the glide path chosen the maximum deviation from the midpoint can vary considerably. Long glide paths can at times suggest that the target is no longer anchored to the RBA's target band (outside 2-3 per cent). In

contrast, a measure that is almost identical to Consensus Economics – Gillitzer and Simon's long term inflation expectations proxy – deviates by an amount similar to the current approach.[109] An RBA Bulletin (2016) states that the Consensus Economics 'measure is ideal for assessing anchoring of long-term inflation expectations'.[110]

Table 4: Maximum deviation from the midpoint of RBA target band—comparison of AER method and select glide paths

Method of estimating 10 year inflation expectations	Maximum deviation from February 2007 to August 2017 (basis points)
Gillitzer and Simon's (2015) long term inflation expectations proxy	20*
AER's current method	17
Glide path: 2 year linear glide	25
Glide path: 2 year non-linear glide	31
Glide path: 7 year linear glide	56 (no longer anchored within the target band)
Glide path: 7 year non-linear glide	93 (no longer anchored within the target band)

* The sample period employed by Gillitzer and Simon is 1998 to 2013, whereas the AER's current method estimates and glide path estimates are considered from February 2007 to August 2017. Nonetheless, it is likely that long term inflation expectations have remained relatively stable since 2013. For example, Finlay and Wende extended their 10 year BBIR decomposition analysis to 2016 and find that 10 year inflation expectations appear relatively stable and close to the midpoint. Gillitzer and Simon's proxy for inflation expectations is a weighted average of a forward-looking measure of long term inflation expectations from Consensus Economics, and a backward-looking measure, lagged year-ended inflation. The weighting has trended to unity with the Consensus Economics expectations since inflation targeting began.

5.3.2 Change to the end target point

ECA's submission suggested a change from the 2.5 per cent end point used in the current method to 3 per cent. Below we detail our reasons for why we chose 2.5 per cent and consider the arguments for changing to 3 per cent.

The 2.5 per cent mid-point

The AER decided to estimate expected inflation using the RBA forecasts and target band approach, rather than the breakeven approach, in its 31 January 2008 final decision for AusNet Services' transmission determination. The mid-point was chosen from the target band for years 3 to 10 after consultation with the RBA, Australian Treasury and retail banks.

In its letter to the ACCC, the RBA advised that:

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[109] Used as Consensus Economics is proprietary. For evidence of near unity movement with consensus, see Christian Gillitzer and John Simon, *Inflation Targeting: A Victim of Its Own Success?*, September 2015, p. 9.

[110] RBA, *Bulletin - December Quarter 2016 - Measures of Inflation Expectations in Australia*, December 2016, 23-32.

> Given inflation expectations have been firmly anchored by the Bank's inflation-target regime for some time, a rough estimate of a real risk free rate would be the nominal government bond less the centre of the inflation target band (ie the nominal yield less 2 ½ per cent).[111]

Similar advice was also received from the Australian Treasury:

> We suggest that [when] working with nominal yields and, where a real return is required, making an inflation adjustment based on the mid point of the RBA's 2 to 3 per cent range, is entirely reasonable. Since the independence of the Reserve Bank Board in conducting monetary policy was formalised in March 1996, annual inflation has averaged 2.5 per cent.
>
> …
>
> We therefore recommend that the ACCC use the mid point of the RBA's target band for inflation (i.e. 2.5% per annum) as the best estimate of inflation.[112]

The AER noted most of the retail banks referenced in AusNet Services' proposal did not forecast inflation beyond a 2-3 year period either. Most of these banks also suggested 2.5 per cent be used for longer term inflation forecasts, on the basis that it is the mid-point of the RBA's target range. Some also note that it was the long term average.

In the absence of a reliable market based estimate, and acknowledging the difficulty of forecasting inflation beyond the short term, the AER considered 2.5 per cent to be a reasonable estimate of inflation beyond the RBA's forecast period.

Inflation, since inflation targeting began in Australia, has averaged around 2.5 per cent to 2017 and 2.3 per cent over the past decade.[113]

More recent studies find that long term expectations of inflation are anchored within the RBA's inflation target band and near the midpoint. [114]

Proposed change to 3 per cent

The report by Professor Quiggin that accompanied ECA's submission to the discussion paper suggests setting estimated inflation at the top of the RBA's target band appropriately allocates inflation risk to investors. The purpose is to protect consumers from 'upside' inflationary risk by setting the regulatory estimated rate at the upper end of the range.

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111 RBA, *Letter to ACCC*, 9 August 2007, p.3.

112 Australian Treasury, *The Treasury bond yield as a proxy for the CAPM risk-free rate*, Letter to ACCC, 7 August 2007, p.5.

113 ABS, 6401.0 - Consumer Price Index Australia, June 2017.

114 Jarkko Jaaskela and Rebecca McKibbin (2010), 'Learning in an Estimated Small Open Economy Model', RDP 2010-02, March, *Reserve Bank of Australia Discussion Paper*, pp. 1–45. and ACCC/AER Working Paper # 11, pp. 16–18.

Our view is that this would be setting a direct transfer from the service providers to consumers but would not necessarily lower risk. This is because the change would be equivalent to an expected 40 basis point drop in annual return compared to the existing approach. However, if inflation was different from what was expected then prices would change in the same manner as the current estimate (including when inflation is above 3 per cent). So while it does reduce the chance that actual inflation is above the estimate, it does not necessarily reduce price fluctuation risk for consumers.

Relevantly, the NER states that the PTRM for electricity distribution and transmission must specify: 'a methodology that the AER determines is likely to result in the best estimates of expected inflation.'[115] The NGR states that an estimate must be arrived at on a reasonable basis and must represent the best forecast or estimate possible in the circumstances.[116] It is doubtful that a change in the current estimation technique in an attempt to shift risk from consumers to service providers would also provide the best estimate of expected inflation. Transfers of risk are better considered as part of any change to the regulatory framework.

5.4 Surveys

Inflation expectations obtained from surveys of professional forecasters, market economists and other groups is another method for estimating market expectations of inflation. There are two types available, those publicly available and those that are not. Neither is our preferred method for the reasons detailed below.

Surveys of inflation expectations that are publicly available are limited in availability. Those that the AER has been able to observe include expectations two years into the future. These surveys are already considered by the RBA and have no particularly obvious advantages in terms of the AER's criteria.[117] Tulip and Wallace, and Tawadros found that these surveys do not provide a better estimate than the RBA forecasts.[118]

Surveys of longer inflation expectations are often proprietary and not publicly available. They, however, are often congruent with actual long term inflation expectations. The RBA provided some detail on these methods in its letter to the AER:[119]

> The RBA monitors three surveys of long-term inflation expectations: those of union officials, local market economists, and the respondents to Consensus Economics' survey. The survey of union officials and the survey of market economists measure expectations of average annual inflation over the next five to ten years, while the survey from Consensus Economics captures expectations of average inflation for between six to ten years. Long-term surveys of expectations are a good way to estimate long-term inflation

115 NER, cll. 6.4.2(b)(1) and 6A.5.3(b)(1).

116 NGR, r. 74.

117 Shaun P. Vahey, *Report to the AER on Estimating Expected Inflation*, 15 September 2017, p. 12.

118 Peter Tulip and Stephanie Wallace (2012), 'Estimates of Uncertainty around the RBA's Forecasts', *RBA Research Discussion Paper – November 2012*, RDP2012-07, p. 16. and George Tawadros (2013), 'The information content of the Reserve Bank of Australia's inflation forecasts', *Applied Economics*, 45, pp. 626–627.

119 RBA, *Letter re: Regulatory treatment of inflation – Inflation expectations*, 5 July 2017.

expectations since they should not be influenced by temporary deviations or financial market developments, and because the respondents are well-informed. They should also react to any unanchoring of expectations. Internal work has found that the Consensus Economics survey is the measure of long-term expectations that best abstracts from near-term influences on inflation. The main drawback of the Consensus Economics survey is its frequency; long-term expectations are only surveyed twice a year (in April and October). Furthermore, the information in this survey is proprietary, which may restrict replicability.

We note that from 2014, the Consensus Economics survey has been issued quarterly (useful for our purposes). This is the same availability as the RBA forecasts published in the Statement of monetary policy.

The Consensus Economics forecast is proprietary and therefore does not satisfy the transparency and replicability criteria. Survey companies sell the inflation estimates derived from their surveys. If we used a proprietary survey estimate in our regulatory process we would have to publish this figure, which would undermine the business case of the survey company.

As mentioned in section 5.2.1 we now have access to the survey results and will be monitoring this information source.

5.5 Swaps

The swaps method has a number of positive attributes. Estimates of expected inflation using swaps are simple to calculate, can give daily estimates and the biases are arguably smaller than bond breakeven approach.

Although there are these positive attributes, we do not prefer the inflation swaps method over the current method. The estimates produced using the inflation swaps methods are likely to incorporate biases and distortions (due to hedging costs, liquidity premium and other premiums) and these biases and distortions are likely time-varying.[120] There also remains uncertainty as to the size of the biases. The ACCC/AER working paper provided a breakdown on these biases as set out in Table 5.

The volatility of the estimates is also undesirable. Evidence before us suggests that long term inflation expectations are relatively stable and are anchored within the RBA target band.[121] The zero coupon inflation swap prices are volatile. This suggests that the method does not produce congruent estimates of inflation expectations.

Focusing on the use of the swaps method in the regulatory framework, we have concerns with the ability of stakeholders to move the market in short averaging periods. Such ability is a concern due to the impact of expected inflation on revenue outcomes for service providers.

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[120] ACCC/AER Working Paper # 11, pp. 75–76.

[121] Jaaskela and McKibbin (2010), 'Learning in an Estimated Small Open Economy Model', RDP 2010-02, March, *Reserve Bank of Australia Discussion Paper*, pp. 1–45. and ACCC/AER Working Paper # 11, pp. 16–18.

The swaps method did not receive much support in submissions to the discussion paper or preliminary position paper. The RBA's letter also advises that this method is probably an unviable alternative to the current method.

Table 5 Issues with swap-implied inflation rates

Bias	Explanation
Hedging costs	Likely to result in potential overestimates of expected inflation. If there is greater demand for the fixed leg than the floating leg dealers may hedge their short exposure in the swap market by taking offsetting exposures in other markets, such as bond markets. In taking these positions dealers are likely to incur hedging costs. Hedging costs include all costs associated with opening, maintaining and closing positions in the market. The zero coupon inflation swap rate may be affected by the hedging costs incurred by swap dealers. Swap dealers may pass on these hedging costs in the form of higher inflation swap rate quotes. In this case, hedging costs may drive a wedge between the inflation swap rate and the market-expected inflation rate. The ACCC/AER working paper #11 found that academic literature suggests that hedging costs may be minor, but there are not many studies to support drawing robust conclusions. As the demand for the fixed and floating leg will change under different market conditions this bias is likely to be time-varying.
Inflation risk premium	Likely to result in potential overestimates of expected inflation. There may be a number of arbitrage and transaction costs associated with hedging the short exposure in the inflation swap market. Hedging may also be imperfect because there may be mismatches in the timing, size and maturity of the cash flows. Hedgers seldom create a perfect hedge because the marginal cost of hedging rises sharply as the risk minimising hedge ratio is approached. The hedger will select a hedge that is less, perhaps substantially less, than the risk-minimising hedge ratio.[122] As a result, swap dealers short in inflation swaps may still require an inflation risk premium to compensate them for inflation uncertainty that persists due to imperfect hedges, and this premium may be included in the published inflation swap rate. This potential bias is likely to be time-varying when inflation expectations are more uncertain.
Inflation indexation lag	Inflation rate swaps are also subject to indexation lag, which may influence the inflation swap rate such that the raw inflation swap rate may depart from the expected inflation rate. The floating leg of the zero coupon swaps is explicitly linked to the reference CPI date. The lag on the Australian zero coupon inflation swap is moderate. Bloomberg and Zine-eddine (2014) identify the lag as 3 months. Because the swap inflation rates are not adjusted for indexation lag, the swap contract is referenced to inflation for a period that starts before the date on which the contract is priced and ends before the contract matures. Therefore, the estimated forward inflation curve from inflation swaps will not entirely capture forward inflation rates, but also include some historical inflation determined by the extent of the indexation lag. This bias is potentially small due to the short lag on indexed CGS and is not likely to be time-varying.
Counterparty default risk	The risk associated with an inflation swap is that the counterparty will fail to fulfil its obligations outlined in the swap agreement. This default risk is known as counterparty risk and as such, default risk premia may be included in inflation swap rates. While the presence of this risk premia is a relatively well-known, the effect of counterparty default risk on zero coupon inflation swap rates may not be significant. This premia could result in overestimates of expected inflation and is not likely to be time-varying.
Liquidity premia	Likely to result in potential overestimates of expected inflation. Zero coupon inflation swap rates may also contain liquidity premia, which may drive a wedge between the raw inflation swap rate and expected inflation rate. A-priori liquidity premia may be near zero since swaps can be created as

[122] Charles Howard and Louis D'Antonio (1994), *'The Cost of Hedging and the Optimal Hedge Ratio'*, The Journal of Futures Markets, 14(2), pp. 237-238.

required and there is no supply limitation. Observations of Australian data suggest that this liquidity premia may be negligible.[123] If the inflation swap method includes a liquidity premium it is likely to produce overestimates of the expected inflation rate. Furthermore, the liquidity premium is likely to be greater during periods of uncertainty when investors' appreciation of liquidity risk may have changed.

Source: ACCC/AER Working Paper # 11, pp. 75–76.

5.6 Bond breakeven approaches

5.6.1 Overview of bond breakeven approaches

The bond breakeven approach was recommended in 9 of the 16 submissions received on the discussion paper.[124] In the submissions to the preliminary position paper, the approach was recommended in 4 out of 8 submissions. The method is also used by some regulators internationally in both adjusted and unadjusted forms. For example, Ofwat uses the bond breakeven approach but adjusts the estimate by 0.3 percentage points.

The bond breakeven inflation rate (BBIR) method, however, is not our preferred approach for the following reasons:

- There is evidence of significant and time-varying premiums and biases in BBIRs for the US and UK markets (more mature and liquid than the Australian market) – as well as for the Australian market.
- BBIR estimates may vary considerably depending on the chosen yield curve models (and there is no consensus in the literature on which model should be used).
- There is evidence that long term inflation expectations are relatively stable and are anchored within the RBA inflation target band. Adjustments can be made to mitigate this.
- If adjustments are made for the above issues the methodology becomes complex and opaque.

5.6.2 Calculation

The BBIR is calculated from the Fisher equation. The Fisher equation provides that:

$$(1 + interest\ rate_{nominal}) = (1 + interest\ rate_{real})(1 + expected\ inflation)$$

Therefore:

$$expected\ inflation = \frac{1+interest\ rate_{nominal}}{1+interest\ rate_{real}} - 1$$

[123] See ACCC/AER Working Paper #11, *Consideration of best estimates of expected inflation: comparing and ranking approaches,* April 2017, pp. 81–85.

[124] Predominantly regulated entities, their owners and their consultants.

The yield to maturity (as a proxy for the interest rate) on the risk free asset (nominal and indexed CGS) is typically used to calculate breakeven inflation rates via the Fisher equation.

5.6.3 Bond breakeven without adjustment

Submissions that recommended the bond breakeven approach preferred using the method without making adjustments for biases. Research suggests the bond breakeven approach has considerable issues if left unadjusted, which were covered in the ACCC/AER working paper. See Table 6 below for more information.

The conclusions of other experts we consulted were consistent with this finding. The RBA detailed that much of the variation in the long term bond breakeven rate is due to changes in the inflation risk premium rather than changes in inflation expectations.[125] Professor Shaun Vahey's paper discussed our previous use of the bond breakeven approach before 2008. The approach was halted because of distorted breakeven inflation estimates due to illiquidity. He describes the risks of further distortions of relative liquidity as considerable.[126]

Many of the supporting submissions of the breakeven approach relied on the report by CEPA. CEPA noted that the breakeven approach is subject to some distortions from bias and risk premium, but evidence suggests these tend to 'average out' over time and on balance overestimate (rather than underestimate) inflation. This is inconsistent with the RBA's advice which stated:[127]

> The inflation risk premium biases the long-term bond breakeven rate upward, while the liquidity premium biases it down; there is no guarantee that these biases will offset one another. Furthermore, these premiums are unobservable and probably vary over time, which complicates the interpretation of changes in the long-term bond breakeven rate. Movements in the breakeven rate could arise from changes to long-term inflation expectations, the liquidity premium, or the inflation risk premium. Previous work undertaken by the RBA has found that, at long horizons, much of the variation in the long-term bond breakeven rate is due to changes in the inflation risk premium rather than changes in expectations.

The RBA's reasoning is informed by Finlay and Wende (2011).[128] These were updated in 2016 with similar findings.[129]

CEPA also stated that the bond breakeven approach on balance overestimates (rather than underestimates) inflation. To do so it relied on a RBA Bulletin article referred to in

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125 RBA, *Letter re: Regulatory treatment of inflation – Inflation expectations*, 5 July 2017.

126 Shaun P. Vahey (2017), *Report to the AER on Estimating Expected Inflation*, 15 September 2017, pp. 16–17.

127 RBA, *Letter re: Regulatory treatment of inflation – Inflation expectations*, 5 July 2017, p. 2.

128 Richard Finlay and Sebastian Wende (2011), 'Estimating Inflation Expectations with a Limited Number of Inflation-indexed Bonds', *Research Discussion Paper,* Reserve Bank of Australia, RDP 2011-01, March, pp. 1-35

129 RBA, Bulletin - December Quarter 2016 - *Measures of Inflation Expectations in Australia*, December 2016, 23-32.

its report.[130] The article only used swaps to calculate market-implied measures of expected inflation and so is not applicable to the bond breakeven approach.[131]

The bond breakeven approach was not supported by consumer groups. The CCP considered each of the four options and agreed with the AER's use of the five criteria. In its report the CCP stated:[132]

> In the case of the proposed move to the bond break even approach to measuring inflation expectations, the CCP's preliminary view is that there is insufficient evidence supporting a shift from the current AER approach.
>
> We base this on our philosophical approach to the importance of the key principles of consistency and predictability in best practice regulatory decision-making. This is important to consumers as well as investors. While some flexibility to adapt to exceptional circumstances is recognised as being necessary the adoption of a consistent, an enduring methodology or approach to decision-making is essential if there is to be consistency and predictability.
>
> Consumers require strong confidence that the benefits of change are present and enduring ie provide a better estimate of inflation expectations over multiple decision cycles in different conditions, not just in the current conditions. We are concerned that a change back to the bond break even approach, after it was abandoned in 2008, will create a risk of flip-flopping of approaches to suit specific interests.

The CCP did not change its position in submission to the preliminary position paper.

ECA and Uniting Communities were also against using the bond breakeven approach.[133]

Below, Table 6 (taken from the ACCC/AER working paper) summarises the key issues with bond breakeven estimates.

Table 6 Issues with bond breakeven estimates

Issue	Explanation
Fitting a yield curve	The approximate matching of 10 year maturities of nominal and indexed CGS is necessary for the calculation of the 10 year breakeven inflation rate. However, a match of such maturities is unlikely to occur given the relatively few tenors of outstanding indexed CGS. Therefore, calculations of breakeven estimates may require yield curve models to interpolate estimates of yields obtained from indexed and nominal CGS with different tenors. The consequence of using yield curve models is that the breakeven estimates are unlikely to reflect mark-to-market expectations of inflation, and the estimates are likely to vary depending on the yield curve models chosen. Deacon and Derry (1994) and Deacon et al. (2004) find that breakeven

130 CEPA, *Best Estimate of Inflation Expectations: Assessment of Approaches*, 28 June 2017, p. 24, 30-31.

131 RBA Bulletin March 2017, *Inflation Expectations in Advanced Economies*, March 2017.

132 CCP, *Response to AER discussion paper, Regulatory treatment of inflation*, 29 June 2017, p. 26.

133 ECA, *Regulatory treatment of inflation, Response to AER discussion paper*, June 2017, p. 8, 26; Uniting Communities, *Submission to the AER on regulatory treatment of inflation*, 5 July 2017, p. 4.

	estimates may vary considerably depending on the yield curve models employed.
Liquidity premia	Indexed CGS are likely to be substantially less liquid than nominal CGS. This implies that liquidity premia included in the yields on indexed CGS may be greater than the liquidity premia included in the yields on nominal CGS. The difference between liquidity premia, or the differential liquidity premia, is likely to drive a wedge between the bond breakeven inflation estimates and inflation expectations. The differential liquidity premia are likely to be greater during periods of uncertainty when investors' appreciation of liquidity risk may have changed. In such a situation, the yield spread between nominal bonds and inflation indexed bonds is likely to narrow – a narrowing that is caused by greater uncertainty, growing differential liquidity premia, and not necessarily a fall in inflation expectations.
Inflation risk premia	The inflation risk premia arise because holders of nominal bonds are exposed to inflation risk, where there is a probability that the actual inflation rate will not match the expected inflation rate. As a result, nominal bondholders may demand compensation for bearing this risk. Inflation risk premia may be positive or negative, depending on whether there are concerns about inflation or deflation.
Convexity bias	Bond prices are a convex function of their respective yields. Therefore, if yields are volatile, giving effect to gains being larger than the losses, bond prices may rise. The rise in the bond prices push down their forward yields, below their expected future yields. The difference between forward yields and expected future yields on a bond is the 'convexity effect'. The size of the convexity effect is likely to be different for nominal and indexed bonds. The difference in the magnitude of the convexity effect for nominal and indexed bonds may result in the bond break-even inflation estimates departing from market expectations of inflation by the amount of a 'convexity bias' (other things unchanged). Convexity bias is sensitive to the relative volatility of forward yields on nominal and indexed bonds. Therefore, the scale of convexity bias estimates may change if relative forward yield volatilities change over time.
Inflation indexation lag	A perfectly indexed CGS would pay a real coupon amount that is adjusted by the increase in the CPI between the issue date and the time of payment. However, there are unavoidable lags between the actual movements in the CPI and adjustments of indexed bond cash flows. Indexation lag may result in the forward yields on indexed CGS being calculated on the basis of both historical inflation rates and expected future short term inflation rates. The effect of indexation lag on indexed CGS yields may be significant during periods of significantly above and below-trend inflation.
Inflation risk premia in indexed bond yields: indexation lag premia	As a result of indexation lag, the real return on indexed bonds may be exposed to some inflation risk. There is research which finds that inflation risk premia may be embedded in indexed bond yields to compensate investors for such risk. This is known as indexation lag risk premia. Risa (2001) finds that the yields on UK 10 year indexed bonds included an indexation lag risk premium of approximately 3.3 basis points. However, Risa considers that this premium is not economically relevant in size. D'Amico et al. (2016) find an indexation lag premium on the yields on 10 year TIPS varies between –5 and 3 basis points.
Inflation risk premia in indexed bond yields: post-tax variability of indexed bond cash flows	Tax regimes in existence tend to cause post-tax real returns to remain uncertain even if pre-tax real yields are known. Since tax is levied on the nominal yield, not the real yield, the tax system reintroduces inflation risk for indexed bonds. Post-tax real yields may become uncertain and variable if inflation is uncertain. If the demand for bonds is a function of their expected post-tax returns, pre-tax indexed bond yields may include inflation risk premia to compensate investors for the potential uncertainty of post-tax real returns. The existence of inflation risk premia in indexed bond yields may result in bond break-even inflation estimates departing from market expectations of inflation.
Mismatched pattern of cash flows	Christensen et al. (2004) argue that even if nominal and indexed bonds have the same maturity, differences in the pattern of coupon payments (resulting in differences of duration and convexity of each bond) may expose each bond to different discount factors. In real terms, the coupon payments on indexed bonds are fixed, while the coupon payments on nominal bonds decline in real terms over their maturity. Since cash flows that arrive later in time are discounted more heavily, the price of the indexed bond will be lower and therefore

	the BBIR may produce downwardly biased estimates of expected inflation. Christensen et al. note that the size of this bias will not be constant through time since it is a function of the coupon and maturity of nominal and indexed bonds and the term structure of interest rates. They find that observed volatility of bond breakeven estimates may be due to mismatched cash flows and not to changes in inflation expectations.
Sensitivity to short term inflation expectations when calculated from coupon-paying bonds	When bond breakeven estimates are calculated from the yields on coupon-paying bonds, the estimates may become more sensitive to changes in short term inflation expectations compared to an approach that is calculated from yields on zero coupon bonds. As a result, if the term structure of inflation expectations is not flat, relatively volatile short term inflation expectations may change the bond break-even estimates, even if the long term market expectations of inflation are unchanged.
Changes to the demand for and supply of indexed and nominal CGS that are unrelated to changes to inflation expectations	There may be changes to the demand for and supply of nominal and indexed CGS that are unrelated to changes in inflation expectations. As a result, relative yields and bond break-even inflation estimates may change even if the term structure of inflation expectations is unchanged. For example, changes to the relative supply of nominal and indexed CGS, changes to investor risk aversion, slow moving capital and capital availability may result in a movement of the relative yields that may be unrelated to changes in inflation expectations.
The effect of the deflation floor on the yields of indexed CGS	Indexed CGS have a 'deflation floor' – coupon interest payments will not be based on a capital value less than the face value and payment of the principal cannot fall below the face value. If deflation becomes a concern, the deflation protection of indexed CGS becomes valuable, pushing up indexed CGS prices and reducing indexed CGS yields. During such episodes, the effect of the deflation floor on indexed CGS may influence bond breakeven estimates. For the US, D'Amico et al. (2016) identify the effect of the deflation floor as a potential driver of bond breakeven estimates. They find that the deflation floor affects the yields on 10 year TIPS by about 5 basis points during normal times but widening to -20 basis points during the recent crisis.
Personal price indices and the substitution effect	In their estimates of the bond breakeven inflation rate for the US, Christensen and Gillan (2012) find that the inflation risk premium in the estimates remained negative even after maximally correcting for the liquidity premium. Christensen and Gillan argue that this may be due to TIPS yields being higher than they otherwise would be for two reasons. Firstly, the CPI may overstate true inflation outcomes because the substitution effects have not been considered. Secondly, the personal price index of investors may be different to the CPI and therefore TIPS are only a partial hedge for inflation risk. Consequently, investors may demand a risk premium for the remaining exposure to an imperfect inflation hedge. The influence of the substitution effect and personal price indices on indexed bond yields may result in bond breakeven inflation estimates departing from market expectations of inflation.

Source: ACCC/AER Working Paper # 11, *Consideration of best estimates of expected inflation: comparing and ranking approaches*, April 2017, pp. 33–36.

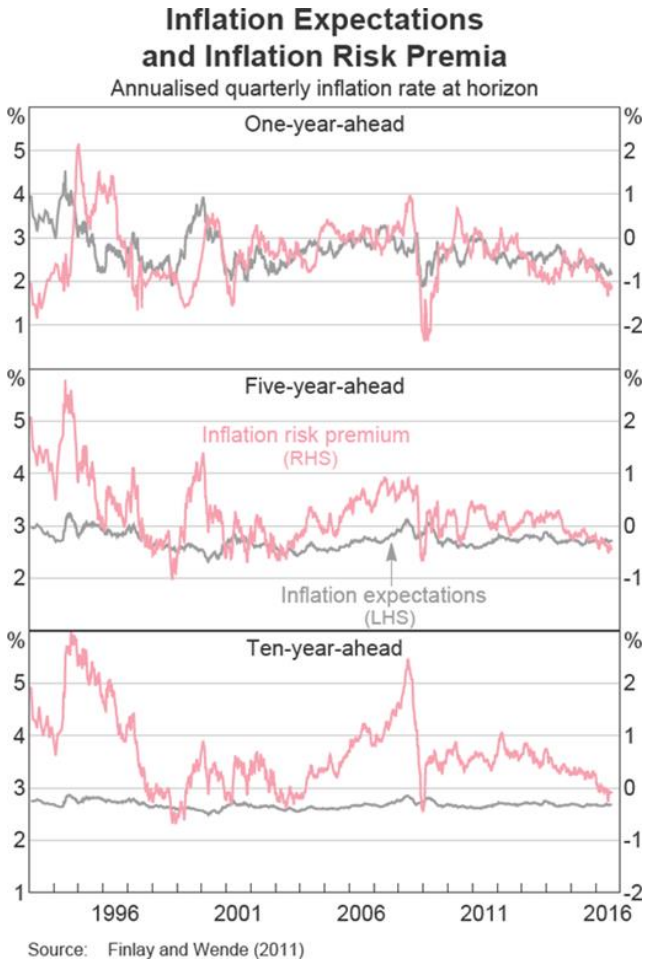
Further discussion to clarify and explain this assessment in response to submissions is available in appendix C.

5.6.4 Bond breakeven with adjustments

Adjusted bond breakeven approaches have been used by regulators in the past internationally and have been created in Australia. Finlay and Wende decomposed the bond breakeven approach into several components in 2011. These were updated by the RBA in 2016 and set out in Figure 4:[134]

[134] RBA Bulletin - December Quarter 2016, *Measures of Inflation Expectations in Australia*, December 2016.

Figure 4: Inflation expectations from adjusted BBIR



Source: RBA.

Figure 4 shows the resulting estimate is considerably more stable than the unadjusted breakeven approach. The inflation risk premia vary considerably more than inflation expectations at the ten-year-ahead range suggesting variation in the unadjusted method is mostly attributable to bias. The stability of the ten-year-ahead forecast is similar to our current approach and the resulting estimate is higher than under the AER's current method.

Using an adjusted approach would produce estimates more congruent with inflation expectations than using the bond breakeven approach unadjusted. It would not, however, achieve the objectives of a simple or transparent method. Perhaps more importantly, the decomposition estimates are likely to differ depending on the study parameters chosen – the bond breakeven method is unlikely to produce robust estimates across decomposition approaches.

Ofwat's adjustment is simpler than that used by Finlay and Wende. However, just choosing a single value like Ofwat does, would not be appropriate in an Australian context. This because the inflation risk premium is considerably more volatile than inflation expectations and can change by more than 2 percentage points in a single year.

6 Analysis of the treatment of inflation in the regulatory framework

6.1 Position and reasoning

Our current approach targets the delivery of the initial real rate of return (derived from the initial nominal rate of return and expected inflation) plus actual inflation outcomes over the regulatory period.[135] Targeting the real rate of return means that revenues received by the service provider move in the same direction as inflation. If actual inflation outcomes are below expected inflation, service providers recover less revenues than expected; but if actual inflation outcomes are above expected inflation, service providers recover more revenues than expected.

Our final position is to continue to target the initial real rate of return on capital. This approach is consistent with the NER and NGR. We consider that there is a strong economic rationale behind an approach that targets the initial real rate of return. It provides stable real returns to investors and stable real prices to customers.[136] We have consistently applied this approach in all our previous electricity and gas decisions (including relevant decisions by the ACCC prior to the formation of the AER). Our method for estimating the rate of return—in particular, the method for estimating equity beta—is consistent with this inflation approach. Hence, we are satisfied that service providers receive the correct overall compensation package.

Under the current implementation, delivery of the initial real rate of return is not exact. That is, when actual inflation outcomes are above or below expected inflation, the obtained real rate of return will differ slightly from the targeted real rate of return.

Our final position is to continue our current implementation of this approach. The deviations around this target appear to be minor and symmetrical. Further, one of the key deviation sources—the first year pricing effect—acts to offset potential errors in the AER's estimate of expected inflation. There were only a few implementation changes proposed by stakeholders, but our analysis of these changes shows they would not act to reduce deviations around the intended target.

Our final position maintains our preliminary position on the intended target and the implementation of that target. We carefully considered all the submissions received in response to our preliminary position, which included a diverse range of perspectives. In particular, we discuss below:

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[135] In other words, the initial real rate of return is the expected (*ex ante*) real rate of return on equity at the start of the regulatory period.

[136] We refer here only to the impact of inflation on the delivery of stable real returns/prices; these outcomes will be influenced by non-inflation-related factors beyond the scope of this review.

- APA's submission on targeting the initial nominal rate of return[137]
- the ENA and (joint) SAPN/CitiPower/Powercor/AGN submissions on the use of a 10 year geometric average[138]
- Spark Infrastructure's submission on targeting the real return on equity[139]
- the CCP submission on targeting the real return on capital.[140]

6.2 Delivery of initial real rate of return under the current approach

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 process and RFM
- multiple regulatory periods—that is, where lagged series are used and over-compensation in one period may be offset by under-compensation in the next
- 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 cashflows.

6.2.1 Delivery of initial real rate of return

We consider that the current regulatory framework acts to deliver the intended target, the initial real rate of return plus ex post inflation outcomes.[141] Understanding the overall inflation approach requires that we consider:

- the operation of the PTRM, annual pricing process and RFM
- changes to within-period cashflows as well as the closing asset base (which represents claims on future cashflows).

We set out the primary inflation-related calculations in section 3.3.4 above.

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137 APA, *Submission in response to AER preliminary position paper, Regulatory treatment of inflation*, 7 November 2017.

138 ENA, *Response to AER's preliminary position paper on regulatory treatment of inflation*, 6 November 2017, pp. 15–16; and SAPN, CitiPower, Powercor and Australian Gas Networks, *Submission re: AER review of expected inflation*, 7 November 2017, p. 3.

139 Spark Infrastructure, *Submission to the AER's preliminary position on the regulatory treatment of inflation*, 9 November 2017.

140 Consumer Challenge Panel, *Submission to the AER, Response to AER discussion paper 'Regulatory treatment of inflation - Preliminary position'*, 6 November 2017, pp. 5–7, 15–19.

141 wWhere we describe the 'target' of the current approach, we mean that the combined regulatory framework (PTRM, RFM and annual pricing process) is designed so that the delivered (realised or *ex post*) real rate of return on capital will equal the initial (expected or *ex ante*) real rate of return on capital.

Initially, stakeholders expressed divergent views on whether the current regulatory framework delivered this intended target. However, following engagement and consultation, stakeholders at our technical workshop reached consensus that the current regulatory framework delivers the initial real rate of return. Following its review of our regulatory framework, the Sapere report also reached this finding:[142]

> The application of the RFM and the PTRM achieves the expected result that the net present value of the investment is zero and the NSP maintains the real value of its capital investment.

The interactions between the different inflation elements are complex and so it may be helpful to consider an illustrative example. In this example, our estimate of expected inflation is 2 per cent. This means that in the PTRM, at the commencement of the regulatory period:

- In the return on capital building block (calculated as nominal rate of return x indexed asset base) there is 2 per cent inflation increase in revenue above the real rate of return.
- In the return of capital building block there will be a 2 per cent decrease in revenue reflecting the negative adjustment for indexation on the opening asset base.
- In the projected roll forward there will be a 2 per cent increase in future revenue (via the value of the closing RAB) reflecting indexation on the opening asset base.

The total *ex ante* inflation compensation will therefore be 2 per cent, equal to the initial estimate of expected inflation. The inflation deduction in the return of capital building block means that compensation for inflation only occurs once. Using the estimate of expected inflation, the initial nominal rate of return and initial real rate of return will be consistent.

If we then assume that actual inflation is 1 per cent, below the initial estimate, then the following inflation effects occur:

- The CPI–X annual pricing process applies 1 per cent actual inflation at the aggregate smoothed revenue level. This therefore equally affects the return on capital and return of capital building blocks. At the highest level, this replaces the 2 per cent expected inflation both for the return on capital building block (1 per cent increase) and the return of capital building block (1 per cent decrease).[143]
- The RFM applies 1 per cent actual inflation when rolling forward the asset base. This will be the basis for building block calculations in the subsequent regulatory period, and therefore reflected in future cashflows.

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[142] Sapere, *Efficient allocation and compensation for inflation risk, Report prepared for the Australian Energy Regulator*, 25 September 2017, p. 8 (paragraph 46).

[143] More technically, the CPI-X pricing adjustment multiplies each of the component building blocks by (1+actual inflation) / (1+expected inflation). Note that this multiplier will be applied to both the return on capital and return of capital building blocks, so the negative inflation adjustment in the return of capital building block will still exactly offset the positive inflation included in the return on capital building block.

The total ex post inflation compensation will therefore be 1 per cent, equal to the actual inflation outcome. The offsetting inflation adjustments in the return on capital and return of capital building blocks are equal. The inflation deduction in the return of capital building block prevents double compensation (once through cashflows in the return on capital building block, once through the change in asset values in the asset base).

These ex ante and ex post inflation outcomes can also be interpreted as inflation compensation added to the initial real rate of return. If, for example, the initial nominal rate of return was 7 per cent, the initial real rate of return is therefore 5 per cent (7 per cent minus 2 per cent).[144] Ex ante we expected nominal outcomes of 7 per cent, but the ex post nominal outcome would be 6 per cent (5 per cent initial real rate of return plus 1 per cent inflation compensation). Although total nominal revenue decreases, the initial real rate of return is preserved.

6.2.2 Deviations from initial real rate of return

Delivery of the intended real rate of return target is not exact. There are a number of causes, but the general outcome is that these deviations are minor and symmetrical. These deviations arise because of practical limitations on when inflation outcomes are known.

We discuss the primary effects below.

First year pricing effect

Our standard approach for annual pricing adjustments is as follows:

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

The use of expected inflation in the first year, instead of (lagged) actual inflation, will result in an inflation deviation from the intended real rate of return.[145] This effect was noted in our discussion paper,[146] demonstrated in several models presented at the technical workshop,[147] and identified in the Sapere report:[148]

> The effect of keeping the first year SMAR at the value set at time 0 is to lock into the outcome for the first year the expected inflation rather than actual

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144 This is a simplified example for illustrative purposes; the precise calculation would use the Fisher equation.

145 The effect of using lagged inflation, instead of unlagged inflation, is discussed in the next section.

146 AER, *Regulatory treatment of inflation, Discussion paper*, April 2017, p. 39.

147 See the models and presentations from the AER, CCP and ECA available at https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/review-of-expected-inflation-2017/initiation.

148 Sapere, *Efficient allocation and compensation for inflation risk, Report prepared for the Australian Energy Regulator*, 25 September 2017, p. 12 (paragraph 77).

inflation. This means that for most NSPs, there is a difference between the expected real revenue and the actual real revenue. If expected inflation for the first year is greater (less) than actual inflation, the NSP receives a higher (lower) return than expected. This effect persists through the regulatory period because each year's revenue is a function of the previous year and so ultimately all are a function of the first year.

This first year pricing effect appears well understood, and has been present in the regulatory framework for more than fifteen years. We do not consider that the first year pricing effect requires any changes to the regulatory framework because it is:

- relatively small
- symmetrical, which means the net effect will reduce across multiple regulatory periods (provided the estimate of expected inflation is unbiased)
- acting to offset errors in the real rate of return (though always of smaller magnitude)
- brings with it some implementation characteristics.

We explain each of these in turn.

The Sapere report quantifies the first year pricing effect on revenue received:[149]

$$(Revenue\ received) = \left(\frac{1 + expected\ inflation}{1 + actual\ inflation}\right) x(target\ revenue)$$

Hence, where expected inflation is greater than actual inflation, the service provider over-recovers relative to the revenue allowance that would be consistent with the initial real rate of return. The equation shows that the first year pricing effect is relatively small, given observed inflation outcomes post the adoption of the RBA's inflation target band. It is also symmetrical, which means that it acts to reduce revenue in the same manner (and to the same magnitude) that it increases revenue.

This deviation only applies to revenue received within the regulatory period. Actual inflation will be used throughout the RFM and so the deviation will not apply to revenue received in later periods. In net present value terms, revenue received in the regulatory period will comprise approximately 15 per cent of total revenue received.[150] This means 85 per cent of overall revenue will not be affected by actual inflation deviating from expected inflation in the first year of a period.

The first year pricing effect will reoccur across subsequent regulatory periods. If our estimate of expected inflation is an unbiased estimate of actual inflation outcomes,

[149] We have rearranged the error formula presented by Sapere—their 'allowed revenue' for year 1 would be the left hand side of this equation . See Sapere, *Efficient allocation and compensation for inflation risk, Report prepared for the Australian Energy Regulator*, 25 September 2017, p. 12 (paragraph 78).

[150] This is an indicative calculation for assets in use within the period (not future capex). It is sensitive to changes in WACC, remaining asset life and the size of opex (relative to other building blocks).

there will be equal probability of revenue increases or revenue decreases. So the net effect across multiple periods will be even smaller.

There is an important offsetting interaction between the first year pricing effect and the effect of inflation on the real rate of return:

- If the AER's estimate of expected inflation is above the 'true' estimate of expected inflation embedded in the nominal rate of return, the real rate of return targeted by the regulatory framework will be too low. As a result revenues for the service provider will be too low.
- If the AER's estimate of expected inflation is above the actual inflation outcome, then first year revenue will be too high (it will be escalated by expected inflation, which is higher than actual inflation) and revenues for the service provider will be too high.

So, to the extent that actual inflation outcomes are likely to be correlated with the 'true' estimate of expected inflation, these two effects will move in opposite directions. However, the predominant effect will always be the effect of inflation on the real rate of return.[151]

There are also implementation advantages to the standard annual pricing approach. We release our final decision just before the commencement of the regulatory period, and the standard approach means nominal revenue from that decision can be directly applied to calculate price impacts for customers.

None of the submissions we received proposed to remove the first year pricing effect.

The APA VTS pricing adjustment

The standard approach is applied to most, but not all, service providers. The key exception is APA VTS, which has the following modification:

- first year revenue is set in nominal terms, which means expected 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

[151] This is true for any regulatory period longer than two years. In a two year regulatory period, the two effects will be approximately equal.

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. Two years of true-up calculations are required, so there is additional uncertainty for consumers over the price path and potentially more short-term volatility. There is also no offsetting effect with the determination of the real rate of return, which might be one reason why this approach is not more widely adopted.[152] Nonetheless, the APA VTS annual pricing approach appears to allow closer targeting the initial real rate of return, albeit with some implementation trade-offs.

Inflation lags

In several places the regulatory framework uses actual inflation lagged by one year instead of (unlagged) actual inflation. There are two prominent examples:[153]

- In the CPI–X annual pricing process, where lagged actual inflation is used by almost all service providers in years 2 to 5 of a regulatory period.
- In the RFM, where lagged actual inflation is used by most service providers to convert new capex from nominal terms to real terms and vice versa; and to convert real straight-line depreciation to nominal terms.

This occurs primarily for practical reasons, because the relevant actual inflation outcome is not known in time.[154]

We consider that there is no material inflation impact from these lags.[155] Generally, where a one-year lagged series is used the upper bound for the revenue impact is the time value of a one year delay. However, any effect is substantially reduced because of offsetting movements in subsequent years, and the inflation impact of these lags diminishes as a longer time period is considered.

Use of a ten year geometric mean

Our inflation approach (the 'RBA method') begins with ten yearly estimates for expected inflation:

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[152] There would also be a specific changeover issue regarding the one-year gap when switching from a lagged actual series to an unlagged actual inflation series. The inflation outcome in this year would determine which of the service provider or consumers received a windfall gain, and which a windfall loss.

[153] Note that even 'unlagged' inflation is lagged to allow for measurement delay; this is six months for most service providers. This implementation delay is excluded when describing 'one year lagged' actual inflation; the actual delay is eighteen months for most service providers.

[154] Our 2016 decision on amendments to the distribution RFM included considerable analysis on the impact of lags in the RFM. See AER, *Final decision, Amendment, Electricity distribution network service providers, Roll forward model (version 2)*, 15 December 2016.

[155] The Sapere report also concludes that the lags have little inflation impact; but largely relies on analysis conducted by the AER in the 2016 RFM review (see previous footnote). Sapere, *Efficient allocation and compensation for inflation risk, Report prepared for the Australian Energy Regulator*, 25 September 2017, pp. 23–24.

- For years one and two, we use the RBA's published short term inflation forecasts (these only extend out two years)
- For years three to ten, we use the mid-point of the RBA's published target inflation band (2 to 3 per cent), which is 2.5 per cent.

There will be variation in the yearly figures whenever the short term forecasts vary from 2.5 per cent. To combine these into one (constant) estimate of expected inflation with ten year horizon, we average the ten figures. More precisely, we use a ten year geometric average (not the arithmetic average), which is the correct average form where the underlying figures represent cumulative rates of change.[156]

Initial submission

A submission to our initial issues paper stated that using a ten year geometric average, as above, would result in under or over compensation whenever (true) expected inflation varied from the 2.5 per cent mid-point during the 10 year estimation period.[157] This under or over compensation would arise even if actual inflation was exactly equal to expected inflation in each year of the period. This submission included a numerical example that showed under-compensation in such a scenario. The proposed solution was to use individual yearly forecasts of inflation rather than averaging across the ten years.[158]

Preliminary position

In our preliminary position, we considered that it was necessary to use the ten year geometric average when estimating expected inflation because it aligned with our approach to estimating the nominal rate of return. That is, under our approach:

- the initial nominal rate of return is estimated in constant terms over a ten year horizon
- the expected inflation rate is estimated in constant terms over a ten year horizon.

Breaking this alignment—for instance, by using different estimates of expected inflation each year—would result in under or over compensation. We included a counter-example demonstrating the delivery of the correct rate of return (no under or over compensation) even though inflation varied from the 2.5 per cent mid-point in years one and two.

Recent submissions

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156 For the set of values $x_1, x_2, \dots, x_n$ the arithmetic average is defined as $\frac{(x_1+x_2+\cdots+x_n)}{n}$, and the geometric average is defined as $\sqrt[n]{(x_1 x_2 \dots x_n)}$. Where the set of values reflect percentage changes (as is the case here), we rebase to $y_n = (1 + x_n)$ and use the formula $\sqrt[n]{(y_1 y_2 \dots y_n)} - 1$

157 In this context, 'true' expected inflation refers to the expected inflation embedded in the nominal rate of return. In practice this is unobservable and so must be estimated; the worked examples directly define this value.

158 The reasoning in the initial submission (and later submissions) does not turn on the distinction between geometric and arithmetic averages (though there would be a slight difference in numerical outcomes), but would apply regardless of the averaging approach applied.

We received two submissions on this issue, one from the ENA and the other a joint submission from SAPN, CitiPower, Powercor and AGN (the joint submission). They submitted:[159]

- the AER's counter-example was constructed using a constant *ex ante* real rate of return, and the reported outcome (no under or over recover) was contingent on this construction (so would not hold if the expected real rate of return varied across the ten year estimation period)
- the AER made an unsupported assumption that the *ex ante* real rate of return (calculated as the initial nominal rate of return less expected inflation) would be delivered by the regulatory system (that is, the combined PTRM, RFM and annual pricing process)
- the initial example therefore remained unanswered.

AER response

Consistent with the preliminary position, we consider that the use of the 10 year geometric average is appropriate because it aligns the estimation basis for our estimate of expected inflation with the estimation basis for the initial nominal rate of return. Both are expressed in constant annual terms over a ten year horizon.

In arriving at this final position, we have explicitly considered scenarios where the *ex ante* real rate of return is either constant or varying across the ten year estimation period. We also consider examples where expected inflation is either constant or varying across the ten year estimation period. This set of examples shows that our standard inflation approach (using a 10 year geometric average) causes no inflation-related distortion in return outcomes.

The recent submissions appear to accept that if the underlying *ex ante* real rate of return is constant there is no inflation-averaging related distortion in return outcomes. Hence, the residual claim in the recent submissions is more limited than the initial submission.[160] The claim is that using a ten year geometric average results in under or over compensation whenever:

- expected inflation varied from the 2.5 per cent mid-point during the 10 year estimation period, and
- the real rate of return varies during the 10 year estimation period.

In engaging with the recent submissions, we make no assessment of whether the *ex ante* real rate of return is more likely to be constant or varying over a ten year

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[159] The two submissions align in content. ENA, *Response to AER's preliminary position paper on regulatory treatment of inflation*, 7 November 2017,pp. 15–16; and SAPN, CitiPower, Powercor and Australian Gas Networks, *Submission re: AER review of expected inflation*, 7 November 2017, p. 3.

[160] The example in our preliminary position paper was sufficient to demonstrate that the more general claim in the original submission was incorrect. The original claim was that variation in expected inflation would cause under or over recovery, without limiting this to scenarios where the rate of return was also varying.

investment horizon. Nonetheless, we construct four scenarios to demonstrate that using the ten year geometric average is appropriate, even when the *ex ante* real rate of return varies across the ten year estimation period. These four scenarios account for the interaction between the underlying real rate of return (constant or varying) and expected inflation (constant or varying) as set out in Table 7.

Table 7 Scenarios considered in the worked examples

	Inflation constant	Inflation varies
Real return constant	Scenario A	Scenario B
Real return varies	Scenario C	Scenario D

Source: AER analysis

Scenario D (where both inflation and real return vary) is that originally submitted by SAPN et al. Scenario B is the counter example in the preliminary position paper (where inflation varies but the *ex ante* real return is constant). We add scenario A and C in this final position paper to further demonstrate why we consider that our inflation averaging approach is not responsible for any under or over compensation.

We describe the construction of the worked examples in detail in appendix D.

Table 8 summarises the outcome of the four worked examples. We report the change in nominal return outcomes relative to the intended target each year (which is the *ex ante* real return plus *ex post* actual inflation).[161] These effects are symmetrical. The effects below arise where the real rate of return in years one and two is above the real rate of return in later years. If this was reversed then the negative figures in the table below would become positive.[162]

Table 8 Difference between 'true' return target and delivered return under each scenario, using the 10 year geometric average

	Inflation constant	Inflation varies
Real return constant	0.0%	0.0%
Real return varies	–0.52%	–0.52%

Source: AER analysis.

Table 8 shows that:

- Scenario A–if the *ex ante* real rate of return is constant, and expected inflation is constant, there is no under-recovery. This is the (trivial) base case.

[161] These are also the change in real return outcomes relative to the initial real target.

[162] That is, the real rate of return in years one and two was below the real rate of return in years three to ten.

- Scenario B—if the *ex ante* real rate of return is constant, and expected inflation varies, there is no under-recovery. This is the (uncontested) example included in our preliminary position paper.
- Scenario C—if the *ex ante* real rate of return varies, and expected inflation is constant, there is under recovery. This scenario was not presented previously.
- Scenario D—if the *ex ante* real rate of return varies, and expected inflation varies, there is under recovery. This is the scenario included in the initial submission.

Importantly, the under recovery in scenario C equals the under recovery in scenario D. The 10 year geometric average is used in both scenarios. However, it cannot be the cause of under recovery in scenario C as there is no mis-estimation of inflation in any year. That is, expected inflation is constant at 2.50 per cent in every year, and the geometric average is also exactly 2.50 per cent (and applied every year). Hence, the under recovery cannot be attributed to our inflation approach.[163]

The comparison of scenario B with scenario D also helps explain that under (or over) recovery cannot be attributed to our inflation approach. In both cases, expected inflation over the regulatory period (years one to five) will differ from expected inflation over the geometric averaging period (years one to ten), because the latter includes expected inflation from years six to ten. However, the expected inflation in years six to ten will be included in both the initial nominal WACC (estimated with a ten year horizon) and the estimate of expected inflation (also estimated with a ten year horizon). The two will net off and there will be no distortion related to the inflation averaging approach. This is why Scenario B produces no under (or over) recovery.

Where these examples show under (or over) recovery (scenarios C and D), it arises from the decision to use a ten year term for the rate of return during a five year regulatory control period. This effect is independent of any inflation averaging effect. The choice of a 10 year term for the rate of return reflects our detailed consideration of all factors relevant to the investment horizon at the current Rate of return guideline:[164]

- the underlying life of the assets (for most networks, the weighted average asset life is between 25 to 30 years)
- the availability of financial market data (which is typically not available beyond 10 years)
- the term at issuance of debt for comparable companies (which was between seven and 10 years)
- the length of the regulatory period (which is typically five years, but may vary).

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[163] It also follows that the proposed solution (to use individual yearly estimates of expected inflation, rather than averaging) would make no difference to the result.

[164] AER, *Rate of return guideline, Better regulation*, December 2013, pp. 15, 21. AER, *Explanatory statement, Rate of return guideline, Better regulation*, December 2013, pp. 48–49, 73–75, 126, 135–152.

Hence, our decision to adopt a ten year investment term reflects our evaluation of the above factors. Having made that decision, a ten year geometric average is the appropriate inflation approach.

Tax interactions

The APA submission on the discussion paper noted that there may be inflation-driven differences in revenue (beyond the intended delivery of a real rate of return) related to our treatment of tax. This inflation effect arises because tax payments are modelled on unsmoothed building blocks, rather than smoothed, and tax will be assessed in strictly nominal terms.[165]

We agree that there is a possible second-order inflation interaction arising from this tax treatment, but consider that it is unlikely to be material.[166]

Other proposed deviations

Several submissions described 'errors' or 'inconsistencies' in the regulatory models that prevented the delivery of the targeted rate of return outcomes, but which we do not agree should be considered deviations.

In some cases, the root cause is a disagreement over the appropriate target for the regulatory framework. Stakeholders identified as 'errors' aspects of the regulatory framework that we consider are intended features, because these features act to deliver the initial real rate of return (and not, for example, the initial nominal rate of return).[167]

The Sapere report provides an accessible discussion of one such example, taken from a report by Frontier Economics for the ENA.[168] In this example, the initial nominal WACC was 6 per cent, and expected inflation was 2.5 per cent. If actual inflation was 1 per cent, Frontier calculated that the current regulatory framework would provide compensation of 4.5 per cent, a 1.5 per cent shortfall relative to the initial nominal target. We do not consider that this is an error; it is the intended operation of a framework that targets the initial real rate of return. Ex ante, the real WACC is 3.5 per

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165 APA, *Regulatory treatment of inflation, APA submission in response to AER consultation*, 29 June 2017, p. 2 (footnote 1).

166 The APA submission makes a broader point about whether the tax building block should be calculated on smoothed or unsmoothed revenue (rather than just the inflation effect arising from this tax treatment) but this is outside the scope of this review.

167 See, for example, Ausgrid, *Letter in response to the AER's regulatory treatment of inflation discussion paper*, 29 June 2017, pp. 3–4; APA, *Regulatory treatment of inflation, APA submission in response to AER consultation*, 29 June 2017, pp. 4–8; ActewAGL, *Letter re: Regulatory treatment of inflation*, 28 June 2017, pp. 3–4.

168 Sapere, *Efficient allocation and compensation for inflation risk, Report prepared for the Australian Energy Regulator*, 25 September 2017, pp. 9–10, 13; Frontier Economics, *Comment on the treatment of inflation in the AER's PTRM and the RFM*, 2016 (section 3.2.1).

cent (6 per cent minus 2.5 per cent), and obtained ex post real WACC is also 3.5 per cent (4.5 per cent minus 1 per cent).[169]

These issues are therefore subordinate to the discussion in section 6.3 below on the appropriate target outcome. We agree that, if the current target approach was to change, several of these calculations within the PTRM/RFM would need to change. However, we consider that targeting the initial real rate of return is the appropriate regulatory objective.

APA identified a 'mismatch' which it considered causes under or over compensation when actual inflation differs from expected inflation.[170] It appears that APA considered that this effect would prevent the delivery of the initial real rate of return.[171] The mismatch is located in the return of capital building block, where the negative indexation adjustment on the asset base in the PTRM uses expected inflation; but the equivalent calculation in the RFM uses actual inflation.

We consider that the APA '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. We discussed the APA 'mismatch' in detail in our recent decision for the APA VTS access arrangement proposal.[172]

6.3 Should the target be the initial real rate of return?

Our final position, consistent with our preliminary position, is that the appropriate target for the regulatory framework is the initial real rate of return.[173] This means that the revenue recovered by service providers will move in line with inflation. If actual inflation is above expected inflation, service providers will recover more than expected; and vice versa.

There are two alternative targets proposed by different stakeholders:

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169 This is a simplified example for illustrative purposes; the precise calculation would use the Fisher equation.

170 APA, *Regulatory treatment of inflation, APA submission in response to AER consultation*, 29 June 2017, pp. 4–8;.

171 APA also considers that the regulatory target should be the initial nominal WACC; the identified mechanism would also appear to prevent the delivery of this target; APA, *Regulatory treatment of inflation, APA submission in response to AER consultation*, 29 June 2017, p. 17.

172 AER, *Draft decision, APA VTS Australia, Gas access arrangement 2018 to 2022*, July 2017, Attachment 2—Capital base, pp. 2-19 to 2-31; AER, *Final decision, APA VTS Australia, Gas access arrangement 2018 to 2022*, July 2017, November 2017, pp. 14-17 to 14-21.

173 Where we describe the 'target' of the current approach, we mean that the combined regulatory framework (PTRM, RFM and annual pricing process) is designed so that the delivered (realised or *ex post*) real rate of return on capital will equal the initial (expected or *ex ante*) real rate of return on capital

- **The framework should target the initial nominal rate of return.** This means that revenue received by service providers does not change when actual inflation outcomes are above or below expected inflation. Proponents for this include Ausgrid and APA.
- **The framework should target the initial real return on equity, and the initial nominal return on debt.** Under this hybrid approach, the revenue relating to debt costs should not vary with inflation outcomes (and so conceptually align with fixed nominal debt issued by the benchmark entity). However, the residual revenue (after debt costs had been paid) would vary with inflation outcomes in order for equity holders to obtain the initial real return on equity. The primary proponent of this position is Spark Infrastructure.

This section discusses the arguments for and against each approach.

6.3.1 Targeting the initial real rate of return

Economic rationale

We set the allowed rate of return so that service providers can 'attract the necessary funds from capital markets for these investments and service the debt they incur in borrowing the funds'.[174] This is reflected in the 'efficient financing costs' language of the NER and NGR. The underlying objective for the service provider is to achieve a real return consistent with the opportunity cost of capital. Since the revenue recovered by the service provider will be in nominal dollars, they also expect to be compensated for inflation. Ex ante, the initial nominal rate of return reflects the joint assessment of expected real returns and inflation. However, receiving the inflation compensation is not an end to itself; it matters only because it determines whether or not the underlying initial real rate of return is received. The current regulatory framework therefore focuses on this outcome.

Equivalently, the focus on real outcomes can be explained in terms of the inflation treatment of the capital investment (asset base). Investors expect to maintain the real value of the asset base across multiple regulatory periods, which means compensation for actual inflation once it becomes known. This is particularly important with long lived assets such as those in the electricity and gas sectors. A framework that targets the initial real rate of return plus actual inflation outcomes will naturally incorporate the indexation of the asset base using actual inflation. This also aligns with the implementation of real straight-line depreciation, spreading the depreciation cost equally across customers over the life of the assets (inter-generational equity).[175]

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[174] AEMC, *Rule determination: Economic Regulation of Network Service Providers, and Price and Revenue Regulation of Gas Services*, 2012, page iii.

[175] Real straight-line depreciation means that we calculate the decrease in the value of the opening asset base by assuming an equal decline in real terms each year until the asset expires (so real asset value divided by remaining life). This real amount is then adjusted for inflation and labelled nominal straight line depreciation.

The Sapere report agrees with this approach:[176]

> As specific, long-life, assets are a significant fraction of total costs of NSPs, the long-term credibility of the regulatory rules are important in convincing investors they will be fairly compensated for the efficient costs they incur in the provision of services. Future decisions are influenced by past outcomes. The long-term interest of consumers requires both an *ex ante* expectation of real returns, and that these returns are able to be achieved *ex post*.

With this background, the current approach for the regulatory treatment of inflation can be described as achieving a real policy outcome (delivery of the initial real rate of return, adjusted for ex post inflation outcomes) but within a nominal framework.[177] The same real policy objective could be obtained without specifying that we start with a nominal rate of return, but the advantage of the current approach is that there is explicit consideration of inflation effects. Any real calculation will require conversion to/from nominal terms, and it aids regulatory transparency and consistency to publicly address these matters.

Consistent with past regulatory treatment

The current treatment of inflation in the regulatory models has long standing regulatory precedent. It has been applied in all AER decisions across gas and electricity sectors. It was also used in relevant ACCC energy sector decisions prior to the creation of the AER. We can trace the framework back to the ACCC's 1999 *Draft Statement of Principles for the Regulation of Transmission Revenues* (DRP). The DRP stated:[178]

> The key elements of the Commission's framework are:
>
> - a revenue cap based on forecasts of the cost of service;
> - CPI–X adjustment of the revenue cap and inflation adjustment of the regulatory asset base on an annual basis. This feature is designed to minimise any inflation risk to the business;
> - the return on assets determined on a post-tax nominal basis with estimated tax relevant to the regulatory period treated explicitly as a component of the cost of service;…

In combination, these components will deliver a real outcome (the initial real rate of return) but with explicit regard to inflation effects—that is, expressed in nominal terms.

These elements were preserved when we moved from the National Electricity Code to the NER, and the rules were explicitly drafted to codify existing practice in these areas.

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176 Sapere, *Efficient allocation and compensation for inflation risk, Report prepared for the Australian Energy Regulator*, 25 September 2017, p. 3 (paragraph 21).

177 Further, indexation on the asset base is related to another policy objective, which is the delivery of real straight line depreciation.

178 ACCC, *Draft Statement of Principles for the Regulation of Transmission Revenues*, May 1999, p. 16.

For instance, the AEMC stated in its 2006 decision on the 6A transmission revenue and pricing rules:[179]

> The Rule Proposal has been substantially based on the current approach to transmission regulation set out in the Statement of Regulatory Principles (SRP). The Commission recognises the considerable work and consultation undertaken by the ACCC in developing the SRP and the widespread support in submissions for continuing that general approach to regulation.
>
> …
>
> As part of the roll-forward of the RAB, the Draft Rule requires the AER to adjust the RAB to reflect outturn inflation. However, under the post-tax nominal framework, TNSPs are compensated for inflation via a nominal return on capital. In order to ensure that the TNSPs are not over-compensated for inflation, the impact of the indexation of the RAB needs to be removed in calculating the building block revenue requirement. This is allowed for in the Rule Proposal and reflects current AER practice. The Commission notes that currently the AER combines depreciation and indexation of the RAB into what it terms 'economic depreciation'.

The 1999 DRP described the advantages of this approach as follows:[180]

> The primary advantages of this framework are that:
>
> - it incorporates the best features of the real and the nominal approaches i.e. the minimisation of inflation risk of a real framework with the direct application of nominal rate of return benchmarks;
> - the nominal post-tax framework eliminates the need to consider the conversion problem (i.e. from a nominal post-tax rate of return to a real pre-tax rate of return);
> - it provides for a rate of return, post-tax nominal, that is more familiar to financial markets, and is therefore comparable with other everyday financial benchmarks;…

We consider that the reference to 'the minimisation of inflation risk' refers to two (related) effects:

- the revenue recovered by the service provider will move in line with inflation, so the inflation risk that is minimised will be the risk that there is an inflation-driven difference between revenue and costs
- the return to investors (in aggregate) will move in line with inflation, so that the inflation risk that is minimised will be the risk that there is an inflation-driven departure from their required real rate of return.

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[179] AEMC, *Review of the electricity transmission revenue and pricing rules, Transmission revenue: Rule proposal report, Draft national electricity amendment (Economic regulation of transmission services) Rule 2006*, February 2006. pp. 11, 58–59.

[180] ACCC, *Draft Statement of Principles for the Regulation of Transmission Revenues*, May 1999, p. 16.

Since the service provider recovers revenue from consumers, this statement also implies that consumers are assigned the inflation risk. Consumers have certainty around the real cost of energy, but not the nominal cost.

Consistent with our rate of return approach

We consider that targeting the initial real rate of return is consistent with fulfilling the allowed rate of return objective and the provision of an opportunity for service providers to recover their efficient financing costs. Our inflation treatment is part of a package that provides appropriate compensation overall.

This consideration begins with estimating the initial nominal rate of return and expected inflation in consistent terms—constant annual figures over a ten year horizon. The data that informs our estimate of the nominal rate of return relates to service providers' returns observed over past years where the current inflation treatment was applied. Hence, there are strong conceptual grounds to consider that the effects of inflation on revenues are already included in the observed data. These effects would include the inflation deviations (first year pricing effects, lags) discussed in section 6.3.1 above, and the debt effects discussed in section 6.3.3 below.

In particular, our equity beta estimates are informed by ASX data for listed regulated service providers over a period where the current inflation treatment (targeting the initial real rate of return) applied. The Sapere report describes the alignment of our rate of return approach in these terms:[181]

> **Comparator firms for equity beta and inflation risk**
>
> In estimating the allowed return, the AER estimates a cost of equity to reflect the riskiness of the *benchmark efficient entity* relative to the market. If the comparator firms from which the asset beta is calculated are also exposed to a similar form of inflation risk, the equity beta estimate may include the extent to which inflation risk is more or less costly for the benchmark efficient entity relative to the market. The implication would be that equity holders in entities regulated by the AER are compensated for the effects of inflation risk inherent in the method used by the AER.

The Sapere report reviews the regulatory framework applying to comparator firms over the time period for estimation of equity beta.[182] It finds that this data will reflect the current inflation treatment.

The current approach targets the overall rate of return—the aggregate return across both debt and equity investors—rather than the return to equity holders directly. The equity holders will receive the benefit or the detriment of many financing decisions,

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[181] Sapere, *Efficient allocation and compensation for inflation risk, Report prepared for the Australian Energy Regulator*, 25 September 2017, p. 27 (paragraph 148).

[182] Sapere, *Efficient allocation and compensation for inflation risk, Report prepared for the Australian Energy Regulator*, 25 September 2017, pp. 27–31.

including what gearing level to target; whether to issue fixed or floating debt; whether to issue debt in Australia or overseas; and so on. The ability to outperform (or underperform) the benchmark is an important feature of our incentive-based regime. This extends to the inflation implications of financing decisions which may also result in over or under recovery relative to the benchmark. Below in section 6.3.3 we discuss debt effects on equity holder returns in more detail.[183]

Avoiding risk due to a methodology change

Given the long regulatory precedent for the current approach, and the alignment between available rate of return data and the current approach, any change to an alternative target involves risk. There are practical problems in any such change, including the risk of windfall gains (losses) for service providers—and therefore windfall losses (gains) for consumers.

It is not clear how we would alter our method for estimating the rate of return if we were to change to target an initial nominal return or a real return on equity. Some of the currently available data would not be directly relevant (since it embodies the current inflation treatment). We would need to set the nominal rate of return without this data or make a judgement on the appropriate conceptual adjustment that would align the data with the chosen approach. This situation would continue for an extended period of time, until sufficient time had elapsed under the new approach (perhaps five years or more).

We asked for submissions on this issue in our discussion paper, and it was also discussed at our August 2017 technical workshop.[184] Some stakeholders also responded to our statement on this issue in the preliminary position paper. There were a range of responses:[185]

- Several service providers who advocated a change to the current approach considered that, if our approach did change, there would be no other consequential changes to the determination of the rate of return.[186]
- Several consumer representatives considered that, if our approach did change, there would need to be consequential changes to the determination of the rate of return.[187]

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[183] This includes consideration of submissions from Spark, the ENA and SAPN/CitiPower/Powercor/AGN on the impact of the 2013 changes to the cost of debt on equity beta estimation.

[184] AER, *Regulatory treatment of inflation, Discussion paper*, April 2017, pp. 42–43. The discussion at our technical workshop reflected diverse views on the potential for consequential changes to other parts, in line with the range of written submissions

[185] Several stakeholders did not address the matter, including several who advocated for maintaining the current approach (targeting the real rate of return) and so the issue of consequential changes to the rate of return did not strictly arise.

[186] See for example, APA, *Regulatory treatment of inflation, APA submission in response to AER consultation*, 29 June 2017, p. 18; Spark, *Letter re: Submission to the AER's discussion paper on the regulatory treatment of inflation*, 29 June 2017, pp. 3, 13; SA Power Networks, CitiPower, Powercor and Australian Gas Networks, *Letter re: Review of the regulatory treatment of inflation*, 29 June 2017, p. 12.

The June 2017 CCP submission included this summary statement on the need for a high bar to be set on any change from our existing approach:[188]

> While some flexibility is important for exceptional circumstances, good regulatory practice is built on consistency and predictability. Both investors and consumers place a high value on these system attributes. Given this, the CCP comes with a philosophical starting point that there must be a very good reason for change – the "bar" for change should be set relatively high to ensure that any change is enduring and unambiguously in the long-term interests of consumers.

We consider that a departure from targeting the real rate of return would be a fundamental change to the regulatory framework. Accordingly, if we were to implement such a change in approach, there would need to be extensive consideration of interrelationships with other regulatory elements and significant stakeholder consultation.

6.3.2 Targeting the initial nominal rate of return

This section begins with a high-level description of what it means to target the initial nominal rate of return.[189]

Next, we address the two distinct reasons advanced for targeting the nominal rate of return:

- an argument based on the NER and NGR references to a 'nominal vanilla WACC'.[190] This reasoning is included in APA's most recent submission,[191] and was also the basis of an earlier Ausgrid submission.[192]
- an argument that it is preferable to 'sterilise' revenue outcomes from any difference between expected and actual inflation, and this would align with the headline return

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187 See, for example, CCP, *Response to AER discussion paper, Regulatory treatment of inflation*, 29 June 2017, pp. 27–30; CCP, *Submission to the AER, Response to AER discussion paper 'Regulatory Treatment of Inflation - Preliminary Position' October 2017*, 6 November 2017, pp, 28–29; ECA, *Regulatory treatment of inflation, Response to AER discussion paper*, June 2017, pp. 39–40; ECA, *Regulatory treatment of inflation, Response to AER preliminary position paper*, November 2017, p. 8; MEU, *Letter re: Regulatory treatment of inflation discussion paper*, 29 June 2017, p. 2. Note that the MEU proposal to 'true up' for actual inflation instead of expected inflation would appear to target the nominal rate of return.

188 CCP, *Response to AER discussion paper, Regulatory treatment of inflation*, 29 June 2017, p. 4.

189 This 'purchasing power' description of targeting an initial nominal rate of return is based on material in our recent final decision for APA VTS.

190 NER, cl. 6.5.3(d)(2) and NGR, r. 87(4)(b).

191 APA, *Submission in response to AER preliminary position paper, Regulatory treatment of inflation*, 7 November 2017, p. 2.

192 Ausgrid, *Letter in response to the AER's regulatory treatment of inflation discussion paper*, 29 June 2017, pp. 3–4.

on capital expected by investors.[193] There is some material in the most recent APA submission on this point, as well as in the earlier Ausgrid submission.[194]

Outline of a nominal rate of return approach

In section 2.1, we provided a 'purchasing power' explanation of what it means to target the initial *real* rate of return. Building on that description, we can describe an approach that targets the *nominal* rate of return on capital as follows:[195]

- **Step one** – would be similar to the current approach. We set target revenue for each year of the five year regulatory period. The target revenue anticipates expected inflation over the five year period so the target is sufficient to meet expected changes in purchasing power.
- **Step two** – as we progress through the five year regulatory period we apply the revenue allowance set at the beginning of the period, without any adjustment for actual inflation. The actual revenue recovered from customers over the five year period will equal the initial target revenue, regardless of inflation outcomes. However, where actual inflation differs from expected inflation the revenue recovered will not have the same purchasing power as initially targeted. The nominal rate of return is constant, but not the real rate of return achieved.

This would no longer be described as 'CPI minus X incentive regulation', since CPI plays no role in updating revenues within the period.[196] Under this approach, the service providers' purchasing power will vary inversely with inflation outcomes:

- If actual inflation is below expected inflation, the revenue recovered from customers will have greater purchasing power than initially expected. The service provider will have more than it needs to undertake a program of works to operate and maintain the network. Returns to investors will be more than needed—that is, the real rate of return on capital will be higher than the initial estimate.
- Conversely, if actual inflation is above expected inflation, the revenue recovered from customers will have less purchasing power than initially expected. The service provider will have less than it needs to undertake a program of works to operate and maintain the network. Returns to investors will be less than needed—that is, the real rate of return on capital will be lower than the initial estimate.

From the customer perspective, the bills they receive will vary in purchasing power terms, in the opposite direction to that for service providers:

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193 APA, *Submission in response to AER preliminary position paper, Regulatory treatment of inflation*, 7 November 2017, p. 2.

194 Ausgrid, *Letter in response to the AER's regulatory treatment of inflation discussion paper*, 29 June 2017, pp. 3–4.

195 We describe the simplest method for implementing a nominal rate of return target. More complicated approaches are possible—for example, where different adjustments are made within an access arrangement period and between access arrangement periods.

196 There would still be an 'X' mechanism, so smoothed revenue could vary across the five year regulatory period. The X factor would incorporate both expected inflation and any expected real changes in revenue.

- If actual inflation is below expected inflation, the bills received by customers will take more purchasing power than initially expected. Paying these bills will mean foregoing other purchases, even though the nominal dollar value on the bills is unchanged.
- Conversely, if actual inflation is above expected inflation, the bills received by customers will take less purchasing power than initially expected. Paying these bills will mean foregoing fewer other purchases, even though the nominal dollar value on the bills is unchanged.

Customers have certainty over the amount of their bills across the regulatory period (in nominal terms) but not the value of those bills (the purchasing power).

Legal basis for targeting the initial nominal rate of return

We have reviewed the legal basis for our current approach in response to the submission that the NER and NGR require us to target the initial nominal rate of return.[197] As in the preliminary position, we consider that our current approach (targeting the initial real rate of return) is consistent with the NER and NGR. Further, it appears that targeting a nominal rate of return as proposed by Ausgrid is not consistent with the NER.

We deal first with the NER requirements. Ausgrid referred to clause 6.5.2(d)(2) of the NER, which states that the rate of return must be 'determined on a nominal vanilla basis'. We set an initial nominal rate of return and then apply it to the asset base to calculate the return on capital building block.[198] Several other clauses go directly to the inflation treatment required in other elements of regulatory framework, which then determines the inflation compensation received by the service provider *ex post*.

Clause 6.5.1(e) of the NER states:

> (e) The roll forward model must set out the method for determining the roll forward of the regulatory asset base for distribution systems:
>
> …
>
> under which
>
> (3) the roll forward of the regulatory asset base from the immediately preceding regulatory control period to the beginning of the first regulatory year of a subsequent regulatory control period entails the value of the first mentioned regulatory asset base being adjusted for actual inflation, consistently with the method used for the indexation of the control

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[197] This position was discussed at the Technical Workshop on 9 August 2017—the workshop summary is available at https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/review-of-expected-inflation-2017/initiation. See also Ausgrid, *Letter in response to the AER's regulatory treatment of inflation discussion paper*, 29 June 2017, pp. 3–4; APA, *Submission in response to AER preliminary position paper, Regulatory treatment of inflation*, 7 November 2017, p. 2.

[198] NER, cl. 6.5.2(d)(1).

> mechanism (or control mechanisms) for standard control services during the preceding regulatory control period.

This clause requires the use of actual inflation in the roll forward of the asset base. This use of actual inflation is then linked to the control mechanism, which will be of the 'CPI–X' form where we substitute (lagged) actual inflation outcomes in place of expected inflation.

Combined, the NER sets out:

- the starting form for estimating the initial nominal rate of return
- how we apply that rate to calculate the return on capital building block
- the subsequent actual inflation adjustment in the asset base roll forward, consistent with the indexation of the control mechanisms.[199]

There are equivalent transmission clauses.[200] For these reasons, we consider that the NER does not require us to target the initial nominal rate of return outcome. Our approach of targeting the initial real rate of return is consistent with the NER.

Similarly, we consider that our approach of targeting the initial real rate of return is consistent with the NGR.[201] The starting point is the same as under the NER, with rule 87(4) of the NGR stating that the rate of return is to be determined on a nominal vanilla basis. We then use that nominal rate of return to calculate the return on capital building block, consistent with rules 76 and 87of the NGR.

Consistent with clause 6.5.2 of the NER, rule 87 of the NGR is focused on the *ex ante* determination of the rate of return. In expectation, the initial nominal rate of return and the initial real rate of return are equivalent (because conversion between the two uses the expected inflation rate). This does not mean, however, that the service provider must receive the initial nominal rate of return *ex post*. Rather, the recognised basis for dealing with inflation is to provide the initial real rate of return combined with *ex post* inflation outcomes.[202] This inflation treatment needs to be applied consistently to both within-period revenues and changes in asset values (which affect revenue in subsequent periods). As such, it will also include an inflation adjustment in the depreciation schedules under rule 89(1)(d) of the NGR, so as to ensure that the inflation compensation is received only once.

We also consider that one consistent approach should be adopted under both the NER and NGR. This preserves regulatory consistency—including consistency with past

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199 NER cll. 6.5.1(e), S6.2.3(c)(4) and 6.4.3(b)(1).

200 NER cll. 6A.5.4(b)(1)(ii), 6A.6.1(e)(3), 6A.6.2(d)(2), and S6A.2.4(c)(4).

201 These reasons are consistent with those in our recent final decisions for APA VTS and APTPPL RBP (part of the APA group); see AER, *Final decision, APA VTS Australia gas access arrangement, 2018 to 2022*, November 2017, pp. 14-12 to 14-14 and AER, *Final decision, Roma to Brisbane gas pipeline access arrangement*, 2017 to 2022, November 2017, pp. 4-13 to 14-15.

202 We consider this approach a 'recognised basis' because it has been used in gas and electricity sector decisions across Australia for more than fifteen years, as we discuss in section 6.3.2 above.

uniform treatment of gas and electricity service providers—and avoids any investment distortions arising from different treatment between the two sectors.

Economic rationale for targeting the initial nominal rate of return

Apart from the legal argument advanced above, APA's submission in response to the preliminary position paper stated that it was desirable for the regulatory framework to 'sterilise' revenues so that the initial revenue target is received by the service provider, regardless of actual inflation outcomes.[203] This appears to build on earlier submissions, where the core reason advanced by stakeholders for targeting the initial nominal rate of return was that investors expected to achieve the headline nominal rate of return, regardless of inflation outcomes.

We note that 'sterilising' revenue outcomes in this manner would preserve nominal returns; but it would result in variation in real returns whenever actual inflation differed from expected inflation. APA has not made the case that preserving nominal returns is more important than preserving the underlying real return (and therefore purchasing power). Further, we do not consider that these submissions correctly characterises the investor perspective. Investors are concerned with underlying real returns, and this is the basis for the determination of efficient financing costs.[204] We agree that investors must make an assessment of expected inflation, and hence nominal returns, because they will receive nominal cashflows in future years. However, the real return basis drives the opportunity cost of capital and is therefore the appropriate target for the regulatory framework. We expand on these reasons in section 6.3.1 above on the economic rationale for targeting the initial real rate of return.

In a recent submission, APA appeared to state that its preferred method for targeting the initial nominal rate of return would be to use forecast inflation (from the PTRM in the preceding regulatory decision) in each RFM.[205] APA had included this proposed implementation in an earlier regulatory proposal, and in response we modelled the likely impact of this approach.[206] Using a Monte Carlo approach, we simulated revenue outcomes under various inflation scenarios, where each scenario represented possible inflation outcomes drawn from a probability distribution based on observed real-world inflation. This modelling suggested that the APA implementation would increase the

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[203] APA, *Submission in response to AER preliminary position paper, Regulatory treatment of inflation*, 7 November 2017, p. 1.

[204] Sapere, *Efficient allocation and compensation for inflation risk, Report prepared for the Australian Energy Regulator*, 25 September 2017, pp. 2–5.

[205] In earlier regulatory proposals for VTS and RBP, APA had proposed a different method (lagged actual inflation updates in the PTRM, applied to selected asset base components within the PTRM) for targeting the initial nominal rate of return.

[206] See AER, *Draft decision, APA VTS Australia gas access arrangement, 2018 to 2022*, July 2017, pp. 2-27 to 2-32 (attachment 2–Capital base); see AER, *Final decision, APA VTS Australia gas access arrangement, 2018 to 2022*, November 2017, p. 14-25 (attachment 14–Inflation).

likelihood of over or under recovery, relative to the AER's current approach.[207] This supports our position that it is not appropriate to target the initial nominal rate of return.

6.3.3 Targeting the initial real return on equity

This section begins with a high-level description of what it means to target the real return on equity.

We then provide an overview of the reasons why we do not consider that we should change to this target. This reasoning is consistent with our preliminary position (and is a summary of the reasoning in that document).[208]

Next, we address the two submissions received post preliminary position that focussed on this issue:

- Spark Infrastructure submitted that the AER should change its regulatory framework to target the real return on equity. Spark Infrastructure stated that the errors and impact of forecasting inflation were not small and symmetrical. Further, the risk under the AER's current approach was not appropriately compensated through the overall rate of return.[209]
- The CCP submitted that the AER should not change its regulatory framework to target the real return on equity. The CCP considered that such a fundamental change in approach would require a 'high bar' for change, and that no such case had been made out. Further, the AER's current approach provides for an appropriate allocation of risk, noting that there was no evidence that risks under the current approach could not be managed.[210]

Outline of a real return on equity approach

In section 2.1, we provided a 'purchasing power' explanation of what it means to target the initial real return on capital (aggregate across debt and equity). We now describe an approach that targets the initial real return on equity (in conjunction with a nominal return on debt).

Describing an approach that targets the initial real return on *equity* requires us to distinguish between two groups of investors. One group owns the company (equity shareholders) and the other are debt investors (banks or bond holders) who have lent money to the business.

Those who lend money may contract for a set return that does not change with inflation—a fixed nominal return. In doing so, these lenders agree not to preserve the

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[207] These modelling results are set out in AER, *Draft decision, APA VTS Australia gas access arrangement, 2018 to 2022*, July 2017, pp. 2-27 to 2-32 (attachment 2–Capital base).

[208] For the avoidance of doubt, we adopt the preliminary position reasoning on this issue as part of this final position.

[209] Spark, *Submission to the AER's Preliminary position on the regulatory treatment of inflation*, 9 November 2017.

[210] CCP, *Submission to the AER, Response to AER discussion paper 'Regulatory Treatment of Inflation - Preliminary Position' October 2017*, 6 November 2017.

initial purchasing power of their investment. Depending on whether actual inflation is more or less than expected inflation, the purchasing power of their investment may be less or more than initially expected. Shareholders (equity investors) will receive the residual revenue after debt costs are paid. Targeting the real return on equity means that purchasing power for this sub-group of investors is preserved, after accounting for the payment of fixed nominal debt.

With this background, we can describe an approach that targets the real return on equity (and the nominal return on debt) as follows:[211]

- **Step one** – would be similar to the current approach. We set target revenue for each year of the five year regulatory period. The target revenue anticipates expected inflation over the five year period so the target is sufficient to meet expected changes in purchasing power.
- **Step two** – as we progress through the five year regulatory period we update the revenue allowance each year. However, the adjustment in annual revenues is not equal to actual inflation, but is part way between the initial expected inflation and actual inflation outcomes. Where actual inflation differs from expected inflation, the purchasing power of the network and of customers is not preserved. Neither is the purchasing power of investors (both groups) preserved. Rather, the annual revenues are adjusted for actual inflation only to the extent necessary to preserve the purchasing power of only the shareholders (who receive the initial real return on equity).

This outcome might be described as 'partial CPI minus X incentive regulation'. Inflation compensation lies between the two approaches described earlier (targeting either the initial real or nominal return on capital). From the customer perspective, there will be more variation in purchasing power than under an approach that targets the initial real return on capital. There will be less variation in purchasing power than under an approach that targets the initial nominal return on capital.

Our preliminary position on targeting the real rate of return on equity

We adopt our reasoning in the preliminary position on this issue and now summarise the key material from that paper.

The current approach targets the initial real rate of return, but this is not the same as targeting the initial real return on equity. Debt holders take precedence; so equity holders received the residual after interest payments to debt holders are made. If the service provider incurs debt costs in line with the initial real return on debt, then equity holders will receive the initial real return on equity. However, if debt costs incurred by the service provider do not equal the initial real return on debt, then equity holders will not receive the initial real return on equity.

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[211] We describe the simplest method for implementing a real return on equity target. More complicated approaches are possible—for example, where different adjustments are made within a regulatory period and between regulatory periods.

There are two inflation-related reasons why debt costs might differ from the regulated debt allowance, assuming the firm issues nominal debt:

1. If actual inflation differs from the regulatory estimate of expected inflation.
2. If the regulatory estimate of expected inflation does not align with the expected inflation embedded in the nominal rate of return (we might label this the 'true' expected inflation). This includes effects arising from changes in the 'true' expected inflation when there are annual updates to the trailing average portfolio debt.

We provided a worked example in the preliminary position, but do not repeat it here for brevity.[212] The key point is that, under an approach that targets the initial real rate of return, debt related inflation effects can cause equity holders to not receive the initial real return on equity.

Several submissions from service providers (prior to the preliminary position) characterised this as either an error or an unintended side effect of the decision to target the initial real rate of return.[213] These stakeholders submitted that the most important outcome was the delivery of the initial real return on equity, and so proposed that we change the inflation objective accordingly. If the benchmark firm issued nominal debt, this would entail a hybrid inflation target: targeting the real return on equity (on the equity portion of the asset base) combined with targeting the nominal return on debt (on the debt portion of the asset base).

We consider that this effect was not an error or side effect; rather, it was well understood prior to the adoption of the current approach more than fifteen years ago.[214] It reflects a deliberate policy decision on the appropriate level to assess returns for the benchmark entity—that is, at the service provider level (not the equity investor level). Targeting the overall rate of return means that financing decisions remain the concern of the service provider, who bears the benefit or detriment of all such decisions (on the appropriate gearing level, whether to issue fixed or floating debt, whether to issue domestically or overseas, and so on). It appropriately assigns any risk arising from these financing decisions to the service provider, rather than consumers. If debt is issued in nominal terms, it is not possible to target both the real return on capital and the real return on equity.

Although this financing risk is assigned to the service provider, and so inflation can alter returns to equity holders, this does not change the allocation of overall inflation risk. Consumers still bear this inflation risk, as the charges they pay move in line with inflation outcomes, and so insulate the business from changes in actual inflation. When inflation causes the real return to equity holders to drop below the initial target, the real

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[212] AER, *Preliminary position, Regulatory treatment of inflation*, October 2017, pp. 78–79.

[213] See, for example, Spark, *Letter re: Submission to the AER's discussion paper on the regulatory treatment of inflation*, 29 June 2017, pp. 1–6; ActewAGL, *Letter re: Regulatory treatment of inflation*, 28 June 2017, pp. 3–4; Ausgrid, *Letter in response to the AER's regulatory treatment of inflation discussion paper*, 29 June 2017, pp. 2–4.

[214] The 1999 DRP refers to the minimisation of inflation risk at the business level, not at the equity holder level.

return to debt holders rises above the initial target—this is a consequence of the decision to issue nominal debt.

We also consider that, given the long period over which the current approach has been applied, this effect will already be included in the historical share market data used when we estimate the rate of return. There are therefore grounds to conclude that the total compensation package we provide will be appropriate. In particular, our equity beta estimates are informed by ASX data for listed regulated service providers over this period. The symmetrical effect would have increased equity returns for some periods (for instance, when actual inflation exceeded expectations) and decreased equity returns in others (when actual inflation did not reach expectations). It is an open question whether this would have increased or decreased covariance with overall market return (that is, the observed equity beta). However, whichever direction it moved the equity beta (if at all), the effect is already priced into our allowed rate of return.

We now consider submissions received in response to our preliminary position paper that were focussed on the potential change to target the real return on equity. Most submissions did not comment directly on this issue; the two exceptions were Spark Infrastructure (proponents for this change) and the CCP (arguing against such a change).[215]

Assessing the risk faced by equity holders

The Spark Infrastructure submission defined 'forecast error risk' as 'equity holders bearing the risk of the AER's forecast of expected inflation being inaccurate. It submitted that 'inflation forecast error' risk was not small or symmetrical, that the impact of forecast error risk was not small or symmetrical, and that the AER had not sought to assess (or presented analysis on) either of these issues. Spark Infrastructure included new analysis, based on a graph from the Vahey report, which it considered suggested asymmetrical errors would arise under the RBA method. Spark Infrastructure proposed we adopt a real return on equity target to address this inflation forecast error risk.[216]

Our preliminary position paper did engage with 'forecast error risk', where we:

- identified potential causes
- assessed the merits of alternative methods for estimating expected inflation
- assessed the likely impact on equity holders, including precise algebraic derivations.

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[215] Some smaller sections from other submissions were relevant as well, including those from the ECA and ENA.

[216] Spark, *Submission to the AER's preliminary position on the regulatory treatment of inflation*, 9 November 2017 pp. 2–5.

Spark Infrastructure's discussion of 'forecast error risk' appears to confound two different causes of varying returns to equity holders, as identified in our preliminary position paper:

1. The AER's estimate of expected inflation may differ from the 'true' estimate of expected inflation embedded in the nominal rate of return.
2. Actual inflation may vary from the AER's estimate of expected inflation.

Spark Infrastructure's written definition would seem to relate only to the first cause,[217] but several arguments within the submission appear to be based on the second cause. We address both potential causes below.

The first cause goes to the key question underlying our 'Issue 1' analysis, where we evaluated alternative estimation methods. In our preliminary position we assessed their accuracy and potential bias—so the size and symmetry of errors under each method. This analysis is expanded in this final position, and includes a response to the new material in the most recent submission (on potential asymmetry in inflation outcomes, based on a graph from the first Vahey report). In appendix C we explain why this Spark Infrastructure's analysis does not suggest there is any asymmetry in errors under the RBA method adopted by the AER. Professor Vahey has also provided a response confirming our approach after reviewing the submission.[218]

The second cause goes to one of the key questions underlying our 'Issue 2' analysis, where we evaluated potential alternative inflation targets for the regulatory framework. In our preliminary position we described the pathway by which inflation outcomes could alter equity holder returns. We commissioned the Sapere report, which algebraically derived inflation exposure for equity holders under a number of different conditions. This included analysis of inflation effects under both causes specified above, and under both debt approaches (before and after the 2013 changes to the cost of debt).

Sapere's analysis indicates the impact of 'inflation error risk' will be symmetrical. The equations derived in the Sapere report are symmetrical, for both causes as listed above. Equity holder returns will increase or decrease in exactly the same manner, and to the same degree. Our method of estimating expected inflation has been chosen because it avoids systematic bias.[219] Actual inflation should be equally likely to be above or below the 'true' estimate of expected inflation.

Spark Infrastructure also submitted that if we did not change from our current approach, we should commit to maintaining the current approach even when inflation was unexpectedly high.[220]

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[217] As the AER estimates expected inflation; actual inflation outcomes do not mean that an estimate of expected inflation was inaccurate (or accurate).

[218] Shaun Vahey, *Response to the Spark Infrastructure submission on the AER's preliminary position*, 7 December 2017

[219] In its latest submission, Spark does not propose that an alternative 'issue 1' method should be adopted.

[220] Spark, *Submission to the AER's preliminary position on the regulatory treatment of inflation*, 9 November 2017 p. 3.

We note that application of a consistent inflation approach is a key reason underlying our final position (as it was in the preliminary position). We consider that the symmetrical operation of the regulatory framework will deliver appropriate regulatory allowance across different inflation conditions. This will include periods where inflation is above our estimate of expected inflation; but also periods where it is below that estimate.

The CCP submission dealt in practical terms with the assessment of risk for equity holders:[221]

> The key message from the comparison with regulatory practice in other countries is that the issue of the potential impacts on nominal returns and the return on equity from a mismatch between expected and actual inflation are not unique to the regulated businesses in Australia. It is common to other countries that have adopted the real WACC on real RAB model. However, as far as we are aware these risks have not been identified as the cause of substantial financial instability for regulated businesses or deterred investment. Indeed, the large multiples of market value to RAB (typically 1.25-1.5) observed across these countries suggests that risk-return package offered is attractive to investors.

Our confidence in the current regulatory approach is not based just on the experience in overseas jurisdictions (as noted by the CCP), but also on the successful application of this approach in Australia over more than fifteen years.

We have assessed the scope and impact of 'forecast inflation risk' and find that our analysis does not support a change in the rate of return target. We have engaged with all the material put to us by stakeholders (including Spark).[222] Consistent with our preliminary position paper, we consider that proponents for a fundamental change in the regulatory framework—and a change in the rate of return target is a fundamental change—bear the onus for undertaking sufficient analysis to advance their proposal. In its most recent submission, the CCP stated:

> As far as we are aware it appears only limited analysis in support of the proposed changes has been provided. The case for change in terms of demonstrating impacts on networks in practice of the current approach has not been made. The modelling provided has been, in several cases, highly simplified and rudimentary. While supporting the theoretical propositions acknowledged in the AER Position Paper and above (i.e. that while the real WACC is achieved the nominal WACC and real ROE may vary), the modelling

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[221] CCP, *Submission to the AER, Response to AER discussion paper 'Regulatory Treatment of Inflation - Preliminary Position' October 2017*, 6 November 2017, p. 26.

[222] One related point, put by the ECA at our October forum, was that there is an 'overcorrection' effect where inflation deviations above or below the target band are often immediately followed by a deviation in the other direction. Such an offsetting effect would reduce the impact of 'forecast error risk'. However, we have seen no empirical analysis to support this effect (the material put to us was observational in nature). ECA, *Regulatory treatment of inflation, Response to AER preliminary position paper*, November 2017, p. 6.

provided does not give an adequate basis for practical evaluation of the alternatives. Nor has the potential impact on the alternatives on the variability of real prices for customers been modelled and analysed.

The mechanisms/models for implementing the proposed alternatives have not been clearly set out in detail and tested. Hence, it is difficult to assess their practicality and whether there are potential administrative requirements or effects on stakeholders that have not yet been foreseen.

The overall compensation package and changes in debt practice

Spark Infrastructure submitted that there was no compensation for the current level of risk borne by service providers (arising from the 'forecast error risk' described above), because:[223]

- the risk is not systematic (and therefore not captured in the equity beta)
- the equity beta (and credit rating) used by the AER did not reflect this risk, because it is based on data from the period prior to the 2013 changes to the return on debt
- an NSP cannot mitigate this risk through inflation indexing debt; or if it did do so there would be additional costs incurred.

Spark Infrastructure also described this risk as 'the risk that compensation for efficient debt costs will differ to the method for estimating efficient debt costs'.[224]

In summary, we have reviewed the submission and it does not change our view from the preliminary position that the overall compensation package is appropriate. The 2013 changes to the return on debt were not contingent upon inflation changes and did not appear to materially change inflation exposure for equity holders. Since the 2013 debt changes improved outcomes for equity holders on non-inflation grounds, there appears to be no net under-recovery and evidence of such under recovery was not submitted as part of this inflation review process.

Risk is not systematic

Spark Infrastructure stated that inflation exposure is not a systematic risk.[225] Consistent with our preliminary position, we do not consider that it is necessary to take a firm position on whether the relevant inflation-related deviation in equity holder returns:

- would constitute systematic or non-systematic risk

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[223] Spark, *Submission to the AER's preliminary position on the regulatory treatment of inflation*, 9 November 2017 pp. 5–9.

[224] Spark, *Submission to the AER's preliminary position on the regulatory treatment of inflation*, 9 November 2017 p. 6.

[225] The ENA submission also asked for more information on the link between our inflation approach and equity beta (if any). ENA, Response to AER's preliminary position paper on regulatory treatment of inflation, November 2017, p. 11.

- would increase or decrease systematic risk (in the event that it did constitute systematic risk).

The important aspect is that, to the extent the current inflation approach causes equity holder returns to change, it will be reflected in the observed financial market data. When we use this data to set the equity beta it will be consistent with that inflation approach. The overall package of inflation compensation, including the rate of return, is consistently estimated. Submissions from consumer groups (the CCP and ECA) supported this position, and further noted the difficulty the AER would have if it did alter the target from the real rate of return, but the available financial data was not consistent with this inflation approach.[226] In the absence of data, it would be necessary for us to make a conceptual adjustment to the observed equity beta in order to provide the correct overall compensation; but this would be difficult to do.

There are two other notable aspects of Spark Infrastructure's submission:

- It appears to submit that diversifiable risk still requires compensation. Further, the submission implies that if our inflation approach was to reduce the equity beta (recognising reduced systematic risk) then there would still be a requirement for an offsetting regulatory allowance. We do not accept that these conclusions are correct.
- There is an underlying perspective that the regulator is responsible for 'forecast error risk', and that this means we can automatically rule out any link to systematic risk. However, cause two (in the previous section) can reflect differences between actual inflation outcomes and the 'true' market estimate of expected inflation. Expressed in these terms, if surprise inflation outcomes (high or low) are correlated with periods of particular market performance (good or bad) this inflation pathway might reflect systematic risk.

Impact of the 2013 debt changes

We do not consider that the 2013 debt changes caused a material change in inflation exposure for the service provider, as per Spark Infrastructure's submission.[227] When we released the 2013 *Rate of return guideline*, we changed our debt approach from using an 'on-the-day' measure to using the trailing average portfolio. Both were estimated using the nominal return on fixed debt with appropriate characteristics (10 year term, BBB+ credit rating). Instead of using a single estimation period just before the commencement of the regulatory period, we changed to use a ten estimation period spread over the previous ten years. There was no change to our inflation approach linked to this change.

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[226] CCP, *Submission to the AER, Response to AER discussion paper 'Regulatory Treatment of Inflation - Preliminary Position' October 2017*, 6 November 2017, pp. 28–29; and ECA, *Regulatory treatment of inflation, Response to AER preliminary position paper*, November 2017, p. 8.

[227] Similar issues were also raised in the ENA submission. ENA, Response to AER's preliminary position paper on regulatory treatment of inflation, November 2017, p. 11.

Spark Infrastructure stated that under the old approach, the nominal return for on-the-day debt issuance would align with on-the-day expected inflation. This is not possible under the trailing average approach, where the nominal return on historical debt will not align with on-the-day expected inflation. On this basis, Spark Infrastructure submitted that there is a material break between the two debt approaches. We accept that relative to the on-the-day approach, the 2013 debt changes may result in a different estimate for the initial nominal return on debt. However, regardless of how the nominal return on debt is set, the primary inflation effect will depend on the difference between our estimate of expected inflation and actual inflation outcomes. Neither of these figures is affected by the change from on-the-day debt estimation to a trailing debt portfolio.[228] This was made clear in the algebraic derivations of inflation exposure for equity holders included in the Sapere report.

The Sapere report included algebraic derivations of inflation exposure arising from the difference between 'true' expected inflation and the regulatory estimate of expected inflation. There were three such derivations. The second and third embedded inflation pathways on this list were absent prior to 2013, where the on-the-day approach applied. These two relate to when historical average cost of debt is calculated at the start of the regulatory period and the portfolio is annually updated within a regulatory period. However, the three pathways may not act in the same direction. The net effect of the three inflation pathways may be larger than the on-the-day effect in isolation; or they may act to net off against each other and so the overall effect will be smaller. It is not possible to say from this analysis whether the net effect on equity holders will be larger or smaller. If the estimate of expected inflation is unbiased, each effect will still be symmetrical, so equally likely to result in increased or decreased returns for equity holders.

All these potential inflation effects need to be placed in the context of the non-inflation aspects of the 2013 debt changes. In our preliminary position, we noted that using a trailing average debt portfolio meant that our initial estimate of the nominal return on debt would better align with the efficient financing costs of the benchmark service provider. Better alignment between the regulated debt allowance and incurred debt costs will make it more likely that equity holders receive the intended return on equity. This link was recognised by the AEMC when it made the legislative changes to allow the return on debt to be set using an annually updated trailing average portfolio.[229]

We moved to the trailing average debt portfolio because it better aligned the regulatory debt allowance with incurred debt costs, and so reduced both interest rate risk and refinancing risk.[230] Our expectation was (and remains) that these risks were larger in

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228 As noted above, when Spark Infrastructure refers to 'forecast error risk' in its submission, the underlying cause appears to be the risk that actual inflation will not equal expected inflation. This risk is unchanged by the 2013 move from on-the-day to trailing average portfolio debt approach.

229 Australian Energy Market Commission, *Final Position Paper, National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012, National Gas Amendment (Price and Revenue Regulation of Gas Services) Rule 2012*, 15 November 2012, p. 65.

230 AER, *Better regulation, Explanatory statement, Rate of return guideline*, December 2013, pp. 104–105.

magnitude than the inflation risk which in current circumstances is likely to be small and symmetric.[231] Submissions from most stakeholders (in the 2013 Better Regulation guideline development process) focused on the ability of a trailing average portfolio to ameliorate these risks, above any discussion of potential inflation risk.[232] Further, Spark Infrastructure did not appear to contest that the 2013 debt changes reduced risk exposure for equity holders in total. The Spark Infrastructure submission notes that 'stakeholders generally' accepted that the predominant effect would be the reduction in exposure for equity holders because the change to a trailing average portfolio aligned debt costs with those they incurred.[233].

Mitigation of inflation risk

Finally, we turn to strategies that might mitigate inflation risk, and the cost to implement them. Spark Infrastructure provided a summary of two hedging strategies (using interest rate swap contracts) that would remove inflation risk for equity holders. It stated that a business following either of these strategies would incur considerable costs to do so and that these costs were not included in the current regulatory allowance.

Hence, Spark Infrastructure concluded that we should alter the inflation approach (to target the real return on equity) so that these hedging strategies were not necessary.[234]

Spark Infrastructure submitted that, if we were to retain the current inflation approach (targeting the real return on capital), the overall compensation package provided by the AER was not correct, because it still included inflation risk for equity holders. It stated that if we define the regulatory allowance using fixed nominal debt costs, we should then define the inflation target using fixed nominal debt costs.[235]

We consider that a service provider would only implement either of the swap strategies presented by Spark Infrastructure if the benefits of doing so outweighed the costs. Both benefits and costs would be assessed relative to the baseline of issuing nominal debt and not hedging. The benefits would be the expected reduction in inflation-related variation in equity returns; the costs would be the costs of executing the various swap contracts. Different service providers may well arrive at different assessment of these factors, and some might choose to implement one of these strategies because they considered they would be better off.[236] In all cases, the equity holders will appropriately

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231 AER, *Better regulation, Explanatory statement, Draft rate of return guideline*, August 2013, p. 166.

232 Some stakeholders (primarily Jemena) advocated for the adoption of a 'hybrid' debt portfolio which combined a trailing average debt risk premium with an on-the-day risk free rate. While not explicitly about inflation risk, elements of these submissions are relevant to the discussion of inflation effects on the return to equity holders.

233 The Spark representative accepted this point at the October 2017 interactive workshop.

234 Spark, *Submission to the AER's preliminary position on the regulatory treatment of inflation*, 9 November 2017, pp. 8–9.

235 Spark, *Submission to the AER's preliminary position on the regulatory treatment of inflation*, 9 November 2017, p. 9.

236 'Better off' would be assessed using the risk-return preferences of the service provider. It might mean, for example, accepting both lower risk (less inflation exposure) and lower return (because of the swap costs).

bear the benefit or detriment of their financing decisions relative to that benchmark. Hence, the key question remains whether the service provider is appropriately compensated if it issues nominal debt and does not adopt these hedging strategies.

Consistent with the analysis presented in the previous two sections, we consider the overall compensation package is appropriate. This is achieved through the joint operation of our inflation approach (targeting the real return on capital) and our rate of return approach (including any effect of inflation risk on required return).

We consider there is no inconsistency in our current use of fixed nominal debt costs. We observe debt costs each year and use these to construct the trailing average portfolio return on debt. These debt costs reflect the issuance of fixed nominal debt. This is the aspect we were referring to in the preliminary position paper when we noted that one part of the benchmark uses fixed nominal debt costs.[237] In the *Explanatory statement* for our 2013 rate of return guideline, we stated:[238]

> To estimate the return on debt we propose:
>
> - to use a trailing average portfolio approach, that is, to estimate:
> - the average return that would have been required by debt investors in a benchmark efficient entity if it raised debt over an historical period prior to the commencement of a regulatory year in the regulatory control period
> - to update the return on debt estimate annually (that is, for each regulatory year)
> - to apply equal weights to all the elements of the trailing average
> - to implement transitional arrangements consistent with the 'QTC method' (an annual re-pricing of a portion of the notional debt portfolio) and the benchmark term of ten years.

This description of the construction of the trailing average portfolio remains accurate. This method for establishing the return on debt in each year does not mean that we have made an explicit determination that the benchmark firm is to issue fixed nominal debt each year, or that the regulatory allowance needs to provide *ex post* inflation compensation that would accompany this debt issuance each year.[239] We need not, and do not, go this far.

Our focus on the overall rate of return, rather than the rate of return to equity, is supported by the reasoning of the Australian Competition Tribunal when it dismissed an application by ActewAGL Gas Distribution for review of our 2016 gas access arrangement decision. While discussing the allowed rate of return objective (ARORO)

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[237] AER, *Preliminary position, Regulatory treatment of inflation*, 13 October 2017, p. 80.

[238] AER, *Explanatory statement, Rate of Return Guideline, Better Regulation*, 17 December 2013, p. 98.

[239] While the overall *ex ante* inflation compensation package needs to be correct, part of this compensation can be provided through the rate of return itself, as happens under our current inflation approach.

and what it means to provide opportunity to recover 'efficient financing costs', the Tribunal stated:[240]

> 114 The allowed rate of return has two components: the return on equity and the return on debt. The allowed rate of return is to be determined such that it achieves the ARORO. The components of the allowed rate of return cannot individually achieve the ARORO. They are to be determined so as to contribute to the achievement of the ARORO. Achievement of the ARORO consists of the rate of return being commensurate with the efficient financing costs of the BEE.
>
> 115 In the Rules, "return on equity" and "return on debt" are rates, ie percentages. The allowed return on equity and return on debt in dollar terms are never calculated. Instead, the estimated rate of return on equity and rate of return on debt are averaged using equity and debt weights to generate the estimate of the overall rate of return on capital, also known as the weighted average cost of capital. Of course, arithmetically, one could instead calculate the dollar allowed return on equity, apply the appropriate weight to it, and add it to the weighted dollar allowed return on debt. The fact that the Rules do not take that approach reflects the underlying theory.
>
> 116 The rate of return on capital has primacy. The use of the rates of return on equity and debt is a means to the end of estimating that overall rate of return, and to then determining the return on capital building block. From its total allowed revenue, the service provider must meet its debt obligations along with its opex, capex and other expenditures. The Rules are careful not to imply that there is a guaranteed return to the shareholders. They get what is left. If the service provider can operate more efficiently than expected – including no less in its debt management than its management of opex, for example – the shareholders may receive a higher rate of return than was expected in the forward-looking framework.

There are two aspects of this reasoning that are particularly relevant to the issue at hand.

First, the Tribunal noted the legislative focus on the combined rate of return on capital, rather than the separate return on equity (or debt). This is evident in the construction of the rate of return and the requirement that we seek to achieve the ARORO at the aggregate (debt and equity) level. Our treatment of inflation needs to be viewed in this context, and our decision to target the real return on capital (aggregate across debt and equity) aligns with this perspective. In contrast, Spark Infrastructure's submission would appear to elevate an 'allowed rate of return on equity objective' above the ARORO. This is not the relevant legislative requirement.

Second, the Tribunal noted the forward-looking nature of the ARORO, where we determine ex ante returns but do not guarantee that this initial return will be met ex

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[240] Australian Competition Tribunal, *Application by ActewAGL Distribution [2017] ACompT 2*, 17 October 2017, paragraphs 114–116.

post. Our decision to target the real return on capital ensure that the *ex ante r*eal return on capital will be delivered. The result of our approach is that it puts the onus of financing decisions back on the service provider, and we consider this to be appropriate.

Our approach also has support from other stakeholders. The CCP submitted:[241]

> The network can, if it wishes, reduce its exposure to the real return on equity risk by reducing its level of gearing and/or using interest rate swaps. This comes at a cost, but it should be noted that the network has been compensated for this risk through the beta in its WACC (see below). It is for the network to decide if the benefits of reducing this risk exceed the costs. In principle this is a sound allocation of risk: the consumers nominal expenditure risk will hopefully be offset by variations in income and the network has opportunities to manage its exposure to risks in regard to the real return on equity. The network has the incentive to efficiently manage its financing risks given the costs of doing so and its risk appetite. Importantly there is no single efficient financing strategy.

Based on the inflation analysis in this section, we consider that the 2013 changes to debt approach have not caused any material inconsistency between our debt approach and our (unchanged) inflation treatment. It is true that the trailing average portfolio is estimated using debt costs for fixed nominal debt—but the previous approach also set the 'on-the-day' debt cost using fixed nominal debt. The primary inflation effect, that return to equity holders varies when actual inflation differs from our estimate of expected inflation, exists under either approach. When the service provider chooses to issue fixed nominal debt it has taken a position that exposes its equity holders to movements in inflation. It receives compensation for this risk in the (consistently estimated) rate of return.

It appears that the move to use a trailing average cost of debt has introduced additional complexity into the calculation of inflation exposure arising from inflation embedded in the debt portfolio. However, it is not clear that the 2013 changes to debt approach have caused any net increase or decrease in the inflation exposure of equity holders arising from this cause.

When we moved to the trailing average portfolio approach, we accepted that the staggered issuance of fixed nominal debt was a reasonable approach for the benchmark. Under an incentive regime, service providers are entitled to depart from the benchmark and retain any benefit or detriment they obtain in doing so. If a service provider was also following this debt strategy while under the previous on-the-day approach, then our move to the trailing average portfolio approach would appear to have reduced the overall exposure of its equity holders—considering both inflation and non-inflation effects.

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[241] CCP, *Submission to the AER, Response to AER discussion paper 'Regulatory treatment of inflation - Preliminary position' October 2017*, 6 November 2017, p. 28

A Rule requirements

A.1 National Electricity Rules (NER)

The following provisions from Chapter 6 (electricity distribution) of the NER are mirrored in Chapter 6A (electricity transmission).

Clause 6.3.1(c) provides that a building block proposal must be prepared in accordance with the PTRM. The PTRM is the model prepared and published by us in accordance with clause 6.4.1(a) of the NER.

Clause 6.4.2(b)(1) provides that the PTRM must establish a "method" that we determine "is likely to result in the best estimates of expected inflation".

Clause 6.4.3(a)(1) specifies that one of the building blocks used to calculate the annual revenue requirement is an amount for indexation of the RAB and refers to clause 6.4.3(b)(1). Clause 6.4.3(b)(1) provides that this RAB indexation building block is to be a negative amount equal to the increase in the RAB value due to inflation indexation. Clause 6.4.3(b)(1) states:

> *(1) for indexation of the regulatory asset base:*
>
> *(i) the regulatory asset base is calculated in accordance with clause 6.5.1 and schedule 6.2; and*
>
> *(ii) the building block comprises a negative adjustment equal to the amount referred to in clause S6.2.3(c)(4) for that year*

Clause 6.5.1 provides that the value of the RAB is to be adjusted via the RFM. Clause S6.2.3(c)(4) provides that the RAB is to be indexed for inflation and states:

> *(c) Method of adjustment of value of regulatory asset base*
>
> *The value of the regulatory asset base for a distribution system as at the beginning of the second or a subsequent year (the later year) in a regulatory control period must be calculated by adjusting the value (the previous value) of the regulatory asset base for that distribution system as at the beginning of the immediately preceding regulatory year (the previous year) in that regulatory control period as follows:*
>
> *…*
>
> *(4) The previous value of the regulatory asset base must be increased by an amount necessary to maintain the real value of the regulatory asset base as at the beginning of the later year by adjusting that value for inflation.*

The purpose of the RFM is to adjust the value of the RAB from one regulatory control period to the next. Clause 6.5.1(e)(3) requires that the RFM sets out the method for determining the roll forward of the RAB for distribution systems under which:

> *(3) the roll forward of the regulatory asset base from the immediately preceding regulatory control period to the beginning of the first regulatory year of a subsequent regulatory control period entails the value of the first mentioned regulatory asset base being adjusted for actual inflation, consistently with the method used for the indexation of the control mechanism (or control mechanisms) for standard control services during the preceding regulatory control period.*

The deduction of inflation from the annual revenue requirement is needed to avoid "double counting" of expected inflation. Under the NER, a nominal rate of return is used in combination with an inflation-adjusted RAB. Without any adjustment, service providers a compensated twice for the effects of inflation – once through the rate of return and again through indexation of the RAB.

Clause 6.5.2(a) provides that the RAB (which is indexed to inflation) is to be applied to the rate of return to determine the return on capital building block. Clause 6.5.2(d)(2) provides that this rate of return is to be a nominal rate of return.

Clause 6.5.2(e)(3) provides that in determining the allowed rate of return, we must have regard to "any interrelationships between estimates of financial parameters that are relevant to the estimates of the return on equity and the return on debt". An estimate of expected inflation may be considered to be a "financial parameter".

Clause 6.4.1(c) requires the PTRM to be "in force" at all times. As noted by the Australian Competition Tribunal in the application for merits review by SA Power Networks, this means that the PTRM:[242]

> *is not merely that the PTRM be available for use. Secondly, the PTRM cannot be amended at a whim. It can only be amended under the distribution consultation procedures. There would be little point in the rule makers establishing such a significant "gatekeeping" requirement if the PTRM were little more than a tool in which to submit a proposal.*

Clause 6.4.1(b) provides that the AER may, from time to time, and in accordance with the distribution consultation procedures, amend or replace the PTRM. The distribution consultation procedure is the procedure set out in Part G of Chapter 6 of the NER (s6.16) and provides for a consultation and decision making process.

Clause 6.5.1(b) requires us in accordance with the distribution consultation procedures, develop and publish a model (the 'roll forward model' or 'RFM') for the roll forward of the RAB. Clause 6.5.1(c) provides that we may amend or replace the RFM from time to time in accordance with the distribution consultation procedures.

The distribution consultation procedures provide that:

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[242] Australian Competition Tribunal, *Application by SA Power Networks* [2016] ACompT 11, para 603.

- Before making a decision on a guideline, methodology, model, scheme, test or amendment; the AER must publish a proposed guideline, methodology, model, scheme, test or amendment along with an explanatory statement.
- The explanatory statement must set out the applicable legislative requirements and our reasons for our proposal.
- The AER must invite written submissions on its proposal and allow for no less than 30 business days for the making of submissions.
- Within 80 business days of publishing a proposed guideline, methodology, model, scheme, test, amendment, or invitation for submissions; the AER must make its final decision and reasons. The AER may extend the timeline but only if "the consultation involves issues of unusual complexity or difficulty" or "the extension of time has become necessary because of circumstances beyond the AER's control".
- In making its final decision, the AER must have regard to submissions and include a summary of each issue raised and the AER's response.
- The AER may publish issues, consultation, and discussion papers and may hold conferences and information sessions.

A.2 National Gas Rules (NGR)

The NGR are somewhat less prescriptive than the NER.

The NGR do not require gas business to use the AER's PTRM and RFM, though the businesses are not prohibited from using it either. The NGR do not expressly state that the AER is to determine an estimate of expected inflation. However, it is clear from Rules 73 and 89 that an estimate of inflation is a required component of an access arrangement proposal.

Rule 73 provides that financial information provided by a gas network operator must be provided with some recognized basis for dealing with the effects of inflation.
Rule 89(1)(d) provides that the depreciation schedule should be designed so that an asset is depreciated only once (i.e. that the amount by which the asset is depreciated over its economic life does not exceed the value of the asset at the time of its inclusion in the capital base (adjusted, if the accounting method approved by the AER permits, for inflation)).

There is no specific requirement in the NGR for the capital base to be indexed for inflation (as there is in the NER). Rule 89, however, by allowing for depreciation to be adjusted and in combination with a mandated nominal rate of return (see next paragraph), seems to allow for an accounting method that maintains the real value of the asset base by indexing it to inflation. In practice, most gas businesses propose using the PTRM and RFM. Hence businesses generally propose the basis for dealing with the effects of inflation (pursuant to rule 73) and the accounting method for adjusting depreciation for inflation (pursuant to rule 89) as set out in our PTRM.

The rate of return provisions of the NGR largely mirror those in the NER. Rule 87(4)(b) provides that the rate of return is to be estimated on a nominal basis. Rule 87(5)(c)

provides that in determining the allowed rate of return, we must have regard to "any interrelationships between estimates of financial parameters that are relevant to the estimates of the return on equity and the return on debt". An estimate of expected inflation may be considered to be a "financial parameter".

Rule 74 provides that a forecast or estimate must be arrived at on a reasonable basis and must represent the best forecast or estimate possible in the circumstances.

B Submissions to discussion paper on best estimate of inflation

This appendix includes a more detailed response to the submissions on 'Issue 1' in the discussion paper. Appendix C includes further clarification requested by some stakeholders in response to our preliminary position.

Responses to each submission can be found in the following sections:

Table 9: Submissions and placement of response

Submission	Section	Reason for section placement	Links
ActewAGL	CEPA	Submission relies on CEPA's submission	Link
APA	APA	Own submission	Link
Ausgrid	CEPA	Submission relies on CEPA's submission	Link
AusNet Services	CEPA	Submission relies on CEPA's submission	Link
CCP	CCP	Own submission	Link
CEPA	CEPA	Own submission	Link
ECA	ECA	Own submission	Link
ENA	CEPA	ENA commissioned and relies on CEPA's submission	Link
Endeavour Energy	CEPA	Submission relies on CEPA's submission	Link
Jemena	CEPA	Argues for glide path. Covered in response to CEPA	Link
MEU	ECA	Submission relies on ECAs submission	Link
QTC	QTC	Own submission	Link
Spark Infrastructure	Spark Infrastructure	Own submission	Link
SAPN, CitiPower, Powercor and AGN	CEPA	Submission relies on CEPA's submission	Link
TransGrid	TransGrid	Own submission	Link
Uniting Communities	ECA	Submission relies on ECA's submission	Link

Source: Discussion paper submissions, AER.

Consideration of CEPA's submission

Bond breakeven approach

Discussion on CEPA's submission which stated that the biases in the bond breakeven approach average out or cause an overestimate is in section 5.6.3. Below we consider CEPA's preference for BBIR.

CEPA states that there are plausible explanations for why breakeven inflation estimates reflect expectations better than the current approach:

> This includes: the central banks reduced ability to affect inflation through monetary policy; global forces bringing about a 'lower for longer' scenario as the macroeconomic conditions have fundamentally changed; and the broadening of the RBA's remit which places greater weight on financial stability and may mean the RBA targets the lower part of its band.'[243]

CEPA did not refer to studies or evidence to support these claims or to support the conjecture that there are plausible explanations in support of the BBIR. In contrast, a number of studies find that long term inflation expectations may be anchored within the inflation target band, including: Leu and Sheen (2006), Finlay and Wende (2011), Gillitzer and Simon (2015) and Mallick (2015).[244] There are also studies by Kuttner and Robinson (2010) and Paradiso and Rao (2012) which find that since the introduction of inflation targeting, the Phillips Curve has flattened. A flattened Phillips Curve is consistent with an anchoring of inflation expectations to the RBA inflation target band. Mallick finds that while the Phillips Curve is flatter, it remains downward sloping over the business cycle. This result indicates that the effectiveness of the RBA's monetary policy in stabilising the business cycle 'has not diminished'.[245]

Tulip and Wallace find that RBA first year forecasts of CPI inflation significantly outperform CPI inflation forecasts based on a random walk (p = 0.00) and the midpoint of the inflation target band (p = 0.04). RBA second year forecasts of CPI inflation significantly outperform forecasts based on a random walk (p = 0.03) but did not significantly outperform forecasts based on the midpoint of the inflation target band.[246] The latter result suggests that there is a relatively rapid reversion of CPI inflation to the mean and such an outcome is consistent with the successful targeting of the inflation rate.

Surveys

In its report CEPA discussed the findings in the ACCC/AER working paper in relation to surveys and there appears to be some misunderstanding. Some potential disadvantages of survey-based estimates were noted in the working paper. However, it was also noted that many studies consider survey-based estimates to be reasonable if not superior proxies for expected inflation.[247] If 10 year survey-based estimates are

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243 CEPA, *Best Estimate of Inflation Expectations: Assessment of Approaches,* 28 June 2017, p. 31.

244 In Moore (2016), Finlay and Wende extend their decomposition analysis of the BBIR to 2016: long term inflation expectations remain stable and near the midpoint of the inflation target band. Angus Moore (2016), 'Measures of Inflation Expectations in Australia, *Reserve Bank of Australia Bulletin*, December Quarter, p. 27.

245 Debdulal Mallick (2015), 'A Spectral Representation of the Phillips Curve in Australia', Faculty of Business and Law, School Working Paper, Economic Series, SWP 2015/7, p. 25.

246 Peter Tulip and Stephanie Wallace (2012), 'Estimates of Uncertainty around the RBA's Forecasts', *RBA Research Discussion Paper – November 2012*, RDP2012-07, p. 11.

247 Vide: Ian Christensen, Frederic Dion and Christopher Reid, 'Real Return Bonds, Inflation Expectations, and the Break-Even Inflation Rate', *Bank of Canada Working Paper 2004-43*, November 2004, pp. 1–36. Refet Gurkaynak,

available for analysis it is possible that this method may rank above other methods with respect to the criteria of assessment. However, since only 2 year survey-based estimates were available for the comparative assessment, this method was ranked last.

Glide path

A glide path approach was discussed as a possible method in the AusNet Services, Jemena and CEPA submissions. The choice of model specification and length of glide is likely to be subjective. Submissions on the model specification and length of glide may also result in widely divergent estimates of expected inflation which is likely to considerably reduce the robustness of this 'modified' AER method. The variability of estimates may also significantly reduce the transparency, replicability and simplicity of the AER's method.

There is also the consideration of the potentially rapid reversion of short term inflation expectations to the midpoint of the RBA inflation target band. Tulip and Wallace found that RBA's second year forecasts of CPI inflation significantly outperform forecasts based on a random walk ($p = 0.03$) but did not significantly outperform forecasts based on the midpoint of the inflation target band.[248] The finding suggests that there is a relatively rapid reversion of CPI inflation to the midpoint and such an outcome is consistent with the successful targeting of the inflation rate. Further, Tawadros finds that the RBA forecasts produce much lower forecasting errors than the forecasts made by the three other private sources.[249] If the relative accuracy of the RBA short term forecasts inform and reflect short term market expectations of inflation, such rapid reversion of short term inflation expectations to the midpoint indicates that a glide path may be unnecessary.

In its support of the glide path, CEPA observes that there has been a historical persistence of the 10 year average inflation rate above the midpoint. Therefore, a glide

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Brian Sack and Jonathan Wright (2010), 'The TIPS Yield Curve and Inflation Compensation', *American Economic Journal: Macroeconomics*, 2(1), pp. 70–92; Sharon Kozicki and P.A. Tinsley (2012), 'Effective Use of Survey Information in Estimating the Evolution of Expected Inflation', *Journal of Money Credit and Banking*, 44(1), pp. 145–169; Carolin Pflueger and Luis Viceira (2015), 'Return Predictability in the Treasury Market: Real Rates, Inflation, and Liquidity', Working Paper, pp. 1–34; Stefania D'Amico, Don Kim and Min Wei (2016), 'Tips from TIPS: The informational content of Treasury Inflation-Protected Security prices', Finance and Economics Discussion Series, Divisions of Research and Statistics and Monetary Affairs, Federal Reserve Board, 2014-24, p. 1–69; Christian Gillitzer and John Simon (2015), 'Inflation Targeting: A Victim of Its Own Success?', RDP 2015-09, August, *Reserve Bank of Australia Discussion Paper*, pp. 1–37; Finlay, R, Wende, S., 'Estimating Inflation Expectations with a Limited Number of Inflation-indexed Bonds', *Research Discussion Paper: Reserve Bank of Australia*, RDP 2011-01, March 2011, pp. 1–35; Zhuoshi Liu, Elisabeth Vangelista, Iryna Kaminski and Jon Relleen (2015), 'The informational content of market-based measures of inflation expectations derived from government bonds and inflation swaps in the United Kingdom', *Staff Working Paper No. 551, Bank of England*, pp. 1–36; Banco Central do Brasil (2014), 'Breaking the Break-even Inflation Rate', *Inflation Report*, December, pp. 18–21.

248 Peter Tulip and Stephanie Wallace (2012), 'Estimates of Uncertainty around the RBA's Forecasts', *RBA Research Discussion Paper – November 2012*, RDP2012-07, p. 11.

249 George Tawadros (2013), 'The information content of the Reserve Bank of Australia's inflation forecasts', *Applied Economics*, 45, pp. 626–627.

path may better represent the persistence of outturn inflation above or below the midpoint. If CEPA's claim of historical persistence is supported by a model of persistence, and this model has forecast inflation outcomes more accurately than other methods, further consideration may be given to a glide path. This is because such a model may be likely to inform and reflect long term inflation expectations.

However, in the absence of such a model and evidence of its relative forecast accuracy, observations of outturn inflation do not properly inform the inquiry into best estimates of expected inflation. Historical and current studies of inflation expectations in Australia are the focus. And the findings of Gillitzer and Simon suggest that as a result of the success and credibility of the RBA's inflation targeting, long-term inflation expectations are firmly anchored at target inflation rates. The anchoring effect is estimated: since 1998 long term inflation expectations have never deviated from the midpoint of the RBA's inflation target band by more than 0.2 percentage points.[250]

Criteria

CEPA has stated that the criteria used in the ACCC/AER working paper could be improved:

> 'the focus is perhaps weighted too heavily towards good regulatory practice (transparency, replicability and elements of robustness)'.
>
> 'We have not included the criterion of simplicity. While we consider that this is a pragmatic [sic], including it may lower the ranking of a preferable methodology because it may be relatively more complex'.[251]

At page 12 of the working paper relative congruence and robustness are considered to rank above all other criteria. However, the rankings are not considered to be absolute, there are always trade-offs. Therefore, at the margin, if a particular method is so complex that it is opaque and cannot be reproduced, the uncertainty and controversy over its estimates may result in other methods being ranked as best estimates, even if the other methods are considered to be marginally less congruent and robust.

Consideration of ECA's submission

The Quiggin report that accompanied ECA's submission suggests setting estimated inflation at the top of the RBA's target band appropriately allocates inflation risk to investors. The purpose is to protect consumers from 'upside' inflationary risk by setting the regulatory estimated rate at the upper end of the range.

Our view is that this would be setting a direct transfer from the service providers to consumers but would not necessarily lower risk. This is because the change would be equivalent to an expected 40 basis point drop in annual return compared to the existing

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[250] Christian Gillitzer and John Simon (2015), 'Inflation Targeting: A Victim of Its Own Success?', RDP 2015-09, August, *Reserve Bank of Australia Discussion Paper*, p. 9.

[251] CEPA, *Best Estimate of Inflation Expectations: Assessment of Approaches,* 28 June 2017, p. 6.

approach. However, if inflation was different from what was expected then prices would change in the same manner as the current estimate (including when inflation is above 3 per cent). So while it does reduce the chance that actual inflation is above the estimate, it does not necessarily reduce price fluctuation risk for consumers.

Relevantly, the NER states that the PTRM for electricity distribution and transmission must specify: 'a methodology that the AER determines is likely to result in the best estimates of expected inflation.'[252] The NGR states that an estimate must be arrived at on a reasonable basis and must represent the best forecast or estimate possible in the circumstances.[253] It is doubtful that a change in the current estimation technique in an attempt to shift risk from consumers to service providers would also provide the best estimate of expected inflation. Transfers of risk are better considered as part of any change to the regulatory framework.

Consideration of APA's submission

APA states that none of the RBA inflation target method, the use of data from inflation swaps, and the bond breakeven method appears to provide a better estimate of expected inflation than either of the other two methods and that instead changes should be made to the PTRM. This point is discussed in section 5.

Consideration of CCP's submission

The CCP states that its preliminary analysis suggests that there is not a strong enough case to change from the AER's current approach. We agree with this preliminary assessment.

The CCP also states that the AER should further consider swaps based methods in terms of biases and risk based premia. The AER has consulted the RBA on the issue, where it advised:[254]

> Furthermore, the market for inflation swaps is not particularly active or representative of broader market views. In the first half of 2016, there were on average just six transactions a week at the ten-year tenor. Individual transactions can therefore move the market price significantly and the daily rates are often based on quotes rather than actual transacted prices. The swap market is also dominated by a few participants, so it may not be representative of broader inflation expectations.

Such low liquidity could become an issue if the service providers can move the market during averaging periods.

Consideration of QTC's submission

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252 NER, cll. 6.4.2(b)(1) and 6A.5.3(b)(1).

253 NGR, r. 74.

254 RBA, *Letter re: Regulatory treatment of inflation – Inflation expectations*, 5 July 2017, p. 2.

The Queensland Treasury Corporation (QTC) outlines a number of concerns with the findings and/or analysis in the Discussion paper and the ACCC/AER working paper. However, many of these concerns are actually addressed in the working paper and the references cited. Other concerns appear to relate to dismissing of term structure models of interest rates to calculating the BBIR/inflation swaps. Term structure models are the technically correct approaches to calculating expected inflation implied from the BBIR and inflation swaps.

Consideration of Spark Infrastructure's submission

In choosing the best estimate of expected inflation, Spark Infrastructure recommends using the bond breakeven approach. In reaching this conclusion Spark Infrastructure refers to findings by a CEG report: Best estimate of expected inflation (August 2016). The AER's considerations of this report are documented at length in our April 2017 final decisions for AusNet Services, Powerlink and TasNetworks.[255]

Consideration of TransGrid's submission

TransGrid believes that the current approach of using the inflation forecast based on the Statement of monetary policy from the Reserve Bank to forecast inflation should continue to be applied going forward. As mentioned above the AER agrees with this view.

[255] AER, *Final Decision AusNet Services Transmission determination 2017-2019: Attachment 3 – Rate of Return,* April 2017. AER, *Final Decision Powerlink Transmission determination 2017-2019: Attachment 3 – Rate of Return*, April 2017. AER, *Final Decision TasNetworks Distribution determination 2017-2019: Attachment 3 – Rate of Return*, April 2017

C Submissions to preliminary position on best estimate of inflation

A brief overview of each of the submissions is given in section 4.4.3. This appendix includes our more detailed response to the submissions to 'Issue 1' in the preliminary position paper. This includes responses to requests made in some submissions for further reasoning, as well as the presentation of new evidence and reasoning.

The eight submissions discussed the following issues:[256]

- Glide path
- Definition of best estimate
- Use of multiple estimates
- Considerations of the bond breakeven approach
- Evidence and scrutiny of the current approach
- Use of Consensus Economics
- Other issues.

We discuss each of these issues in the sub-headings below.

As noted in section 2, after consideration of the issues presented in submissions and the results of our further research, we consider that the current approach to calculating the best estimate is most appropriate at this time.

Glide path

Extreme examples and further research

The joint SAPN, CitiPower, Powercor and AGN submission noted that in our consideration of the glide path we did not consider extreme examples (defined as current inflation below 1.5 per cent or above 3.5 per cent) and the potential inability to come back to the mid-point within two years for those examples.[257] The joint

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[256] SAPN, CitiPower, Powercor and AGN, *AER review of expected inflation*, 7 November 2017. APA, *Submission in response to AER preliminary position paper*, 7 November 2017. AusNet Services, *Re: Regulatory Treatment of Inflation – Preliminary Position Paper*, 3 November 2017. CCP, *Response to AER discussion paper, Regulatory treatment of inflation - preliminary position*, 6 November 2017. ECA, *Regulatory treatment of inflation - Response to AER preliminary position paper*, 6 November 2017. ENA, *Response to AER's Preliminary Position Paper on regulatory treatment of inflation*, 6 November 2017. Jemena, *Response to AER's Preliminary Position Paper on Regulatory Treatment of Inflation,* 6 November 2017. Spark Infrastructure, *Re: Submission to the AER's Preliminary position on the regulatory treatment of inflation*, 9 November 2017.

[257] Current research shows that even if short term inflation expectations are noisy and 'extreme', long term inflation expectations have become relatively stable and anchored within the band. See: ACCC/AER Working Paper #11, *Consideration of best estimates of expected inflation: comparing and ranking approaches,* April 2017, Richard

submission indicated that a 'contingent' glide path which applied in these extreme circumstances might be appropriate. SAPN, CitiPower, Powercor and AGN also claimed that we used reversion in actual inflation rather than expected in our reasoning.

We agree that the assessment in the preliminary position paper included some indirect evidence on the rate of change in inflation expectations.[258] Our position paper noted there was relatively little evidence on this issue, assessed the available information, and explicitly asked for submissions on the speed of reversion of inflation expectations.[259]

We have since completed our own research on how long it takes inflation expectations to return to the mid-point using Consensus Economics' data.[260] We examined data from the survey after 2000. For each survey, we used the expected inflation for each year over a ten year horizon.[261] We then identified four sub-groups, based upon expected inflation in year one:

- Expected inflation was below 2.5 per cent. This contains all surveys with inflation expectations lower than the mid-point at the commencement of the period.
- Expected inflation was above 2.5 per cent. This is the inverse of the first group, and reflects all surveys with inflation expectations higher than mid-point at the commencement of the ten year period.
- Expected inflation was below 1.5 per cent. This is a subset of the first group, and represents more extreme starting conditions with low inflation expectations, as per the suggested threshold in the joint submission.
- Expected inflation was above 3.5 per cent. This is a subset of the second group, and represents more extreme starting conditions with high inflation expectations, again as per the suggested threshold in the joint submission.

Figure 5 shows the average year-by-year expected inflation across the ten year forecast period, for each of these four groups.

Finlay and Sebastian Wende (2011), 'Estimating Inflation Expectations with a Limited Number of Inflation-indexed Bonds', Research Discussion Paper, Reserve Bank of Australia, RDP 2011-01, March, pp. 1-35; Christian Gillitzer and John Simon (2015), 'Inflation Targeting: A Victim of Its Own Success?', RDP 2015-09, August, Reserve Bank of Australia Discussion Paper, pp. 1-27.

258 We consider that the discussion in the preliminary position paper on this issue is still relevant. We discuss below the material on mean reversion of actual inflation in Tulip and Wallace (2012) and its relevance to inflation expectations.

259 AER, *Preliminary position, Review of the regulatory treatment of inflation*, 13 October 2017, pp. 13, 41, 44–48.

260 The Consensus Economics data is proprietary; we obtained permission from Consensus Economics to publish the aggregated results as set out in Figure 5.

261 The survey collects data on average expected inflation over each horizon (so over the next year, or next two years, next three years etc.); we derive the forward rates of year-by-year expected inflation from this raw data.

Figure 5: Average forward rates of expected inflation, with groups based on expected inflation in year one

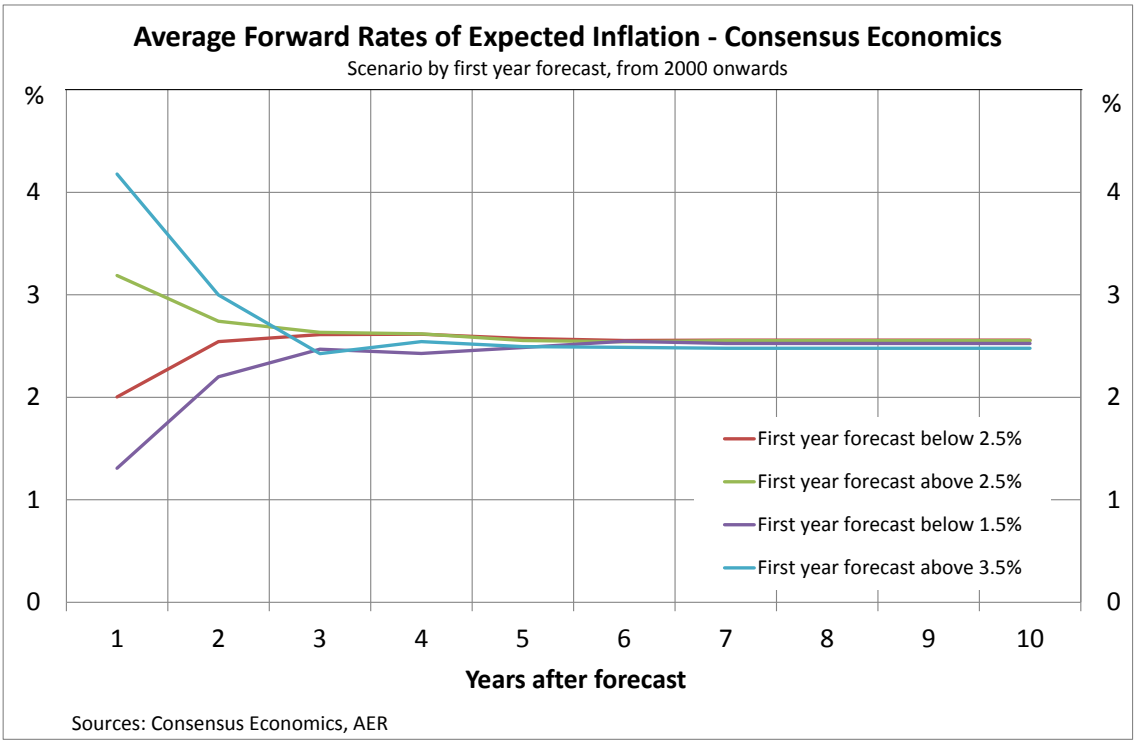


Figure 5 suggests that expected inflation does not take a long time to revert to the mid-point. Consider the group where expected inflation in year one was above 3.5 per cent (the light blue line). Although the average expected inflation in year one was above 4 per cent, by year two it was 3 per cent, and by year three it was around 2.5 per cent, in line with the mid-point of the RBA's target band. Conversely, consider the group of where expected inflation in year one was below 1.5 per cent (the purple line). There is a rapid increase from the low initial expected inflation in year one (1.3 per cent) such that by year three expected inflation is once again aligned with the mid-point of the RBA target band (2.5 per cent).

This analysis indicates that even when initial forecasts are below 1.5 per cent or above 3.5 per cent, reversion to the mean occurs rapidly. By the third year, expected inflation for each group is close to the 2.5 per cent midpoint, with the 'extreme' groups no further from the midpoint than the non-'extreme' groups (Figure 5). This suggests that the adoption of a glide path that delayed the return to the mid-point of the RBA target band beyond year three would not reflect underlying inflation expectations.

We continue to hold the view that a glide path approach would not provide the best estimate of expected inflation.

Maximum deviation from the midpoint of RBA target band

Jemena requested further clarification on the reasoning used in our preliminary position on the maximum deviation from the mid-point of RBA target band.

The table of deviations from 2.5 per cent was used as a method to use publicly available data to complete a comparison between methods.[262] As Consensus Economics data is proprietary it could not be directly used, but its maximum deviations from 2.5 per cent was publicly available. We used it to emphasise the current similarity in results between the Consensus Economics forecasts and the current method. It was not used to suggest the inflation estimate should be 2.5 per cent.

As the Consensus Economics inflation expectations are, according to the RBA, a good way to estimate long-term inflation expectations, a glide path that deviates considerably more is unlikely to be a good estimate of expectations.[263]

Monetary policy transmission

The ENA was not satisfied with the evidence provided in our preliminary position paper for monetary policy transmission occurring typically within one to two years. There is a large body of literature on this issue. The RBA refers to it in a speech given in 2015 (emphasis added):

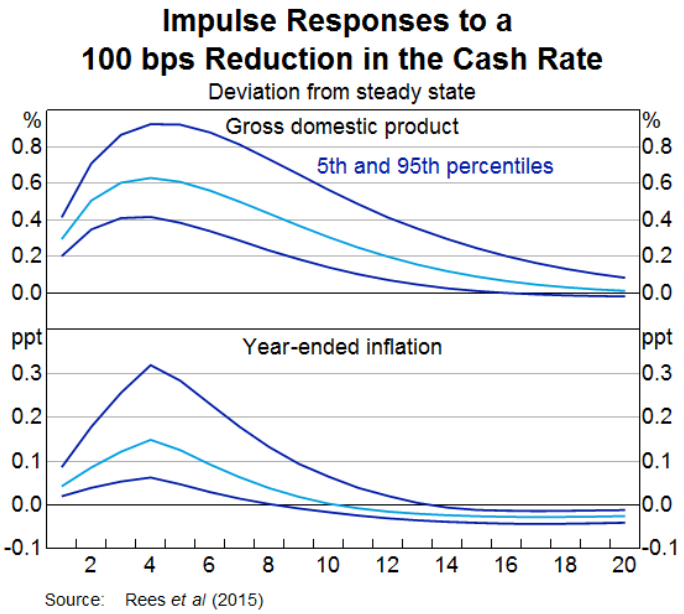
> There are a wide range of model estimates from which to choose, each capturing different aspects of the ways in which the world works in reality. For illustrative purposes, let me mention just one set of recent estimates provided by some of my colleagues using a so-called Dynamic Stochastic General Equilibrium (DSGE) model. Consider the estimated effects of a decrease in the cash rate of 100 basis points. This will lead GDP to be higher than otherwise by between about ½ and ¾ of a percentage point over the course of two years (Graph 1). **Inflation is estimated to rise by somewhat less than ¼ percentage point per annum over 2–3 years. These estimates are close to those of other models.**
>
> Estimates from this DSGE model tentatively suggest that the overall effect of monetary policy has not changed significantly in recent years. [..][264]

[262] AER, Preliminary Position Paper - Regulatory Treatment of Inflation, 13 October 2017, p. 48.

[263] RBA, *Letter re: Regulatory treatment of inflation – Inflation expectations*, 5 July 2017, p. 2.

[264] Chris Kent (AG at RBA), *Monetary Policy Transmission - What's Known and What's Changed*, 15 June 2015.

Figure 6: DSGE impulse response in quarters



Source: Rees *et al* (2015)

The RBA also refers to a number of different models to make its assessment.[265]

We note that in this speech the transmission is stated to occur over 2-3 years. In the DSGE the largest impact occurs in the fourth quarter (Figure 6).[266] If the central bank predicts inflation expectations deviating from its target, it will be able to change the interest rate and the effect will occur over three years. As this is public knowledge it should be known by the market and incorporated into expectations. To test this we used forward curves of expected inflation from Consensus Economics. These showed that inflation expectations for the third year are around the mid-point under a number of scenarios (see above section 'Extreme examples, further research and Jemena's recommendation').

Jemena requested further explanation of the transmission of monetary policies effect on our reasoning.[267] The transmission of monetary policy lags are mentioned due to its effect on later years of inflation expectations. If the RBA expects inflation to be different from its target then it can adjust interest rates at the next meeting to influence inflation. However, the effect is not immediate. As a result, deviations from the target can and do occur in the short term. Research suggests the transmission of monetary policy occurs

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[265] The RBA lists the following models as evidence: Dungey M and A Pagan (2000), 'A Structural VAR Model of the Australian Economy', *Economic Record*, 76(235), pp 321–342; Berkelmans L (2005), 'Credit and Monetary Policy: An Australian SVAR', RBA Research Discussion Paper No 2005-06; Bjørnland H (2009), 'Monetary Policy and Exchange Rate Overshooting: Dornbusch Was Right After All', *Journal of International Economics*, 79(1), pp 64–77; and Jääskelä J and K Nimark (2011), 'A Medium-scale New Keynesian Open Economy Model of Australia', *Economic Record*, 87(276), pp 11–36.

[266] We also note that after quarter 8 the effect is statistically insignificant at the 95 per cent level.

[267] Jemena, *Response to AER's Preliminary Position Paper on Regulatory Treatment of Inflation,* 6 November 2017, p. 1.

within a few years. A glide would be more appropriate if the transmission of monetary policy took considerably longer than this.

Use of Tulip and Wallace (2012) for glide path reasoning

Jemena requested further explanation of the relationship between Tulip and Wallace's Research Discussion Paper (RDP) and the glide path reasoning. The Tulip and Wallace (2012) reasoning in our preliminary position was used to emphasise their findings on second year forecasts. The RBA's forecasts for inflation for 'year two' were not statistically significantly better at forecasting than just using the midpoint. If that is the case, and inflation expectations are anchored to 2.5 per cent, then it is reasonable to assume the 2.5 per cent is a reasonable estimate for the third year as well. As mentioned by ENA in its submission, this is comparing expectations to actual outcomes, which is not necessarily the same as comparing expectations to expectations. Nevertheless, these results should influence market expectations.

CPI persistence

We note that the ECA presented evidence that quarterly CPI per cent changes involve steep corrections and that this implies that a glide path is unnecessary.

Short term effects on inflation and the glide path

We note Jemena's point on the central banks providing CPI forecasts that exclude major short term impacts. We could use these to avoid incorporating known short term inflation movements into a potential glide path and by doing so improve the estimate. The availability of these forecasts would be useful if we were to move to a glide path in the future.

Definition of best estimate

The relative congruence metric

The joint SA Power Networks, CitiPower, Powercor and Australian Gas Networks submission stated that there were problems with the relative congruence metric due to the circularity of logic in its use and its implementation.[268] The ENA presented an excerpt on congruence from the SA Power Networks, CitiPower, Powercor and Australian Gas Networks submission to the discussion paper with a similar argument.

Much of our reasoning behind using the metric is set out in the ACCC working paper.[269] Further explanation on the use of the congruence criterion is below.

Circularity in reasoning

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[268] SAPN, CitiPower, Powercor and AGN, *AER review of expected inflation*, 7 November 2017, p. 2.

[269] ACCC/AER Working paper #11, *Consideration of best estimates of expected inflation: comparing and ranking approaches*, April 2017, p. 10-11.

SAPN, CitiPower, Powercor and AGN stated that to implement the metric we need to know what true expected inflation is, but if we knew true expected inflation we would not need any estimates. Therefore, they consider the inclusion of the metric relies on a circularity of reasoning.[270]

The ACCC working paper, however, makes no claim that 10 year inflation expectations are observable. Market expectations of inflation over a 10 year horizon are unobservable, and can only be estimated. Consequently inflation expectations can be estimated in multiple ways:

- Inflation expectation estimates can be obtained indirectly from observed variables, such as the yields on nominal and index bonds or the prices of inflation swaps. The studies estimating inflation expectations in this way may also estimate the magnitude of the biases affecting the observed variables and (consequently) the unobserved variable of inflation expectations.
- Studies of inflation expectations may often use proxy estimates of inflation expectations, such as survey-based estimates. The choice of such proxies may be supported by their forecast accuracy of inflation outcomes, where it may be argued that their relative forecast accuracy may more closely inform and reflect market expectations of inflation.
- Estimates of inflation expectations may also be obtained from Phillips Curve analysis.

The criterion of relative congruence compares and ranks different methods because inflation expectations are unobservable. The criterion of relative congruence does not measure the relative distance between a method's estimator and inflation expectations for this reason.

This does not mean that ranking estimates by congruence is logically impossible. This criterion can and does rank methods based on consistent findings in the literature on the relative superiority of different method's estimates of inflation expectations. If there are consistent findings in the literature that a particular method is relatively superior to other methods, this particular method is arguably relatively congruent with market expectations of inflation. The criterion of relative congruence therefore can be invoked without 'observing' inflation expectations. The ACCC working paper states:

> 'A particular method may produce relatively congruent estimates of market expectations of inflation *vis-à-vis* other methods if, for example:
>
> - there are several or more research findings that this method results in estimates of expected inflation which may contain zero, small or insignificant biases and/or distortions
> - there are several or more research findings that this method produces estimates that closely mimic the characteristics and processes of market expectations of inflation, and

[270] SAPN, CitiPower, Powercor and AGN, *AER review of expected inflation*, 7 November 2017, p. 2.

- there is less evidence that alternative methods produce estimates that more closely correspond to market expectations of inflation, or
- the biases, premia and/or distortions related to alternative methods are well-documented in the literature and are difficult to estimate and remove.'[271]

The criterion of relative congruence considers that an ordinal ranking of methods arising from the consideration of a number of studies is more appropriate than a cardinal ranking. A 'cardinal' ranking would imply a measure of the magnitude of the relative bias between methods, which is arguably unknowable and sensitive to the particular study parameters employed.

Implementation of congruence

SAPN, CitiPower, Powercor and AGN stated that the ACCC working paper simply lists potential issues with estimation approaches without clearly stating its purpose.[272]

The implementation of relative congruence is not based on a list of potential issues as suggested by SAPN, CitiPower, Powercor and AGN. The ACCC working paper's implementation is based on analysis and ranking of methods as informed by consistent findings in the literature on the relative superiority/inferiority of different method's estimates of inflation expectations. This approach avoids the problems arising from a reliance on a particular study or engaging in a study of inflation expectations:

- Estimates of inflation expectations and biases obtained from a particular study are likely to be sensitive to chosen study parameters. The study parameters include sample period, choice of term structure model and even a proxy for inflation expectations. Therefore, relying on a particular study is likely to (legitimately) invite criticism that changing the study parameters may change the bias estimates and possibly even the rankings.
- Many studies in the literature may only compare methods implicitly – estimating the magnitude of the biases of one method by benchmarking it against a proxy for inflation expectations. The potential problem of relying on such a study alone is that there may be little analysis and justification for the chosen proxy. This is because the authors of the study may consider that proxy is already well-supported in the literature.
- Engaging in a study to estimate which method produces best estimates of expected inflation by comparing the magnitude of their biases may require a proxy or proxies for inflation expectations. A problem may emerge as a result. The inquiry may be considered superfluous and tautological since the best estimate of expected inflation is already chosen in the form of the proxy.

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[271] ACCC/AER Working paper #11, *Consideration of best estimates of expected inflation: comparing and ranking approaches*, April 2017, page 10.

[272] SAPN, CitiPower, Powercor and AGN, *AER review of expected inflation*, 7 November 2017, p. 2.

The criterion of relative congruence and the ranking of methods rely on the consistency of findings of studies of different methods. The ranking based on the latest research avoids the problems outlined above and is arguably well-supported by the literature.

Best in terms of NEO and NGO

We note the ECA submitted that a technical fixation on “best” estimate is irrelevant – best estimate is the one that best achieves the NEO and NGO. We consider that our approach achieves the NEO and NGO.

As in the preliminary position paper, our view is that the ECA's proposal to use a 3 per cent forecast in outer years would be setting a direct transfer from the service providers to consumers but would not necessarily lower consumers' risk. This is because the change would be equivalent to an expected 40 basis points drop in annual return compared to the existing approach. However, if inflation was different from what was expected then prices would change in the same manner as the current estimate (including when inflation is above 3 per cent). While it does reduce the chance that actual inflation is above the estimate, it does not necessarily reduce price fluctuation risk for consumers. Transfers of risk are better considered as part of a change to the regulatory framework.

Use of multiple estimates

SA Power Networks, CitiPower, Powercor and Australian Gas Networks' submission asked for the AER's reasoning for choosing a sole 'best' measure.[273] They noted an alternative approach could include evidence from a number of different inflation expectation estimates and given some weight. They submitted that we have misunderstood our task as one of selecting one method for estimating expected inflation.

The ACCC working paper analysis which is based on comparing and ranking all of the considered methods is consistent with our task which is to determine the method that derives the best estimate.

As mentioned in the 'Definition of best estimate' section, the criterion of relative congruence considers that an ordinal ranking of methods arising from the consideration of a number of studies is more appropriate than a cardinal ranking. A ‘cardinal’ ranking would imply a measure of the magnitude of the relative bias between methods, which is arguably unknowable and sensitive to the particular study parameters employed.

There may be considerable difficulty forming a plausible or consensus view that one method is, for example, twice as close as another method to inflation expectations and therefore should be assigned double the weight. This is because the size of the weight assigned to each method would have to be a (negative) function of the relative size of

[273] SAPN, CitiPower, Powercor and AGN, *AER review of expected inflation*, 7 November 2017, p. 2.

the net effects of all the biases affecting each method. An approach that assigned the same weight to each method, regardless of the magnitude of their relative bias, is unlikely to produce best estimates of expected inflation.

However, estimating the net effects of the biases affecting each method over time or at any point in time would be extremely complex and difficult to do. The estimation is also a subjective exercise which is sensitive to chosen study parameters, such as choice of model, sample period and proxies for expected inflation. This would render the estimation of assigned weights a difficult, subjective and potentially contentious exercise. The result would be estimates of expected inflation that are more complex, less predictable, and are less transparent without necessarily improving the congruency of such estimates with expectations of inflation. Indeed, if the net effects of the biases and the associated weights are not robust to different study parameters used to estimate them, such estimates may be less congruent with inflation expectations.

For the first two years, the current approach does have regard to other approaches. In coming to its forecasts, the RBA monitors surveys from professional forecasters, households and firms, as well as financial market-based measures.[274]

As noted by the CCP, there are also a number of issues with a multi-model approach (giving weight to a number of estimates):

> Moreover, it is not clear that weighting of multiple models or methods can provide better solutions, even if – and it is a big if – assuming the AER could get agreement on the weighting criteria and their relative weights for each criterion. For example, if there are four methods, but the inputs to two of them are closely correlated, then should each of the two models be weighted 25% given each one adds limited new information to the other? On the other hand, if the models reflect very different approaches, is a weighted average of the outputs of the four models a meaningful concept? In all probability it will produce an outcome of convenience that has no theoretical foundation and limited explanatory power. We have a false and very misleading sense of accuracy.[275]

We agree with the CCP's view that a multi-model approach would be more complex than a single method and would affect the simplicity criterion.

Considerations of the bond breakeven approach

Quantification of biases

SAPN, CitiPower, Powercor and AGN, and ENA submitted that they are concerned with the list of issues with bond breakeven approaches in our preliminary position and requested that we provide evidence of their materiality.

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[275] CCP, *Response to AER discussion paper, Regulatory treatment of inflation - preliminary position*, 6 November 2017, p. 12.

The concern that there is no quantification was addressed several times in the ACCC working paper. In the studies surveyed, the scale and sign of each bias/premia is likely to be sensitive to the sample period chosen, the proxy used for inflation expectations, the term structure modelling and estimation methods, the datasets chosen, etc (this is first discussed on pages 10-11 of the ACCC working paper).

Because common 'metrics' are rarely applied across studies of the same or different methods, there is no estimate of the magnitude of each bias, premia and/or distortion affecting each method. Even if common metrics were applied, biases may be time-varying and may switch sign, making it difficult to quantify and remove the biases from a method whenever inflation expectations are estimated. Further, in the absence of a consensus on the approach to modelling, estimation, the sample period and/or proxy, there is unlikely to be consensus on the magnitude of the various biases. Therefore, the best outcome that may be achieved is a ranking of methods that is informed by consistent findings in the literature. An attempt at estimation of the size of the biases is likely to result in false precision.

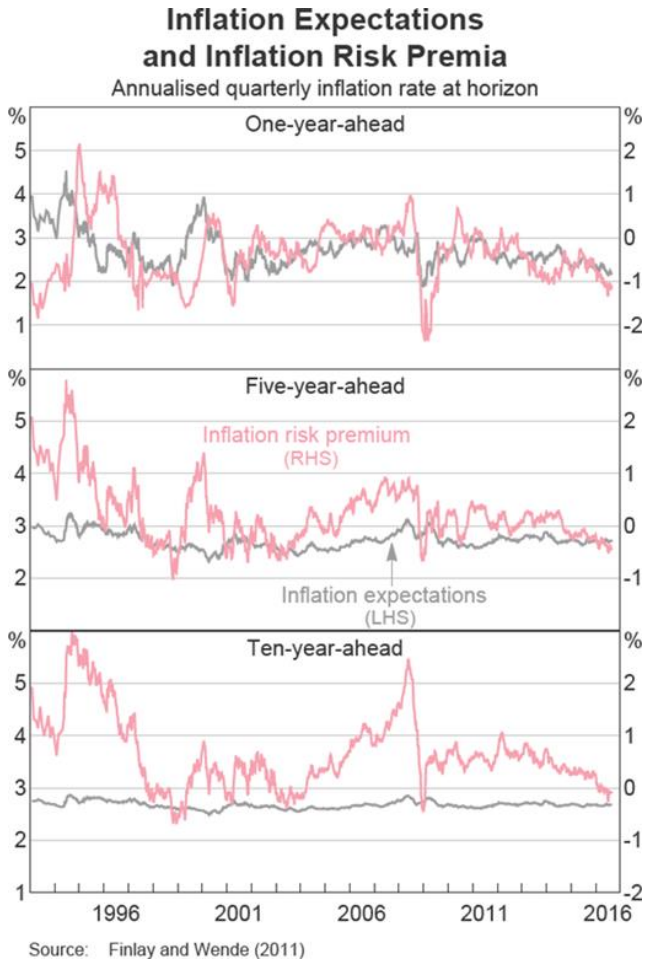
Use as an upper bound

SAPN, CitiPower, Powercor and AGN, and ENA's submissions suggest that the breakeven approach is generally upwardly biased and should be seen as an upper bound on the true estimate.

We note that an upwardly biased estimate would have issues meeting the criterion of a best estimate. We also note that just because a measure can be upwardly biased at times, does not mean it always is. At Figure 7, an updated graph (in 2016) from Finlay and Wende (2011) below illustrates this case. The bias is indeed often above zero (suggesting a general upward bias), but currently the graph suggests that the bond breakeven approach is downwardly biased. It therefore should not be used as an upper bound (especially in current conditions).[276]

[276] We note that Finlay and Wende use a specific estimation of the biases present in the bond breakeven approach. Another approach may show a different direction of biases at different moments in time. This does not diminish from the point though that, as the net biases are not always known to be positive, the bond breakeven approach cannot be considered an upper bound.

Figure 7: Inflation expectations from adjusted BBIR



We therefore do not agree that the RBA's evidence supports the use of the bond breakeven approach as an upper bound.

SAPN, CitiPower, Powercor and AGN also submitted that we should be particularly concerned with an estimate that is above the bond breakeven approach, as they consider it an upper bound. As we do not consider the bond breakeven approach an upper bound and some estimates of the bias suggest the bias is currently downward, we do not consider the fact that the current approach estimate is currently above the bond breakeven approach to be a cause for concern.

SAPN, CitiPower, Powercor and AGN submitted that if the bond breakeven approach is generally upwardly biased that using the estimate would be beneficial to consumers due to lower prices. We do not agree that an upwardly biased estimate would promote efficient investment, as a best estimate of expected inflation allows us to calculate a best estimate of the real opportunity cost of capital. Therefore, the estimate would not be in the long term interests of consumers.

Market based estimation

AusNet Services' submission stated that the bond breakeven approach is likely to provide a more accurate indication of inflation expectations embedded in the nominal

rate of return, than the current approach. However, AusNet Services did not provide studies or evidence to support this claim. The ACCC working paper drew on a number of studies and bond/swap market evidence in ranking the RBA method above other methods.

Although, a priori, a method that is likely to result in best estimates of expected inflation is a market-based method it is evident that market-based methods may contain biases, premia and distortions. The ACCC working paper demonstrated these problems. Our consideration of these problems and findings of studies that long term inflation expectations are anchored within the RBA inflation target band, resulted in the AER's current method ranking above market-based estimates.

Evidence and scrutiny of the current approach

Literature used and level of scrutiny in ACCC working paper

The ENA submitted that there is an absence of academic literature on the current approach and that the method is not used globally. That the studies used were either old or based from overseas, and that there was a difference in the level of scrutiny applied to the current approach and the bond breakeven approach. SAPN, CitiPower, Powercor and AGN's submission also suggested there was a difference in the level of scrutiny applied to the current approach and the bond breakeven approach.

The ENA is correct that there is no literature on the current method per se. The approach taken in the working paper, however, is not 'asymmetric' because the relative congruence and robustness of the AER's current method depends on an anchoring of inflation expectations to the RBA target band. Studies which examine the accuracy of RBA short term inflation forecasts can also be used to assess the relative congruence and robustness of the AER's current method.

The studies of long term inflation expectations find that such expectations are anchored within the RBA inflation target band. See, for example, Finlay and Wende (2011), Gillitzer and Simon (2015), Mallick (2015) and Moore (2016).[277, 278]

RBA short term inflation forecasts are an input into the AER's current method. Further, there are studies which find that RBA short term inflation forecasts have considerable explanatory power and are relatively accurate compared to private sector forecasts. Accurate short term forecasts by the RBA may both inform and reflect short term

[277] Debdulal Mallick (2015), 'A Spectral Representation of the Phillips Curve in Australia', Faculty of Business and Law, School Working Paper, Economic Series, SWP 2015/7, pp. 1-48; Richard Finlay and Sebastian Wende (2011), 'Estimating Inflation Expectations with a Limited Number of Inflation-indexed Bonds', *Research Discussion Paper, Reserve Bank of Australia*, RDP 2011-01, March, pp. 1-35; Christian Gillitzer and John Simon (2015), 'Inflation Targeting: A Victim of Its Own Success?', RDP 2015-09, August, *Reserve Bank of Australia Discussion Paper*, pp. 1-27.

[278] In Moore (2016), Finlay and Wende extend their decomposition analysis of the BBIR to 2016: long term inflation expectations remain stable and near the midpoint of the inflation target band. Angus Moore (2016), 'Measures of Inflation Expectations in Australia, *Reserve Bank of Australia Bulletin*, December Quarter, p. 27.

market expectations of inflation. See, for example, Tulip and Wallace (2012) and Tawadros (2013).[279]

To date there is no research or studies which find that long term inflation expectations are no longer anchored within the RBA inflation target band. If there were such studies, these studies would have been included in working paper and would have informed the comparative assessment. Our consultant, an academic macroeconomist, also has no evidence of these studies.[280]

Many of the papers mentioned above are Australian studies. Our preliminary position also referred to research undertaken by the RBA in 2016 on multiple estimation approaches and to correspondence with the RBA in 2017.

We are also not unique in using the central banks' forecasts as a base. As mentioned by CEPA in their submission to the discussion paper, there are a number of regulators that have used the central banks' forecasts.[281]

Consideration of RBA letter

SAPN, CitiPower, Powercor and AGN's submission claimed that we did not fully consider the evidence in the RBA letter.

The submission stated that:

> The PPP cites various passages from the RBA letter that provide some support for the AER's current approach. However, the RBA letter also sets out a number of problems and issues with the AER's approach (see, for example, above) and notes that the AER approach might not produce an accurate estimate of expected inflation in some market conditions. The PPP does not engage with those aspects of the RBA letter, or discuss how it might determine whether the current market conditions might be commensurate with those that are the subject of the RBA warning.[282]

Our preliminary position does mention these parts of the RBA letter and includes a check on these conditions in the form of monitoring the Consensus Economics surveys.[283] This will allow us to monitor if inflation expectations are becoming unanchored and respond accordingly.

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279 George Tawadros (2013), 'The information content of the Reserve Bank of Australia's inflation forecasts', *Applied Economics*, 45, pp. 626-627; Peter Tulip and Stephanie Wallace (2012), 'Estimates of Uncertainty around the RBA's Forecasts', *RBA Research Discussion Paper – November 2012*, RDP2012-07, p. 11.

280 Shaun P. Vahey, Response to the Spark Infrastructure Submission on the AER's Preliminary Position Paper, 6 December 2017, p. 7.

281 CEPA, *Best Estimate of Inflation Expectations: Assessment of Approaches*, 28 June 2017, pp. 32-38.

282 SAPN, CitiPower, Powercor and AGN, *AER review of expected inflation*, 7 November 2017, p. 5.

283 AER, Preliminary Position Paper - Regulatory Treatment of Inflation, 13 October 2017, p. 44.

The ENA also stated that we have missed the more fundamental shortcoming of the current approach mentioned in the letter from the RBA. The ENA quotes the RBA stating:[284]

> Firstly, the mid-points of the published forecast ranges are not necessarily the RBA's central forecasts. Secondly, if actual long-term inflation expectations were to move notably for a sustained period, it would not be valid to use the Bank's target as a proxy.

The ENA also submitted that the first point the RBA was making clear that the use of the mid-point of the target band is not always appropriate. This is a misunderstanding. The first point refers to the forecast bands in the RBA's Statement of monetary policy. The mid-point here is a modal estimate which is not necessarily always the same as the RBA's mean estimate. It, however, has historically outperformed other forecasts on forecast measures (such as the RMSE) that penalise non-probability weighted estimates.[285, 286] We are therefore satisfied that the first issue the RBA raised does not materially affect the current approach.

Frequency of data availability

AusNet Services submitted that the RBA forecasts cannot be updated on a daily basis and that is a weakness of the current approach. We acknowledge that this is the case. ACCC working paper also acknowledged this.[287] The working paper also noted that there is recent research which suggests that monetary policy and inflation targeting remains effective, such that 10 year market expectations of inflation are relatively stable and anchored within the RBA inflation target band.[288]

Asymmetrical forecast inflation errors

Spark Infrastructure submitted that forecast errors of our forecasting method are not small or symmetrical. To make this point it used analysis provided by our consultant Professor Shaun P. Vahey on the skew of actual inflation over the past ten years.

In response, Professor Vahey stated:

> There are, of course, many ten-year rolling windows of data that could be sampled. None of them, individually, provide a reliable estimate of expected future inflation, over the next ten years, or beyond. For example, no central bank uses that approach to assess inflation expectations. Such an approach

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[284] See ACCC/AER Working Paper #11, *Consideration of best estimates of expected inflation: comparing and ranking approaches,* April 2017, p. 19.

[285] Peter Tulip and Stephanie Wallace (2012), 'Estimates of Uncertainty around the RBA's Forecasts', *RBA Research Discussion Paper – November 2012*, RDP2012-07, pp. 15-16.

[286] RMSE and MAE measure the average magnitude of errors in a set of forecasts. Selecting the probability weighted estimate minimises the average size of the errors.

[287] See ACCC/AER Working Paper #11, *Consideration of best estimates of expected inflation: comparing and ranking approaches,* April 2017, p. 95.

[288] See ACCC/AER Working Paper #11, *Consideration of best estimates of expected inflation: comparing and ranking approaches,* April 2017, p. 95.

> would yield a biased estimate of the unconditional mean of the unknown inflation distribution.
>
> The key issue here is whether Australian inflation is expected to be skewed in the future. There is no evidence in the Vahey Report that this is the case and I know of no academic studies that support this view.
>
> It is worth emphasising too that fluctuations outside the inflation target band are usual in Australia. The Vahey Report notes this. However, no evidence is presented in the Vahey Report to suggest that forecast errors have been "unusually" large since the introduction of inflation targeting, over the last ten years, or that they will be in the future. I know of no existing academic studies making this claim based on Australian inflation data.[289]

We agree with Professor Vahey's assessment.

Evidence of anchored expectations

Spark Infrastructure submitted that:

> It is unlikely to remain appropriate for inflation expectations to remain 'anchored' to the mid-point of the RBA's target band when inflation has remained below the target band for four years.[290]

The studies of long term inflation expectations find that expectations are anchored within the RBA inflation target band. See, for example, Finlay and Wende (2011), Gillitzer and Simon (2015), Mallick (2015) and Moore (2016).[291, 292]

To date there is no research or studies which find that long term inflation expectations are no longer anchored within the RBA inflation target band. If there were such studies, these studies would have been included in working paper and would have informed the comparative assessment. Our consultant, an academic macroeconomist, also has no evidence of these studies.[293] Our testing using Consensus Economics data also suggests that expectations remain currently anchored.

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[289] Shaun P. Vahey, *Response to the Spark Infrastructure Submission on the AER's Preliminary Position Paper*, 6 December 2017, p. 6.

[290] Spark Infrastructure, *Re: Submission to the AER's Preliminary position on the regulatory treatment of inflation*, 9 November 2017, p. 5.

[291] Debdulal Mallick (2015), 'A Spectral Representation of the Phillips Curve in Australia', Faculty of Business and Law, School Working Paper, Economic Series, SWP 2015/7, pp. 1-48; Richard Finlay and Sebastian Wende (2011), 'Estimating Inflation Expectations with a Limited Number of Inflation-indexed Bonds', *Research Discussion Paper, Reserve Bank of Australia*, RDP 2011-01, March, pp. 1-35; Christian Gillitzer and John Simon (2015), 'Inflation Targeting: A Victim of Its Own Success?', RDP 2015-09, August, *Reserve Bank of Australia Discussion Paper*, pp. 1-27.

[292] In Moore (2016), Finlay and Wende extend their decomposition analysis of the BBIR to 2016: long term inflation expectations remain stable and near the midpoint of the inflation target band. Angus Moore (2016), 'Measures of Inflation Expectations in Australia, *Reserve Bank of Australia Bulletin*, December Quarter, p. 27.

[293] Shaun P. Vahey, *Response to the Spark Infrastructure Submission on the AER's Preliminary Position Paper*, 6 December 2017, p. 7.

Use of Consensus Economics inflation

AusNet Services supported our intention to monitor consensus economics surveys. It wanted us to include assessment of deviation of previous survey results between 2013 and 2017 and the RBA target band in this final position paper. Figure 1 in our preliminary position (which is publicly available) suggests that it has not deviated at least between 2013 and 2016.

SAPN, CitiPower, Powercor and AGN suggested that we could use the Consensus Economics inflation expectations for glide path evidence. We have done this and found no evidence to support the use of a glide path. The results can be found in the glide path section of this appendix.

The CCP supported our proposal to regularly review long term inflationary expectations through the Consensus Economics forecasts to see if they deviate substantially from the RBA mid-point.

Other issues

SAPN, CitiPower, Powercor and AGN requested for further reasoning/evidence in the following areas:

- symmetry of mismatches
- cancelling out in the long run.

Symmetry of mismatches

SAPN, CitiPower, Powercor and AGN stated that we suggest in our preliminary position that there is symmetry in mismatches between our best estimate of expected inflation and market expectations of inflation.[294] This comment appears to be based on a misreading of the different types of mismatches discussed in our preliminary position. When the paper mentions symmetry in mismatches it is almost exclusively in section 6 in relation to mismatches between the intended real rate of return and that actually received due to inflation lags, the first year pricing effect, etc.

SAPN, CitiPower, Powercor and AGN also stated that there is an asymmetry in effect of monetary policy on inflation (this argument is also present in Spark Infrastructure's submission). For example, if inflation is too low rather than too high then the effect of a change in monetary policy may be lower.

We note this may be the case. This, however, does not mean that the distribution of expected inflation is necessarily asymmetric. If a central bank was convinced there was an asymmetry in the effect of monetary policy on inflation, then it would drop interest rates by more than it would raise them in similar absolute differences from the

[294] SAPN, CitiPower, Powercor and AGN, *AER review of expected inflation*, 7 November 2017, p. 2.

target band. This would lead to asymmetrical changes in interest rates but not asymmetrical inflation expectations.

Cancelling out in the long-run

SAPN, CitiPower, Powercor and AGN's submission also stated:

> The PPP suggests that the above inflation mis-matches will effectively cancel out over time and will consequently be NPV neutral, but there does not appear to be any evidence or analysis supporting this conclusion.[295]

Our preliminary position paper does not suggest this. A mismatch between our best estimate of expected inflation and 'true' expected inflation will have an NPV effect ex ante.[296] As described in section 6.2, our regulatory framework (PTRM, RFM and annual pricing process) will deliver the ex ante real rate of return on capital derived from the initial nominal rate of return less our estimate of expected inflation.[297] If the estimate of expected inflation is lower than the expectation of inflation embedded in the nominal rate of return then the *ex ante* real return, and therefore revenues, will be set too high (and vice versa). This will not necessarily cancel out in the long run. Getting the best estimate of expected inflation is important to minimise this effect—this is why 'Issue 1' matters.

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[295] SAPN, CitiPower, Powercor and AGN, *AER review of expected inflation*, 7 November 2017, p. 3.

[296] Here, the 'true' estimate of expected inflation is that embedded in the *ex ante* nominal rate of return.

[297] The conversion between nominal and real will use the Fisher equation.

D Worked examples on 10 year geometric averaging

Consistent with the preliminary position, we consider that the use of the 10 year geometric average is appropriate because it aligns:

- our nominal rate of return, which is expressed in constant annual terms over a ten year horizon
- our estimate of expected inflation, which (as a result of the use of the 10 year geometric average) is expressed in constant annual terms over a ten year horizon.

This appendix presents four worked examples (included those from the initial submission and the preliminary position). These are presented to demonstrate that our approach to averaging inflation estimates does not cause under (or over) recovery.

First, we clarify several points raised in the written submissions.

The joint SAPN, CitiPower, Powercor and AGN submission appears to accept that if the underlying real return is constant there is no inflation-averaging related distortion in return outcomes:[298]

> The Preliminary Position paper presents a counter-example, which the AER contends demonstrates that no over/under-recovery arises under its current approach. However, the AER's example is constructed so that no over/under-recovery can ever arise. This is because the AER's example assumes a fixed real allowed return that always corresponds to the real return targeted by the AER. The nominal return is then allowed to vary with inflation expectations.
>
> We submit that this construction assumes the problem away by fixing the real return.

However, there is an implication in this text that the AER's worked example reversed causality (the real WACC determined by the AER's regulatory system defined the 'true' real WACC). This is not the case—the preliminary position example follows the same logic as the initial submission example, where the AER observes only the nominal rate of return and expected inflation. The regulatory system (PTRM, RFM and annual pricing process) then acts to:

- derive a real rate of return by deducting the estimate of expected inflation (reflecting the 10 year geometric average) from the initial nominal rate of return
- deliver that initial real rate of return plus actual inflation each year.

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[298] SAPN, CitiPower, Powercor and Australian Gas Networks, *Submission re: AER review of expected inflation*, 7 November 2017, p. 3

The ENA submission appears to state that this was not occurring in the preliminary position worked example:[299]

> By combining a nominal allowed rate of return with an estimate of expected inflation, the AER targets (rather than fixes) a real allowed rate of return. Hence, it is not appropriate for the AER's worked example to assume that a real allowed rate of return is delivered in each year of the regulatory control period. Doing so assumes away the problem associated with a 10-year geometric mean that the NSPs that submitted on this issue sought to bring to the AER's attention.

This appears incorrect; the worked example followed the same logic we set out above, beginning with the nominal rate of return.[300] The confusion may have arisen because the preliminary position example did not detail every calculation (in the interests of brevity). We provide more detailed calculation tables in this appendix.

Hence, the residual claim in the recent submissions is more limited than the initial submission; it is that using a ten year geometric average results in under or over compensation whenever:

- expected inflation varied from the 2.5 per cent midpoint during the 10 year estimation period, and
- the real rate of return varies during the 10 year estimation period.

Inputs for the four worked examples

This description of the problem requires us to vary both expected inflation and the real rate of return. This results in four scenarios to consider, shown in Table 10:

Table 10 Scenarios to be considered in the worked examples

	Inflation constant	Inflation varies
Real return constant	Scenario A	Scenario B
Real return varies	Scenario C	Scenario D

Source: AER analysis.

We present the numerical inputs for the four scenarios below in Table 11. In each case the nominal WACC and real WACC are consistent—so real WACC plus expected

[299] ENA, *Response to AER's preliminary position paper on regulatory treatment of inflation*, 7 November 2017,p. 16.

[300] An alternative interpretation of the ENA submission is that, for reasons separate to the use of the 10 year geometric average, the ENA does not consider that the current regulatory system delivers the real rate of return on capital. However, the ENA submission provided no explanation for why this might be the case (it is otherwise entirely focused on issue 1). As described in section 6.2.2, there is broad stakeholder consensus that this does occur (the only exception is APA).

inflation equals nominal WACC, using the Fisher equation. We have calibrated the inputs around those in the initial submission, which means that:

- for year three onwards, all scenarios are the same (nominal WACC of 6.15 per cent, expected inflation of 2.5 per cent, real WACC of 3.56 per cent)
- where expected inflation varies, it increases from 2 per cent in years one and two to 2.5 per cent in year three.
- where the real WACC varies, it decreases from 4.07 per cent in years one and two to 3.56 per cent in year three.

This construction was deliberately chosen by SAPN, CitiPower, Powercor and AGN so that the movement in expected inflation and the real rate of return offset each other. This means that the nominal WACC is constant in scenario D (where both are varying). It also means that the nominal WACC will increase in scenario B (as expected inflation increases) and decrease in scenario C (as the real WACC decreases).

Outcomes beyond the end of the first regulatory control period—so for years 6 to 10—are consistent with that in year 6, but we omit them from the table for display purposes. Although we define exact inputs in Table 11, these values will not be known with precision in the real world. In our scenarios, initial real WACC for each year is precisely defined, so that we can test how the real WACC estimated by the AER varies from the 'true' value. In practice, of course, the initial real WACC is not directly observable.

Table 11 Comparison of scenario inputs

Year	1	2	3	4	5	6+	Notes
Scenario A inputs: Constant real WACC, constant expected inflation							
Initial Nominal WACC	6.15%	6.15%	6.15%	6.15%	6.15%	6.15%	Constant
Expected Inflation	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	Constant
Initial Real WACC	3.56%	3.56%	3.56%	3.56%	3.56%	3.56%	Constant
Scenario B inputs: Constant real WACC, varying expected inflation							
Initial Nominal WACC	5.63%	5.63%	6.15%	6.15%	6.15%	6.15%	Increasing
Expected Inflation	2.00%	2.00%	2.50%	2.50%	2.50%	2.50%	Increasing
Initial Real WACC	3.56%	3.56%	3.56%	3.56%	3.56%	3.56%	Constant
Scenario C inputs: Varying real WACC, constant expected inflation							
Initial Nominal WACC	6.67%	6.67%	6.15%	6.15%	6.15%	6.15%	Decreasing
Expected Inflation	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	Constant
Initial Real WACC	4.07%	4.07%	3.56%	3.56%	3.56%	3.56%	Decreasing
Scenario D inputs: Varying real WACC, varying expected inflation							
Initial Nominal WACC	6.15%	6.15%	6.15%	6.15%	6.15%	6.15%	Constant
Expected Inflation	2.00%	2.00%	2.50%	2.50%	2.50%	2.50%	Increasing
Initial Real WACC	4.07%	4.07%	3.56%	3.56%	3.56%	3.56%	Decreasing

Source: AER calculations.

Notes: All conversions between real and nominal use the Fisher equation.

Results for the four worked examples

We now turn to the worked examples themselves. Following the initial submission, we assume that:

- actual inflation always equals expected inflation[301]
- the AER always correctly estimates the nominal WACC,[302] using its standard approach—in constant terms over a ten year horizon[303]
- annual pricing always uses actual inflation (following the APA VTS approach)[304]
- These assumptions allow us to isolate the effect of the inflation averaging approach on revenue outcomes.

[301] If actual inflation differs from expected inflation, there will not be any under or over compensation (the initial real return is still delivered) but the worked examples will become more complicated.

[302] If the nominal WACC is incorrectly estimated, this will cause under or over compensation—but this is distinct from the inflation averaging issue we are attempting to resolve.

[303] In the simplified examples below, we calculate the nominal rate of return using a geometric average. As described in the *Rate of Return guideline*, the process for determining the nominal rate of return is more complicated than this and does not use a geometric average calculation in this manner. However, the key point is that our nominal WACC is estimated in constant annual terms over the 10 year horizon, and our estimate of expected inflation aligns with this. AER, *Better regulation, Explanatory statement, Rate of return guideline*, December 2013, pp. 48–49, 74–79, 135–147.

[304] If we followed the standard pricing approach , the first year pricing effect would cause under or over compensation—but this is distinct from the inflation averaging issue we are attempting to resolve.

Table 12 Scenario A—constant real WACC and constant expected inflation

Year	1	2	3	4	5	6+		Notes
Initial Nominal WACC	6.15%	6.15%	6.15%	6.15%	6.15%	6.15%	(a)	
Expected Inflation	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	(b)	
Initial Real WACC	3.56%	3.56%	3.56%	3.56%	3.56%	3.56%	(c)	Initial nom. WACC less exp. Inflation: (a) minus (c)
Actual inflation	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	(d)	Always equals (b)
AER estimate Nominal WACC	6.15%	6.15%	6.15%	6.15%	6.15%		(e)	10 year geometric average of (a)
AER estimate Expected inflation	2.50%	2.50%	2.50%	2.50%	2.50%		(f)	10 year geometric average of (b)
AER estimate Real WACC	3.56%	3.56%	3.56%	3.56%	3.56%		(g)	AER nom. WACC less AER inflation: (e) minus (f)
AER delivered Nominal WACC	6.15%	6.15%	6.15%	6.15%	6.15%		(h)	AER real WACC plus actual inflation: (g) plus (d)
Target WACC	6.15%	6.15%	6.15%	6.15%	6.15%		(j)	Initial real WACC plus actual inflation: (c) plus (d)
Difference	0.00%	0.00%	0.00%	0.00%	0.00%		(k)	AER delivered WACC less target WACC: (h) minus (j)
Total Difference	0.00%						(l)	Sum of (k)

Source: AER calculations.

Notes: All conversions between real and nominal use the Fisher equation.

The first four rows in Table 12 show the key inputs–which are all constant in scenario A. The first three rows show the 'true' expectations (of nominal WACC, inflation and real WACC) for investors in the firm, prior to the AER undertaking any calculations. The fourth row shows actual inflation outcomes. The second set of four rows then shows the key outcomes from the AER's regulatory system (PTRM, RFM and annual pricing process). The AER estimate of the nominal WACC is exactly equal to the 'true' nominal WACC in every year. Similarly, the AER's estimate of the expected inflation exactly aligns with the 'true' value. The bottom three rows of Table 12 then compare these revenue outcomes against the intended target (which is the initial real WACC plus ex post). Unsurprisingly, in this case there is no difference between the target WACC and the WACC delivered by the regulatory system. We now turn to scenario B.

Table 13 Scenario B—constant real WACC and varying expected inflation

Year	1	2	3	4	5	6+		Notes
Initial Nominal WACC	5.63%	5.63%	6.15%	6.15%	6.15%	6.15%	(a)	
Expected Inflation	2.00%	2.00%	2.50%	2.50%	2.50%	2.50%	(b)	
Initial Real WACC	3.56%	3.56%	3.56%	3.56%	3.56%	3.56%	(c)	Initial nom. WACC less exp. Inflation: (a) minus (c)
Actual inflation	2.00%	2.00%	2.50%	2.50%	2.50%	2.50%	(d)	Always equals (b)
AER estimate Nominal WACC	6.05%	6.05%	6.05%	6.05%	6.05%		(e)	10 year geometric average of (a)
AER estimate Expected inflation	2.40%	2.40%	2.40%	2.40%	2.40%		(f)	10 year geometric average of (b)
AER estimate Real WACC	3.56%	3.56%	3.56%	3.56%	3.56%		(g)	AER nom. WACC less AER inflation: (e) minus (f)
AER delivered Nominal WACC	5.63%	5.63%	6.15%	6.15%	6.15%		(h)	AER real WACC plus actual inflation: (g) plus (d)
Target WACC	5.63%	5.63%	6.15%	6.15%	6.15%		(j)	Initial real WACC plus actual inflation: (c) plus (d)
Difference	0.00%	0.00%	0.00%	0.00%	0.00%		(k)	AER delivered WACC less target WACC: (h) minus (j)
Total Difference	0.00%						(l)	Sum of (k)

Source: AER calculations.

Notes: All conversions between real and nominal use the Fisher equation.

The first four rows in Table 13 show the key inputs for scenario B. As in the previous table, the first three rows show the 'true' expectations for investors in the firm, prior to the AER undertaking any calculations. In this scenario, inflation expectations increase from 2.0 per cent in year one and two to 2.5 per cent in years three to ten. The fourth row shows actual inflation outcomes, which are in line with expected inflation each year.

The next four rows of Table 13 then deal with the calculations in the AER's regulatory models. The AER will calculate the nominal WACC using a ten year horizon, in this case at 6.05 per cent. This will not be the average nominal WACC over the five years of the first regulatory period (this would be 5.94 per cent). The AER will also calculate the estimate of expected inflation using the 10 year geometric average, at 2.40 per cent. This will not be equal to the average expected inflation over the first five years (2.30 per cent). The current regulatory approach combines these estimates to derive the initial real WACC—and this will be exactly equal to the ‘true’ initial real rate of

return, at 3.56 per cent. Expected inflation in years 6 to 10 is included in both ten year horizons—for the nominal WACC and expected inflation. This alignment ensures the correct real return is delivered.

As in scenario A, there is no difference between the target WACC and the WACC delivered by the regulatory system.[305]

We now turn to scenario C.

Table 14 Scenario C—varying real WACC and constant expected inflation

Year	1	2	3	4	5	6+		Notes
Initial Nominal WACC	6.67%	6.67%	6.15%	6.15%	6.15%	6.15%	(a)	
Expected Inflation	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	(b)	
Initial Real WACC	4.07%	4.07%	3.56%	3.56%	3.56%	3.56%	(c)	Initial nom. WACC less exp. Inflation: (a) minus (c)
Actual inflation	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	(d)	Always equals (b)
AER estimate Nominal WACC	6.25%	6.25%	6.25%	6.25%	6.25%		(e)	10 year geometric average of (a)
AER estimate Expected inflation	2.50%	2.50%	2.50%	2.50%	2.50%		(f)	10 year geometric average of (b)
AER estimate Real WACC	3.66%	3.66%	3.66%	3.66%	3.66%		(g)	AER nom. WACC less AER inflation: (e) minus (f)
AER delivered Nominal WACC	6.25%	6.25%	6.25%	6.25%	6.25%		(h)	AER real WACC plus actual inflation: (g) plus (d)
Target WACC	6.67%	6.67%	6.15%	6.15%	6.15%		(j)	Initial real WACC plus actual inflation: (c) plus (d)
Difference	-0.42%	-0.42%	0.10%	0.10%	0.10%		(k)	AER delivered WACC less target WACC: (h) minus (j)
Total Difference	-0.52%						(l)	Sum of (k)

Source: AER calculations.

Notes: All conversions between real and nominal use the Fisher equation.

The first four rows in Table 14 show the key inputs for Scenario C. Expected inflation is constant at 2.50 per cent. Both the real rate of return and the nominal rate of return

[305] Since actual inflation varies between scenario A and scenario B (in line with expected inflation, by construction), the nominal WACC differs – but the initial real WACC is preserved.

decrease from year 2 to year 3. As with previous tables, these rows reflect the 'true' investor expectations prior to the AER undertaking any calculations.

The next four rows of Table 14 then deal with the calculations in the AER's regulatory models. The AER estimates the nominal WACC using a ten year horizon, at 6.25 per cent. Note this differs from the nominal WACC for the first five years (this would be 6.36 per cent). The estimate of expected inflation is calculated using the 10 year geometric mean at 2.50 per cent. Combined, resulting real WACC (3.66 per cent) will not equal the real WACC over the first five years (this would be 3.76 per cent). This then flows through to delivered returns (the AER's estimate of the real WACC plus actual inflation outcomes). There is net under-recovery across years one to five of 0.52 per cent.

However, the inflation averaging approach cannot be the cause of under recovery in scenario C. Since expected inflation is constant at 2.50 per cent in every year, and the geometric average is also exactly 2.50 per cent (and applied every year), there is no mis-estimation of inflation in any year. Hence, the under recovery cannot be attributed to our inflation approach. It also follows that the proposed solution (to use individual yearly estimates of expected inflation, rather than averaging) would make no difference to the result.

We now turn to scenario D.

Table 15 Scenario D—varying real WACC and varying expected inflation

Year	1	2	3	4	5	6+		Notes
Initial Nominal WACC	6.15%	6.15%	6.15%	6.15%	6.15%	6.15%	(a)	
Expected Inflation	2.00%	2.00%	2.50%	2.50%	2.50%	2.50%	(b)	
Initial Real WACC	4.07%	4.07%	3.56%	3.56%	3.56%	3.56%	(c)	Initial nom. WACC less exp. Inflation: (a) minus (c)
Actual inflation	2.00%	2.00%	2.50%	2.50%	2.50%	2.50%	(d)	Always equals (b)
AER estimate Nominal WACC	6.15%	6.15%	6.15%	6.15%	6.15%		(e)	10 year geometric average of (a)
AER estimate Expected inflation	2.40%	2.40%	2.40%	2.40%	2.40%		(f)	10 year geometric average of (b)
AER estimate Real WACC	3.66%	3.66%	3.66%	3.66%	3.66%		(g)	AER nom. WACC less AER inflation: (e) minus (f)
AER delivered Nominal WACC	5.74%	5.74%	6.25%	6.25%	6.25%		(h)	AER real WACC plus actual inflation: (g) plus (d)
Target WACC	6.15%	6.15%	6.15%	6.15%	6.15%		(j)	Initial real WACC plus actual inflation: (c) plus (d)

Difference	-0.41%	-0.41%	0.10%	0.10%	0.10%	(k)	AER delivered WACC less target WACC: (h) minus (j)
Total Difference	-0.52%					(l)	Sum of (k)

Source: AER calculations.

Notes: All conversions between real and nominal use the Fisher equation.

The first four rows of Table 15 show the key inputs under scenario D. Expected inflation and the real rate of return move in opposite directions in year 3. The nominal WACC is constant as a result. As with previous tables, these rows reflect the 'true' investor expectations prior to the AER undertaking any calculations.

The next four rows of Table 15 then deal with the calculations in the AER's regulatory models. The AER estimates the nominal WACC using a ten year horizon, at 6.15 per cent. This is also equal to the nominal WACC over the first five years (since, by construction, the movements in real rate of return and expected inflation cancel each other out). The estimate of expected inflation is calculated using the 10 year geometric mean at 2.40 per cent. This differs from the five year horizon (2.30 per cent).

Combined, resulting real WACC (3.66 per cent) will not equal the real WACC over the first five years (3.76 per cent). This then flows through to delivered returns (the AER's estimate of the real WACC plus actual inflation outcomes). There is net under-recovery across years one to five of 0.52 per cent. This is the same under-recovery as in scenario C.[306]

The use of a 10 year geometric average in our inflation approach is not the cause of this under recovery. As noted in scenario B, we know that whatever inflation expectations were embedded in years six to ten, they were included in the ten year horizon for both expected returns and the nominal WACC. The two align and cancel out. As noted in scenario C, even where inflation is constant in every year (and so averaging cannot cause mis-estimation) the same under-recovery arises.

Where scenarios C and D show under (or over) recovery, it arises from the decision to use a ten year term for the rate of return during a five year regulatory control period. This effect is independent of the inflation averaging effect. Further, any inflation path combined with the varying real return from scenario C and D will result in the same under recovery.[307]

In isolation, this suggests that the term of the return on equity and return on debt should align with the length of the regulatory period. In normal circumstances, with a five year regulatory period, both should be set at five years.[308] However, there are

[306] Since actual inflation varies between scenario C and scenario D (in line with expected inflation, by construction), the nominal WACC differs – but difference between delivered and target WACC is the same.

[307] There will be variation at the second decimal place (so 0.0X per cent) arising from the Fisher equation.

[308] If a different regulatory period was chosen (for instance, a two year regulatory control period) then the return on capital term would be different too.

several other factors to consider when setting the term for the return on equity or the return on debt.

We discussed these at length in our Rate of return guideline.[309] The most important factor aside from the length of the regulatory period is the life of the underlying assets, which is much longer than five years. Hence, our decision to use a ten year investment horizon reflects the tension between these competing factors.

However, having made the decision to use a ten year term, these worked examples show that using a ten year geometric average is the appropriate inflation approach.[310]

[309] AER, *Rate of return guideline, Better regulation*, December 2013, pp.15, 21. AER, *Explanatory statement, Rate of return guideline, Better regulation*, December 2013, pp. 48–49, 73–75, 126, 135–152.

[310] It follows, then, that if the upcoming review of our Rate of return guideline were to change the term for the return on equity or the return on debt, it would be necessary to reconsider if there should be a consequential change to the method for estimating expected inflation.