Economic meaning of gas legal instruments
Expert report

Victorian Gas Businesses

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1 Introduction and overview

1.1 Introduction

1.1.1 Terms of reference

I have been engaged by Johnson Winter and Slattery on behalf of the Victorian gas distributors and the owner of the main Victorian transmission network – SP Ausnet, Multinet, Envestra and APA – to prepare an expert report on the economic meaning of the National Gas Objective (NGO) and Revenue and Pricing Principles (RPP) as set out in the National Gas Law (NGL). As a complement to my economic interpretation, I am also to draw on extrinsic material that informed the development of the NGO and RPPs. The specific context of this advice is with respect to how those clauses apply to the determination of the rate of return on capital and the cost of equity as a component of this. The full terms of reference are at Attachment A.

Throughout this report, while I commence with a broad overview of the meaning and effect of the NGO and RPP, I focus particularly on the implications of these clauses for the determination of the rate of return on capital. I observe at the outset that the NGO and RPP have implications for many regulatory decisions beyond those that are the subject of this report.

1.1.2 Qualifications and compliance with the Expert Code

This report has been prepared by Jeff Balchin, Principal at PricewaterhouseCoopers. I have almost 20 years experience with the application of economic regulation to network businesses, having worked for policy makers, regulators, major customers and network owners across the gas, electricity and other infrastructure sectors in Australia and New Zealand. My full curriculum vitae is at Attachment B.

I have been assisted in the preparation of this report by Adam Rapoport.

I confirm that I have read, understood and complied with the Federal Court Expert Witness Guidelines.

1.1.3 Structure of the NGL and treatment in the report

I observe that the NGO and the RPP perform different but complementary roles in the gas regulatory regime. In particular:

- the NGO sets out the *outcomes* that are intended for the sector, which thereby form a guide for decisions made under the NGL, and
- the operation of the RPP is limited to the task of setting regulated prices (or setting rules to govern the setting of regulated prices) and is focussed upon the appropriate *mechanisms or techniques* for achieving these outcomes.

In this report I first set out my views upon the economic meaning of the NGO, and then draw inferences from this for the specific matter of determining the rate of return on capital. I then set out my views on the economic meaning of the RPP. I then conclude with the implications of this discussion for the determination of the return on capital.

1.1.4 Nomenclature adopted in this report

In this report, I distinguish between two separate concepts.

- The terms cost of equity and weighted average cost of capital are used to refer to the returns that investors require in order to invest in the equity finance of a particular asset, and the return required for all financiers combined (that is, averaged across the providers of equity and debt finance), respectively, in view of the returns available on substitute investments and relative risk. These values are market outcomes, being the equivalent of a price for investment capital, and are estimated from the available data.

- The rate of return on capital (and, as an input into this, the rate of return on equity), in contrast, are values that are determined by the AER and factored into the setting of regulated prices. One of the key issues addressed in this report is whether the rate of return on capital (and, as an input into this, the rate of return on equity) should be set at an estimate of the weighted average cost of capital (and cost of equity).

1.2 National Gas Objective

1.2.1 Reconciling the different components of the objective

The objective of the National Gas Law is:[1]

> ...to promote **efficient investment** in, and **efficient operation** and **use of,** natural gas services for the **long term interests of consumers** of natural gas **with respect to price, quality, safety, reliability and security of supply of natural gas**

The objective contains within it three separate components, namely:

- the requirement to promote economic efficiency;

- the reference to the long term interests of consumers; and

- the requirement that the above instruction be focussed upon the price, quality, safety reliability and security of supply of natural gas.

I observe at the outset that how the first two components of the objective are to be read together is not wholly unambiguous, whereas I consider the third to be clear (discussed below). Both the "promotion of economic efficiency" and pursuit of the "long term interests of consumers" could provide complete guidance for economic regulatory decisions, and so the effect of combining them may be susceptible to differing interpretations. There are at least two alternative ways in which these components of the objective could operate in combination.

- *Efficiency is presumed to further the long term interests of consumers* – the long term interests of consumers is the presumed outcome of actions that promote economic efficiency. The corollary of this is that there would be no need for the regulator to test explicitly whether a decision would promote the long term interests of consumers – satisfying the requirement to promote economic efficiency would be sufficient.

- *Pursue the simultaneous achievement of economic efficiency and the long term interests of consumers* – the regulator is required to pursue measures that promote the intersection of promoting economic efficiency and the long term interests of consumers. This would imply a requirement to focus on the promotion of economic efficiency (and not to pursue measures that reduce economic efficiency), but only to the extent that this simultaneously advances the long term interests of consumers.

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[1] National Gas Law, section 23.

The difference between these interpretations rests with how the regulator is required to treat transfers between classes of participants. A pure economic efficiency objective looks only at the aggregate benefit of all participants – consumers, generators, retailers and owners of network assets – whereas the pursuit of the long term interests of consumers, on its face at least, gives priority to the long term interests of consumers.

How these different requirements should be reconciled is principally a legal question. However, I note that the available extrinsic material, namely, the report of the Expert Panel on Energy Access Pricing[2] and the Second Reading Speech when the NGL was passed[3], suggest that the first of the interpretations summarised above was intended, which is that efficiency is the objective and the long term interests of customers is the presumed outcome of efficiency. A pure efficiency objective is also consistent with the test that is applied to assess the worth of transmission investments in electricity, which predates the current version of the National Electricity Objective (NEO, which is materially the same as the NGO) and that I assume informed the NEO/NGO.[4] I observe, however, that the panel reviewing the limited merit review regime recently expressed a preference for the second of these interpretations,[5] while the Productivity Commission expressed a preference for an interpretation that was most consistent with the first.[6]

Notwithstanding the potential for differences of view as summarised above, in my view these differences in interpretation are unlikely to prompt different regulatory decisions in practice in relation to setting regulated prices, and the appropriate regulatory rate of return as an input thereto, for the following reasons.[7]

- First, as discussed further below, the consumers' interests that the regulator is required to consider are the interests of consumers in the long term. The reference to the long term is an important addition[8] and directs a regulator to consider allowing prices to be higher than possible in the short term where there is a more than commensurate payoff for consumers in the long term, which is a central feature of modern regulation. As an example, this direction would accommodate a regime whereby firms are able to earn higher returns ("rents") in the short term where efficiency gains have been found – the short term rent being justified because it spurs the long term gain (the efficiency gain, such as a cost reduction). Equally, the requirement to focus on the long term would also require a regulator to trade off the benefits to customers from a lower regulatory rate of return – that is, to ask whether a lower rate of return (with commensurately lower prices) having the potential to increase the risk of future service provision and so create disproportionate costs for consumers.

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2 http://www.ret.gov.au/Documents/mce/_documents/CompleteFinalReportFINAL200604191620 32.pdf

3 http://www.ret.gov.au/Documents/mce/_documents/National_Gas_(South_Australia)_Bill_2008_Second_Reading20080411095722.pdf

4 This example also underscores the fact that the NGO (and NEO) apply more broadly than to setting regulated prices – such as to the setting of rules for the competitive parts of the market – and the 'producers' (as distinct from 'consumers') include producers/generators and retailers.

5 Yarrow, G., M. Egan and J. Tamblyn (LMR Panel), 2012, Review of the Limited Merits Review Regime – Stage Two Report, September, p.26. The LMR Panel has also recommended to governments to change the NGO/NEO to ensure that its interpretation is upheld (ibid, p.38).

6 The Productivity Commission also appeared to conclude that the objective would permit the interests of consumers to be pursed if this did not adversely affect efficiency (Productivity Commission, 2012, Electricity Network Regulatory Frameworks – Draft Report, p.126). This interpretation seems difficult to be sustained given the structure of the objective, although this is a legal question.

7 The Productivity Commission also observed that it considers the objective of efficiency to be not contrary to distributional goals (Productivity Commission, 2012, Op. Cit., p.126).

8 I observe that the LMR Panel also emphasises the importance of the qualifier "long term": LMR Panel, Op. Cit, p.26.

- Equally, an unqualified objective of economic efficiency provides a sound basis for a regulator to challenge prices with monopoly rents unless such rents are expected to encourage efficiency improvements or improve the certainty of service provision – that is, inviting the same considerations as a focus upon the long term interests of consumers. The important factor underpinning this conclusion is the established finding in the economics literature and of regulators that prices for utility services appreciably above competitive levels necessarily bring with them a loss of efficiency.[9,10]

I now address in more detail the economic meaning of the three components of the objective.

1.2.2 *Economic meaning of the National Gas Objective*

Economic efficiency

The first part of the objective is the promotion of efficiency and, more specifically, three specific aspects of economic efficiency.

In my view, this clause is a reference to the fairly standard concept of economic efficiency as understood by economists. It is common to distinguish three different dimensions to economic efficiency, which are as follows:

- *allocative efficiency* – which means the right amount of the right type of the good or service is produced and consumed, so that the economy's scarce resources cannot be reallocated in a manner that results in a higher valued bundle of outputs

- *productive efficiency* – which means that goods and services are produced at minimum cost, including that the least-cost combination of inputs (land, labour and capital) are employed

- *dynamic efficiency* – which means that allocative and productive efficiency continues to be achieved over time (often referred to as the continued achievement of static efficiency) as consumer tastes and technology changes, which includes both responding to external factors and applying effort to improve performance and innovate.

In my view, the objective makes direct or implicit reference to each of these dimensions to efficiency.

- Efficient use of, and efficient investment in, natural gas services are both achieved where there is allocative efficiency, so that the right amount of natural gas services are provided and consumed.

- Efficient investment in, and efficient operation of, natural gas services are both achieved where there is productive efficiency, so that outputs are provided at least cost including a cost minimising combination of capital and other inputs.

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9 The LMR Panel argued that an unqualified economic efficiency objective may not permit monopoly rents to be challenged if a regulated business is assumed to undertake perfect, or near perfect, price discrimination (LMR Panel, Op. Cit, p.26). In my view, the assumption of perfect price discrimination is so unrealistic that the potential that a regulator could not challenge rents could never arise in a regulatory setting, being only a theoretical and not practical possibility. The Productivity Commission also assumed virtually as a matter of course that prices containing "monopoly rent" would necessarily imply a loss of efficiency (Productivity Commission, 2012, Op. Cit., p.121).

10 Whether there is a net benefit from controlling these prices via regulation is a separate and empirical question, depending on, amongst other things, the size of the efficiency losses from monopoly pricing and the nature and size of potential regulatory failures.

- While not stated expressly, the fact that the NGO is intended to operate over time implies a concern for dynamic efficiency.

I observe that these different dimensions of efficiency may at times conflict. For example, a key tool of modern incentive regulation is to provide regulated businesses with the opportunity to earn a rent where this is achieved by an efficiency improvement, such as a cost reduction. Thus, (short term) allocative efficiency is compromised in order to enhance (longer term) dynamic efficiency. Accordingly, for such measures, both the short term and long term effects need to be considered, with a measure being preferred if the aggregate is positive (after allowing for the time value of money).[11]

I draw out additional lessons for the pricing of regulated services – and the regulatory rate of return – below.

For the long term interests of consumers

This term directs attention specifically to all of the dimensions of a consumer's interests, which include the benefit derived from the service, the price that is paid and related matters, like the risk of outages of differing magnitude.

As noted above, the most important element of the clause is the reference to the "long term" interests of consumers. This reference recognises that there are a number of instances where measures may be implemented that appear adverse to consumers in the short term, but are expected to deliver a benefit to consumers over the longer term that more than compensate for the short term cost. Some of the key examples of this include:

- providing financial incentives for cost reduction, whereby regulated businesses are able to earn a 'rent' from reducing costs for a period of time, which is expected to spur efforts for cost reduction and deliver a long term benefit to consumers
- where practicable, providing a reward for innovation, and
- ensuring that regulated prices are sufficiently high that continued provision of the service is possible

I interpret this clause as directing the regulator to favour decisions that advance consumers' long term interests over the short term in circumstances where the long term payoffs more than compensate for short term costs. I note that this need to consider short term and longer term outcomes is consistent with the instruction provided by the dynamic efficiency dimension of the objective that was discussed above.

With respect to price, quality, safety, reliability and security of supply of natural gas

In my view, this clause restricts the classes of benefit that may be considered under either the efficiency or consumer criteria to only those that relate directly to the provision and consumption of gas services, and to ignore possible external costs and benefits.

As an example, if the worth of a new gas transmission project was being considered, it would be valid to consider the construction cost of the project and the benefits (as relevant) from additional capacity and higher reliability and security of supply (all being directly related to the provision and consumption of natural gas services), but to ignore potential effects on

[11] The LMR Panel argued that balancing the impacts upon efficiency in the short term and long term "usually depends upon a value system beyond the notion of economic efficiency itself" (LMR Panel, Op. Cit., p.38). I disagree with this. All that is required is for the magnitude of the short term and long term impacts to be compared and adjusted for the time value of money or time preference of consumers using a suitable discount rate.

amenity values or the existence values of national parks (both being external costs or benefits).

In my view, this restriction on the classes of qualifying costs and benefits reflects a view that public policy decisions in relation to externalities are better managed separately to economic regulation. Any measures that a regulated business is required to comply with (such as the purchase of carbon permits) would become a cost of operation that would then be taken into account.[12]

Importance of "promote"

Lastly, I observe that the objective refers to the *promotion* of efficiency, rather than something more definitive, like the *achievement* of efficiency. I interpret this as recognition that economic regulation is a complex task, where material information shortcomings exist and hence, where perfection is unattainable.

I observe that in the presence of such constraints, the optimal form of regulation is likely to be different to what it would look like if such constraints did not exist. I discuss below that an outcome of modern incentive regulation is that regulated businesses are given the opportunities to earn rents if they improve production efficiency, a policy that is predicated on the information asymmetry between the regulator and regulated business. More relevant to the matters addressed in this report, in view of the uncertainty about the true cost of capital associated with regulated assets, a question exists as to whether a departure from the central estimate may be appropriate.

1.2.3 Implications of the NGO for the regulated rate of return

The context for applying the NGO is one where the regulator sets regulated charges with reference to the cost of provision, and where the rate of return on investment that is awarded by the regulator is a key input.

In my view, the outcomes required by the efficiency and consumer components of the NGO for the regulated rate of return are very similar:

- Requiring a rate of return that is consistent with ensuring continued service provision over the long term. A rate of return that is set too low would amount to an allocative inefficiency (as the provision of natural gas services would be withdrawn even though they are valued by consumers by more than other goods and services in the economy) and be detrimental to the long term interests of consumers (given that the service is valued by more than the cost). In the same vein, a rate of return that is set too high will dissuade use of natural gas services where that use was efficient and raise prices to consumers without the prospect of an offsetting benefit.

- Requiring a rate of return that is consistent with encouraging an optimal use of the various factor inputs. An outcome whereby the firm substituted away from capital in favour of other inputs (or away from other inputs towards capital) would raise the cost of provision, amounting to both productive inefficiency and higher prices to customers.[13]

- Encouraging consideration of the relative magnitudes of the likely loss – either in terms of loss of efficiency or loss of consumer benefit – from setting a rate of return

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[12] The Productivity Commission also opined that an economic efficiency objective may justify redistributive policies if the populace was found to have a willingness to pay for social equity (Productivity Commission, 2012, Op. Cit., p.124-126). In my view, the narrowing of the focus of efficiency discussed above would also preclude such an argument under the NGO/NEO.

[13] Albeit the extent to which such substitution can be achieved will be limited in the case of gas networks, given that they are inherently capital intensive.

that is too low compared to one that is too high. This could lead to a conclusion that the optimal return was one that was biased on one direction or the other.[14]

I observe that, if the NGO was the sole guidance for regulatory decision-making, that further inferences could be drawn for how the above outcomes could and should be achieved. However, as noted above, the Revenue and Pricing Principles (RPP) contained in the NGL provide detailed requirements on the mechanisms for meeting the outcomes sought by the NGO, including those specifically related to the regulatory rate of return. Accordingly, my observations of what the NGO means for these mechanisms are included in a discussion of the RPP, which is next.

1.3 Revenue and pricing principles

1.3.1 Context for the Revenue and Pricing Principles

Role of prices in a market economy and implications for regulated pricing

Important context for understanding the appropriate mechanisms for encouraging the outcomes of economic efficiency or consumer benefits as described above is the role that prices perform in a market economy like Australia. Prices (and competition) perform a key role in encouraging decentralised decision makers to make individual decisions that, in combination, are consistent with encouraging these desirable outcomes. For example:

- Consumers are free to choose what to consume (subject to budget constraints), and competition forces output prices to align with the (full) cost of production. These pressures encourage consumers to purchase only goods and services where they value that good or service greater than the societal cost of production.

- The impact of consumers' decisions on the output price also signals to producers the worth of supplying a particular good or service – if demand for a product is high and prices rise, then additional supply will be induced.

- The output price also determines the returns that firms are able to make from their investments – with a high output price motivating investment, and a low output price encouraging a reduction in supply and (for some firms) eventual exit from the industry. Similarly, the returns available from investment relative to the cost of other inputs will affect a firm's decisions about the choice between factor inputs.

The role of prices in unregulated sectors has important implications for how to set regulated prices. When making consumption decisions, consumers will compare the price of regulated gas services to alternatives they could spend their budgets on, the majority of which are from unregulated sectors. Similarly, investors will only invest in regulated businesses where the returns available are at least as good as in other sectors, the majority of which again are unregulated.

[14] I observe here that the calculations that, in principle, would be required on this matter would differ depending upon whether the objective was to promote economic efficiency or the long term interests of consumers. If the question was whether prices should be raised to reduce the probability of future loss of supply, then the cost of this measure would be the allocative efficiency loss (which is less than the detriment to consumers) and the benefit would be the expected increase in the sum of consumer and producer surplus from continued provision (which is greater than the benefit to consumers, which is just the consumer surplus). A priori, adding an insurance premium on prices would be likely to be more justified under an efficiency objective than under a consumer benefits objective. Having said that, it is questionable whether the calculation could ever be performed to a level of precision that would result in the two objectives giving different advice.

Link between regulatory rate of return and investment

An important question, however, is the link between the regulatory rate of return and the propensity for investment in the regulated industry.

As noted above, the regulatory regime that is assumed in the RPP and implemented in the NGR is one where the regulator determines a control over the prices of the relevant natural gas services with reference to the cost of provision, including an allowance for the rate of return on investment. However, an incremental unit of capital expenditure does not immediately and automatically deliver a return equal to the regulatory rate of return. Rather, in line with modern incentive-based approaches to economic regulation, the link between price and cost is broken for a period so that regulated businesses retain additional profits where they achieve certain efficiency gains, intended in turn to motivate such initiatives.

As discussed above, allowing a rent to accrue where it arises from the efforts of regulated businesses is consistent with the NGO, promoting both dynamic efficiency and the interests of consumers over the long term. In addition, these incentives to reduce cost are typically supported with complementary financial incentives with respect to service quality, as well as regulatory obligation applying to many aspects of performance, including safety.

In view of the above features in the regulatory regime, the following observations may be made about the link between the regulatory rate of return and investment.

- Where investment is mandated by obligations or even discretionary, a temporarily low rate of return (for example, as may occur if the cost of debt financing rises during a regulatory period) may not lead to a change in investment plans if there is an expectation that the next price review would restore the return to a reasonable level.

- However, a low rate of return that was expected to persist – which may arise where there was a loss of confidence that an anomalously low rate of return would be identified and corrected at the next review – would create a strong disincentive against investment, notwithstanding the existence of short term incentive measures. Discretionary projects would be put on hold. Moreover, such a return increases the difficulty of raising the investment funds required to undertake the activity and so threatens the regulated firms' capacity to continue to provide the service.

I elaborate on the process by which a low rate of return has a deleterious effect on investment and outcomes in Chapter 3 (3.1.2), but note that for the purpose of the discussion below that a low regulatory rate of return can be expected to have a deleterious impact on investment in regulated services and so adversely affect outcomes for consumers.

This distinction between a focus on using incentives to encourage efficiency enhancing behaviour while simultaneously creating an environment that is conducive to the long term financial sustainability of regulated businesses is reflected in the content of the RPP, to which I now turn.

1.3.2 Economic meaning of the Revenue and Pricing Principles

In view of the discussion above, it is convenient to change the order of discussion, and instead I focus first upon the principle that creates the short term incentives and then those directed to create the longer term incentive and capacity for investment.

Subsection 3) – Incentives

This clause directs the regulator to consider providing financial incentives to the regulated business, where practicable, to encourage improvements in the various dimensions to the efficiency of performance. The measures contemplated by this clause envisage the prospect of some allocative efficiency being sacrificed (that is, where the regulated business earns a rent where it is able to improve efficiency) in return for improvements in other dimensions of efficiency (for example, productive efficiency).

Subsection 2) – Opportunity to recover at least efficient cost

This clause emphasises the importance of ensuring that regulated businesses are able to recover costs (at least if efficiently incurred), so that regulated businesses are able to attract the capital required for investment over the long term. While this requirement is one that applies to all inputs in combination, it would be sufficient to direct the regulator to provide a regulatory rate of return at least equal to the returns that are available elsewhere for comparable investments, given the materiality of the regulatory rate of return for the total economic cost of service. However, I note that this is subject to separate guidance, discussed below.

The reference to "reasonable opportunity" is important to ensure consistency between the short term and long term objectives. In particular, this recognises that, under common forms of incentive regulation, the business must be exposed to the risk that actual returns will be below the cost of capital, particularly if performance is inefficient. However, the hurdle for cost recovery must be "reasonable".

The reference to the expectation of recovering "at least" efficient cost, in my view, is a direction that the regulator should have confidence that the regulated business is able to recover cost. This clause may also allow a margin of safety to be provided – this is the subject of separate guidance, and is discussed below. The clause can be further interpreted as suggesting that, at a minimum, the regulator should avoid erring on the downside when setting all allowances, including the rate of return. This would be consistent with consideration of the asymmetric costs of setting the rate of return too high versus too low. I discuss this further below.

Subsection 4) – Regard to asset values

This clause recognises the importance of certainty with respect to the investment value upon which the regulatory rate of return is allowed. The payoff to an investor from investment in a regulated gas asset is dependent upon both the rate of return that is earned, and the base to which the rate of return is allowed.

Subsection 5) – Return should be commensurate with the regulatory and commercial risks

I consider that this clause requires a return that is in line with returns that could be earned in alternative investments (including those in unregulated activities), adjusted for the different risks that are associated with the investments. The field of possibly relevant risk is drawn widely – including regulatory and commercial risk. However, the actual return would only embody an adjustment for risks to the extent that they would be seen as important or relevant by investors.[15] That said, the clause draws attention to the need to be mindful of risks that may be particular to regulated activities – like the potential for regulators to expose regulated businesses to the downside consequences of events that do not have an offsetting upside.

Subsections 6) and 7) – Departure from central estimates?

I interpret these two clauses as accepting that many of the inputs into regulated prices are uncertain and invite a case-by-case inquiry into the efficiency losses (evaluated against the NGO) from setting prices that are too high or too low. The implication is that if there was a greater efficiency loss if the error is in a certain direction, then a deliberate tilting in the other direction (or, alternatively, the inclusion of a "safety margin") would be justified.

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[15] That is, in line with standard finance theory, risk that can be eliminated at no cost by holding an asset as part of a diversified portfolio would not command an additional return.

While these clauses are drafted on the assumption that a case-by-case analysis is required rather than an a priori assumption adopted, I observe that the Commerce Commission in New Zealand and the Productivity Commission have both accepted that the losses from setting prices too low exceed the reverse case, and hence a positive safety margin to prices is justified. This essentially reflects the greater loss of efficiency (or consumer benefit) that would result from future non-supply than the loss of allocative efficiency (or consumer benefit) from prices exceeding cost (at the margin).

1.4 Implications of the NGO and RPPs for setting the regulatory rate of return

In my view the above interpretation has the following implications for setting the regulatory rate of return.

In my view, the guidance from the NGO for this task is that the regulated rate of return should be set with reference to an estimate of the "true" cost of capital, but with a consideration as to whether there may be a net benefit from varying from this starting point in view of the imprecision of the estimate and the potential losses from erring on the upside compared to the downside. I consider that the *efficiency* and *consumer* components of the clause provide materially the same guidance on this matter. I note the following in particular:

- If the regulatory rate of return is set below the true cost of capital, then the incentive and capacity for service provision over the long term would be imperilled. This would amount to an allocative inefficiency as the provision of natural gas services would be withdrawn even though they are valued by consumers by more than other goods and services in the economy. Equally, it would be detrimental to the long term interests of consumers given that they value service provision in excess of the cost.

- A low regulatory rate of return could also encourage firms to substitute away from capital in favour of labour and increase the overall cost of provision. This would amount to a productive inefficiency, and also raise the price paid by consumers over the long term.

- In contrast, a regulatory rate of return that is above the level required to provide the incentive and capacity for service provision over the long term would risk dissuading efficient use of the service, thus causing a loss of allocative efficiency. Similarly, it would create a cost to consumers with no offsetting benefit. In addition, a high regulatory return could also encourage an excessive use of capital as an input, creating productive inefficiency and higher prices than required to customers.

- Notwithstanding the above points, both the efficiency and consumer objectives would allow the regulator to recognise the inherent imprecision of estimates of the cost of capital. The objectives, in turn, would encourage consideration of whether the losses from setting the regulatory return too high or too low differ, and whether an optimal policy may be to adopt an estimate in a direction away from the central estimate. The form of analysis would be essentially the same across the efficiency and consumer objectives, although the "benefits" of higher or lower prices would differ.

Regarding the last of these matters – whether there should be a "tilting" of the rate of return away from the central estimate – I observe the following.

- The NGO and RPPs leave open the question of whether a rate of return above the central estimate should be adopted, delegating this decision to be made by the regulator. However, the requirement for a reasonable opportunity to "at least" recover efficient cost would preclude erring on the downside when setting the regulatory rate of return.

- In my view, it is an entirely reasonable proposition that the efficiency costs of setting the rate of return too low tend to outweigh those of setting it too high. This reflects the

fact that the value of the services provided by gas and electricity infrastructure is high, hence the consequences of non-supply are equally adverse. I also note that this presumption is consistent with the views of both the Commerce Commission in New Zealand and the Productivity Commission in Australia.

- In the current matter, I am aware that the AER's draft decision for the Victorian gas distributors included a regulatory rate of return that is very low compared to past regulatory decisions, caused principally by a very low estimate of the cost of equity compared to that in previous decisions for the Victorian gas distributors (whereas the cost of debt is only modestly below the allowance provided in past decisions and is not a major source of dispute). I am also aware that other expert evidence has been produced that has argued that the AER's estimate of cost of equity is implausibly low, and that (unlike in previous reviews of the reference tariffs for the Victorian gas distributors) the model applied by the AER to estimate the cost of equity has been the subject of serious challenge, rather than merely the appropriate inputs. In this environment of heightened uncertainty, in my view, the potential for "regulatory error" and the consequences that this may bring are of particular importance and should be a central concern for the AER.

2 National Gas Objective

The National Gas Objective is, by necessity, a legal entity, enshrined in legislation. Fundamentally, however, the objective is an economic construct: it is an expression of economic concepts, directed at economic phenomena, for an economic context. In this chapter, I provide an economic interpretation of the meaning and intended objective of the national gas objective, particularly as it relates to the cost of capital set by the regulator.

In this chapter, I also adduce and comment on relevant extrinsic material that was pivotal to the establishment of the objective. This material can shed further light on the meaning of and intention behind the objective. I have identified two pieces of extrinsic material – the Expert Panel report and the Second Reading speech for the National Gas Law.

I also draw attention to the AER's discussions in relation to the Regulatory Investment Test for Transmission.[16] This is because the Regulatory Investment Test requires the AER to be clear about which benefits are counted under the National Electricity Objective and which cannot, which is applicable to the National Gas Objective given that the objectives are virtually identical.

2.1 Components of the clause

The objective of the National Gas Law is:[17]

> ...to promote **efficient investment** in, and **efficient operation** and **use of,** natural gas services for the **long term interests of consumers** of natural gas **with respect to price, quality, safety, reliability and security of supply of natural gas**

Three separate components of the objective can be usefully distinguished, namely:

- the requirement to promote economic efficiency;
- the reference to the long term interests of consumers; and
- the requirement that the above instruction be focussed upon the price, quality, safety reliability and security of supply of natural gas.

I discuss the meaning of each of these components separately in turn below. However, I first make some comments on the objective as a whole, particularly in regards the interrelationship between these components, and what this implies for the interpretation of the objective.

2.1.1 Reconciling the different components of the objective

In my view, how the first two components of the objective are to be read together is not wholly unambiguous. Both the "promotion of economic efficiency" and pursuit of the "long term interests of consumers" could be used on their own and, had this been done, would provide complete guidance for economic regulatory decisions, which would also permit the regulator to make decisions that would be widely considered reasonable (this point is not accepted unanimously, and is discussed further below). However, the effect of combining the objectives may be susceptible to differing interpretations.

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16 http://www.aer.gov.au/sites/default/files/Final%20RIT-T%20-%2029%20June%202010.pdf

17 National Gas Law, section 23.

Drawing upon my own analysis and the discussions of others, there would appear to be at least two potential ways in which these objectives could operate in combination, which are that:

- *Efficiency is presumed to further the long term interests of consumers* – the long term interests of consumers is the presumed outcome of actions that promote economic efficiency. The corollary of this is that there would be no need for the regulator to test explicitly whether a decision would promote the long term interests of consumers – satisfying the requirement to promote economic efficiency would be sufficient

- *Pursue the economic efficiency but with a weighting toward the long term interests of consumers* – the regulator is required to pursue measures that promote the intersection of promoting economic efficiency and the long term interests of consumers. This would imply a requirement to focus on the promotion of economic efficiency (and not to pursue measures that reduce economic efficiency), but only to the extent that this is also consistent with advancing the long term interests of consumers.

The extent to which these objectives differ depends upon the extent to which a policy that advances economic efficiency may nevertheless be adverse to the long term interests of consumers. Pre-empting the discussion below, I acknowledge that at a theoretical level the objectives may give differing answers; however, at a practical level, in my view, both the objective of economic efficiency would require the regulator to pursue a broadly similar set of policies to which the regulator would be directed under an objective to pursue the long term interests of consumers. My reasoning for this is set out below.

Economic efficiency vs. long term interests of consumers – theoretical issues

I observe first that the fact that objective refers to the promotion of economic efficiency is not surprising.[18]. Economics (and economists) is concerned with economic efficiency not as an ideological fancy, but because it is the concept that encapsulates some of the central ideas of economics. Economics is, at its core, the study of the interrelationship between unlimited wants and scarce resources; the subject would not exist if wants were limited or resources were abundant. The central role of economic efficiency in the theory and practice of economics reflects the fact that the principal concern of economics is how to optimise the use of scarce resources in order to best meet unlimited consumer demands. That aim requires that the right amount of the right type of goods and services are produced and consumed, at least cost, with adaptation over time to continue to meet consumer demands – that is, economic efficiency. Departures from such an outcome, known as sub-optimal outcomes, lead to intangible but very real societal losses, known as deadweight loss. This loss represents all the utility (economic happiness) that could have been enjoyed but has been foregone, due to the inefficiencies resulting from prices diverging from costs, costs being unduly high, and/or firms not reacting to changing consumer demands over time. I define economic efficiency more precisely in the next section.

I also observe that it is not problematic that the objective refers to the economic efficiency being directed towards achieving a different end – efficiency is an abstract construct from economics, its usefulness is in providing prescriptions on how to achieve the well-being of the populace.

However, what creates ambiguity is the reference to the economic efficiency promoting the long term interests of *consumers*. This is not an outcome that follows necessarily from a theoretical consideration of economic efficiency. Rather, the beneficiaries that are identified

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[18] I observe, however, that despite the centrality of economic efficiency in economics, it is one of the three standard sets of objectives that are common for monopoly regulators – the three being the requirements to replicate the outcomes that would be observed in competitive markets, pursue the long term interests of consumers and to promote economic efficiency. The equivalent objective for the NZ regulator includes all three of these elements.

in the economics discipline are households, who are the consumers of the final goods and services produced in an economy, but are also the owners of all of the factors of production – that is, earners of labour income, rents from land and the profits obtained by the capital that firms employ. It is possible (in theory at least – see below) that households in their role as consumers may be disadvantaged by a policy, but nonetheless are better off (because the policy results in one or more of greater labour income, rents or dividends to the adversely affected households).

Faced with an argument that a policy maker should be specifically concerned with a policy that advantages firms (producers) over consumers, a reasonably standard response from economic principles would be to observe that:

- this concern is only a partial measure of the change in income distribution – what matters is to whom the benefits accrued to the producers ultimately accrue and even so to consider that matter within the broader context of the overall distribution of wealth, and

- in any event, pursuit of economic efficiency will provide a greater capacity for governments to pursue policies of redistribution – in effect, maximising the size of the "pie" that can then be distributed (and redistributed) in accordance with broader social equity objectives.

An implication of this analysis is that it would be misdirected to pursue advancing the interests of consumers' interests specifically, as policies of redistribution are better pursued at an aggregate level, focussing upon the complete position of each household or class of households. In addition, the analysis would suggest that it would be counterproductive to pursue the advancement of consumer interests if this led to a reduction in economic efficiency (as it would always be a better policy to grow the size of the pie so that there is more economic benefit to distribute).

I observe, however, that a more contemporary analysis of economic efficiency and utility pricing would lead to a softening of some of these observations.

- First, I would expect many to consider that a material increase in the price of utility services – and thereby a distribution away from consumers to producers – would be assumed to have adverse distributional consequences, in view of the importance of such services.

- Secondly, there is a recognition now that the act of redistributing wealth is not itself costless, but may itself have a material economic cost.

An implication from these observations is that policy makers may well be concerned to direct a regulator to avoid policies that have adverse distributional consequences for consumers of utility services, at least where economic efficiency was not advanced.

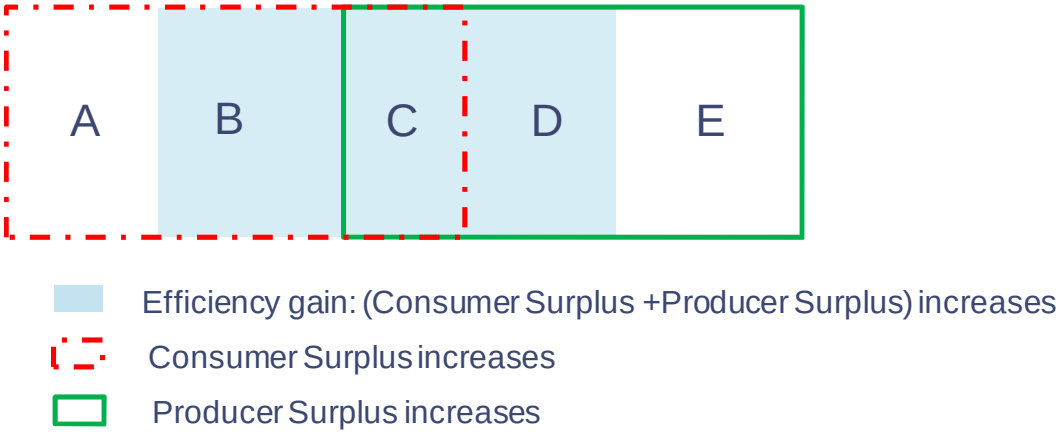
Economic efficiency vs. long term interests of consumers – in practice

Figure 1 below illustrates the potential outcomes for regulatory policies in terms of the impact on consumers and producers that flows from the discussion above. The terms used – consumer surplus and producer surplus – refer to their common use in economics, which is the difference between the value obtained and price paid for the good or service (consumer surplus), and the price received and cost of production (producer surplus). The figure depicts the following possible outcomes:

- A region where the interests of consumers and producers in combination are advanced – which means that efficiency improves (the blue shaded area).

- A region where the interests of consumers are advanced – illustrated as the red dashed box, and

- A region where the interests of producers are advanced – illustrated as the green box.



As illustrated:

- an efficiency objective would permit any measure to be adopted that fell in the blue box – including measures detrimental to consumer interests (Sector D)

- whereas a consumer focussed objective would permit any measure that is in the red hashed box to be adopted – including those that were detrimental to efficiency (Sector A) and would rule out measures in Sector D, and

- a requirement to pursue the intersection between economic efficiency and the interests of consumers would restrict measures to those in Sectors B and C, again, ruling out D but also ruling out A.

The important practical question when asking how the NGP should be interpreted, however, is whether there is a material likelihood that:

- policies that are implemented to promote economic efficiency would be detrimental to the long term interests of consumers – that is, does Sector D exist in a practical and meaningful sense, and

- policies that are implemented to advance the long term interests of consumers would be detrimental to economic efficiency – that is, does Sector A exist in a practical and meaningful sense.

In my view, the answer to both of these questions when considered in the context of a regulator setting regulated charges is “no”, meaning that each objective considered in isolation would direct the regulator to pursue broadly similar policies and approaches. This is based principally upon the following reasons.

First, an objective purely of economic efficiency would provide the regulator with a sound basis for challenging prices that contain monopoly rents. The important factor underpinning this conclusion is the established finding in the economics literature and of regulators that prices for utility services appreciably above competitive levels necessarily bring with them a loss of efficiency as prices that are set at a greater margin above marginal cost than necessary would dissuade usage that is nonetheless socially desirable (i.e., where the benefit to consumers exceeds the cost of provision). Equally, a pure economic efficiency objective would imply that it is desirable to allow a degree of rent to be earned – namely, where this encouraged greater cost efficiency or a change to the reliability of supply that was valued by consumers – are the same policies that would be pursued when the long term interests of consumers were considered.

Secondly, the consumers' interests that the regulator is required to consider are the interests of consumers in the *long term*. The reference to the long term is an important qualifier, reflecting the acknowledgement that consumers expect to be consuming gas services for an extended period and so value arrangements that will ensure continued service provision and the totality of outcomes over that time horizon. This focus, in turn, would in turn give rise to a number of implications for regulatory decisions, including that it is in consumers' interests:

- to allow suppliers to recover their costs – including to earn a reasonable return on investment – as this will affect the incentive and capacity for investment and hence continued service provision over future periods
- to allow rents to be earned where this arises from improvements in cost efficiency, as this will reduce prices in future periods compared to where they would have been
- to allow rents to be earned where this arises from investments that improve reliability more than it costs, as this will improve the net outcome for consumers in future periods, and
- to allow a consideration of whether it may be beneficial to provide a safety margin with respect to cost recovery in the short term in order to reduce the risk associated with the quality or continuity of future service provision.

I note that the first of my provisions above would appear not to be accepted universally. In particular, the Limited Merit Review Panel recently has observed that an economic efficiency objective may not permit monopoly rents to be challenged if a regulated business is assumed to undertake perfect price discrimination.[19] In contrast, however, a recent draft report by the Productivity Commission also assumed virtually as a matter of course, like myself, that prices containing "monopoly rent" would necessarily imply a loss of efficiency that an economic regulator with an efficiency objective could challenge.[20] Equally, the Commission observed (quoting from a previous speech of the chair of the Commission) that:[21]

> *promoting efficiency should not be seen as contrary to distributional goals*

I disagree with the views of the LMR Panel on this matter and agree with those of the Productivity Commission. In my view, the assumption of perfect price discrimination is so unrealistic that the potential that a regulator could not challenge rents could never arise in a regulatory setting, being only a theoretical and not practical possibility.

Implications of the theoretical and practical issues for the interpretation of the NGO

The conclusions that I would draw from the discussion above is as follows.

First, there is no ambiguity or absurdity as a practical matter from interpreting the long term interests of consumers as the presumed outcome of the pursuit of economic efficiency, as the first of the interpretations set out above would imply. This is because it indeed would have been a valid assumption on the part of policy makers that the strict pursuit of economic efficiency would have been synchronous with the advancement of consumers' interests provided that a long term perspective is taken.

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19 LMR Panel, Op. Cit, p.26.

20 Productivity Commission, 2012, Op. Cit., p.121.

21 Productivity Commission, 2012, Op. Cit., p.128.

Secondly, equally, an interpretation that required the regulator to pursue policies that simultaneously promote economic efficiency and consumers' interests would be unlikely to alter regulatory outcomes from what would emerge under a strict requirement to pursue economic efficiency.

Thirdly, as a practical matter, it is also difficult to see that material situations will emerge whereby there are a range of outcomes that are adjudged to be equal in terms of their implications for economic efficiency, so where consumer benefits could then be prioritised.

The question then arises as to which of the two interpretations of the NGO should be preferred. I note that how these different requirements should be reconciled is a legal question. However, I have reviewed the available extrinsic material, and observe that the first of the interpretations appears (a presumed outcome) would appear to be what was intended.

The key report to governments that the led to the adoption of the current objective for the gas and electricity regimes was the report of the Expert Panel on Energy Access Pricing[22]. The Expert Panel's view was that the objective is an economic concept, with economic efficiency as the core and primary focus, and noted that:[23]

> *[Quoting from the Second Reading Speech for the Bill that introduced the national electricity market objective] "…Investment in and use of electricity services will be efficient when services are supplied in the long run at least cost, resources including infrastructure are used to deliver the greatest possible benefit and there is innovation and investment in response to changes in consumer needs and productive opportunities."*
>
> *In short, the elements of productive, allocative and dynamic efficiency …are at the core of the objective. …*

One of the inputs into the Expert Panel's considerations was whether the then National Electricity Market Objective should be altered and/or applied to the gas sector. The Expert Panel observed as follows:[24]

> *The national electricity market objective expresses the long-term interests of consumers as a presumed outcome of the promotion of efficient investment in, and efficient use of, electricity services. Efficient investment in and use of electricity services is said to be <u>for</u> the long term interests of consumers. Hence, while long term consumer interest is the ultimate goal, the role of the NEL in achieving this is through the promotion of efficiency and not by other means (such as by measures directed at distributional impacts).*

The Expert Panel considered expressly whether the reference to consumers should be retained in the objective. It advised that its first preference would be not to include such a reference, but satisfied itself that the form of the inclusion that it ultimately proposed would not distract from the efficiency objective[25]:

> *…the Panel would, on a first principles analysis, question whether reference in the objective to the long term interests of consumers is helpful… it raises questions where changes may be efficiency enhancing but not directly advance consumer interests… Without explicit reference to a particular class of stakeholders, efficiency outcomes*

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[22] Available at http://www.ret.gov.au/Documents/mce/_documents/CompleteFinalReportFINAL200604191620 32.pdf

[23] Expert Panel on Energy Access Pricing, p. 36-37.

[24] Expert Panel on Energy Access Pricing, p. 34.

[25] Expert Panel on Energy Access Pricing, p. 37-38.

> *are implicitly for the benefit of the community generally, including consumer interests…*
>
> *Given that express reference to consumer interests is to be included, it is important that this not detract from the efficiency focus of the objective.*

In this regard, the Expert Panel also drew attention (as I have) to the importance of the reference to consumers being to their long term interests[26]:

> *long term perspective is to be taken with respect to consumer interests, and that a critical factor in such a long term perspective is the impact of decisions on investment in gas infrastructure services.*

In addition, I note that at the time that the NGO was developed, in the electricity sector the ACCC (prior to the creation of the AER) had been required to set out a test for assessing the economic worth of major transmission investments. This was then referred to as the Regulatory Test, although it has now been renamed the Regulatory Investment Test for Transmission. While this test was directed to a different end, as part of framing that test, the ACCC was required to consider explicitly how the measure benefits and whether a different weighting should be given to consumers than producers (in this case, typically referring to generators and retailers). In that matter, the ACCC decided explicitly that the sum of producer and consumer surplus should be pursued – that is, a sole focus on efficiency. The debate that gave rise to this test was current at the time the NGO was determined and I assume informed the wider debate on the latter.

As discussed above, the Limited Merit Review Panel has recently reached a different view on the construction of the objective, advocating for one that requires consumer interests and efficiency to be achieved simultaneously. For the reasons already set out, I view this as based upon an incorrect analysis of what an efficiency objective directs a regulator to consider.

I now address in more detail the economic meaning of the three components of the objective.

2.1.2 *Economic efficiency*

The first part of the objective is the promotion of efficiency and, more specifically, three specific aspects of economic efficiency. In my view, this clause is a reference to the fairly standard concept of economic efficiency as understood by economists.

Economic efficiency refers to an outcome, whereby society's scarce resources are used to maximise the well being of the citizenry. It is common to distinguish three different dimensions to economic efficiency, which are as follows:

- *allocative efficiency* – which means the right amount of the right type of the good or service is produced and consumed, so that the economy's scarce resources cannot be reallocated in a manner that results in a higher valued bundle of outputs

- *productive efficiency* – which means that goods and services are produced at minimum cost, including that the least-cost combination of inputs (land, labour and capital) are employed

- *dynamic efficiency* – which means that allocative and productive efficiency continues to be achieved over time (often referred to as the continued achievement of static efficiency) as consumer tastes and technology changes, which includes both responding to external factors and applying effort to improve performance and innovate.

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[26] Expert Panel on Energy Access Pricing, p. 40.

In my view, the NGO makes direct or implicit reference to each of these dimensions to efficiency.

- Efficient use of, and efficient investment in, natural gas services are both achieved where there is allocative efficiency, so that the right amount of natural gas services are provided and consumed.

- Efficient investment in, and efficient operation of, natural gas services are both achieved where there is productive efficiency, so that outputs are provided at least cost including a cost minimising combination of capital and other inputs.

- While not stated expressly, the fact that the NGO is intended to operate over time implies a concern for dynamic efficiency.

I observe that these different dimensions of efficiency may at times conflict. For example, a key tool of modern incentive regulation is to provide regulated businesses with the opportunity to earn a rent where this is achieved by an improvement in service performance, such as a cost reduction. Thus, (short term) allocative efficiency is compromised in order to enhance (longer term) dynamic efficiency. Accordingly, for such measures, both the short term and long term effects need to be considered, with a measure being preferred if the aggregate is positive (after allowing for the time value of money).[27]

As discussed further in the next section, the role of prices in a market economy (and, related to this, the link between competition and efficiency) is important. The basic mechanism for how competition drives efficiency and the role of prices (in broad terms) is that:

- Competition forces firms to minimise the cost of production in order to outdo their competitors – thus achieving productive efficiency

- The same competition forces firms to set prices that reflect the cost they incur, and customers buy the sets of products that they value most – if customers do not value certain goods or services sufficiently, then those goods will not be bought, rates of return in producing the relevant good or service will fall and so production will fall or cease, and the resources will be directed to producing more valued goods and services – thus achieving the efficient allocation of resources, or allocative efficiency

- The same forces of competition force changes in response to taste and technology and for innovation – thus bringing about dynamic efficiency.

The discussion above directs attention to the important role that prices play in encouraging efficient outcomes in non-regulated markets. These implications are important for how prices are regulated – regulated prices must encourage consumers to make an efficient choice between consuming regulated and unregulated services, and also provide a return to investors that is commensurate with the returns that are available in other activities, the vast majority of which are unregulated.

I draw out some of the lessons for the pricing of regulated services – and the regulatory rate of return – below.

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[27] The LMR Panel argued that balancing the impacts upon efficiency in the short term and long term "usually depends upon a value system beyond the notion of economic efficiency itself" (LMR Panel, Op. Cit., p.38). I disagree with this. All that is required is for the magnitude of the short term and long term impacts to be compared and adjusted for the time value of money or time preference of consumers using a suitable discount rate.

2.1.3 For the long term interests of consumers

This term directs attention specifically to all of the dimensions of a consumer's interests, which include the benefit derived from the service, the price that is paid and related matters, like the risk of outages of differing magnitude.

As noted above, the most important element of the clause is the reference to the "long term" interests of consumers. This reference recognises that there are a number of instances where measures may be implemented that appear adverse to consumers in the short term, but are expected to deliver a benefit to consumers over the longer term that more than compensate for the short term cost. Some of the key examples of this include:

- providing financial incentives for cost reduction, whereby regulated businesses are able to earn a 'rent' from reducing costs for a period of time, which is expected to spur efforts for cost reduction and deliver a long term benefit to consumers
- where practicable, providing a reward for innovation, and
- most relevant to this report, considering the costs and benefits associated with getting key inputs into the regulated prices – such as the regulatory rate of return – incorrect, in view of the imprecision of such estimates.

I interpret this clause as directing the regulator to favour decisions that advance consumers' long term interests over the short term in circumstances where the long term payoffs more than compensate for short term costs.[28] I note that this is consistent with the dynamic efficiency dimension of the objective, which gives equal status to factors such as service quality and reliability to short term, static efficiency factors such as price at a point in time.

2.1.4 With respect to price, quality, safety, reliability and security of supply of natural gas

In my view, this clause restricts the classes of benefit that may be considered under either the efficiency or consumer criteria to only those that relate directly to the provision and consumption of gas services, and to ignore possible external costs and benefits.

As an example, if the worth of a new gas transmission project was being considered, it would be valid to consider the construction cost of the project and the benefits from additional capacity and possibly higher reliability and security of supply (all being directly related to the provision and consumption of natural gas services), but to ignore potential effects on amenity values or the existence values of national parks (both being external costs or benefits).

In my view, this restriction on the classes of qualifying costs and benefits reflects a view that public policy decisions in relation to externalities are better managed separately to economic regulation. Any measures that a regulated business is required to comply with (such as the purchase of carbon permits) would become a cost of operation that would then be taken into account.

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[28] The Productivity Commission appears live to the importance of this trade-off. As put more boldly by its Chairman, Gary Banks, "*While the Commission has found that [economic] regulation [of network infrastructure] appears warranted, it has signalled a need for greater legislative recognition — both in the application of regulation and the setting of terms and conditions — of the tradeoff between cheap services today and inadequate services tomorrow.*" The good, the bad and the ugly: economic perspectives on regulation in Australia, October 2003, Gary Banks, available at http://www.pc.gov.au/__data/assets/pdf_file/0009/7794/cs20031002.pdf

2.1.5 *Importance of "promote"*

Lastly, I observe that the objective refers to the *promotion* of efficiency, rather than something more definitive, like the *achievement* of efficiency. I interpret this as recognition that economic regulation is a complex task, where material information shortcomings exist and hence where perfection is unattainable.

I observe that in the presence of such constraints, the optimal form of regulation is likely to be different to what it would look like if such constraints did not exist. I discuss below that an outcome of modern incentive regulation is that regulated businesses are given the opportunities to earn rents if they improve production efficiency, a policy that is predicated on the information asymmetry between the regulator and regulated business. More relevant to the matters addressed in this report, in view of the uncertainty about the true cost of capital associated with regulated assets, a question exists as to whether a departure from the central estimate may be appropriate.

2.2 Implications of the NGO for the regulated rate of return

The context for applying the NGO is one where the regulator sets regulated charges with reference to the cost of provision, and where the rate of return on investment that is awarded by the regulator is a key input.

In my view, the outcomes required by the efficiency and consumer components of the NGO for the regulated rate of return are very similar:

- Requiring a rate of return that is consistent with ensuring continued service provision over the long term. The contrasting situation would amount to an allocative inefficiency (as the provision of natural gas services would be withdrawn even though they are valued by consumers by more than other goods and services in the economy) and be detrimental to the long term interests of consumers (given that the service is valued by more than the cost).

- Requiring a rate of return that is consistent with encouraging an optimal use of the various factor inputs. An outcome whereby the firm substituted away from capital in favour of other inputs (or away from other inputs towards capital) would raise the cost of provision, amounting to both productive inefficiency and higher prices to customers.

- Encouraging consideration of the relative magnitudes of the likely loss – either in terms of loss of efficiency or loss of consumer benefit – from setting a rate of return that is too low compared to one that is too high. This could lead to a conclusion that the optimal return was one that was biased on one direction or the other.[29]

I observe that if the NGO was the sole guidance for regulatory decision-making that further inferences could be drawn for how the above outcomes could and should be achieved. However, as noted above, the Revenue and Pricing Principles (RPP) contained in the NGL provide detailed requirements on the mechanisms for meeting the outcomes sought by the NGO, including those specifically related to the regulatory rate of return. Accordingly, my

[29] I observe here that the calculations that, in principle, would be required on this matter would differ depending upon whether the objective was to promote economic efficiency or the long term interests of consumers. If the question was whether prices should be raised to reduce the probability of future loss of supply, then the cost of this measure would be the allocative efficiency loss (which is less than the detriment to consumers) and the benefit would be the expected increase in the sum of consumer and producer surplus from continued provision (which is greater than the benefit to consumers, which is just the consumer surplus). As a general rule, adding an insurance premium on prices would be likely to be more justified under an efficiency objective than under a consumer benefits objective. Having said that, it is questionable whether the calculation could ever be performed to a level of precision that would result in the two objectives giving different advice.

observations of what the NGO means for these mechanisms are included in a discussion of the RPP, which is next.

3 Revenue and pricing principles

(2) *A service provider should be provided with a reasonable* ***opportunity to recover at least the efficient costs*** *the service provider incurs in—*
- (a) *providing reference services; and*
- (b) *complying with a regulatory obligation or requirement or making a regulatory payment.*

(3) *A service provider should be provided with effective incentives in order to promote economic efficiency with respect to reference services the service provider provides. The economic efficiency that should be promoted includes—*
- (a) *efficient investment in, or in connection with, a pipeline with which the service provider provides reference services; and*
- (b) *the efficient provision of pipeline services; and*
- (c) *the efficient use of the pipeline.*

(4) *Regard should be had to the capital base with respect to a pipeline adopted—*
- (a) *in any previous—*
  - (i) *full access arrangement decision; or*
  - (ii) *decision of a relevant Regulator under section 2 of the Gas Code;*
- (b) *in the Rules.*

(5) *A reference tariff should allow for a* ***return commensurate with the regulatory and commercial risks*** *involved in providing the reference service to which that tariff relates.*

(6) *Regard should be had to the* ***economic costs and risks of the potential for under and over investment*** *by a service provider in a pipeline with which the service provider provides pipeline services.*

(7) *Regard should be had to the* ***economic costs and risks of the potential for under and over utilisation of a pipeline*** *with which a service provider provides pipeline services.*

3.1 Context for the Revenue and Pricing Principles

3.1.1 Role of prices in a market economy

Important context for understanding the appropriate mechanisms for encouraging the outcomes of economic efficiency or consumer benefits as described above is the role that prices perform in a market economy like Australia. Prices (and competition) perform a key role in encouraging decentralised decision makers to make individual decisions that, in combination, are consistent with encouraging these desirable outcomes. For example:

- Consumers are free to choose what to consume (subject to budget constraints), and competition forces output prices to align with the (full) cost of production. These pressures encourage consumers to purchase only goods and services where they value that good or service greater than the societal cost of production.

- The impact of consumers' decisions on the output price also signals to producers the worth of supplying a particular good or service – if demand for a product is high and prices rise, then additional supply will be induced.

- The output price also determines the returns that firms are able to make from their investments – with a high output price motivating investment, and a low output price encouraging a reduction in supply and (for some firms) eventual exit from the industry. Similarly, the returns available from investment relative to the cost of other inputs will affect a firm's decisions about the choice between factor inputs.

3.1.2 Regulated pricing in the context of a market economy

Link between regulatory rate of return and investment

The role of prices in unregulated sectors has important implications for how to set regulated prices. When making consumption decisions, consumers will compare the price of regulated gas services to alternatives they could spend their budgets on, the majority of which are from unregulated sectors. Similarly, investors will only invest in regulated businesses where the returns available are at least as good as in other sectors, the majority of which again are unregulated.

An important question, however, is the link between the regulatory rate of return and the propensity for investment in the regulated industry. As noted above, the regulatory regime that is assumed in the RPP and implemented in the NGR is one where the regulator determines a control over the prices of the relevant natural gas services with reference to the cost of provision, including an allowance for the rate of return on investment. However, an incremental unit of capital expenditure does not immediately and automatically deliver a return equal to the regulatory rate of return. Rather, in line with modern incentive-based approaches to economic regulation, the link between price and cost is broken for a period so that regulated businesses retain additional profits where they achieve certain efficiency gains, intended in turn to motivate such initiatives.

As discussed above, allowing a rent to accrue where it arises from the efforts of regulated businesses is consistent with the NGO, promoting both dynamic efficiency and the interests of consumers over the long term. In addition, these incentives to reduce cost are typically supported with complementary financial incentives with respect to service quality, as well as regulatory obligations applying to many aspects of performance, including safety.

In view of the above features in the regulatory regime, the following observations may be made about the link between the regulatory rate of return and investment.

- Where investment is mandated by obligations or even discretionary, a temporarily low rate of return (for example, as may occur if the cost of debt financing rises during a regulatory period) may not lead to a change in investment plans if there is an expectation that the next price review would restore the return to a reasonable level. In this case, the temporarily low return would not affect the marginal return from investment.

- However, where a low rate of return was expected to persist into future regulatory periods, then a strong disincentive against investment would be created, notwithstanding the existence of short term incentive measures. The expectation that a low rate of return would persist may be created where there was a loss of confidence that an anomalously low rate of return would corrected at the next review – for example, in the case where the regulator did not believe that the low rate of return was anomalous and so was not expected to change this view in the future. The effect would be that discretionary projects would be put on hold. Moreover, such a return increase the difficulty for regulated firms raising the investment funds required to undertake the activity and so threaten their capacity to continue to provide the service.

I observe that the withdrawal of investment may not be immediate for those areas that are subject to strong regulatory obligations; however, even if the *willingness* for investment may be there, a persistently low return would affect the *capacity* for the firm to raise funds and also create the incentive for the minimum necessary actions for compliance and for corners

to cut. This dynamic is explained further below by showing how, in practical terms, a low rate of return would flow through into decisions and actions taken by the firm.

Practical response to a low regulated price

A regulated utility that is faced with a revenue constraint due to an adverse regulatory decision on the rate of return is subjected to a trade-off between several influences.

- On the one hand, noting that, in contrast to the product market, capital markets are competitive, investors in utilities are likely to be clienteles that value a relatively high and stable dividend yield. This reflects the fact that the average dividend yield of Australian regulated utilities is significantly higher than for the average ASX listed company; i.e. they are rightly seen as defensive yield stocks. Due to this, a reduction in the dividend payment by a listed utility company, resulting from lower allowable revenues, will be met with a much stronger negative price reaction than for the average industrial firm. Hence, utilities will endeavour not to cut dividends unless they absolutely must.

- On the other hand, regulated businesses may face a threat of licence revocation or commensurately large fines if service requirements are not met, and must also meet debt servicing requirements, which include the maintenance of minimum financial ratios.

Thus, the first influence goes in the direction of cutting cost (in order to maintain the dividend), whereas the second influence will tend to constrain the scope to cut costs.

The first response of the firm will be to cut expenditure wherever possible in order to meet dividend payments, which will include deferring any discretionary capital expenditure, or undertaking more cautious investment (for example, investing at suboptimal scale).

In addition, the reduction in revenue to the firm will put pressure on the credit rating of the firm. A credit ratings downgrade would mean that funding costs – i.e. the cost of debt capital – will rise – which will have a further negative impact on the cash flow available for dividends.[30] This rise in interest costs may be particularly extreme if the firm falls outside of the investment grade band.

But now dividends may need to be cut in order to preserve credit ratings and/or make available sufficient cash for the firm's activities. Given these imperatives, cutting dividends will be done. However, as discussed, this would cause material downward pressure on the firm's share price. The firm may also seek additional equity in order to improve credit metrics, but this would be resisted by current shareholders and cause further downward pressure on the share price. Pressure would be created for a change in management.

These pressures would translate into extreme pressure to cut costs, which would place commensurate pressure on the regulatory obligations to ensure service performance.

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[30] Recent analysis by Standard & Poor's on the impact of lower regulated rates of return for utilities on credit risks is instructive: "*Given the relatively high leverage of most rated entities in the sector, the pressure on the rated entities' finances would present a challenge for the sector unless proactive corrective action is taken to improve the finances. Overall, we see potential erosion in the credit quality of the rated network providers ... as a result of the proposed regulatory reforms. Overall, a ...lower [rate of return] will place pressure on the rated entities' financial risk profiles [FRPs]. As the AER is seeking to allow a DRP [debt risk premium] that reflects actual financing practices, the DRP allowance could fall. If this were to occur, we believe that the DRP allowance could fall to about 250 basis points. Such shrinkage would flow through to rated utilities' credit metrics. In particular, we expect the service providers' funds-from-operations (FFO) to interest and FFO to debt [ratios] to fall by an average of about 10 basis points and 50 basis points respectively … The quantum of the final impact may seem small in absolute terms. However, many service providers have thin headroom against our expectations for their ratings; thus, even a small reduction could worsen their FRPs* – Standard & Poor's Research, Australian Network Utilities: Draft Reforms Give Regulators More Flexibility, But Raise Credit Risks, October 2012

Functions like customer service and long term planning would be cut, and the business will experience a reduction in managerial and operational talent, as strong performers will not be able to achieve their potential within the firm.

The ultimate outcome of these forces is that, in an effort to maintain the share price, undue pressure would be brought to bear on costs. Regulatory imposed service standards would constrain the scope and scale of cost cutting, especially in the short term. However, over time, the pressure to cut costs would be irresistible. In particular, costs which are seen as more discretionary, such as expansion of capacity, would deferred or shelved. All of these factors would be to the long term detriment of service performance.

These pressures for costs to be reduced at all cost would increase the probability of major breakdowns in infrastructure or to hold-ups in investment where capacity is much-needed (for example, where there has been a surge in demand). As illustrated in Appendix A,[31] breakdowns in infrastructure or hold-ups in investment can give rise to substantial economic and social costs. By creating the conditions that increase the likelihood of such events occurring, a rate of return that is below the true cost of capital equally can be said to bring with it a substantial (expected) economic cost.[32]

3.2 Economic meaning of the Revenue and Pricing Principles

In view of the discussion above, it is convenient to change the order of discussion, and instead I focus first upon the principle that creates the short term incentives and then those directed to create the longer term incentive and capacity for investment.

Subsection 3) – Incentives

This clause directs the regulator to consider providing financial incentives to the regulated business, where practicable, to encourage improvements in the various dimensions to the efficiency of performance. The measures contemplated by this clause accommodate and envisage the prospect of trade-offs between the three dimensions of efficiency. As noted earlier, under various forms of incentive regulation, some allocative efficiency is sacrificed (that is, where the regulated business earns a rent where it is able to improve efficiency) in return for improvements in other dimensions of efficiency (for example, productive efficiency).

The Expert Panel highlighted that there is a trade-off between the promotion of allocative, productive and dynamic efficiency. It noted[33] that "*allocative efficiency is of no less importance"* although it noted that *"[its] relative significance ...remains an empirical issue*."

Subsection 2) – Opportunity to recover at least efficient cost

This clause emphasises the importance of ensuring that regulated businesses are able to recover costs (at least if efficiently incurred), so that regulated businesses are able to attract the capital required for investment over the long term. While this requirement is one that applies to all inputs in combination, it would be sufficient to direct the regulator to provide a regulatory rate of return at least equal to what is available elsewhere for comparable

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31 To be clear, I do not argue that a low regulatory rate of return caused any of the events that are summarised in Appendix A. The purpose of summarising these events is to indicate the potential economic and social costs from major infrastructure breakdowns or hold-ups in investment.

32 I use the term "(expected) economic cost" to refer to the change in the probability of event occurring multiplied by the consequences of that event.

33 Expert Panel on Energy Access Pricing, p. 111.

investments, given the materiality of the regulatory rate of return for the total economic cost of service. However, I note that this is subject to separate guidance, discussed below.

The reference to "reasonable opportunity" is important to ensure consistency between the short term and long term objectives. In particular, this recognises that, under common forms of incentive regulation, the business may be exposed to the risk that actual returns will be below the cost of capital, particularly if performance is inefficient. However, the hurdle for cost recovery must be "reasonable".

The reference to the expectation of recovering "at least" efficient cost, in my view, is a direction that the regulator should have confidence that the regulated business is able to recover cost. This clause may also allow a margin of safety to be provided – this is the subject of separate guidance, and is discussed below. The clause can be further interpreted as suggesting that, at a minimum, the regulator should avoid erring on the downside when setting all allowances, including the rate of return.

Consistent with this, the Expert Panel noted the importance of the expectation of cost recovery to both service levels and ongoing investment incentives, and in light of this it recommended that "an 'at least' threshold for efficient cost recovery" be explicitly incorporated in pricing guidance.[34] I view these statements by the Expert Panel as indicative of a view that the clause directs the regulator to provide a high level of confidence that the opportunity to recover efficient costs is allowed.

Of relevance to the idea that the "at least efficient costs" criterion applies to the cost of capital, the Expert Panel also noted that "*the concept of efficient costs incorporates an assessment of all relevant risks in a manner that is consistent with the nature and scope of risks that are incorporated into the measure of the rate of return to be applied.*"[35]

Subsection 4) – Regard to asset values

This clause recognises the importance of certainty with respect to the investment value upon which the regulatory rate of return is allowed. The payoff to an investor from investment in a regulated gas asset is dependent upon both the rate of return that is earned, and the base to which the rate of return is allowed.

The implication of this clause is that the regime would be steered towards one where regulated businesses would recover the cost of investments that had been undertaken (after the incentive schemes had run their course) rather than being compensated for some form of "notional" capital cost that could bring with it large risks that the entity is not properly compensated. While this clause is not directly relevant to the matters that are the focus of this report, it is indicative of an intention that there be a high level of confidence as to the expectation that capital costs would be recovered.

Subsection 5) – Return should be commensurate with the regulatory and commercial risks

I consider that this clause requires a return that is in line with returns that could be earned in alternative investments (including those in unregulated activities), adjusted for the different risks that are associated with the investments. The field of possibly relevant risk is drawn widely – including regulatory and commercial risk. However, the actual return would only embody an adjustment for risks to the extent that they would be seen as important or relevant by investors.[36] That said, the clause draws attention to the need to be mindful of

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34 Expert Panel on Energy Access Pricing, p. 110.

35 Expert Panel on Energy Access Pricing, p. 113.

36 That is, in line with standard finance theory, risk that can be eliminated at no cost by holding an asset as part of a diversified portfolio would not command an additional return.

risks that may be particular to regulated activities – like the potential for regulators to expose regulated businesses to the downside consequences of events that do not have an offsetting upside.

The Expert Panel supports my view on the importance of the cost of capital reflecting all relevant risks. Moreover, the Expert Panel acknowledges a range of regulatory risks, such as truncated regulatory returns, asymmetric risk from regulatory error, and systematic regulatory bias (towards consumers).[37]

I believe this recognition by the Expert Panel that regulatory risk is significant is consistent with my view that the clause recognises that the regulator itself forms a critical part of the risk matrix faced by the regulated business and that the regulator itself is fallible. The mechanistic application of a process for estimating the regulatory rate of return (such as applying the Capital Asset Pricing Model and taking central estimates) is liable to overlook the implications of any risk beyond commercial risk, namely that arising from the application and process of regulation. The clause explicitly opens the path for the regulator to be more holistic in its approach to the estimation of efficient costs, including to factor in the potential effect of its decision making and inherent shortcomings.

Regarding whether the RPPs imply erring on the upside in regulatory rate of return estimates, the Expert Panel's view on these risks is that it "is not clear that an upward bias in all regulatory rate of return outcomes …is the best means of dealing with these concerns."[38] That said, it is observed here that the Expert Panel was advising upon the guidance to be included in legislation – which would therefore be locked in place for an extended period of time – and not necessarily expressing a view as to how those clauses should be applied. It is noted that this issue is one upon which contrary views have been expressed by other independent and credentialed parties. I discuss this issue further below.

Subsections 6) and 7) – Departure from central estimates?

I interpret these two clauses as accepting that many of the inputs into regulated prices are uncertain and invite a case-by-case inquiry into the efficiency losses (evaluated against the NGO) from setting prices that are too high or too low. The implication is that if there was a greater efficiency loss if the error is in a certain direction, then a deliberate bias in the other direction (or, alternatively, the inclusion of a "safety margin") would be justified.

As already noted above, the Expert Panel did not consider that the legislation should incorporate a requirement for the regulator to err to the upside in WACC, emphasising the need for flexibility in addressing risk and the prospect of regulatory error:[39]

> *The Panel does not accept the proposition that the risks or costs of regulatory error are necessarily or predominately asymmetrical thereby requiring a presumption in favour of over-compensating a service provider in order to encourage new investment outcomes.*
>
> *The Panel does not consider that, even if it was considered that regulatory error in a particular situation or generally would involve asymmetric consequences, systematically increasing returns across all regulatory decisions is the most appropriate remedy. Rather, given the different forms of regulatory error that may be made, the appropriate response is to address the problem as close as possible to its source.*

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37 Expert Panel on Energy Access Pricing, p. 77-78.

38 Expert Panel on Energy Access Pricing, p. 78.

39 Expert Panel on Energy Access Pricing, p. 112.

I observe, however, that both the Commerce Commission in New Zealand (NZCC) and the Productivity Commission have accepted that the potential losses from setting a regulatory rate of return that is below the cost of capital exceed the cost from setting a return that is too high, and that it is therefore appropriate to incorporate a positive safety margin to the regulatory rate of return.

Turning first to the NZCC, it has given effect to its view that a safety margin be added to the regulatory rate of return in a reasonably sophisticated manner by deriving a statistical confidence interval for the true cost of capital, and deciding to use the 75th percentile estimate from this interval when setting regulated prices for the electricity and gas network businesses:[40]

> *Weighing the arguments, and having regard to the Part 4 Purpose, and in particular, that there are incentives for EDBs [Electricity Distribution Businesses], GPBs [Gas Pipeline Businesses], and Transpower [NZ electricity transmission network] to invest and innovate, the Commission adopts the 75th percentile estimate of the cost of capital as the cost of capital for price-quality regulation.*

Its reasoning is noteworthy in the present context: it accords a greater weight to dynamic efficiency considerations than to the benefit to consumers from removing all excessive profits.

> *Incentives for dynamic efficiency can have significant benefits for consumers over the long term, so it is important to preserve incentives to invest and innovate. Accordingly, this consideration has been given greater weight than limiting suppliers' ability to extract excessive profits.*
>
> *The Commission's choice over the precise percentile estimate of the WACC that is used for price-quality regulation is informed by a number of considerations:*
>
> — *the [relevant legislative objective] is to promote the long-term benefit of consumers, including ensuring suppliers of regulated services have incentives to invest and innovate (s.52A(1)(a)) and the potential long-term benefits to consumers from investment and innovation;*
>
> — *ensuring regulated suppliers are limited in their ability to extract excessive profits (s.52A(1)(d));*
>
> — *the risk that the true (but unobservable) WACC is above the estimated midpoint WACC*
>
> — *the risk that CAPM … may underestimate the returns on low beta stocks; and*
>
> — *the risk of error in estimating individual parameters of the [preferred model of CAPM]*

The Productivity Commission has examined the issue of the risks of over- and under-investment and utilisation and concluded that the cost of regulatory error was asymmetric in its impact.[41]

> *…the Commission accepts that there is a potential asymmetry in effects. Over-compensation may sometimes result in inefficiencies in the timing of new investment in essential infrastructure (with flow-ons to investment in related markets), and occasionally lead to inefficient investment to by-pass parts of a network. However, it will never preclude socially worthwhile investments from*

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[40] New Zealand Commerce Commission, Input Methodologies (Electricity distribution and gas pipeline services), Reasons Paper, December 2010, p.167-168.

[41] *Productivity Commission, Review of the National Access Regime,* 2001, p.83.

> *proceeding. On the other hand, if the truncation of balancing upside profits is expected to be substantial, major investments of considerable benefit to the community could be forgone, again with flow-on effects for investment in related markets.*
>
> *In the Commission's view, the latter is likely to be a worse outcome. Accordingly, it concurs with the argument that access regulators should be circumspect in their attempts to remove monopoly rents perceived to attach to successful infrastructure projects.*

I also note that both the NZCC and Productivity Commission conclude explicitly or implicitly that errors in the regulatory rate of return are of particular importance. This is not surprising given the link between the regulatory rate of return and incentives for investment, and the importance of investment in utility sectors.

In my view, it is an entirely reasonable proposition that the costs of setting the regulatory rate of return too low exceed the cost of setting it too high. This consistent with my discussion in the previous chapter that explained how a low regulatory rate of return would (through its negative effect on investment) be expected to create conditions that raise the likelihood of breakdowns in infrastructure of a hold-up in needed investment, which themselves could cause substantial cost. As a consequence, I consider it an entirely reasonable position that the clauses discussed above be applied as directing the regulator to build in a safety margin to the regulatory rate of return. I also consider that the clauses to be of particular relevance when the risk of error in the regulatory rate of return are especially large. I consider this to be the case at the present time, which I discuss in the next chapter.

4 The implications of the Objective and the RPPs for setting the regulatory cost of capital

4.1 Context for the current review – an unusually low regulatory rate of return

As discussed further below, a key question raised by the NGO and RPPs is whether they accommodate a policy where an estimate above the central estimate for the cost of capital is selected in view of the risk of getting that estimate incorrect. Before addressing this question, I believe it is pertinent to make some observations about the current context to the estimation of the cost of capital (and determination of the regulatory rate of return) and the manner in which the regulator is addressing the current unusual market circumstances. These are brief observations for context only – I understand that separate expert evidence on these matters will be provided.

In the current matter, I am aware that the AER's draft decision for the Victorian gas distributors included a regulatory rate of return that is very low compared to past regulatory decisions. I am also aware that this reduction was caused principally by a very low estimate of the cost of equity compared to that in previous decisions for the Victorian gas distributors, whereas the cost of debt is only modestly below the allowance provided in past decisions and is not, I understand, a source of dispute.

I am also aware that other expert evidence has been produced that has argued that the AER's estimate of the cost of equity is implausibly low, being the result of the current very low yield on Commonwealth Government bonds being used as the risk free rate of return in the Capital Asset Pricing Model. Unlike in previous reviews of the reference tariffs for the Victorian gas distributors, I understand that the model applied by the AER to estimate the cost of equity – namely the Capital Asset Pricing Model with a long term average market risk premium and spot estimate of the risk free rate – has been the subject of serious challenge, and rather than merely the appropriate inputs. From my own experience, I note that the issue of whether previously accepted methods remain appropriate currently is a debate that extends beyond regulation, and is currently a very live issue amongst firms that undertake commercial valuations.

In my view, the estimation of the cost of capital is subject to a much higher level of uncertainty at present than has been the case during previous reviews of reference tariffs for the Victorian gas distributors. In this environment of heightened uncertainty, in my view, the potential for "regulatory error" is particularly material. I discuss the implications of this below.

4.2 Implications of the NGO and RPPs for setting the regulatory rate of return

In my view the interpretation NGO and RPPs I provided in the previous chapters has the following implications for setting the regulatory rate of return.

In my view, the guidance from the NGO for this task is that the regulated rate of return should be set with reference to an estimate of the "true" cost of capital, but with a consideration as to whether there may be a net benefit from varying from this starting point in view of the imprecision of the estimate and the potential losses from erring on the upside compared to the downside. I consider that the *efficiency* and *consumer* components of the clause provide materially the same guidance on this matter. I note the following in particular:

- If the regulatory rate of return is set below the true cost of capital, then the incentive and capacity for service provision over the long term would be imperilled. This would amount to an allocative inefficiency as the provision of natural gas services would be withdrawn even though they are valued by consumers by more than other goods and services in the economy. Equally, it would be detrimental to the long term interests of consumers given that they value service provision in excess of the cost.

- A low regulatory rate of return could also encourage firms to substitute away from capital in favour of labour and increase the overall cost of provision. This would amount to a productive inefficiency, and also raise the price paid by consumers over the long term.

- In contrast, a regulatory rate of return that is above the level required to provide the incentive and capacity for service provision over the long term would risk dissuading efficient use of the service, thus causing a loss of allocative efficiency. Similarly, it would create a cost to consumers with no offsetting benefit. In addition, a high regulatory return could also encourage an excessive use of capital as an input, creating productive inefficiency and higher prices than required to customers.

- Notwithstanding the above points, both the efficiency and consumer objectives would allow the regulator to recognise the inherent imprecision of estimates of the cost of capital. The objectives, in turn, would encourage consideration of whether the losses from setting the regulatory return too high or too low differ, and whether an optimal policy may be to adopt an estimate in a direction away from the central estimate. The form of analysis would be essentially the same across the efficiency and consumer objectives, although the "benefits" of higher or lower prices would differ.

Regarding the last of these matters – whether there should be a "tilting" of the rate of return away from the central estimate – I observe the following.

- The NGO and RPPs leave open the question of whether a rate of return above the central estimate should be adopted, delegating this decision to be made by the regulator. However, the requirement for a reasonable opportunity to "at least" recover efficient cost would preclude erring on the downside when setting the regulatory rate of return.

- In my view, it is an entirely reasonable proposition that the efficiency costs of setting the rate of return too low tend to outweigh those of setting it too high. This reflects the fact that the value of the services provided by gas and electricity infrastructure is high, hence the consequences of non-supply are equally adverse. I also note that this presumption is consistent with the views of both the Commerce Commission in New Zealand and the Productivity Commission in Australia.

- In the current matter, I am aware that the AER's draft decision for the Victorian gas distributors included a regulatory rate of return that is very low compared to past regulatory decisions, caused principally by a very low estimate of the cost of equity compared to that in previous decisions for the Victorian gas distributors (whereas the cost of debt is only modestly below the allowance provided in past decisions and is not a major source of dispute). I am also aware that other expert evidence has been produced that has argued that the AER's estimate of cost of equity is implausibly low, and that (unlike in previous reviews of the reference tariffs for the Victorian gas distributors) the model applied by the AER to estimate the cost of equity has been the

subject of serious challenge, rather than merely the appropriate inputs. In this environment of heightened uncertainty, in my view, the potential for "regulatory error" and the consequences that this may bring are of particular importance and should be a central concern for the AER.

Appendix A Cases of infrastructure failure and their costs

In this Appendix, I summarise infrastructure failures across a range of sectors (electricity, gas, transport) and describe their consequential economic costs. For the avoidance of doubt, it is not stated or implied in the description of these events that a low regulatory rate of return was a key contributing factor or even a factor at all in these failures. The purpose of this Appendix is to illustrate the severity of the costs that can arise as a result of infrastructure failings, irrespective of their root cause. These basic insights are then used in the body of this report, which sets out the transmission mechanism for how an insufficient rate of return creates the conditions under which failings of these types – and hence the resulting costs – would be more likely to occur.

I have placed the infrastructure failure case studies into two broad categories:

- Breakdown of an existing piece of infrastructure
- Investment hold-up.

I believe this categorisation is useful, as it serves to highlight that a breakdown of existing infrastructure, while the more visible, is not the only form of infrastructure failure that can arise. As the examples below graphically show, an unduly protracted delay or deferral of investment can be equally or more damaging to the economy.

For each case study, I provide the following:

- A brief description of factual circumstances
- Publicly available qualitative and, where possible, quantitative economic impact/costs of these failings
- An outline of the purported reasons/drivers for these failures.

The general message from the case studies below is that failures of infrastructure, whether breakdowns or undue deferrals of augmentation, impose a material cost to the economy and society.

1 Infrastructure breakdowns

In this section, I present the following two case studies as examples of events involving a breakdown of existing infrastructure:

- The North American electricity outage of 2003
- The Italy/Switzerland blackouts of 28 September 2003

North America, electricity outage, 2003

In August 2003, a widespread outage occurred in Canada and dozens of cities in eastern United States. At the time it was the second most widespread blackout in history, and impacted an estimated 10 million people in Canada and 45 million in the US. Power in impacted areas was restored generally within two days, but parts of Ontario endured rolling

blackouts for over a week after the incident. The total average blackout duration was 18.2 hours.[42] However, restoration differed across state, industry and company. In hospitals, the average duration of the outage was 13.0 hours and at manufacturing industries it was 19.9 hours.

Impact

Within 3 minutes of the outage, 21 power plants shut down and the operations of trains, elevators and the normal flow of traffic were disrupted.[43] In several areas, sewage spills were rampant and water supply was halted due to the interruption of power to water and sewage pumps. This affected 4 million customers in Detroit alone, who had no water access for 4 days after the incident due to fears of water contamination. The outage contributed to 11 fatalities and mass panics (many people were throwing rotting food onto the streets and thousands were stuck in elevators and underground transport tunnels).

The U.S. Department of Energy published a total cost estimate of around $6 billion, which is the most cited estimate.[44] ICF Consulting estimated the total economic cost of the August 2003 blackout to be between $7 and $10 billion.[45] Anderson Economic Group estimated total cost to be in the range of $4.5 and $8.2 billion, with a mid-point of $6.4 billion. This calculates $4.2 billion in lost income, $15 to $100 million in extra costs to government agencies, $1 to $2 billion in costs to the impacted utilities, and between $380 and $940 million in costs related to lost or spoiled commodities.[46]

Cause

In its interim report on the incident, the New York Independent System Operator concluded that a 3,500 MW power surge (towards Ontario) affected the transmission grid – sending a wave of blackouts to surrounding cities, followed by a cascade of blackouts in cities initially unaffected.[47] The hot weather (over 31 °C) in much of the affected region played a role in the initial event due to increased energy demand. The power lines were consequently over heated due to higher currents.

The final report of the Task Force on the blackout confirmed that the incident could have been prevented. The underlying cause of the blackout was due to a long-standing institutional failure: prior to the blackout, standards and processes were inadequate. There was insufficient direction to industry members concerning preventive measures needed to ensure reliability, and the North American Electric Reliability Council, the organisation in charge of promoting reliability and adequacy of power transmission, did not have the authority to enforce compliance with the standards.[48]

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42 Toshio Ariu, 2003, "Impact of the 2003 North America Blackout on Commercial/Industrial Customers of Electric Power Companies", CRIEPI report Y0300.

43 CNN US, Major *Power Outage Hits New York, Other Large Cities*, http://articles.cnn.com/2003-08-14/us/power.outage_1_outage-power-plant-lightning-strike?_s=PM:US .

44 Electricity Consumers Resource Council (2004), *The Economic Impacts of the August 2003 Blackout*, http://www.elcon.org/Documents/EconomicImpactsOfAugust2003Blackout.pdf .

45 ICF Consulting, "The Economic Cost of the Blackout: An Issue Paper on the Northeastern Blackout, August 14, 2003." http://www.solarstorms.org/ICFBlackout2003.pdf .

46 Anderson, Patrick L. and Ilhan K, Geckil, "Northeast Blackout Likely to Reduce US Earnings by $6.4 Billion," AEG Working Paper 2003-2, August 19, 2003

47 NYISO (January 2004) *Interim Report on the August 14, 2003 Blackout*, http://www.hks.harvard.edu/hepg/Papers/NYISO.blackout.report.8.Jan.04.pdf .

48 U.S.-Canada Power System Outage Task Force (April 2004), *Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations*, https://reports.energy.gov/BlackoutFinal-Web.pdf .

Italy/Switzerland blackouts – 28 September 2003[49]

In September 2003, a severe power outage affected the whole of the Italian mainland and parts of Switzerland. The outage in Italy lasted 12 hours; however, given the existing transnational electricity system, the blackout also spread to Switzerland, where the Geneva Canton suffered a power outage for three hours. The blackout affected more than 56 million people for more than 48 hours.[50] While the immediate trigger was a fault in the Swiss transmission system, the consequences of such a failure rippled across international networks, affecting not only Italy and Switzerland, but also networks in France, Slovenia and Austria.[51]

Impact[52]

The blackout had wide and varying costs. 110 trains were cancelled and over 30,000 people were trapped on trains, with hundreds more stranded in the underground system. Significant knock-on effects were also felt across other infrastructure networks across Italy: e.g. the mobile phone system began to fail as receivers lost power and networks became overloaded. These flow on effects also affected large areas of the Internet, as UPS sources failed or ran run out of battery power.

Cause

The main causes of the 28 September 2003 blackouts have been linked to the unresolved conflict between the trading interests of the involved countries and the technical requirements of the existing transnational electricity system.[53]

2 Investment hold-up

The following examples in this section are situations where investment in capacity has been unduly deferred:

- *Dalrymple Bay coal terminal*: deferral of augmentation to the terminal, leading to queues of ships off of the Queensland coast and billions of dollars in lost coal sales
- *North Pipeline, Auckland*: significant capacity shortages

Dalrymple Bay coal terminal[54]

In order to meet booming demand for mineral and energy commodities, BBI,[55] the then owner of the Dalrymple Bay Terminal (DBCT), initiated plans for terminal augmentation to increase capacity to an estimated 68 metric tons by July 2007, and 80mt by September 2008. BBI started negotiations with port users in 2003, predicting an increase in loading rates to fund the planned expansion. BBI proposed a price increase from $2.08 to $2.77/tonne, while the port users rejected this and rather proposed a reduction to $1/tonne.

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49 http://news.bbc.co.uk/2/hi/3146136.stm

50 Johnson, C.W., "Analysing the Causes of the Italian and Swiss Blackout, 28 September 2003", Glasglow Accident Analysis Group, University of Glasgow

51 Cowie et al., "Impact of the 2003 Blackouts on Internet Communications, Renesys Corporation", 1 march 2004

52 http://www.boston.com/news/nation/articles/2003/09/29/massive_outage_darkens_italy/

53 Swiss Federal Office of Energy, "Report on the blackout in Italy on 28 September 2003", November 2003

54 http://adl.brs.gov.au/data/warehouse/pe_abare99001734/ac06_ExportInfrastructure.pdf

55 The owner of the Dalrymple Bay Terminal was previously Prime, and the changeover occurred during the years under discussion. For sake of consistency, the owner of DBCT will be referred to in this paper as BBI.

BBI stated that it would only undertake expansion if the costs could be recovered through an increased access price paid by the mining companies, while the mining companies, with regulatory arbitration as a backstop, believed that loading rates should decrease. A demurrage rate of $2m/day is approximately $1.15/tonne.[56] The mining companies opted to pay demurrage rather than the additional loading rates to fund DBCT's expansion. The regulator, the Queensland Competition Authority (QCA), had to step in at this point to mediate and determine terminal charges. After a process lasting two years, the QCA ruled that loading rates should be $1.56/tonne.

Impact

A ship queue started to form and DBCT had about 50 vessels anchored at any given time. There was a queue of up to 50 bulk carriers waiting for coal through DBCT. Although the normal waiting time for vessels to be loaded is between 3 and 5 days, the incident caused delays between 23 and 30 days.[57]

The average queue was 21 days – a cost of $2m per day to mining companies, or about $550m per annum.[58] Excluding any detention charges paid by offshore coal consumers and any flow on impact of the queue on freight rates, the costs of demurrage have been estimated to be as high as $600m.[59] One fifth of net demurrage at DBCT was incurred by the BHP Billiton Mitsubishi Alliance alone. With current prices, the foregone revenue in coal sales due to a 12 month delay in the planned expansion is approximately AUD$1,000 million.[60]

Furthermore, the DBCT bottleneck affected the investment incentives and decisions of stakeholders dependent on the port's facilities. For example, potential new mines in the Bowen Basin were delayed due to uncertainty of access to DBCT.[61] In the same paper, BHPBIO notes that coal producers had to turn away new sales from Asian markets and the overall competitiveness and reputation of the Australian coal industry was damaged, in terms of reliability in delivery time and volume. Coal producers had to use alternative coal terminals for exporting production that incurred considerably higher transportation costs.

Reasons

The problems with capacity at DBCT have been attributed to the simultaneous rapid increase in demand and a lengthy approvals process for and investment in necessary capacity expansion.[62] Since DBCT was declared under the Queensland Competition Authority Act 1997, the QCA was above to set an arbitrated price in the absence of commercial agreement by the parties. The expansion was delayed due to disagreements between the parties and then BBI and the QCA over key inputs into the price, and the process eventually took 22 months.[63] This flowed through to a delay in the physical investment as financing for the project was dependent on resolution of the regulated tariff in view of the magnitude of the investment ($850 million). By contrast, the Hay Point Coal Terminal, located beside DBCT,

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56 Everett, Sophia and Robinson, Ross (2007) "Supply chain inefficiencies: Regulation misdirected? An examination of Queensland's Dalrymple Bay Coal Terminal," *Public Infrastructure Bulletin*: Vol. 1: Iss. 6.

57 Australian Financial Review, "Long haul to solve export block", 11 April 2005.

58 Everett, Sophia and Robinson, Ross (2007) "Supply chain inefficiencies: Regulation misdirected? An examination of Queensland's Dalrymple Bay Coal Terminal," *Public Infrastructure Bulletin*: Vol. 1: Iss. 6.

59 DBCT Pty Ltd (April 2005) *Submission in support of authorisation for proposed queue management system at Dalrymple Bay Coal Terminal*; Australian Financial Review, "Long haul to solve export block", 11 April 2005; BHPBIO (2005) *Submission to the Council of Australian Governments: Review of National Competition Policy*

60 Queensland Government, *Submission in response the QCA's draft decision in relation to the Dalrymple Bay Coal Terminal Draft Access Undertaking*, 30 November 2004.

61 BHPBIO (2005) *Submission to the Council of Australian Governments: Review of National Competition Policy*

62 ABARE (2006) "Export Infrastructure and Progress", *Australian Commodities*: Vol. 13: No. 2.

63 Queensland Transport (2007) *Review of Current Port Competition and Regulation in Queensland - Discussion Paper*

is not subject to access regulation and its expansion proceeded without any regulatory impact.[64]

North Pipeline, Auckland

In mid-2009, Vector, the owner of New Zealand's North Pipeline, advised the industry that it was unable to issue additional reserved capacity due to pipeline capacity constraints. After this announcement, large end users supplied by the pipeline noticed an increase in the amount of gas supply contracts offered by retailers which were conditional on obtaining transmission capacity.[65] The incumbent supplier could thus make an unconditional offer of supply, while other retailers could make an offer only subject to availability of transmission capacity. While the incumbent retailer retains this competitive advantage, the end user is effectively denied a choice of supplier.

Terms and conditions of access to Vector's North Pipeline are governed by the Vector Transmission Code (VTC), which allows retailers to reserve capacity according to grandfathering rights. The VTC access arrangements aimed to provide retailers with the possibility to enter into multi-year contracts with their end users. Due to the physical constraint of the pipeline, however, the unintended consequence of the VTC access arrangements was that the incumbent retailer receives a competitive advantage when contracts come up for renewal.[66]

The pipeline at peak times is operating at, or near, the limit of its physical capacity. New transmission capacity would alleviate the constraint; however, as of this year, pipeline owners have indicated that there is insufficient regulatory certainty to enable new investment.[67] Without change to access arrangements to the pipeline, the competition issue will remain until the pipeline becomes physically unconstrained.

Impact

The co-regulator of the New Zealand gas industry[68] concluded from the evidence that there was a statistically significant reduction in the level of competitive activity since the constraint was announced, which confirmed the opinions of end users that in the presence of a constraint, commercial arrangements are proving a barrier to competition. It found that competition had lessened for large gas end users, and estimated the deadweight losses arising from the reduced number of offers (lack of retail competition on the pipeline) to be between $1.4 million and $4.1 million annually.[69]

Reasons[70]

The reason for the reduction in competition has been attributed to the combination of insufficient physical capacity and the "grandfathering" of the rights to the capacity to the incumbent retailers.

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64 BHPBIO (2005) *Submission to the Council of Australian Governments: Review of National Competition Policy*

65 Panel of Expert Advisors (PEA) (a group appointed by Gas Industry Co) (2012), *Review of Transmission Access and Capacity Pricing : Advice from the Panel of Expert Advisers.*

66 Gas Industry Company Ltd (2010) *Retail Competition and Transmission Capacity: Statement of Proposal*. Available at http://gasindustry.co.nz/sites/default/files/u180/retail_competition_and_transmission_capacity_sop_submissions_analysis_final_155240.9_2.pdf

67 PEA (2012) *Review of Transmission Access and Capacity Pricing : Advice from the Panel of Expert Advisers*

68 The Gas Act empowers the co-regulator, Gas Industry Co, to propose regulation or pursue the objectives set out in the Gas Act and the Government Policy Statement on Gas Governance.

69 Gas Industry Company Ltd (2011), *Retail Competition and Transmission Capacity Statement of Proposal: Submissions Analysis and Next Steps.*

70 Gas Industry Company Ltd (2011), Retail Competition and Transmission Capacity Statement of Proposal: Submissions Analysis and Next Steps.

The insufficient physical capacity has been attributed (at least in part) to uncertainty in the New Zealand regulatory system. In particular, it has been noted that although utilities are allowed a reasonable rate of return on 'prudent investments', New Zealand has no established approach to determining what a 'prudent investment' in pipeline capacity would be, creating uncertainty for Vector. New Zealand's Gas Act provides for Gas Industry Co to recommend that regulations be introduced to require that new pipeline investment be made. However, as of 2011, there is still no related work in progress.[71] An additional reason for a delay in investment is that gas demand has been relatively stable, making investment in expansion difficult to justify. However, it has also been argued that it is likely that demand would grow if more capacity was available.[72] It has also been noted that under existing arrangements, prices to end users are confidential and individual retailers capture rents. Therefore, Vector has no visibility on a scarcity price signal to help inform an investment decision.[73]

3 Comments by the Expert Panel (2006)

The Expert Panel on Energy Access Pricing made some comments on infrastructure failures, which are worthy of note in this context:

> *The Panel has examined reports on recent failures of integrated infrastructure systems, such as the report on the blackouts in the north eastern part of the United States of America, the recent reliability issues from the Queensland electricity distributors as set out in the Somerville report, and a review of outages in the United Kingdom and elsewhere by a Committee of the UK House of Commons. The Panel notes that it is* ***beyond doubt that major infrastructure failures may give rise to large social losses****. It also notes that, while such failings inevitably are the* ***product of multiple causes*** *or events,* ***poor regulatory decisions can be a contributor****. However, the Panel also notes that the events described in the reports referred to above also demonstrate that regulatory error may take on many forms. By way of example:*
>
> - *the report into the US blackouts – which emphasised the importance of mandated standards for the planning and operation of transmission networks for interconnected systems, and the importance of regulators (in respect of regulated infrastructure) providing greater certainty that reliability expenditures will be recovered through prices;*
> - *the Somerville report – identified the inflexibility of the regulatory regime to deal with higher than forecast demand, including the selection of a revenue cap control on prices (rather than a price cap) and the treatment of customer contributions as revenue under the overall revenue cap (rather than a capital contribution that is not constrained by the revenue cap), as a contributor to low rates of renewal investment by the Queensland distributors; and*
> - *the UK House of Commons Committee report – identified the regulator's (Ofgem) policy of 'tightly limiting capital expenditure for replacement and continuing the pressure to reduce operational expenditure on maintenance' as a matter of concern, and identified the application to transmission of financial rewards for service provision (as it observed are applied already to distribution) as a useful means of focussing concern on the consequences of network failures.*

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71 Gas Industry Company Ltd (2011), *Retail Competition and Transmission Capacity Statement of Proposal: Submissions Analysis and Next Steps*

72 Gas Industry Company Ltd (2011), *Retail Competition and Transmission Capacity Statement of Proposal: Submissions Analysis and Next Steps*

73 Vector's Industry Presentation (September 2009), https://www.oatis.co.nz/Ngc.Oatis.UI.Web.Internet/Common/Publications.aspx.

Attachment A: Terms of Reference

The terms and conditions upon which each of the Gas Businesses provides access to their respective networks are subject to five yearly reviews by the AER.

The AER undertakes that review by considering the terms and conditions proposed by each of the Gas Businesses against criteria set out in the *National Gas Law* and *National Gas Rules*.

Rule 76 of the *National Gas Rules* provides that the Gas Businesses' total revenue for each regulatory year is to be determined using the building block approach, in which one of the building blocks is a return on the projected capital base for the year.

Rule 87(1) provides that the rate of return on capital is to be commensurate with prevailing conditions in the market for funds and the risks involved in providing reference services. Rule 87(2) provides that a well accepted approach incorporating the cost of equity and debt (such as the Weighted Average Cost of Capital (WACC)) is to be used along with a well accepted financial model (such as the Capital Asset Pricing Model (CAPM)) in determining the rate of return on capital.

Section 28 of the *National Gas Law* (Schedule to the *National Gas (South Australia) Act 2008* (SA) requires that the AER, in exercising its economic regulatory functions and powers, must perform or exercise that function or power in a manner that will or is likely to contribute to the achievement of the "national gas objective", and must take into account the "revenue and pricing principles" when exercising a discretion in relation to reference tariffs in an access arrangement.

The "national gas objective" is set out in section 23 of the National Gas Law, and the "revenue and pricing principles" in section 24.

The Gas Businesses are seeking expert assistance in respect of their proposed estimates of the cost of equity to be used in the calculation of the WACC (through the CAPM) and the approach of the AER in the recent Draft Decisions published for each of the Gas Businesses in September 2012.

In this context the Gas Businesses wish to engage you to prepare an expert report which:

a provides your expert opinion, as an economist, of the meaning and intended objective of the "national gas objective" set out in section 23 of the *National Gas Law* – i.e. to promote efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas – particularly in relation to the rate of return on capital and the cost of equity; and

b provides your expert opinion, as an economist, of the meaning and intended objective of the "revenue and pricing principles" set out in subsections (2), (5), (6) and (7) of section 24 of the *National Gas Law*, particularly in relation to the rate of return on capital and the cost of equity;

c considers any extrinsic material available in respect of the meaning and objective of sections 23 and 24(2), (5), (6) and (7) of the *National Gas Law*;

d considers the impact of regulatory rates of return that do not meet the NGO and RPPs.

Attachment B: Jeff Balchin CV

Jeff Balchin - Principal at PwC (Economics)

Summary of Experience

Jeff is an economist in the PwC Economics and Policy team. Jeff has almost 20 years of experience in relation to economic regulation issues across the electricity, gas and airports sectors in Australia and New Zealand and experience in relation to water, post and telecommunications. He has advised governments, regulators and major corporations on issues including the development of regulatory frameworks, regulatory price reviews, licensing and franchise bidding and market design. Jeff has also undertaken a number of expert witness assignments. His particular specialities have been on the application of finance principles to economic regulation, the design of tariff structures, the design of incentive compatible regulation and the drafting and economic interpretation of regulatory instruments.

In addition, Jeff has led a number of analytical assignments for firms to understand the responsiveness of consumers to changes to prices or other factors (like promotional activities) and to use this information to inform pricing strategy.

His experience is outlined below in more detail.

Qualifications

- B.Ec. (Hons.) at the University of Adelaide (First Class Honours)
- CEDA National Prize for Economic Development

Previous Experience

Prior joining PricewaterhouseCoopers, Jeff was a Director with the Allen Consulting Group and prior to becoming a consultant, Jeff held a number of policy positions in the Commonwealth Government.

- Commonwealth representative on the secretariat of the Gas Reform Task Force (1995 1996) - Played a lead role in the development of a National Code for third party access to gas transportation systems, with a particular focus on market regulation and pricing.
- Infrastructure, Resources and Environment Division, Department of the Prime Minister and Cabinet (1994-1995) - Played a key role in the creation of the Gas Reform Task Force (a body charged with implementing national gas reform that reports to the Heads of Government). During this time he also had responsibility for advising on primary industries, petroleum and mining industry issues, infrastructure issues, government business enterprise reform and privatisation issues.
- Structural Policy Division, Department of the Treasury (1992-94). Worked on environment policy issues in the lead up to the UN Conference on Environment and Development at Rio de Janeiro, as well as electricity and gas reform issues.

Experience – Economic Regulation of Price and Service:

Periodic Price Reviews – Major Roles for Regulators

- **ACT regulated retail electricity price review (Client: Independent Competition and Regulatory Commission, ACT, 2009)** – Directing a team that is developing a method to derive a benchmark cost of purchasing wholesale electricity for a retail business that is subject to a regulated price but exposed to competition.

- **South Australian default gas retail price review (Client: the Essential Services Commission, SA, 2007-2008)** - Directed a team that derived estimates of the benchmark operating costs for a gas retailer and the margin that should be allowed. This latter exercise included a bottom-up estimate of the financing costs incurred by a gas retail business.

- **South Australian default electricity retail price review (Client: the Essential Services Commission, SA, 2007)** -Directed a team that estimated the wholesale electricity purchase cost for the default electricity retail supplier in South Australia. The project involved the development of a model for deriving an optimal portfolio of hedging contracts for a prudent and efficient retailer, and the estimate of the expected cost incurred with that portfolio. Applying the principles of modern finance theory to resolve issues of how the compensation for certain risk should be quantified was also a central part of the project.

- **South Australian default gas retail price review (Client: the Essential Services Commission, SA, 2005)** - As part of a team, advised the regulator on the cost of purchasing gas transmission services for a prudent and efficient SA gas retailer, where the transmission options included the use of the Moomba Adelaide Pipeline and SEAGas Pipeline, connecting a number of gas production sources.

- **Victorian Gas Distribution Price Review (Client: the Essential Services Commission, Vic, 2006 2008)** - Provided advice to the Essential Service Commission in relation to its review of gas distribution access arrangements on the treatment of outsourcing arrangements, finance issues, incentive design and other economic issues.

- **Envestra Gas Distribution Price Review (Client: the Essential Services Commission, SA, 2006)** - Provided advice on several finance related issues (including 'return on assets' issues and the financial effect of Envestra's invoicing policy), and the treatment of major outsourcing contracts when setting regulated charges.

- **Victorian Electricity Distribution Price Review (Client: the Essential Services Commission, Vic, 2003 2005)** - Provided advice to the Essential Service Commission on a range is economic issues related to current review of electricity distribution charges, including issues related to finance, forecasting of expenditure and the design of incentive arrangements for productive efficiency and service delivery. Was a member of the Steering Committee advising on strategic regulatory issues.

- **Victorian Water Price Review (Client: the Essential Services Commission, Vic, 2003 2005)** - Provided advice to the Essential Services Commission on the issues associated with extending economic regulation to the various elements of the Victorian water sector. Was a member of the Steering Committee advising on strategic regulatory issues, and also provided advice on specific issues, most notably the determination of the initial regulatory values for the water businesses and the role of developer charges.

- **ETSA Electricity Distribution Price Review (Client: the Essential Services Commission, SA, 2002 2005)** - Provided advice on the 'return on assets' issues

associated with the review of ETSA's regulated distribution charges, including the preparation of consultation papers. The issues covered include the valuation of assets for regulatory purposes and cost of capital issues. Also engaged as a quality assurance adviser on other consultation papers produced as part of the price review.

- **Victorian Gas Distribution Price Review (Client: the Essential Services Commission, Vic, 2001 2002)** - Economic adviser to the Essential Services Commission during its assessment of the price caps and other terms and conditions of access for the three Victorian gas distributors. Was responsible for all issues associated with capital financing (including analysis of the cost of capital and assessment of risk generally, and asset valuation), and supervised the financial modelling and derivation of regulated charges. Also advised on a number of other issues, including the design of incentive arrangements, the form of regulation for extensions to unreticulated townships, and the principles for determining charges for new customers connecting to the system. Represented the Commission at numerous public forums during the course of the review, and was the principal author of the finance related and other relevant sections of the four consultation papers and the draft and final decisions.

- **ETSA Electricity Distribution Price Review (Client: the South Australian Independent Industry Regulator, 2000 2001)** - As part of a team, prepared a series of reports proposing a framework for the review. The particular focus was on the design of incentives to encourage cost reduction and service improvement, and how such incentives can assist the regulator to meet its statutory obligations. Currently retained to provide commentary on the consultation papers being produced by the regulator, including strategic or detailed advice as appropriate.

- **Dampier to Bunbury Natural Gas Pipeline Access Arrangement Review (Client: the Independent Gas Pipelines Access Regulator, WA, 2000 2002)** - Provided economic advice to the Office of the Independent Regulator during its continuing assessment of the regulated charges and other terms and conditions of access for the gas pipeline, including a review of all parts of the draft decision, with particular focus on the sections addressing the cost of capital (and assessment of risk generally), asset valuation and financial modelling. Represented the Office on these matters at a public forum, and provided strategic advice to the Independent Regulator on the draft decision.

- **Goldfield Gas Pipeline Access Arrangement Review (Client: the Independent Gas Pipelines Access Regulator, WA, 2000 2004)** - Provided economic advice to the Office of the Independent Regulator during its continuing assessment of the regulated charges and other terms and conditions of access for the gas pipeline, including a review of all parts of the draft decision, with particular focus on the sections addressing the cost of capital (and assessment of risk generally), asset valuation and financial modelling. Represented the Office on these matters at a public forum, and provided strategic advice to the Independent Regulator on the draft decision.

- **Victorian Electricity Distribution Price Review (Client: the Office of the Regulator General, Vic, 1999 2000)** - Economic adviser to the Office of the Regulator General during its review of the price caps for the five Victorian electricity distributors. Had responsibility for all issues associated with capital financing, including analysis of the cost of capital (and assessment of risk generally) and asset valuation, and supervised the financial modelling and derivation of regulated charges. Also advised on a range of other issues, including the design of incentive regulation for cost reduction and service improvement, and the principles for determining charges for new customers connecting to the system. Represented the Office at numerous public forums during the course of the review, and was principal author of the finance related sections of three consultation papers, and the finance related sections of the draft and final decision documents.

- **Victorian Ports Corporation and Channels Authority Price Review (Client: the Office of the Regulator General, Vic, 2000)** - Advised on the finance related issues (cost of capital and the assessment of risk generally, and asset valuation), financial modelling (and the derivation of regulated charges), and on the form of control set over prices. Principal author of the sections of the draft and final decision documents addressing the finance related and price control issues.

- **AlintaGas Gas Distribution Access Arrangement Review (Client: the Independent Gas Pipelines Access Regulator, WA, 1999 2000)** - Provided economic advice to the Office of the Independent Regulator during its assessment of the regulated charges and other terms and conditions of access for the gas pipeline. This advice included providing a report assessing the cost of capital associated with the regulated activities, overall review of all parts of the draft and final decisions, with particular focus on the sections addressing the cost of capital (and assessment of risk generally), asset valuation and financial modelling. Also provided strategic advice to the Independent Regulator on the draft and final decisions.

- **Parmelia Gas Pipeline Access Arrangement Review (Client: the Independent Gas Pipelines Access Regulator, WA, 1999 2000)** - Provided economic advice to the Office of the Independent Regulator during its assessment of the regulated charges and other terms and conditions of access for the gas pipeline, including a review of all parts of the draft and final decisions, with particular focus on the sections addressing the cost of capital (and assessment of risk generally), asset valuation and financial modelling. Also provided strategic advice to the Independent Regulator on the draft and final decisions.

- **Victorian Gas Distribution Price Review (Client: the Office of the Regulator General, Vic, 1998)** - Economic adviser to the Office of the Regulator General during its assessment of the price caps and other terms and conditions of access for the three Victorian gas distributors. Major issues addressed included the valuation of assets for regulatory purposes, cost of capital financing and financial modelling. Principal author of the draft and final decision documents.

Periodic and Other Price Reviews – Other Activities

- **Regulatory cost of debt (Clients: Powerlink, ElectraNet and Victorian gas distributors 2011 2012)** – provided a series of reports addressing how the benchmark cost of debt should be established pursuant to the National Electricity Rules and on the appropriate benchmark allowance for debt and equity raising costs.

- **Strategic advice, Victorian electricity distribution review (Client: Jemena Electricity Networks, 2009 2011)** – provided ongoing advice on regulatory economic issues during the course of the price review, including on regulatory finance matters, issues associated with the AER's desire to end the former service performance incentive scheme, issues associated with the regulatory treatment of related party contracts, allocation of costs between regulated and unregulated activities and forecasting of expenditure.

- **Regulatory cost of debt (Client: Powercor Australia Limited, 2009 2010)** – provided a series of reports addressing how the benchmark cost of debt should be established pursuant to the National Electricity Rules.

- **Cessation of service incentive scheme (Client: Powercor Australia Limited, 2010)** – assisted Powercor to quantify the financial effect that would have flowed if the former service performance incentive scheme had continued. Also prepared an expert report pointing to a material inconsistency in how the AER intended to close out the old scheme and the parameters for the new service performance incentive scheme, which was accepted by the AER.

- **Strategic advice, NSW gas distribution review (Client: Jemena Gas Networks, 2009 2011)** – provided ongoing advice on regulatory economic issues during the course of the price review, including on regulatory finance matters, issues associated with the regulatory treatment of related party contracts, allocation of costs between regulated and unregulated activities, forecasting of expenditure and issues associated with the updating of JGN's regulatory asset base.

- **Input methodologies for NZ regulated businesses (Clients: Powerco NZ and Christchurch International Airport, 2009 ongoing)** – advising in relation to the Commerce Commission's development of input methodologies and related matters, covering issues associated with regulatory asset valuation, the regulatory cost of capital, the use of productivity trends in regulation and the design of incentive compatible regulation.

- **Equity Betas for Regulated Electricity Network Activities (Client: Grid Australia, APIA, ENA, 2008)** - Prepared a report presenting empirical evidence on the equity betas for regulated Australian electricity transmission and distribution businesses for the AER's five yearly review of WACC parameters for these industries. The report demonstrated the implications of a number of different estimation techniques and the reliability of the resulting estimates. Also prepared a joint paper with the law firm, Gilbert+Tobin, providing an economic and legal interpretation of the relevant (unique) statutory guidance for the review.

- **Economic Principles for the Setting of Airside Charges (Client: Christchurch International Airport Limited, 2008 2009)** - Provided advice on a range of economic issues relating to its resetting of charges for airside services, including the valuation of assets and treatment of revaluations, certain inputs to the cost of capital (beta and the debt margin) and the efficiency of prices over time and the implications for the depreciation of assets and measured accounting profit.

- **Treatment of Inflation and Depreciation when Setting Landing Charges (Client: Virgin Blue, 2007 2008)** - Provided advice on Adelaide Airport's proposed approach for setting landing charges for Adelaide Airport, where a key issue was how it proposed to deal with inflation and the implications for the path of prices over time. The advice also addressed the different formulae that are available for deriving an annual revenue requirement and the requirements for the different formulae to be applied consistently.

- **Application of the Grid Investment Test to the Auckland 400kV Upgrade (Client: Electricity Commission of New Zealand, 2006)** - As part of a team, undertook a review of the Commission's process for reviewing Transpower's proposed Auckland 400kV upgrade project and undertook a peer review of the Commission's application of the Grid Investment Test.

- **Appropriate Treatment of Taxation when Measuring Regulatory Profit (Client: Powerco New Zealand, 2005 2006)** - Prepared two statements for Powerco New Zealand related to how the Commerce Commission should treat taxation when measuring realised and projected regulatory profit for its gas distribution business (measured regulatory profit, in turn, was a key input into the Commission's advice to the Minister as to whether there would be net benefits from regulating Powerco New Zealand's gas distribution business). A key finding was that care must be taken to ensure that the inputs used when calculating taxation expenses are consistent with the other 'assumptions' that a regulator adopts if it applies incentive regulation (most notably, a need for consistency between assumed tax depreciation and the regulatory asset value).

- **Application of Directlink for Regulated Status (Client: Directlink, 2003 2004)** - Prepared advice on the economic issues associated with the Directlink Joint Venture's request to be converted from an unregulated (entrepreneurial)

interconnector to a regulated interconnector. As with the Murraylink application, the key issues included the implications for economic efficiency flowing from its application and the appropriate application of a cost benefit test for transmission investment (and the implications of that test for the setting of the regulatory value for its asset).

- **Principles for the 'Stranding' of Assets by Regulators (Client: the Independent Pricing and Regulatory Tribunal, NSW, 2005)** - Prepared a report discussing the relevant economic principles for a regulator in deciding whether to 'strand' assets for regulatory purposes (that is, to deny any further return on assets that are partially or unutilised). An important conclusion of the advice is that the benefits of stranding need to be assessed with reference to how future decisions of the regulated entities are affected by the policy (i.e. future investment and pricing decisions), and that the uncertainty created from 'stranding' creates real costs.

- **Principles for Determining Regulatory Depreciation Allowances (Client: the Independent Pricing and Regulatory Tribunal, NSW, 2003)** - Prepared a report discussing the relevant economic and other principles for determining depreciation for the purpose of price regulation, and its application to electricity distribution. An important issue addressed was the distinction between accounting and regulatory (economic) objectives for depreciation.

- **Methodology for Updating the Regulatory Value of Electricity Transmission Assets (Client: the Australian Competition and Consumer Commission, 2003)** - Prepared a report assessing the relative merits of two options for updating the regulatory value of electricity transmission assets at a price review - which are to reset the value at the estimated 'depreciated optimised replacement cost' value, or to take the previous regulatory value and deduct depreciation and add the capital expenditure undertaken during the intervening period (the 'rolling-forward' method). This paper was commissioned as part of the ACCC's review of its Draft Statement of Regulatory Principles for electricity transmission regulation.

- **Application of Murraylink for Regulated Status (Client: Murraylink Transmission Company, 2003)** - Prepared advice on the economic issues associated with Murraylink Transmission Company's request to be converted from an unregulated (entrepreneurial) interconnector to a regulated interconnector. The key issues included the implications for economic efficiency flowing from its application and the appropriate application of a cost benefit test for transmission investment (and the implications of that test for the setting of the regulatory value for its asset).

- **Proxy Beta for Regulated Gas Transmission Activities (Client: the Australian Competition and Consumer Commission, 2002)** - Prepared a report presenting the available empirical evidence on the 'beta' (which is a measure of risk) of regulated gas transmission activities. This evidence included beta estimates for listed firms in Australia, as well as those from the United States, Canada and the United Kingdom. The report also included a discussion of empirical issues associated with estimating betas, and issues to be considered when using such estimates as an input into setting regulated charges.

- **Treatment of Working Capital when setting Regulated Charges (Client: the Australian Competition and Consumer Commission, 2002)** - Prepared a report assessing whether it would be appropriate to include an explicit (additional) allowance in the benchmark revenue requirement in respect of working capital when setting regulated charges.

- **Pricing Principles for the South West Pipeline (Client: Esso Australia, 2001)** - As part of a team, prepared a report (which was submitted to the Australian Competition and Consumer Commission) describing the pricing principles that should

apply to the South West Pipeline (this pipeline was a new asset, linking the existing system to a new storage facility and additional gas producers).

- **Relevance of 'September 11' for the Risk Free Rate (Client: the Australian Competition and Consumer Commission, 2001)** - Prepared a report assessing the relevance (if any) of the events of September 11 for the proxy 'risk free rate' that is included in the Capital Asset Pricing Model (this is a model, drawn from finance theory, for estimating the required return for a particular asset).

- **Victorian Government Review of Water Prices (Client: the Department of Natural Resources and the Environment, Vic, 2000 2001)** - Prepared a report discussing the principles regulators use to determine the capital related cost (including reasonable profit) associated with providing utility services, and how those principles would apply to the water industry in particular. The report also provided an estimate of the cost of capital (and assessment of risk in general) associated with providing water services. The findings of the report were presented to a forum of representatives of the Victorian water industry.

- **Likely Regulatory Outcome for the Price for Using a Port (Client: MIM, 2000)** - Provided advice on the outcome that could be expected were the dispute over the price for the use of a major port to be resolved by an economic regulator. The main issue of contention was the valuation of the port assets (for regulatory purposes) given that the installed infrastructure was excess to requirements, and the mine had a short remaining life.

- **Relevance of 'Asymmetric Events' in the Setting of Regulated Charges (Client: TransGrid, 1999)** - In conjunction with William M Mercer, prepared a report (which was submitted to the Australian Competition and Consumer Commission) discussing the relevance of downside (asymmetric) events when setting regulated charges, and quantifying the expected cost of those events.

Licensing / Franchise Bidding

- **Competitive Tender for Gas Distribution and Retail in Tasmania (Client: the Office of the Tasmanian Energy Regulator, 2001 2002)** - Economic adviser to the Office during its continuing oversight of the use of a competitive tender process to select a gas distributor/retailer for Tasmania, and simultaneously to set the regulated charges for an initial period. The main issues concern how the tender rules, process and future regulatory framework should be designed to maximise the scope for 'competition for the market' to discipline the price and service offerings. Principal author of a number of sections of a consultation paper, and the regulator's first decision document.

- **Issuing of a Licence for Powercor Australia to Distribute Electricity in the Docklands (Client: the Office of the Regulator General, Vic, 1999)** - Economic adviser to the Office during its assessment of whether a second distribution licence should be awarded for electricity distribution in the Docklands area (a distribution licence for the area was already held by CitiPower, and at that time, no area in the state had multiple licensees). The main issue concerned the scope for using 'competition for the market' to discipline the price and service offerings for an activity that would be a monopoly once the assets were installed. Contributed to a consultation paper, and was principal author of the draft and final decision documents.

Development of Regulatory Frameworks

- **Review of the Australian energy economic regulation (Client: Energy Networks Association, 2010-ongoing)** – assisting the owners of energy infrastructure to engage in the current wide-ranging review of the regime for economic regulation of energy infrastructure. Advice has focussed in particular on the setting of the regulatory WACC and on the regime of financial incentives for capital expenditure

efficiency, and included strategic and analytical advice, preparation of expert reports and assistance with ENA submissions.

- **Review of the Australian electricity transmission framework (Client: Grid Australia, 2010-ongoing)** – assisting the owners of electricity transmission assets to participate in the wide-ranging review of the framework for electricity transmission in the national electricity market, covering such matters as planning arrangements, the form of regulation for non-core services and generator capacity rights and charging. Has included analytical advice on policy choices, facilitation of industry positions and articulation of positions in submissions.

- **Implications of greenhouse policy for the electricity and gas regulatory frameworks (Client: the Australian Energy Market Commission, 2008 2009)** – Provided advice to the AEMC in its review of whether changes to the electricity and gas regulatory frameworks is warranted in light of the proposed introduction of a carbon permit trading scheme and an expanded renewables obligation. Issues addressed include the framework for electricity connections, the efficiency of the management of congestion and locational signals for generators and the appropriate specification of a cost benefit test for transmission upgrades in light of the two policy initiatives.

- **Economic incentives under the energy network regulatory regimes for demand side participation (Client: Australian Energy market Commission, 2006)** – Provided advice to the AEMC on the incentives provided by the network regulatory regime for demand side participation, including the effect of the form of price control (price cap vs. revenue cap), the cost efficiency arrangements, the treatment of losses and the regime for setting reliability standards.

- **Application of a 'total factor productivity' form of regulation (Client: the Victorian Department of Primary Industries, 2008)** - Assisted the Department to develop a proposed amendment to the regulatory regime for electricity regulation to permit (but not mandate) a total factor productivity approach to setting price caps – that is, to reset prices to cost at the start of the new regulatory period and to use total factor productivity as an input to set the rate of change in prices over the period.

- **Expert Panel on Energy Access Pricing (Client: Ministerial Council on Energy, 2005 2006)** - Assisted the Expert Panel in its review of the appropriate scope for commonality of access pricing regulation across the electricity and gas, transmission and distribution sectors. The report recommended best practice approaches to the appropriate forms of regulation, the principles to guide the development of detailed regulatory rules and regulatory assessments, the procedures for the conduct of regulatory reviews and information gathering powers.

- **Productivity Commission Review of Airport Pricing (Client: Virgin Blue, 2006)** - Prepared two reports for Virgin Blue for submission to the Commission's review, addressing the economic interpretation of the review principles, asset valuation, required rates of return for airports and the efficiency effects of airport charges and presented the findings to a public forum.

- **AEMC Review of the Rules for Setting Transmission Prices (Client: Transmission Network Owners, 2005 2006)** - Advised a coalition comprising all of the major electricity transmission network owners during the new Australian Energy Market Commission's review of the rules under which transmission prices are determined. Prepared advice on a number of issues and assisted the owners to draft their submissions to the AEMC's various papers.

- **Advice on Energy Policy Reform Issues (Client: Victorian Department of Infrastructure/Primary Industries, 2003 ongoing)** - Ongoing advice to the Department regarding on issues relating to national energy market reform. Key areas

covered include: reform of cross ownership rules for the energy sector; the reform of the cost benefit test for electricity transmission investments; and the reform of the gas access arrangements (in particular, the scope for introducing more light handed forms of regulation); and the transition of the Victorian electricity transmission arrangements and gas market into the national regulatory regime.

- **Productivity Commission Review of the National Gas Code (Client: BHP Billiton, 2003 2004)** - Produced two submissions to the review, with the important issues including the appropriate form of regulation for the monopoly gas transmission assets (including the role of incentive regulation), the requirement for ring fencing arrangements, and the presentation of evidence on the impact of regulation on the industry since the introduction of the Code. The evidence presented included a detailed empirical study of the evidence provided by the market values of regulated entities for the question of whether regulators are setting prices that are too low.

- **Framework for the Regulation of Service Quality (Client: Western Power, 2002)** - Prepared two reports advising on the framework for the regulation of product and service quality for electricity distribution, with a particular focus on the use of economic incentives to optimise quality and the implications for the coordination of service regulation coordinated with distribution tariff regulation.

- **Development of the National Third Party Access Code for Natural Gas Pipeline Systems Code (Client: commenced while a Commonwealth Public Servant, after 1996 the Commonwealth Government, 1994 1997)** - Was involved in the development of the Gas Code (which is the legal framework for the economic regulation of gas transmission and distribution systems) from the time of the agreement between governments to implement access regulation, through to the signing of the intergovernmental agreements and the passage of the relevant legislation by the State and Commonwealth parliaments. Major issues of contention included the overall form of regulation to apply to the infrastructure (including the principles and processes for establishing whether an asset should be regulated), pricing principles (including the valuation of assets for regulatory purposes and the use of incentive regulation), ring fencing arrangements between monopoly and potentially contestable activities, and the disclosure of information. Was the principal author of numerous issues papers for the various government and industry working groups, public discussion papers, and sections of the Gas Code.

Pricing work for non-regulated businesses

- **Application of the netback calculation for MRRT purposes (Client: Confidential, 2011-12)** – advised on how 'arms length prices that would be observed in a competitive market' for the use of downstream infrastructure should be computed, focussing in particular on what economic principles predicts for the valuation of assets, the rates of return and the potential for providers to earn higher returns arising from incentive compatible contracts.

- **Cost justification of airport charges (Client: Dunedin Airport, 2010 11)** – assisted Dunedin Airport to quantify the cost of providing its airport landing and terminal charges and justify to its major customers a substantial increase in its charges.

- **Australian airport landing charges (Client: Virgin Australia, 2009 12)** – have assisted Virgin during its negotiations of airport landing and terminal charges for a number of Australian airports, including review of the airports' proposed pricing models, asset valuation methods and proposed rates of return.

- **Measuring the effectiveness of promotions (Client: a major Australian department store 2011/12)** – as part of a team, drawing on 'point of sale' information to estimate the effect of price and promotions on sales (using transaction information) as part of a major review of the store's promotional activities.

- **Estimating the price sensitivity of consumers for retail goods (Client: a major Australian supermarket (2010/11)** – led a team to develop of a dynamic model to estimate the sensitivity of sales of an item to its price, the price of substitutes and other factors using transactions data. Allowed the client to predict how changing prices across a group of close substitutes would affect margin and to understand the effect of promotional activities.

Regulatory due diligence and related work

- **Sale of the Sydney Desalination Plant (Client: a consortium of investors, 2011-12)** – Prepared a regulatory due diligence report for potential acquirer of the asset, including a review of the financial modelling of future pricing decisions.

- **Sale of the Abbot Point Coal Terminal port (Client: a consortium of investors / debt providers, 2010-11)** – Prepared a regulatory due diligence report for potential acquirer of the asset, including a review of the financial modelling of future pricing decisions.

- **Private Port Development (Client: Major Australian Bank, 2008)** - Prepared a report on the relative merits of different governance and financing arrangements for a proposed major port development that would serve multiple port users.

- **Sale of Allgas gas distribution network (Client: confidential, 2006)** – Prepared a regulatory due diligence report for potential acquirer of the asset.

- **Review of Capital Structure (Client: major Victorian water entity, 2003)** - Prepared a report (for the Board) advising on the optimal capital structure for a particular Victorian water entity. The report advised on the practical implications of the theory on optimal capital structure, presented benchmarking results for comparable entities, and presented the results of detailed modelling of the risk implications of different capital structures. Important issues for the exercise were the implications of continued government ownership and the impending economic regulation by the Victorian Essential Services Commission for the choice of – and transition to – the optimal capital structure.

Expert Witness Roles

- **Victorian gas market pricing dispute – dispute resolution panel (Client: VENCorp, 2008)** – Prepared a report and was cross examined in relation to the operation of the Victorian gas market in the presence of supply outages.

- **Consultation on Major Airport Capital Expenditure – Judicial Review (Client: Christchurch International Airport, 2008)** - Prepared an affidavit for a judicial review on whether the airport consulted appropriately on its proposed terminal development. Addressed the rationale, from the point of view of economics, of separating the decision of 'what to build' from the question of 'how to price' in relation to new infrastructure.

- **New Zealand Commerce Commission Draft Decision on Gas Distribution Charges (Client: Powerco, 2007 2008)** - Prepared an expert statement about the valuation of assets for regulatory purposes, with a focus on the treatment of revaluation gains, and a memorandum about the treatment of taxation for regulatory purposes and appeared before the Commerce Commission.

- **Sydney Airport Domestic Landing Change Arbitration (Client: Virgin Blue, 2007)** - Prepared two expert reports on the economic issues associated with the structure of landing charges (note: the evidence was filed, but the parties reached agreement before the case was heard).

- **New Zealand Commerce Commission Gas Price Control Decision – Judicial Review (Client: Powerco, 2006)** - Provided four affidavits on the regulatory economic issues associated with the calculation of the allowance for taxation for a regulatory purpose, addressing in particular the need for consistency in assumptions across different regulatory calculations.

- **Victorian Electricity Distribution Price Review – Appeal to the ESC Appeal Panel: Service Incentive Risk (Client: the Essential Services Commission, Vic, 2005 2006)** - Prepared expert evidence on the workings of the ESC's service incentive scheme and the question of whether the scheme was likely to deliver a windfall gain or loss to the distributors (note: the evidence was filed, but the appellant withdrew this ground of appeal prior to the case being heard).

- **Victorian Electricity Distribution Price Review – Appeal to the ESC Appeal Panel: Price Rebalancing (Client: the Essential Services Commission, Vic, 2005 2006)** - Prepared expert evidence on the workings of the ESC's tariff basket form of price control, with a particular focus on the ability of the electricity distributors to rebalance prices and the financial effect of the introduction of 'time of use' prices in this context (note: the evidence was filed, but the appellant withdrew this ground of appeal prior to the case being heard).

- **New Zealand Commerce Commission Review of Information Provision and Asset Valuation (Client: Powerco New Zealand, 2005)** - Appeared before the Commerce Commission for Powerco New Zealand on several matters related to the appropriate measurement of profit for regulatory purposes related to its electricity distribution business, most notably the treatment of taxation in the context of an incentive regulation regime.

- **Duke Gas Pipeline (Qld) Access Arrangement Review – Appeal to the Australian Competition Tribunal (Client: the Australia Competition and Consumer Commission, 2002)** - Prepared expert evidence on the question of whether concerns of economic efficiency are relevant to the non price terms and conditions of access (note: the evidence was not filed as the appellant withdrew its evidence prior to the case being heard).

- **Victorian Electricity Distribution Price Review – Appeal to the ORG Appeal Panel: Rural Risk (Client: the Office of the Regulator General, Vic, 2000)** - Provided expert evidence (written and oral) to the ORG Appeal Panel on the question of whether the distribution of electricity in the predominantly rural areas carried greater risk than the distribution of electricity in the predominantly urban areas.

- **Victorian Electricity Distribution Price Review – Appeal to the ORG Appeal Panel: Inflation Risk (Client: the Office of the Regulator General, Vic, 2000)** - Provided expert evidence (written and oral) to the ORG Appeal Panel on the implications of inflation risk for the cost of capital associated with the distribution activities.

- **Major Coal Producers and Ports Corporation of Queensland Access Negotiation (Client: Pacific Coal, 1999)** - Provided advice to the coal producers on the outcome that could be expected were the dispute over the price for the use of a major port to be resolved by an economic regulator. The main issues of contention were the valuation of the assets for regulatory purposes, whether the original users of the port should be given credit for the share of the infrastructure they financed, and the cost of capital (and assessment of risk generally). Presented the findings to a negotiation session between the parties.

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