MONASH BUSINESS SCHOOL

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Dear Chair

CONSULTATION ON THE REGULATORY ESTIMATION OF INFLATIONARY EXPECTATIONS

Thank you for the opportunity to respond to the Australian Energy Regulator's discussion paper, *Regulatory treatment of inflation*, released in May for public consultation.

Even though the regulatory estimation of inflationary expectations is unlikely to capture the public imagination any time soon, the approach adopted by the AER is important in upholding consumer confidence in the regulatory framework.

The attached submission reframes the problem of estimating inflationary expectations as a problem about 'invited behaviours' rather than a problem about estimation methodologies. The behaviours observed under current regulatory arrangements can be avoided by making networks, rather than the AER, responsible for setting inflationary expectations in the regulatory model.

To avoid gaming by the networks, the submission proposes an incentive mechanism that could be included in the AER's models for calculating regulated revenue allowances. Importantly, the incentive mechanism involves no external thresholds or targets that would need to be set or policed by the AER. All the incentives and disciplines are internalised within the network.

Preliminary analysis confirms the incentive mechanism has the desired effect when it is included in a model of the AER's PTRM and CPI-X adjustment mechanism.

While I am on the Consumer Reference Group (CRG) recently established by the AER, the views expressed in this submission are mine and not those of the CRG or the Monash Business School.

Yours sincerely

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Submission on the regulatory estimation of inflationary expectation

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1. Introduction

One of the most peculiar aspects of the regulatory framework for network services must surely be its reliance on the regulator's estimates of inflationary expectations. Not its estimates of inflation, but its estimates of *expected* inflation. Not its own expectations of inflation, but its estimates of *other people's* expectations.

Other people's expectations of inflation is something the regulator cannot see and having estimated its value, it cannot prove. Despite this, the prices paid by consumers can be significantly influenced by the regulator's estimates of other people's inflationary expectations.

In the unlikely event that an energy customer took an interest in the regulatory framework, what might they be expected to conclude about a system that relies on the regulator reading other people's minds? What might this customer make of the seemingly endless cycle of reviews where regulators, networks, consultants and academics spend months (and small fortunes) debating the most accurate way to read other people's minds? What would the customer make of regulatory review processes in which they cannot effectively participate?

How would this customer know whether they could trust the regulator? After all, there is no objective way for this customer to confirm whether the regulator has estimated inflationary expectations in accordance with its statutory objective of promoting the long-term interests of consumers.

This is not to suggest that the regulator is not adhering to its statutory objective, it is merely highlighting the futile situation in which the regulator finds itself.

This paper responds to a discussion paper released by the Australian Energy Regulator (AER) on the regulatory treatment of inflation.[1]

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[1] Australian Energy Regulatory (2020) *Discussion paper. Regulatory treatment of inflation* (May)

The objective of this paper is to propose a mechanism which eliminates the need for the regulator to estimate the value of something that is neither observable nor verifiable. Consequently, it also removes the need and pressure for repeated and exclusive reviews into how the regulator makes its estimates of inflationary expectations.

The paper contends that by alleviating the regulator of this burden, consumer confidence in the regulatory framework can be enhanced.

Section 2 of this paper briefly outlines why a regulatory framework for revenue allowances is required. It provides context for the current review and proposes two guiding principles for any future reforms to the regulatory treatment of inflationary expectations. Namely, that (i) the regulatory framework produces outcomes that are free of bias, and (ii) the regulatory framework does not afford advantage to any of the parties to the framework.

Section 3 uses these guiding principles to reframe the problem of estimating inflationary expectations. It argues that constant regulatory reviews into the estimation of inflationary expectations enshrines a power imbalance at the core of the regulatory framework that benefits networks over consumers. Moreover, the paper argues that all things being equal, these reviews sap consumer confidence because they signal the futility of the regulator's efforts to estimate inflationary expectations. The section proposes that consumer confidence in the regulatory framework can be enhanced if networks, rather than the regulator, are made responsible for estimating inflationary expectations. After all, only networks know their expectations of future inflation. The section concludes by recognising that an effective incentive mechanism is required to ensure networks do not take advantage of the responsibility being handed to them.

Section 4 proposes an incentive mechanism that would accompany the transfer of responsibility to networks for estimating inflationary expectations. The mechanism is initially described in its general form, followed by some alternative specific formulations. Most importantly, the incentive mechanism involves no external thresholds or targets that would need to be set or policed by the regulator. All the incentives and disciplines are internalised within the network.

Section 5 concludes the paper by noting that the formulation for the incentive mechanism specified in this paper is less important than the idea that such a mechanism is possible.

Unfortunately, but for the sake of brevity, this paper proceeds on the assumption the reader has a working knowledge of the theoretical foundations of the regulatory framework as well as the various models applied by the regulator.

2. The context for the regulatory treatment of inflationary expectations

This section briefly outlines the rationale for regulating networks' revenue allowances as well as the dilemma and paradox this entails. Two guiding principles are proposed. The second principle represents an original contribution. It emphasises the role of conduct in determining consumer confidence in the regulatory framework. The importance of conduct is explored further in Appendix A.[2]

2.1 The unavoidable dilemma and paradox of regulation

In most parts of the economy, suppliers determine their own prices taking into account their costs and the demand for their goods and services. Exploitative pricing is constrained by consumers withdrawing their custom if prices exceeds the perceived value being delivered by the producer.

Networks are natural monopoly suppliers of an essential service. As natural monopolies, they face no threat from competitors. As providers of an essential service, they face a comparatively inelastic demand for their services. These conditions suggest that in the absence of any other constraints, networks will be tempted to charge extractive (or monopolistic) prices for their services.

Governments establish regulatory controls over prices in order to protect customers from these potentially exploitative practices. Doing so, creates an unavoidable **dilemma** for the regulator.

Regulators cannot directly observe or control the costs incurred by network service providers. Nor should they be given powers to do so. Granting a regulator control over a service providers' costs would entangle the regulator in the management of the network. This would confuse and destabilise lines of accountability for the outcomes experienced by consumers (and shareholders).

Regulators are thus encumbered by an unavoidable dilemma: They exercise control over prices without controlling costs.

In response to this unavoidable dilemma, regulators endeavour to model the assumed cost structure of a notionally efficient service provider. This notionally efficient service provider is used to benchmark network service providers' costs. It is argued this approach creates incentives for networks to outperform the regulator's benchmarks. In doing so, the networks keep their profits but they reveal more about their true costs to regulators, who can then update the design of, and inputs to, their regulatory models in the next regulatory period.[3]

The AER's regulatory framework consists of a number of models (discussed below). The current review into the treatment of inflationary expectations sits deep within the regulatory framework and is distant to the final energy prices observed by consumers.[4] Nonetheless, it can have a significant impact on prices.

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[2] **Appendix A** describes a thought experiment that puts the second guiding principles into perspective.

[3] Known as the 'revealed costs' model, this approach seeks to provide incentives for networks to drive the incurred costs towards the efficient cost of providing network services. While this is a noble objective, experience highlights the many pitfalls that have accompanied translating this theoretical objective into an administrable regulatory pricing framework.

[4] Network costs typically represent 30-50 per cent of the final energy prices paid by households and small businesses. Other elements include: wholesale energy costs, market costs, the costs of policy schemes, and retailers' costs and margins.

The regulatory framework consists of components that are neither intuitive nor readily understandable without prior knowledge of its theoretical underpinnings. While this is not necessarily a barrier to consumer participation, effective participation requires a time- and skills intensive commitment. History demonstrates this commitment represents an effectively insurmountable barrier to meaningful consumer participation in regulatory processes. Of course, the same cannot be said of network service providers who are well resourced and indeed, compensated for their participation in regulatory processes.

Outmatched in every regard, consumers' only recourse is to hold the regulator responsible for promoting, protecting and pursuing their interests. This represents a **paradox** for the regulator.

Because consumers cannot engage effectively in the reviews established by the regulator, they expect the regulator to represent their interests during those reviews. However, for the regulator to do this effectively, it must have knowledge about those interests. But to have knowledge of those interests, it must engage with consumers who cannot effectively engage with the regulator.

Nowhere is the paradox deeper than when it comes to the regulatory treatment of inflationary expectations given its remoteness from customers' day-to-day experiences.

2.2   Two guiding principles for enhancing consumer confidence

If consumers cannot be engaged on issues as abstruse as the estimation of inflationary expectations, then the regulator must be guided by first principles about how consumer confidence can be enhanced through the regulatory framework.

It seems self-evident that consumers will, at a minimum, be concerned about (i) the impact of a regulatory decisions on the service standards they experience and the prices they must pay, and (ii) the manner in which the parties conduct themselves during the course of a regulatory decision-making process. These two concerns can be reflected in the following guiding principles.

1. ***The framework is free of bias*** – The framework does not favour any party or group of parties at the expense of another party or group of parties to a regulatory decision

2. ***The framework does not afford advantage*** as a result of:

    - *special pleadings* – where a party or group of parties subject to the regulatory framework seek exceptional treatment for allegedly unique circumstances

    - *gaming* – where a party or group of parties seek to gain advantage by virtue of information they alone possess (i.e. the information asymmetry problem)

    - *undue influence* – where a party or group of parties are granted or obtain unmatched standing to influence the design or operation of the regulatory framework.

The first principle largely addresses matters of impact, while the second principle largely addresses standards of conduct. The second principle is concerned with whether the parties to a regulatory decision have the opportunity, *or are seen to* have the opportunity, to take advantage of the way in which inflationary expectations are estimated. In other words, it addresses the behaviours promoted by the regulatory framework.

3. Reframing of the problem of (and solution to) inflationary expectations

This section reflects on the current review of inflationary expectations initiated by the AER. It then proposes an alternative framing of the problems associated with estimating inflationary expectations. This opens the door to new thinking about how these problems might be avoided.

3.1 This review of inflationary expectations

This review into the treatment of inflationary expectations is taking place between two guardrails. The first guardrail consists of the theoretical foundations of regulatory pricing. This includes economic and financial concepts such as the Fisher Equation linking nominal and real rates of return through inflationary expectations. The second guardrail consists of the regulatory models applied by the regulator. These include the post-tax revenue model (PTRM), the roll forward model (RFM) and the CPI-X adjustment mechanism. Between the two guardrails lie various rules and conventions governing regulatory decision-making, including a commitment to open, transparent and inclusive processes.

Network service providers have raised concerns with the regulatory treatment of inflationary expectations. These concerns are not new. Nor are they unique to energy networks. For 20-30 years, economic regulators across Australia have reviewed and re-reviewed and re-reviewed again, the methodologies they apply when estimating inflationary expectations.

The AER's discussion paper identifies two strategies for dealing with the perennial problem of estimating inflationary expectations. The first strategy seeks to side-step the problem by adopting a revenue model which does not require an estimate of inflationary expectations. The discussion paper identifies two options under this strategy. These include replacing the current real rate of return (or Indexed RAB) approach with either a nominal rate of return (Unindexed RAB) approach, or a 'hybrid' approach. This paper does not address these options, largely because the decision to adopt one of these alternative approaches is likely to be inconclusive when judged against the advantages and disadvantages it bestows on different customers.

The second strategy considered in the AER's discussion paper involves choosing an alternative methodology for estimating inflationary expectations. Five well-known options are identified. These are: the so-called 'RBA-method' (currently in use), a glide path, the bond break-even approach, the swaps method, and a survey-based approach.

The two market-based methodologies (the bond break-even approach and the swaps method) may be well-grounded in theory, but they have been shown to be unreliable in practice. The other three approaches (the RBA-based method, glide paths and surveys) are relatively straightforward in practice, but they are not well-grounded in economic or financial theory.

These shortcomings highlight the problem caused by the framework's reliance on estimates of inflationary expectations – that is, expectations that cannot be observed by the regulator and estimates which are not objectively verifiable by the regulator or consumers.

This lack of observability and verifiability may help explain why the estimation of inflationary expectations has been subject to perennial review since the inception of economic regulation in Australia. The lack of verifiability appears to invite stakeholders to contest the regulator's approach. Of course, large and well-resourced stakeholders, who potentially benefit by many millions of

dollars, face immeasurably greater incentive and capacity to challenge the regulator than atomistic customers. This large power imbalance is embedded in the core of the regulatory framework. This power imbalance represents a *prima facie* shortcoming in the framework's design.

The discussion paper's alternative methodologies for estimating inflationary expectations are unlikely to allay these behavioural incentives on an enduring basis. Networks' preferred methodology for the regulator's estimation of inflationary expectations will change over time, in line with their short-term interests. This will invite future calls for more reviews into the regulator's estimation of inflationary expectations.

The principles described at the end of section 2 highlight the importance of designing the regulatory framework in a way that eliminates these types of behaviours.

3.2   Reframing the problem of inflationary expectations

Reframing the problem of estimating inflationary expectations as a problem about 'invited behaviours' rather than a problem about estimation methodologies, creates an opportunity to rethink one or both of the guardrails that presently bound the regulatory framework.

The AER's discussion paper does not appear to contemplate a profound re-examination of the theoretical constructs that guide the determination of regulated prices. This paper therefore only focuses on the question of whether the AER's regulatory models (the second guardrail) can be reconfigured to avoid the behavioural responses it currently invites.

This paper considers the most effective way of eliminating these invited behaviours is to alleviate the AER of the burden of estimating inflationary expectations. The obvious alternative involves transferring this responsibility to the regulated entities. They alone know their inflationary expectations so they alone should be responsible for determining the inflationary expectations that determine their regulated revenues.

Quite obviously, this leads to a secondary problem. Networks may not submit their true expectations of inflation if they consider alternative values would produce greater regulated revenues. Such behaviour would be a perfectly rational response by the networks, but consumers would rightly see it as a 'gaming of the regulator'. As the principles in section 2 highlight, consumers cannot be expected to feel confident about a regulatory framework that can be gamed so readily because of an information asymmetry between the networks and the regulator.

The solution to this problem requires identifying a mechanism where the benefits for networks are maximised if their submitted inflationary expectations represent their true expectations of inflation. In other words, the risks of making bids that are contrary to their true expectations are internalised within the calculation each network undertakes when deciding the value of the inflationary expectations it provides to the regulator.

Importantly, an efficient incentive mechanism would not rely on external thresholds or targets set or policed by the regulator. This means there would be no need for the regulator to estimate inflationary expectations or attempt to review the accuracy of a network's submitted values for expected inflation.

Handing responsibility for determining inflationary expectations to the networks would eliminate the behavioural incentive they currently face to seek ongoing review of the regulator's methodology for setting inflationary expectations. An effective incentive mechanism would ensure networks could not take advantage of the responsibility handed to them. If both these conditions can be satisfied, then consumers could feel more confident that the regulatory framework was operating in their long-term interests.

The following section describes an incentive mechanism which internalises the risks for networks of misrepresenting their expectations of inflation when providing this data to the regulator.

4. An alternative approach to the estimation of inflationary expectations

The previous section proposes transferring responsibility to networks for setting inflationary expectations when determining regulated revenue allowances, after all, only they know their expectations of future inflation. This requires an incentive mechanism to ensure networks 'bid' their true expectations of inflation rather than values that might meet other strategic objectives.

This section proposes an incentive mechanism that internalises for networks the risks of not bidding honestly when providing their inflationary expectations to the regulator. Most importantly, the incentive mechanism does not involve external thresholds or targets that need to be set or policed by the regulator. Under the incentive mechanism, no further action is required from the regulator regarding the estimation of inflationary expectations.

The following discussion initially describes the general proposition behind the proposed incentive mechanism and then its general form. Three specific options are then described. This is followed by a discussion regarding how such an incentive mechanism would be implemented.

4.1 The general proposition

The proposed incentive mechanism is predicated on the different information sets available to the networks at different points in time – namely, before (*ex ante*) and during the regulatory period. Whereas networks know the value of actual inflation (or 'out-turn' inflation) during the regulatory period, this information is not available *ex ante*. Networks must therefore form expectations of what they believe will be the future value of inflation.

Under the current regulatory framework, the only expression of networks' expectations of future inflation is through their behaviours in seeking to influence the choice of methodology used by the regulator to estimate inflationary expectations. Networks are motivated to influence the regulator's methodology because the methodology will affect their expected revenue allowances during the regulatory period. These are the revenue allowances they expect to be generated by the regulator's models. Or to be more precise, the net present value of that expected revenue.

The proposed incentive mechanism shifts the 'game' (as the term is used in game theory). Whereas the current framework promotes a game between networks and the regulator, the incentive mechanism shifts the game so that it lies within the network. This is achieved by handing responsibility for the setting of inflationary expectations to the networks. By doing so, the incentive mechanism effectively forces the *ex ante* network to play a cooperative game with its expected future self.

The 'pay-off' in this internalised game is the net present value of the revenue allowances the *ex ante* network can expect from the regulator.

Consumers and the regulator can never know the true value of a network's expectation of future inflation. They would only be able to observe the values (or 'bids') submitted by the network to the regulator. Consumers and the regulator would have no way to confirm whether the network is acting honestly when submitting these bids. A network might be motivated to submit 'dishonest' bids if it believes doing so would maximise its expected pay-off during the regulatory period. These higher returns would come at consumers' expense.

The proposed incentive mechanism overcomes the risk of strategic bidding by the networks by internalising the cost of any bids that do not align with a network's true expectations of inflation. As such, the incentive mechanism is designed to operate internally. Its operation cannot be observed externally (by consumers or the regulator) because the network's true expectations of inflation cannot be observed.

This means the role of the regulator is limited to creating and implementing the incentive mechanism. The regulator would have no further role in monitoring, reviewing or challenging the accuracy of the bids submitted by the networks.

The incentive mechanism's general form is presented below along with a description of its power to promote honest bidding by networks when submitting their bids of expected inflation.

4.2 The incentive mechanism's general form

Under the AER's current framework, the real WACC[5] is determined at the start of the regulatory period using the Fisher equation, a nominal WACC and the regulator's estimate of expected inflation. This paper treats the nominal WACC as exogenously determined. The incentive mechanism focusses exclusively on the role of inflationary expectations. Section 4.4 provides a fuller discussion about how the incentive mechanism would be integrated into the PTRM and CPI-X adjustment mechanism.

The proposed incentive mechanism would see the real WACC determined at the start of the regulatory period using the Fisher equation, a nominal WACC (determined by the regulator) and the network's submitted bid (B) of expected inflation – instead of the regulator's estimate of expected inflation. This arrangement is represented by Equation 1. In effect, this arrangement means that each network is free to bid its own real WACC for the duration of the regulatory period.

$$Real\ WACC\ bid = \frac{Nominal\ WACC_{t=0}}{B} \tag{1}$$

where:

$\textbf{Real WACC}$ **bid**   is the real WACC set for the duration of the regulatory period

$\textbf{Nominal WACC}_{t=0}$ is the nominal WACC observed at the start of the regulatory period

$\textbf{B}$ is the inflation bid submitted by the NSP (*ex ante*)

The proposed incentive mechanism would replace the AER's estimated value of inflationary expectations with a weighted measure of inflationary expectations in the PTRM. The weighted measure (W) is a function of the network's bid of inflationary expectations (B) and actual inflation each year (A). The weighted measure's general form is given by Equation 2.

[5] Weighted Average Cost of Capital (WACC).

$$W = \frac{B^2}{B + \left[\left(\frac{B-A}{B}\right)^2\right]^h} \tag{2}$$

where:

        A   = Actual or 'out turn' inflation (*ex post*)

        W   = Weighted measure of inflationary expectations (*ex post*)

        h   = Curvature parameter

        B   = is the inflation bid submitted by the NSP (*ex ante*)

The value of the weighted measure (W) is maximised when the network's bid (B) correctly predicts the value of out-turn inflation (that is, B = A). The curvature parameter (h) determines the extent to which the weighted measure differs from the network's bid of expected inflation. The lower the value of the curvature parameter, the more the weighted measure (W) will differ from the bid value when the network incorrectly anticipates the value of inflation (that is, B ≠ A). The effect of the curvature parameter is shown in Figure 1.[6]

Figure 1. The relationship between the curvature parameter (h) and the weighted measure (W)
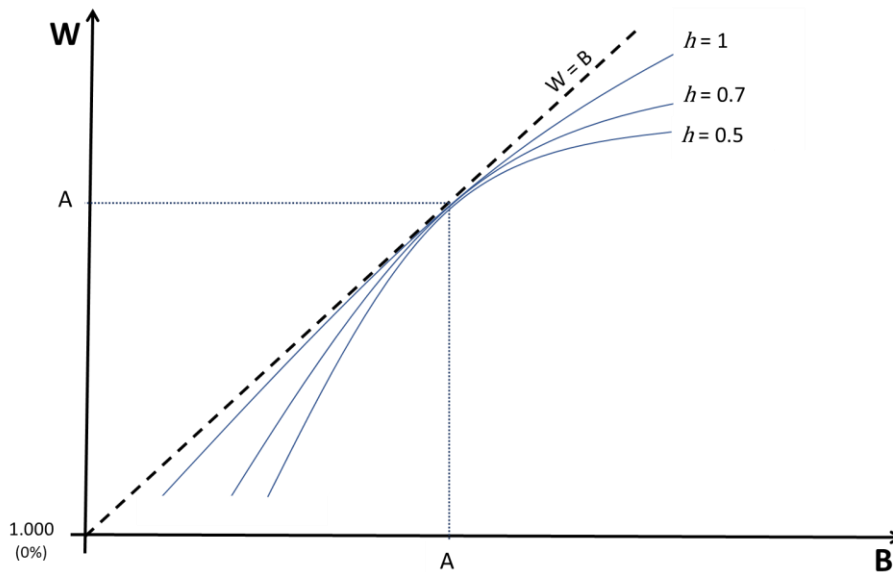
Some numerical examples are shown in Figures 2 and 3 using a curvature value of h = 0.7.

In Figure 2, the network bids a value for inflationary expectations of 2.0 per cent (B = 1.02). Actual inflation turns out to be 2.5 per cent (A = 1.025). Substituting these values into Equation 2 when h = 0.7 results in a weighted measure of 1.94 per cent (W = 1.0194). Under this scenario, the PTRM would index the value of the RAB by 1.94 per cent while the real WACC would be determined using the network's bid of 2.0 per cent for inflationary expectations, as per Equation 1.

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[6] **Appendix B** provides a table showing how the weighted measure (W) varies depending on the difference between a network's bid (B) and actual (A) inflation when the curvature value is set at h = 0.7

Figure 2. The value of the weighted measure (W) when B = 1.02 (2%) and A = 1.025 (2.5%)
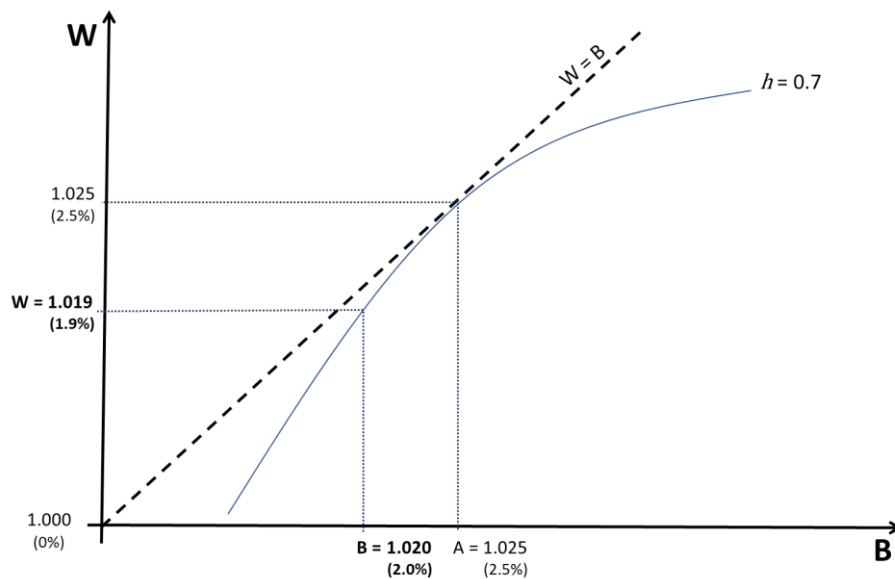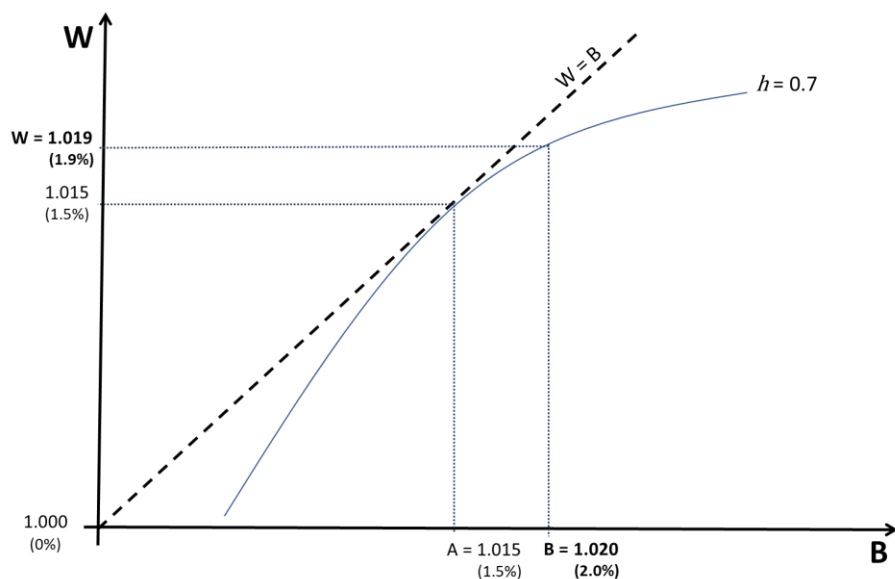

Figure 3. The value of the weighted measure (W) when B = 1.02 (2%) and A = 1.015 (1.5%)

In Figure 3, the network once again bids 2.0 per cent (B = 1.02) as its expectation of inflation, but in this case actual inflation turns out to be 1.5 per cent (A = 1.015). Under this scenario, the weighted measure has a value of 1.94 per cent (W = 1.0194) according to Equation 2. The real WACC would be determined using the network's bid of 2.0 per cent (B = 1.02) according to Equation 1.

The incentive mechanism leverages network's efforts to maximise their expected revenues out of the AER's models for determining their revenue allowances.

Because networks cannot observe actual inflation (A) as required by Equation 2 to calculate the weighted measure (W), they must use their expectation of future inflation (E) to calculate the *expected* value for the weighted measure (EW). In turn, their expected value for the weighted measure (EW) will determine their *expected* revenue allowance from the regulator. Their expected regulated revenue allowance is maximised when they bid honestly (B = E).

Equation 3 represents the *ex ante* version of Equation 2 that networks would use to calculate their expectations of the weighted measure (EW) and their expected regulatory revenue allowances (as discussed in section 4.4).

$$EW = \frac{B^2}{B + \left[\left(\frac{B-E}{B}\right)^2\right]^h} \tag{3}$$

where:

E = NSP's inflationary expectations (*ex ante*)

EW = NSP expectation of the weighted measure of inflation (*ex ante*)

Because the network cannot know the actual value of future inflation, its best strategy is to bid honestly (B = E) in order to maximise its *expected* revenue allowances from the regulator.

Most importantly, how a network determines its expectations of inflation (E) is of no consequence to the regulator or consumers. Whether the network chooses to mimic the AER's RBA-method, or whether it uses a glide path, the bond break-even approach, a swaps method or a survey-based approach – or even a dart board – is of no concern to the regulator. The regulator's role is limited to ensuring maximum transparency of its models for calculating regulated revenue allowances. This is discussed further in section 4.4.

4.3 Some specific forms for the incentive mechanism

Equation 2 describes the incentive mechanism in its general form. The following discussion describes three specific forms for the incentive mechanism. Other options may exist. Further modelling is required to identify the preferred approach.

Option 1

The first option is similar to the AER's current approach, but it substitutes the weighted measure in place of the AER's estimates of inflationary expectations in the PTRM. Ahead of the regulatory period, the network would submit its bids of annual inflationary expectations (B_t) for each year of the estimation period.[7] The geometric average value of these bids ($\overline{B}$) would be used to calculate the network's real WACC using Equation 4.

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[7] The estimation period refers to the outlook period over which inflation is estimated for the purposes of calculating the real WACC for the regulatory period. The AER currently applies a 10 year estimation period in line with its use of a 10 year nominal WACC. The estimation period is discussed further in section X.5.

The weighted measure (W_t) is calculated annually using the network's bid for that year (B_t), as shown in Equation 5.

$$Real\ WACC\ bid\ =\ \frac{Nominal\ WACC_{t=0}}{\overline{B}} \tag{4}$$

$$W_t\ =\ \frac{B_t^2}{B_t\ +\ \left[\left(\frac{B_t - A_t}{B_t}\right)^2\right]^h} \tag{5}$$

where:

$\overline{B}$ = geometric mean of the NSP's inflationary bids for the estimation period (*ex ante*)

B_t = NSP's inflation bid for year *t* (*ex ante*)

W_t = weighted measure of inflation in year *t* (*ex post*)

A_t = actual inflation in year *t* (*ex post*)

Option 2

This option would also require the network to submit its annual bids for inflationary expectations (B_t) for each year of the estimation period. As with the first option, the geometric average value of these bids ($\overline{B}$) would be used to determine the real WACC in lines with Equation 4.

Option 2 differs from the first option because instead of using the network's bids for each year (B_t) to calculate the weighted measure, it applies the geometric average of the network's bids ($\overline{B_t}$) *up to* the year in question. This arrangement is represented by Equation 6.

$$W_t\ =\ \frac{\overline{B_t}^2}{\overline{B_t}\ +\ \left[\left(\frac{\overline{B_t} - A_t}{\overline{B_t}}\right)^2\right]^h} \tag{6}$$

where:

$\overline{B_t}$ = geometric mean of the NSP's inflation bids up to year *t* (*ex ante*)

By using an annually updated geometric average of the network's bids ($\overline{B_t}$), increasingly less weight is placed on future year's annual bids – thus compensating for the increasing uncertainty associated with the network's expectations of inflation in later years.

Option 3

This option again requires the network to submit its annual bids for inflationary expectations (B_t) for each year of the estimation period. These bids are used to calculate the geometric average value of the bids ($\overline{B}$) used to determine the real WACC in line with Equation 4.

Like the second option, Option 3 applies an annually updated geometric average of the network's bids ($\overline{B_t}$), however, it also applies an annually updated geometric average of actual inflation ($\overline{A_t}$) when calculating the annual value of the weighted measure (W_t) to be applied in the PTRM each year. This formulation is shown in Equation 7.

$$W_t \;=\; \frac{\overline{B}_t^2}{\overline{B_t} \;+\; \left[\left(\dfrac{\overline{B_t} - \overline{A_t}}{\overline{B_t}}\right)^2\right]^h} \tag{7}$$

where:

$\overline{A_t}$ = Geometric mean of actual inflation up to year t (*ex post*)

Using an annually updated geometric average of the actual inflation ($\overline{A_t}$) as suggested in this option, dampens the impact on the weighted measure (W_t) of unpredicted volatility in the annual value of actual inflation (A_t).

4.4 Other changes to the regulatory framework

Under the proposed incentive mechanism, the weighted measure (W_t) would replace the AER's annual estimation of inflationary expectations when indexing the RAB in the PTRM. The geometric mean of the network's bids of inflationary expectations ($\overline{B}$) would replace the regulator's expectations of inflation in the calculation of the real WACC as shown by Equation 4. The annual revenue allowance generated from this revised PTRM model would continue to feed into the AER's CPI-X adjustment mechanism.

The 'X factor' in the CPI-X adjustment mechanism would continue to be set using the annual rate of change in the nominal revenue generated by the PTRM, but instead of discounting this ratio by the regulator's expectation of inflation, the ratio would be discounted by the network's bid of annual expected inflation (B_t).

The CPI part of the calculation of "CPI-X" would continue to use each year's actual (out-turn) rate of inflation (A_t).

The first year's calculation in the AER's CPI-X adjustment mechanism does not apply an X factor. Instead, it is determined by the nominal revenue generated by the PTRM adjusted by the ratio of the first year's actual inflation (A_t) to the AER's expectation of inflation for the first year. Under the proposed incentive mechanism, the nominal revenue generated by the PTRM in the first year would

be adjusted by the ratio of actual inflation (A_t) in the first year to the network's bid of expected of inflation (B_t) in the first year.

The RFM would continue to operate in the same way but it would be updating the value of the RAB to account for the difference between the weighted measure (W_t) and actual inflation (A_t) – recalling, under the proposed incentive mechanism, the RAB is indexed by the weighted measure (W_t) rather than the AER's estimates of expected inflation.

The above description explains how the AER's models would determine the regulated revenue allowance *ex post* – that is, after actual inflation (A_t) is known.

Sections 4.1 and 4.2 highlight how the incentive mechanism leverages networks' revenue maximising objectives *ex ante* when they do not yet know the value of future inflation, and when they are still relying on their expectations about the future.

When a network is seeking to calculate *ex ante* its expected revenue allowance from the AER, it cannot perform the calculations described so far in this sub-section because it does not yet know the value of actual inflation (A_t). Instead, it will need to substitute its expectation (E_t) of future inflation for actual inflation (A_t), and its expectation of the weighted measure (EW_t) for the weighted measure (W_t), in all of the above calculations.

Preliminary analysis confirms these *ex ante* substitutions, along with the proposed incentive mechanism, have the desired effect when they are included in a simplified model of the PTRM and CPI-X adjustment mechanism.[8] That is, the network will maximise the net present value of its expected revenue allowance by bidding honestly ($B_t = E_t$).

Appendix C demonstrates the difference between (1) the AER's current approach, (2) the *ex post* operation of the incentive mechanism as it would be applied by the AER, and (3) the network's *ex ante* expectation about the operation of the incentive mechanism. These differences are described in terms of the calculations that would be made under the PTRM, the CPI-X adjustment mechanism and the RFM.

4.5   Other considerations

The incentive mechanism proposed in this paper provides networks with the opportunity to submit their own real rates of return via their bids of inflationary expectations. This approach recognises that networks are better placed to identify market expectations of inflation than the regulator who is self-evidently not a market participant.

Under the proposed mechanism, networks would be guaranteed the use of their submitted real rate of return in the PTRM. Consumers would continue to bear inflation risk (as they always do in a real rate of return model). Whereas the current regime fixes the inflation risk carried by consumers at the actual (or out turn) rate of inflation minus 'X' each year, under the proposed mechanism the risk borne by consumers would be *up to* the annual rate of inflation minus 'X'. The final amount would depend on the accuracy of the networks' bids of expected inflation.

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[8] The simplified model is based on a single investment with a finite asset life. No additional capital expenditures are made during the life of the asset. The model does not include taxation or any operating expenditures during the life of the asset.

This means the proposed mechanism judges whether networks have bid honestly by comparing their *ex ante* bids to actual inflation outcomes *ex post* – after all, that is the only objective measure against which to gauge their bids (because their true expectations are never observable). This is a significant departure from the current approach which does not judge the accuracy of the regulator's expected inflation *ex ante* against actual inflation *ex post*. However, it is a less significant departure than it may appear.

Because networks know the incentive mechanism relies on the difference between their bids and actual inflation, they will take this into account when determining their bids. The mechanism is calibrated via the weighted measure so that the networks' *expected* returns are maximised when they equate their bids to their true expectations of inflation (which only they know).

Of course, actual (or out turn) inflation may prove to be different even from a bid based on the network's honest expectation of inflation. This can also happen under the current framework. Indeed, this entire review has been prompted because it *is* happening under the AER's current framework. In this regard, the proposed incentive mechanism provides networks with an important advantage when compared to current arrangements.

Networks can hedge against inflationary uncertainty, but under the AER's current model, the availability and cost of hedging instruments may limit the network's ability to hedge efficiently if the regulator sets inflationary expectations which are out of kilter with market expectations. By allowing networks to bid inflationary expectations into the model, they can be expected to bid at a rate that minimises their hedging costs. In other words, a network's bids of inflation will be disciplined by prevailing market expectations of inflation. The regulator faces no such discipline when setting its expectations of inflation in the current model.

In other words, by bidding truly, networks will not only maximise their expected returns from the revenue model, but they will also minimise their hedging costs against unexpected inflationary outcomes.

In addition, by extracting the regulator from the role of setting inflationary expectations, networks can focus their efforts where they belong – on efficiently delivering services valued by customers – rather than spending untold effort seeking to influence the regulator's methodology and decisions.

Under the proposed mechanism, the regulator and consumers should be indifferent to the methods used by the networks to arrive at their bids of expected inflation. That said, there still may be some concerns that networks are bidding strategically. To allay these concerns, networks could be required to publish their methodologies for determining their bids of inflationary expectations (at least in the early years of the incentive mechanism).

The proposed mechanism suggests the estimation period for inflationary expectations should be shortened to align with the five-year length of the regulatory period (irrespective of whether a 5 or 10 year nominal WACC is used). The reason for this a twofold. First, to obviate networks' likely concerns about the increasing uncertainty that accompanies long-term forecasting. Secondly, to prevent networks from manipulating the average value of their bids ($\overline{B}$) and consequently their real WACC, by over- or underestimating inflation in the out years (years 6 to 10) which would have no other consequences for their allowed revenue in this (or the next) regulatory period.

5. Conclusion

What would a casual observer make of the time and effort that goes into estimating the value of something that is neither observable nor measurable? What would this observer think about the ongoing cycle of reviews established to investigate how to estimate the value of something that is unmeasurable? And what would this observer think about the enormous advantage afforded to vested interests with much to gain from how this invisible quantum is estimated? Unfortunately, all these questions are germane to the AER's estimation of inflationary expectations.

Beyond the regulatory community consisting of regulators, regulated entities and consultants, none of this makes a great deal of sense.

When the aforementioned casual observer also happens to be an energy customer, they might also begin to wonder why their energy bills are made hostage to such abstruse arguments and exclusive processes. It would not be surprising if this hypothetical customer also began to wonder whether the regulatory framework was truly calibrated around their long-term interests, as required by legislation.

This paper is motivated by ending the futile and the confidence-sapping cycle of debates over how to correctly estimate unobservable inflationary expectations. It does this by acknowledging that only network service providers, as market participants, know their inflationary expectations when financing their investments. The paper therefore proposes that networks, rather than the regulator, should take responsibility for setting the value of the inflationary expectations used to determine their revenue allowances. Networks rather than the regulator would identify the inflationary expectations to be used in the regulator's revenue models.

Self-evidently, neither the regulator nor customers would be able to assess whether a network had honestly submitted its expectations of inflation. This is something only a network would know. Customers would be right to suspect that networks might seek to 'game' the regulator if they thought they could increase their revenues by claiming to have higher or lower expectations than they really held.

For this reason, this paper also proposes a mechanism that creates an incentive for networks to submit their true expectations of inflation. The incentive mechanism would require some changes to the various models used by the AER to determine networks' revenue allowances. The incentive mechanism would be included in the regulatory framework openly and with the full knowledge of the networks. Indeed, the mechanism only works if the revenue models are made fully transparent to the networks. The incentive mechanism leverages this transparency.

To be clear, the formulation for the incentive mechanism specified in this paper is less important than the idea that such a mechanism is possible.

The paper should be read in that light.

A useful thought experiment

As discussed in section 2, the absence of consumer participation in regulatory processes cannot be interpreted as lack of interest in the consequences of those processes. Likewise, the regulatory paradox described in section 2 does not mean that the long-term interests of consumers can be considered in isolation from their confidence in the regulatory framework.

Rather than asking how inflationary expectations might be estimated in a way that is consistent with the long-term interests of consumers, a more appropriate test involves a Rawlsian-like thought experiment. This thought experiment involves stepping into the shoes of a randomly selected customer. This hypothetical customer is provided with all the information and support they require to make informed observations about the regulatory treatment of inflationary expectations – including the review currently underway. What would this customer observe?

First, this hypothetical customer might be puzzled about why the regulator is trying to estimate how other people are thinking about the future (that is, how investors and markets view future inflation). It would seem odd that the regulator is engaging in mind-reading rather than just developing its own views about the future. Second, the hypothetical observer might be surprised to realise the extent to which the prices they pay depend on the regulator's estimates of other people's thoughts about the future. Third, and given what is at stake for the prices they must pay, the customer might begin to wonder how they can be confident that the regulator's estimates are right. Fourth, they are likely to be disappointed when they realise the regulator has no way of proving its estimates are right – meaning the regulator has no way of proving that the customer is paying a fair price for the network services they are consuming.

Turning their attention to the regulator's current review of the estimation of inflationary expectations, the customer might wonder why networks are afforded the opportunity to play such an assertive role. This hypothetical customer is likely to be surprised when they learn these reviews are quite regular events on the regulatory calendar. They are likely to be startled by the months and small fortunes regulators, networks, consultants and academics spend debating how the regulator ought to be reading other people's minds. When the customer is told that they are effectively paying for the parties' indulgences in these debates, their eyes are likely to moisten.

This imagined customer is likely to walk away with more doubts than assurances. These doubts probably won't be driven by the sincerity of the regulator's intentions. Doubts about the fairness of the regulatory framework will be driven by the observed behaviours it is seemingly promoting among the parties (namely, networks and the regulator).

Consumers' confidence that the regulatory framework is promoting their long-term interests can be expected to be enhanced by reforms that eliminate or diminish the behavioural incentives it has created– and therefore, the conduct these incentives have elicited.

Sometimes a thought experiment is the most helpful way of judging whether a regulatory framework is likely to promote consumer confidence – and therefore, the long-term interests of consumers.

Values for the Weight Measure (W) for different bids of inflationary expectations (B) and Actual rates of inflation (A) rates between 0 and 8 per cent when $h = 0.7$

		ACTUAL RATE (A)								
		1.00	**1.01**	**1.02**	**1.03**	**1.04**	**1.05**	**1.06**	**1.07**	**1.08**
		(0%)	(1%)	(2%)	(3%)	(4%)	(5%)	(6%)	(7%)	(8%)
	1.00	1.0000	0.9984	0.9958	0.9927	0.9891	0.9851	0.9809	0.9764	0.9717
	1.01	1.0084	1.0100	1.0084	1.0059	1.0028	0.9992	0.9953	0.9912	0.9867
	1.02	1.0159	1.0185	1.0200	1.0185	1.0159	1.0129	1.0094	1.0055	1.0014
	1.03	1.0230	1.0260	1.0285	1.0300	1.0285	1.0260	1.0230	1.0195	1.0157
BID RATE (B)	**1.04**	1.0297	1.0331	1.0361	1.0385	1.0400	1.0385	1.0361	1.0331	1.0297
	1.05	1.0361	1.0398	1.0432	1.0461	1.0485	1.0500	1.0485	1.0461	1.0432
	1.06	1.0424	1.0463	1.0499	1.0532	1.0562	1.0585	1.0600	1.0585	1.0562
	1.07	1.0485	1.0526	1.0565	1.0601	1.0633	1.0662	1.0686	1.0700	1.0686
	1.08	1.0545	1.0587	1.0628	1.0666	1.0702	1.0734	1.0763	1.0786	1.0800

Comparison of the AER's current model and the proposed incentive mechanism

The table below provides a comparison between the AER's current approach, the *ex post* operation of the incentive mechanism, and the network's *ex ante* expected operation of the incentive mechanism.

	AER's current model	Proposed model *ex post*	Proposed model *ex ante*
PTRM			
Real WACC determined by	Geometric average of AER's estimate of inflationary expectations	Geometric average of NSP's bid of inflationary expectations **(B)**	Geometric average of NSP's bid of inflationary expectations **(B)**
RAB indexed by	AER's estimate of annual expected inflation	The weighted measure **(W)**	The NSP's expectation of the weighted measure **(EW)**
The weighed measure determined by	—	NSP's bid of inflationary expectations and actual inflation **(B & A)**	NSP's bid of inflationary expectations and its expectation of inflation **(B & E)**
Return on investment calculated using the	AER's real WACC	NSP's bid real WACC	NSP's bid real WACC
fCPI-X adjustment mechanism			
X-factor calculated using	AER's expectation of inflation	NSP's bid of inflationary expectations **(B)**	NSP's bid of inflationary expectations **(B)**
Calculation of CPI-X using	Actual inflation	Actual inflation **(A)**	NSP's expected inflation **(E)**
First year's calculation in the CPI-X adjustment mechanism using the ratio between	The AER's expectation of inflation and actual inflation	NSP's bid of inflationary expectation and actual inflation **(B & A)**	NSP's bid of inflationary expectations and its expectation of inflation **(B & E)**
RFM			
Updating the RAB between regulatory periods to reflect the difference between	The AER's expectation of inflation and actual inflation	The weighted measure and actual inflation **(W & A)**	—

Preliminary analysis (of option 1) confirms the incentive mechanism has the desired effect when included in a simplified model of the PTRM and CPI-X adjustment mechanism as described in the following table.[9]

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[9] The simplified model is based on a single investment with a finite asset life. No additional capital expenditures are made during the life of the asset. The model does not include taxation or any operating expenditures during the life of the asset.