FINAL REPORT - PUBLIC VERSION

Review of the Commerce Commission's Gas Control Inquiry Draft Report

Submitted to

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2 July 2004

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1. EXECUTIVE SUMMARY

1.1. THE DYNAMICS OF THE NEW ZEALAND GAS INDUSTRY

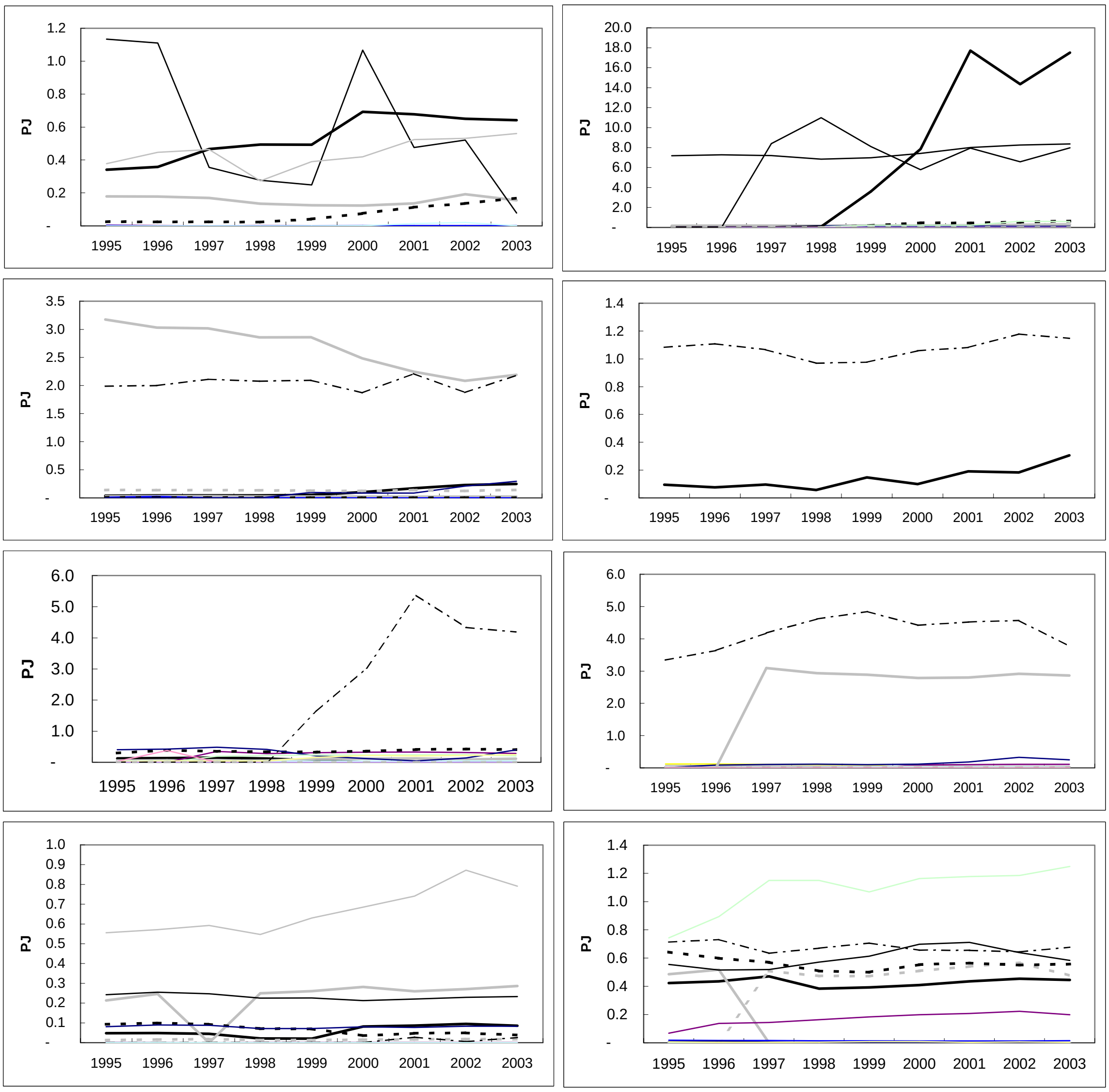
The Commerce Commission's pipeline inquiry occurs at a time when the New Zealand gas industry is under-going a period of rapid change. In particular, the price of gas is rising, and pipeline owners are facing increasing competitive pressures. Gas demand is already volatile, as illustrated by Figure 1 and Figure 2 below, and is likely to become increasingly so, further escalating stranding and revenue risks. Government policy is for New Zealand to be a participant in global actions to reduce greenhouse gases, and the relative cost of gas and other fossil fuels will rise significantly compared with renewables. Developed nations face risks of 'carbon leakage' from industries that relocate to developing countries that tax fossil fuels less heavily.

As a result of such changes, the long-term shape of the gas pipeline sector in New Zealand is extremely difficult to predict. However, what is clear is that the informative value of historical performance must be diminished. The risks and volatility inherent in the New Zealand environment mean that the Commission must be very careful in basing predictions on *ex post* profitability studies, and must recognise the extent to which volatility in demand would create significant difficulties for a regulator attempting to set a price path for any period.

Data on sectoral use of gas in New Zealand shows that demand is heavily concentrated in industrial production, electricity generation and petrochemicals. Many of these customers are likely to be covered by long term contracts entered into prior to any investment in infrastructure, or will otherwise have options that provide them with countervailing power. Residential consumption of gas makes up a mere 4% of gas demand, and penetration is relatively low.

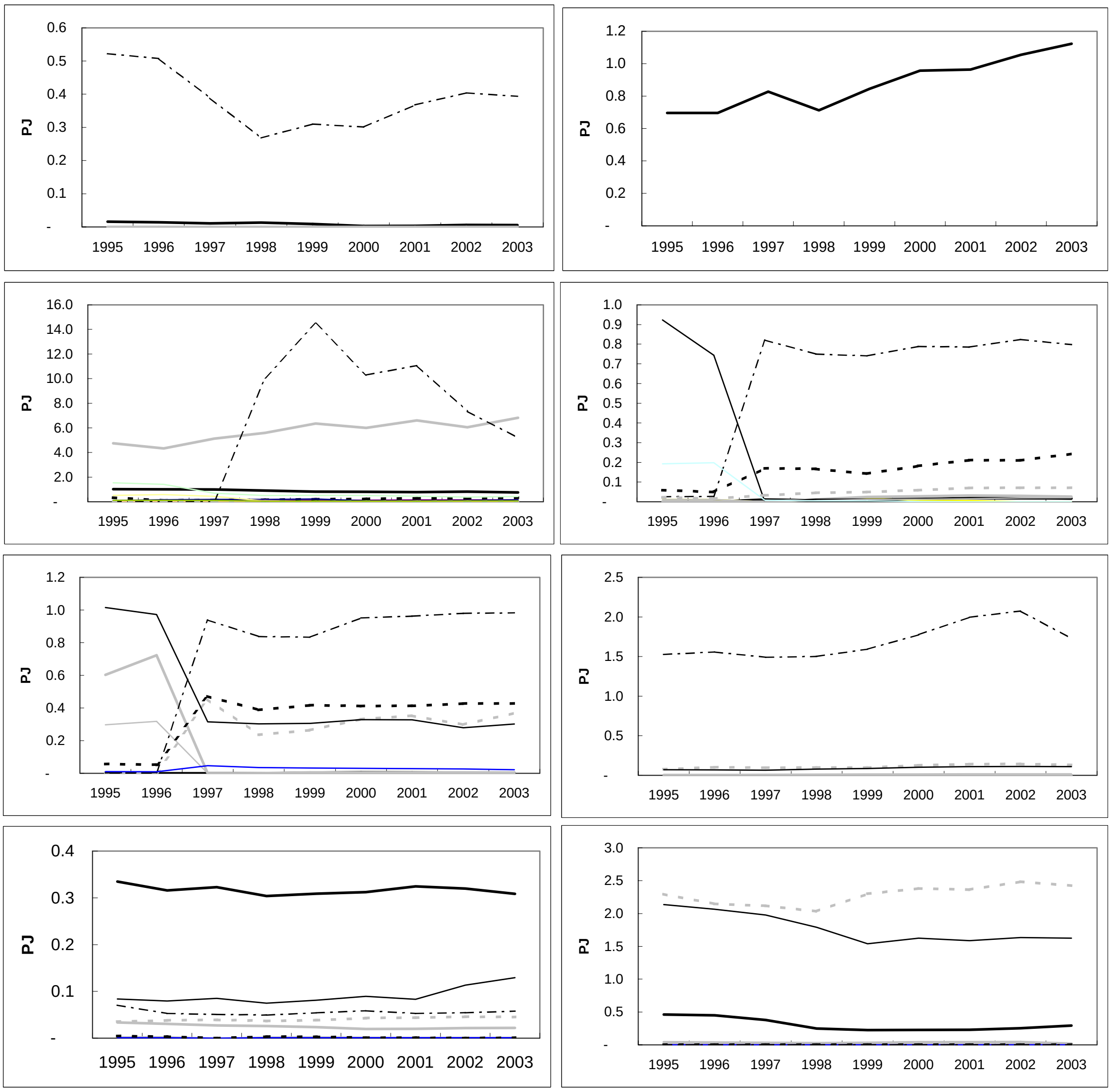
It is important to recognise that there is no obligation on pipeline providers to invest. Furthermore, unlike electricity, gas is a discretionary fuel: most households are not connected to gas, and there are numerous instances where gas and other fuels, such as electricity, coal and biomass, are used in very similar applications. Although gas prices are expected to rise, it is likely that pipeline businesses, absent regulatory restraint, will continue to connect new sources of demand (particularly in the reticulated market) as other loads drop off.

Figure 1: Demand Variability on NGC's Networks, Regions 1-8[1]



1 Each region chart corresponds to a network area, and each line is demand at a gate station. (Source: NGC Data).

Figure 2: Demand Variability on NGC's Networks, Regions 9-16



Figures 1 and 2 demonstrate two very important points. First, demand is extremely volatile, making it very difficult for pipeline businesses to forecast future demand and revenues. Second, there is significant evidence of large loads connecting and disconnecting over time. We would expect that in future, volatility is likely to increase, and pipeline businesses will be exposed to substantial revenue risks as customers respond to higher gas prices by reducing demand.

1.2. CONCERNS WITH THE COMMISSION'S QUANTITATIVE ANALYSIS

In spite of:

- The volatility of the New Zealand gas industry; and
- The increasing gas price;

the Commission adopts a model that is:

- Highly deterministic;
- Focuses heavily on a mostly backward-looking analysis of profits;
- Assumes that pipeline businesses price, or should price, using exactly the same method as Transpower, by simply passing all risks on to consumers; and
- Fails to adequately account for the fact that regulation does affect behaviour and dynamic performance.

1.2.1. Excess Profits Calculation

The Commission's model rests on three key propositions that are either not consistent with reality or not consistent with accepted regulatory practice.

1. The Commission models the effect of price control over the period 1997 to 2008. While this approach is potentially capable of answering the question 'what would the effect of price control have been if it had been imposed in 1997?' it is not capable of addressing the forward-looking issue of what future benefits price control may bring. While we note that the Commission's intention is to calculate average costs and benefits, so that individual years do not distort the analysis, the effect of compounding up past excess profits exaggerates the costs and benefits of price control. For example, the elimination of a $1 excess profit in 1997 is treated as a $1.70 benefit in 2004.

   The only reasonable approach is to look at the benefits and costs of control on a forward-looking basis, consistent with the Commission's timeframes described in the factual and counterfactual. The assessment may be informed by past behaviour of consumers and producers of all related fuels, but must also recognise the different character of the gas market moving forwards. The best way to handle this is within a Monte Carlo simulation framework, which allows for direct examination of uncertainty and volatility on the range of potential welfare outcomes. We return to this issue below.

2. The most crucial of all of the Commission's assumptions is that pipeline businesses bear no risks, by imposing any unexpected costs such as asset stranding, optimisations, or catastrophic (and only partly insurable) events on consumers *ex post*. This is essentially the Transpower model of pricing. In our view there is substantial evidence to suggest that this is not NGC's pricing practice, and nor could it be:

   - There are a significant proportion of customers who are on fixed term contracts, are potentially subject to bypass, or have alternative fuel options that would prevent NGC raising prices to them to recover unexpected costs;

- Unlike electricity distributors, which may be able to withstand annual variations in Transpower charges, pipeline customers are more likely to be end-users who will prefer to pay a premium to avoid variation in pipeline costs. Apart from Transpower, we are not aware of any other infrastructure business in New Zealand that prices in this manner; and

- There is no evidence that pipeline charges vary according to annual variations in costs. To the contrary, NGC has set prices for multiple years, bearing risks of variations in costs, demand, etc, over time.

Accordingly, it is inappropriate for the Commission to adopt the *ex post* cost recovery assumption, and it therefore must assess how profits are likely to be affected by demand and cost volatility. The Commission must also assess how the cost of capital is affected by such risks. Lally (2004) advises the Commission that, if businesses adopt an *ex ante* approach to recovering unexpected costs such as stranding, then adopting an *ex post* approach to excess profit calculations may bias an excess profits study depending on the incidence of such costs. Only where such risks are 'slight' is the *ex post* assumption acceptable. As the $50 million stranding and unstranding of the Kapuni line (discussed below) and likely future [ ] stranding of the [ ] line (discussed later in this report) demonstrate, stranding risks for NGC are anything but 'slight'.[2]

3. The Commission's methodology assumes that the present value of returns should be equal to zero over a snapshot of an asset's life. This assumption is partly tied to the assumption that customers bear all risks, and therefore prices vary to recover unexpected costs over time. If a business adopts an *ex ante* approach to recovering the expected cost of possible asset stranding or other unexpected costs, then NPV must exceed zero during periods where those costs do not occur.[3] But even if a business attempted to recover unexpected costs *ex post*, given the degree of volatility in demand for gas there is no guarantee that a business would be able to achieve an NPV=0 result.[4] In section 3 of this report, we set out in detail the myriad reasons why on both a theoretical and practical basis NPV is unlikely to be zero over a snapshot of an asset's life.

In addition to these concerns, we have identified two important events that significantly overstate profits in the Commission's approach:

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2 Transpower's Economic Value Statement shows that even though it has pricing policies to target NPV=0 over time, it has over-recovered $68 million from customers.

3 See Lally (2004) p 3 to 4.

4 Gas demand is considerably more volatile than demand for electricity, yet Transpower's Economic Value Statement shows that even though it has pricing policies to target NPV=0 over time, it has over-recovered $68 million from customers.

- The Kapuni line was optimised out of the asset base in NGC's first ODV valuation. We are advised that this stranding cost was not recovered from consumers via a price increase in subsequent years. As a consequence, the Commission's treatment of the unstranding of the Kapuni line in 2003 as economic income is inappropriate. The idea that an asset, which has not earned NGC any income over the past 12 years, returning to the asset base requires NGC to lower its charges by $50 million is simply unworkable. Proper treatment of the Kapuni line unstranding by excluding the revaluation from income, removes any benefits (acquirers or net public benefits) from control of NGC transmission at any reasonable level of WACC; and

- The gain on sale of Taranaki assets is treated as income that NGC should immediately give to consumers. In our view, this is inappropriate, for the following reasons. First, there is no reason to believe that it constitutes an excess profit that NGC has recovered from consumers. Second, the sale of an asset is usually accompanied by valuable options that are not reflected in the book value, so the gain on book value is likely to reflect the valuable options that are associated with the asset and is not an 'excess profit'. Third, if such gains were to be passed to consumers under price control, then NGC would never sell any assets, so on a forward-looking basis such gains cannot be treated as a benefit of price control. Indeed, the loss of capital market efficiency would be a cost of control.

1.2.2. Dynamic Efficiency Estimates

The other key element of the Commission's quantitative approach is the calculation of dynamic efficiency losses.

The Commission models dynamic efficiency losses as the loss of welfare from missing markets that may emerge if NGC reduces investment. The Commission also estimates a quality effect that it argues may arise as a result of a larger number of customers shifting to interruptible supply contracts.

Both of these models are extremely conservative. The 'missing markets' analysis effectively assumes that NGC reduces investment in the first year, and then continues to invest, as the size of the missing market is virtually constant over the entire period of the Commission's analysis. The size of the missing market is trivially estimated to be 0.5% of total demand. The Commission argues that because the aggregate level of gas demand is not likely to grow over the coming years, this means that future investment is not likely to be required, and even if NGC doesn't invest, another pipeline provider such as Nova will, or customers themselves might end up owning the assets.

All these assumptions are inconsistent with reality:

- It is unlikely that there would be a one-off reduction in volumes in the missing market of 0.5% of counterfactual volumes. The effect of investment foregone should more reasonably be modelled as having a cumulative effect;

- Figure 1 and Figure 2 show large discrete changes in gas demand over the separate gate stations. This evidence is consistent with NGC's experience of customers connecting and disconnecting over time. New connections require investments in network assets, and, as the Commission's model shows, there will continue to be growth in customers;

- NGC has publicly disclosed to the investment community that it has investment hurdle rates of 8.5% to 10%. Other pipeline providers, such as Nova, are likely to have similar investment hurdle rates, so if they were to invest and gain similar returns, they would be at substantial risk of regulation, and would not likely invest in the first place, since under the Commission's WACC range, they would fail to earn their cost of capital; and

- NGC's experience with customer capital contributions shows that customers are extremely sensitive to paying an up front capital contribution. Over the past 18 months, where NGC has required a capital contribution for an investment to proceed, only [ ] of projects commenced. Above a threshold level of somewhere between [ ] for a residential subdivision, all projects did not proceed.

Modelling of the quality impacts of control is also unrealistically conservative. The Commission assumes that a reduction in quality means that some customers voluntarily shift to an interruptible supply contract, and the loss of value is the difference in price between the interruptible and firm supply contract. This neglects to examine the cost of involuntary exposure to greater risk of outages, where customers may value continuity of supply very highly, because of production processes, etc. It also ignores changing demands for different quality of gas supply, e.g. different gas pressures required for some modern high rate appliances.

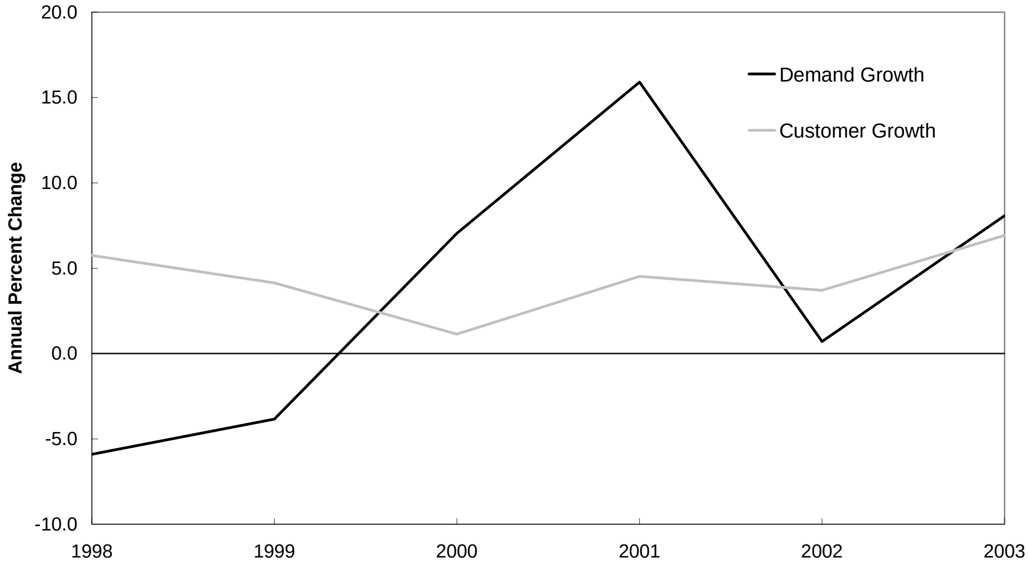
Although regulators attempt to set incentives to maintain quality, this may be done only imperfectly. Accordingly, the Commission's modelling under-estimates welfare losses from under-provision of reliability.

1.3. A MORE APPROPRIATE MODEL

To address the key concerns outlined above, we have developed a Monte Carlo simulation approach to assessing the benefits and costs of regulation.[5] This approach enables us to investigate directly how volatility might affect the probability that a regulator might improve welfare. While, inevitably, we have made a number of assumptions and modelling choices in constructing the simulation scenarios, wherever possible we have used empirical data to calibrate the model, and have generally relied on historic data to calibrate the models in preference to using NGC's own forecast information (although recognising the changing dynamics of the industry).

The fundamental driver of our results is volatility in gas demand and customer numbers, which flows through to end revenues. This volatility is illustrated in Figure 3.

Figure 3: Annual Percent Change in Customer Numbers and Demand (NGC Networks)



NGC Information Disclosure Data 1997 to 2003

In the Monte Carlo analysis we mimic the price setting process under price control and light-handed regulation. The regulator forms a forecast of future costs and sets a price path for five years. The ranges of potential actual financial and welfare outcomes are then simulated from a probability distribution of potential customer and through-put outcomes based on observed historic variability.

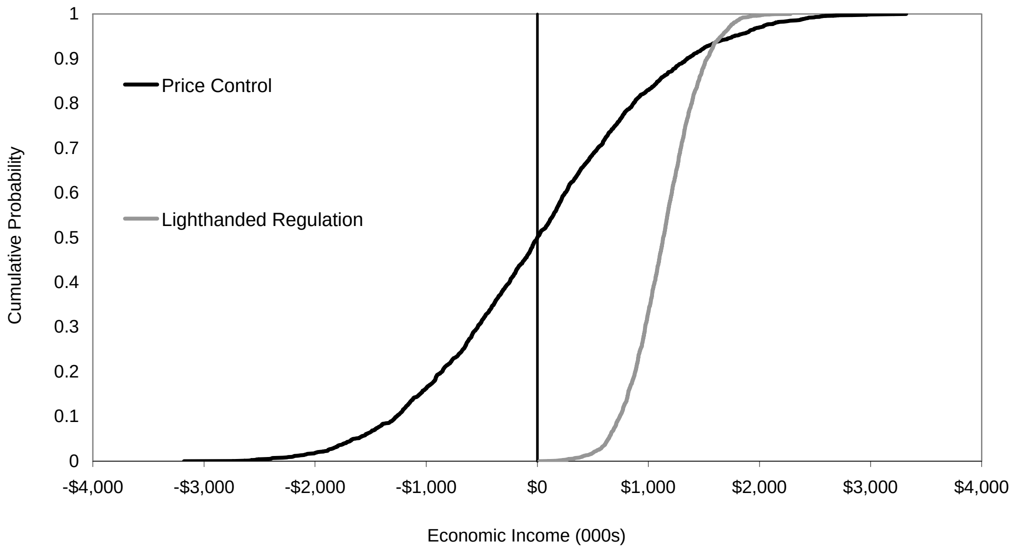
5 Monte Carlo simulation involves constructing scenarios of potential future outcomes, based on a probability distribution of particular variables, e.g. demand, customer numbers, costs, etc.

Welfare is then compared to a model of light-handed regulation where NGC is assumed to target a rate of return consistent with profitability calculated in the Commission's model. NGC is assumed to vary prices each year to target this return, but actual financial performance is determined by actual volumes consumed and customers connected.[6] (We discuss in Section 7 of this report the implications for our modelling of the practical constraints on NGC's pricing flexibility.)

Further detail of the model is provided in Section 7, but another key advantage of the model is its treatment of capital expenditure, which varies in proportion to the number of customers connected. In contrast, capital expenditure in the Commission's model is completely static, even though NGC is assumed to reduce investment under price control.

Under our model, a five-year price path period, which is the standard regulatory length before parameters are reset, would result in the following distribution of economic income:

Figure 4: Distribution of Economic Income Under Price Cap and Light-handed Regulation (Networks)[7]



6 The model generates revenues from fixed and variable charges.

7 These results correspond to a simulation run where WACC is set equal to 8.5%.

The chart illustrates that the combination of setting prices for a period of five years, and significant variability in customer growth and gas throughput, results in a wide range of potential outcomes. In contrast, if NGC were to target a return of 9.5% per annum (being the average rate of profitability that the Commission finds in its modelling of NGC Distribution), but has the flexibility to adjust prices in response to variation in demand, then there is likely to be a reduced spread in potential outcomes, but 'excess' returns are positively skewed above zero.

The variability in outcomes under price cap regulation is striking, and this would of course increase risk for the regulated firm, which would in turn detrimentally impact on dynamic efficiency.

It is important to note that in this model economic income is based on a capital cost of 8.5%, but this is for illustrative purposes only. Given the stranding and optimisation risks NGC is exposed to, the true cost of capital is likely to be much higher. NGC's disclosed investment hurdle rate range is 8.5% to 10%, for example.

Referencing returns to a more appropriate cost of capital estimate would shift the distribution of economic profits to the left in Figure 4 under the light-handed regulation case, since true capital costs would be higher.[8] The distribution for the price cap scenario, however, would similarly be located further to the left if evaluated at a more reasonable WACC estimate.

More importantly, our simulation modelling of dynamic efficiency effects of control indicates that there is substantial risk of reducing welfare by suppressing returns below NGC's investment hurdle rates. NGC has significant discretion over whether or not it invests, and capital contributions are a significant deterrent to developer's decisions to install gas. The following diagram illustrates the distribution of potential welfare losses in missing markets under a price control scenario where WACC is set at 8.5%.[9] These missing markets represent the loss of welfare associated with NGC reducing the level of investment, because regulated charges do not cover incremental investment costs. Of course, regulation of gas pipelines could also result in other missing markets (for example, diminished incentive to provide higher levels of quality required by some customers), which we have not modelled at this stage, so these estimates should be taken as illustrative (and conservative) only.[10]

8 Equivalently recognising stranding risks would place the distribution of economic profits under price control would shift the curve to the left.

9 At the Commission's lower WACC estimates of 6.2% and 7.2% NGC would require even larger capital contributions, leading to even larger dynamic efficiency losses.

10 It is also important to note that dynamic inefficiency costs of control will have legacy costs, even if control were phased out after ten years. For example, if a household is forced to use an electric hot-water heater because of the reduction in investment by NGC, then it will be 30+ years before the appliance is likely to be replaced. Accordingly, the narrow period over which we measure dynamic efficiency costs understates the true welfare cost.

Figure 5: Welfare Losses in Missing Markets (Annual Average Over Ten Years)

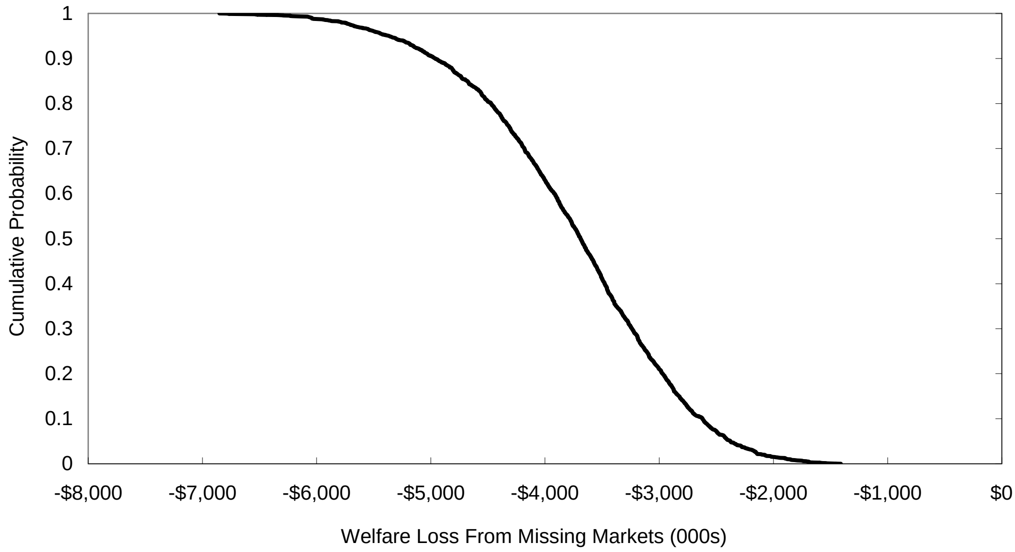
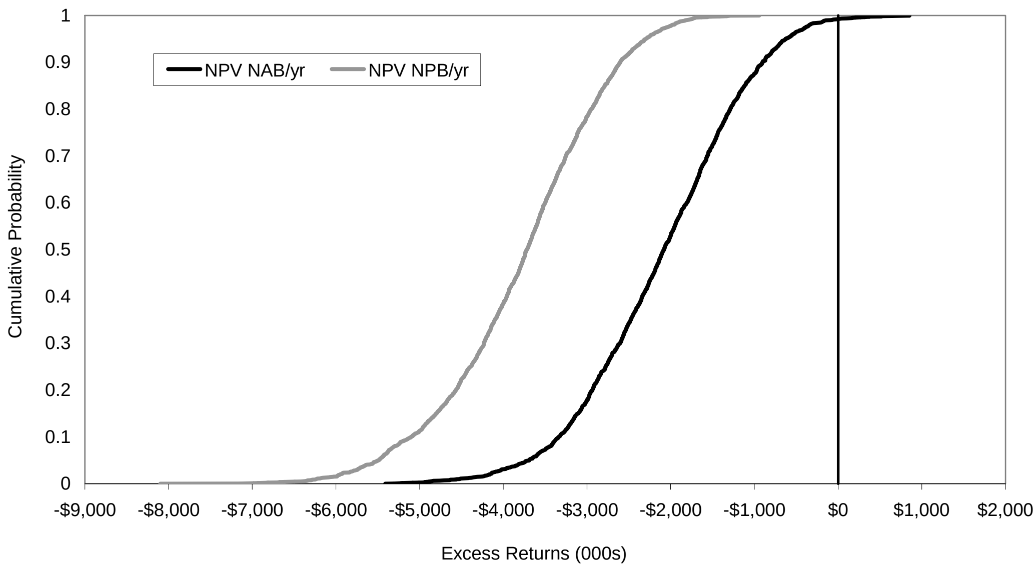


Figure 6 combines all of the various welfare components into a measure of the net costs and benefits of control.[11] It illustrates that in all circumstances there are likely to be negative benefits to acquirers and negative net public benefits.

Figure 6: Welfare Impacts of Price Control (Annual Average Over 10 Years)



11 Full details of these are provided in section 7. In most cases we adopt the Commission's welfare calculation approach, but none of the other welfare effects, such as direct costs, allocative efficiency calculations for existing consumers, are material to these conclusions.

1.4. Other Key Conclusions

The other key points that we make in this report are as follows.

Treatment of Foreign Ownership

Foreign investment is important to the New Zealand economy. We would expect foreign investment to be sensitive to the behaviour, or perceived behaviour, of the Commerce Commission or any other agency with an ability to influence property rights. If the policy objective is to promote the long-term interests of consumers, then it is inappropriate to discriminate against foreigners.

If, nevertheless, the Commission wishes to count wealth transfers from foreign owned firms as a benefit to the public of New Zealand, then it is incumbent on the Commission to demonstrate that they are in fact wealth transfers and that the public of New Zealand will benefit from them. Identifying the incidence of surplus allocations is likely to be virtually impossible, and treating them as estimable materially discriminates among firms for no economic or social reason. The Commission treats the transfer of excess earnings from NGC's foreign shareholders as benefit to New Zealanders, yet it is clear that there is substantial foreign ownership of the gas industry supply chain and gas acquirers.

Metering

The Commission reaches the view that meters owned by distributors are part of the inquiry, but otherwise are not. This creates the unusual situation where meters may be regulated based on ownership rather than a benefits test applied equally across all providers of metering services. In the event that the Minister makes an order for control, regulation would potentially be avoided by transferring ownership of the meters to a non-pipeline business, regardless of its efficiency or otherwise in providing this service.

Direct Costs of Control

The direct costs of control are substantially under-estimated. A building blocks process for establishing forecasts of revenues, costs, demand and investment is substantially more information intensive than a control inquiry. We adopt more realistic estimates of the costs of control, based on a conservative view of information provided by NGC about AGL's costs in a price path reset year.

Dynamic Efficiency

On top of the earlier discussion, a further concern with the Commission's dynamic efficiency calculations is that the slope of the demand curve is calculated using the wrong formula. We correct for this.

Productive Efficiency

The Commission assumes that the pressure of price reductions caused by control would more than offset the loss of productivity incentive created by having to share gains with consumers at price path resets. Yet the mechanism that price control relies on to realise productivity gains is exactly the same as the mechanism under light-handed regulation: the prospect of higher profits motivates cost reductions. A more realistic modelling approach would be to assume that productivity gains in each year are identical in the factual and counterfactual, except in years 4 and 5 under the factual, where there would be an incentive to 'save-up' productivity gains, and in year 6 for those gains to be realised to maximise the benefits to shareholders.

Producer Surplus

The Commission uses a long-run assumption for modelling the impact on the producer surplus component of the deadweight-loss triangle. This effectively implies that NGC is capacity constrained or that if demand falls then NGC would be able to save costs equivalent to total average costs. Neither of these propositions matches reality, and it is more appropriate to use a short-run model to examine the impacts on surplus of small changes in demand. This has the effect of increasing the calculated benefits of control.

Transmission Easements

The Commission adopts an approach to determining historic cost valuation of easements that understates their value, as only one third of the network was built in 1974, the rest over the course of the 1980s.

Effect of Variations On Calculated Benefits

The effect of making adjustments to the Commission's model to reflect these variations is summarised in the following tables, which show the impact on the net acquirers and net public benefits tests for distribution and transmission respectively.

Our presentation of these results, however, should not be taken as supporting the use of the Commission's deterministic and largely static model framework.

Table 1: Impact of Variations on Benefits Tests – NGC Distribution

	Net Acquirers Benefits		Net Public Benefits		Net Benefits to New Zealanders	
	Change	Net Benefit	Change	Net Benefit	Change	Net Benefit
Baseline		1,077		-780		435
Excluding gain on sale of Taranaki	-456		1		-296	
More realistic cumulative dynamic efficiency loss	-1,346		-1,346		-1,346	
Forward looking Characterisation	-1,050		153		-636	
More realistic direct costs of control	-88		-88		-88	
More realistic producer surplus assumption	0		608		608	
More realistic productive efficiency approach	-210		-210		-210	
Combined Effect (without WACC adjustment)	**-2,100**	**-1,023**	**-1,192**	**-1,973**	**-1,489**	**-1,054**
More realistic WACC estimate	-986		-22		-656	
Combined Effect	**-3168**[12,13]	**-2091**	**-1,547**	**-2,327**	**-2,526**	**-2,091**

12 Note the combined effect excludes the variation that would result from adopting a forward looking approach. It is excluded, however, only because the Commission's model is incapable of dealing with this issue on any meaningful basis, unless past history is completely ignored.

13 Note the individual effects do not sum to the combined effect because of the interdependencies of the various variations.

Table 2: Impact of Variations on Benefits Tests – NGC Transmission

	Net Acquirers Benefits		Net Public Benefits		Net Benefits to New Zealanders	
	Change	Net Benefit	Change	Net Benefit	Change	Net Benefit
Baseline		3,322		-342		2,117
Excluding Revaluations from Kapuni	-3,947		-54		-2,623	
More realistic cumulative dynamic efficiency loss	0		-2,390		-2,390	
Forward looking Characterisation	496		-289		229	
More realistic direct costs of control	-88		-88		0	
More realistic producer surplus assumption	0		176		176	
More realistic productive efficiency approach	-566		-566		-566	
More accurate historic easement valuation	-237		10		-149	
Combined Effect (without WACC adjustment)	**-4,870**	**-1,548**	**-3,113**	**-3,455**	**-5,850**	**-3,733**
More realistic WACC estimate	-3,311		-16		-2,176	
Combined Effect	**-8,342**	**-5,019**	**-3,362**	**-3,704**	**-8,365**	**-6,248**

Within the Commission's model framework, there are a number of assumptions that may not be reasonably used. Varying these assumptions within the Commission's model has significant impacts on the quantum of costs and benefits of control. While some increase the estimated net benefits, the combined effect of the variations leads to negative benefits under each of the Commission's tests.

1.5. CONCLUDING COMMENTS

Cost-benefit analysis can be a valuable tool in public policy decision-making, but it is important not to lose sight of the fact that quantitative analysis is limited by the models that can be estimated and the data available. The Commission, in forming a view of the overall inferences provided by quantitative analysis, must be mindful of the limitations in the study and the uncertainties inherent in conducting cost-benefit analysis.

Our analysis of the Commission's model suggests that there are a number of areas where the assumptions and modelling framework should be varied. These variations lead us to the conclusion that under both the net acquirers and the net public benefits tests, welfare would be reduced by control. Placed in a broader context of considerable uncertainty about the future state of the gas market and the narrowness with which a number of important dynamic efficiency costs have been estimated, there is likelihood that we have under-estimated the negative impacts on welfare.

Finally, it worth reflecting on the estimated costs and benefits of control relative to the size of the total market. Total gas consumption in New Zealand is around 200 PJ per annum. At future gas (energy) prices of around [ ], and transport costs of $1-2 /GJ, this puts annual market revenues in the range of $[ ] billion to $[ ] billion. Even if there is a fall in demand with the increase in wholesale gas prices, total turnover will still be of the order $1 billion per annum. Across the gas pipeline businesses the Commission estimates net benefit to acquirers of around $18 million per year, or 1-2% of annual market revenues. Even if the Commission's calculations were accurate, regulation to achieve such trivial benefits in the face of significant market uncertainty is not justified.

2. INTRODUCTION

The Commerce Commission ("Commission") has released its draft determination on control of gas pipelines, reaching a preliminary conclusion that competition in gas pipeline markets is limited and, based on quantitative analysis, control is warranted for a number of pipeline businesses.

NGC has commissioned CRA to undertake a review of the economic analysis in the Commission's draft determination. Specifically, we have been asked to:

- Examine the framework that the Commission has adopted for quantifying the benefits and costs of control, in particular:
  - The timeframe for the analysis;
  - The appropriateness of the quantitative models used to estimate benefits and costs; and
  - The treatment of foreigners in the net public benefits test;
- Audit the Commission's models for computational accuracy; and
- Examine the competition tests the Commission has applied in reaching the preliminary conclusion that competition is limited in the relevant gas pipeline markets.

The report is set out as follows:

- In section 3, we address the Commission's framework for evaluating excess profits from both a theoretical and practical perspective;
- Section 4 considers the use of the various welfare measures the Commission uses to evaluate benefits of control;
- Section 5 provides a qualitative assessment of the Commission's approach to quantifying the costs and benefits of control;
- Section 6 reports the results of further quantitative analysis within the Commission's model framework; and
- Section 7 provides the details of a more appropriate Monte Carlo modelling approach to evaluating the benefits and costs of control.

3. CALCULATION OF EXCESS PROFITS

3.1. Introductory Comments

The key source of the Commission's conclusions that there would be net benefits to acquirers and net benefits to the public of control is the Commission's profitability study, which concludes that NGC has earned excess profits. In this section we examine the methods and assumptions used by the Commission to reach this conclusion.

The Commission's model is based heavily around the proposition that returns in competitive markets, on average, are equal to normal returns and that over short periods of analysis the present value of returns should be equal to zero. In this section we evaluate that proposition from a theoretical and practical perspective. We demonstrate that the proposition that over a snapshot of an asset's life the present value of economic returns equals zero will only hold in extremely unrealistic circumstances and there are practical considerations which mean that in reality the assumptions that the Commission relies on to support its modelling framework do not hold.

3.2. Theoretical Basis For NPV=0

The Commission's model of excess returns is built on the notion that a firm in a competitive market will earn an NPV of zero when the CAPM-based WACC is used as the discount rate. This suggests that the Commission is using the benchmark of a perfectly competitive or perfectly contestable market. It is quite clear, however, that the benchmark standard should be that of effective or workable competition, as required by the Commerce Act.

As the Commission itself notes, the Court of Appeal has defined workable or effective competition as:[14]

> *… a market framework which participants may enter and in which they may engage in rivalrous behaviour with the expectation of gaining advantage from greater efficiency.*

As market reality moves away from the abstract model of perfect competition to one that nonetheless faces workable or effective competition, the overly restrictive and unrealistic assumptions of the perfectly competitive model are relaxed. There is no longer perfect freedom of entry and exit, firms are no longer atomistic price takers (so that there is some product differentiation and some control over investment and production decisions). Knowledge of the future, and much of the current environment, is also imperfect.

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14 *Port Nelson Limited v Commerce Commission* (1996) 3 NZLR 554, 564-565.

Under these conditions, some alternative theory is required to suggest that in a competitive industry the NPV of particular investment projects or of a collection of projects should be zero.

The assumptions of perfect competition are not met in any real-world markets, and, although investment can create options, there is a range of reasons why NPV will exceed zero in workably or effectively competitive markets. As noted by Evans and Guthrie (2004a) and Lally (2004), firms may *ex ante* raise prices to compensate for the risk of asset stranding or catastrophic events. It is also the case that for any given project, the option to wait for more information prior to investment has positive value (i.e. NPV > 0 at the cost of capital) for a wide range of investments: at a minimum, for any investment that does not permit instantaneous recovery of costs incurred.

The Commission's framework says that "excess profit" (*EP*) should equal NPV = 0. It is common in regulatory set-ups to design price regulation such that expected NPV of projects and the firm equal zero (for an example, see Evans and Guthrie (2004a)[15]) but this does not replicate a workably competitive market: it is a tighter specification than the outcomes that are expected in competitive equilibrium. In the jargon of the High Court,[16] positive *ex ante* expected *NPV* has a *function* in that it imparts information for investors about the amount and timing of investment as it is checked against some positive threshold (hurdle rate), and it will generally be positive at the firm's cost of capital. To claim that *ex ante* future income should be such that NPV = 0, at a simple estimate of the cost of capital, is not supported by theory and ignores the asymmetric effect on long term consumer welfare of making errors in investment decisions, particularly where there is investment irreversibility (see Evans and Guthrie (2004b)[17]).

Ex post, of course, NPV measures may be positive or negative and the reasons for these variations are myriad.

15 Evans, Lewis and Graeme Guthrie (2004a) "Incentive Regulation of Prices when Costs are Sunk", *mimeograph*, NZISCR, May.

16 *Telecom Corporation of New Zealand Limited v Commerce Commission* (1991) 4 TCLR 473.

17 Evans, Lewis and Graeme Guthrie (2004b) "Dynamically Efficient Investment Under Uncertainty: Regulatory Settings Matter", *mimeograph*, NZISCR, June.

It has been suggested by a variety of authors that competition brings forward investment in the presence of options to delay, in order to pre-empt investment by others. However these are partial, even individual-behaviour stories. Lambrecht and Perraudin (2003) find in their model (based on a basic investment timing option, modified so that two firms compete for the right to move first and capture the whole market; firms know their own cost structure, but not their competitor's) that the delay option can be worth anything between zero and the usual monopolistic option value.[18]

In contrast, Grenadier (2002) looks at the effect of competition on firms' investment timing options and finds that the option value falls to zero.[19] Novy-Marx (2004) argues that Grenadier's result follows from his assumption that the production technology is linear and incremental,[20] standard perfect competition assumptions that are hardly met in the gas pipeline industry, where there are considerable scale economies and investment occurs in large increments. He finds that competition can actually elevate the value of firms' investment timing options above the monopolistic option value. Options are not present under perfect competition where there is complete information: options come into play when there is imperfect information which, of course, is a feature of any real world decision.

In a situation where NPV>0 in workably competitive markets, it is therefore critical that the Commission's calculations must either:

1. Include an adjustment to profits to reflect the impact of real options or the expected value of contingent events that did not occur; or

2. Include an adjustment to the cost of capital to reflect the additional premium that firms in a workable competitive market require so that NPV in a workably competitive market will equal zero at this higher cost of capital.

While both options are theoretically equivalent, the more straightforward approach is to make an adjustment to the cost of capital.

Setting aside the rationale for the Commission's adoption of the NPV=0 assumption, the process of measurement over a snapshot of an asset's life may result in NPV $\neq$ 0 for any sub-period of the assets life.

The NPV methodology for calculating excess profits over the life of an asset or the life of a firm utilises as the value of the firm or asset:

18 Lambrecht Bart M., and William R. M. Perraudin (2003) "Real options and pre-emption under incomplete information," *Journal of Economic Dynamics and Control* 27(4), 619-643.

19 Grenadier, Steven R. (2002) "Option exercise games: An application to the equilibrium investment strategies of firms," *Review of Financial Studies* 15, 691-721.

20 Novy-Marx, Robert (2004) "An equilibrium model of investment under uncertainty," Working paper, University of California, Berkeley.

$$NPV = -B_0 + \sum_{t=1}^{\infty} \frac{(CF_t - CAP_t)}{(1+k)^t} \qquad (1)$$

where B_0 is the initial cost of the firm's assets (book value in period 0), CF_t is the cash flow in period t, CAP_t is capital expenditure in period t, ∞ is the indefinite future, and k is the cost of capital.

The Commission states that asset values are linked from on period to the next by the change in the value of the existing assets plus additional capital expenditure – given in equation (2):

$$B_{t-1} \equiv B_t + DEP_t - REV_t - CAP_t \qquad (2)$$

Equation (2) is in fact an identity. By specifying all but one of the inputs the level of the other input is determined. It is useful to interpret the identity as either:

- (Case 1) An accounting balance sheet identity based on historical cost (B), in which case $REV_t = 0$; or
- (Case 2) An "economic" balance sheet identity where DEP_t - REV_t is determined by setting the $B_t = R_t$, where R_t is the optimised replacement cost of the assets at date t. For a given asset in this case DEP_t - REV_t is economic depreciation.

The identity also admits other interpretations including the possibility of some combination of cases 1 and 2, such as when occurs a switch to ODRC from historical cost.

Following the Commission, for some period (P), the present value of earnings is given by:

$$NPV(C) = \sum_{t=1}^{P} (CF_t + REV_t - DEP_t - kB_{t-1}) \qquad (3)$$

$$= \frac{CF_1 + REV_1 - DEP_1 - kB_0}{1+k} + \frac{CF_2 + REV_2 - DEP_2 - kB_1}{(1+k)^2} + \ldots$$

$$= \frac{CF_1 + B_1 - B_0 - CAP_1 - kB_0}{1+k} + \frac{CF_2 + B_2 - B_1 - CAP_2 - kB_1}{(1+k)^2} + \ldots$$

$$= -B_0 + \frac{CF_1 - CAP_1}{1+k} + \frac{B_1}{1+k} + \frac{CF_2 - CAP_2 + B_2}{(1+k)^2} - \frac{B_1}{1+k} + \ldots$$

$$= -B_0 + \sum_{t=1}^{P} \frac{CF_t - CAP_t}{(1+k)^t} + \frac{B_P}{(1+k)^P} \qquad (4)$$

It is apparent that (4) has the effect of adding to the present value of the cash flows over the period the difference between the starting asset value and the present value of the final period asset value.[21]

Note also that the NPV into the indefinite future can be written using (4) as the sum of the components, where each component measures the present value over a sub-period of the total life of the asset:

$$V(0,N) = -B_0 + \sum_{t=1}^{N} \frac{CF_t - CAP_t}{(1+k)^t} + \frac{B_N}{(1+k)^N}$$

$$V(N,L) = -\frac{B_N}{(1+k)^N} + \sum_{t=1+N}^{L} \frac{CF_t - CAP_t}{(1+k)^t} + \frac{B_L}{(1+k)^L} \qquad (5)$$

$$V(L) = -\frac{B_L}{(1+k)^l} + \sum_{t=1+L}^{\infty} \frac{CF_t - CAP_t}{(1+k)^t}$$

as

$$NPV(C) = V(0,N) + V(N,L) + V(L)$$

Note that for (4) to represent the cash flow approach in (1) (i.e. $NPV = NPV(C)$), it must be true that in all time periods the identity (2) must hold. The form for *NPV(C)* shows that the present value of returns over a sub-period (e.g. $V(N,L)$) exceeding zero says nothing at all about the value of a project over its entire lifetime: it may be positive or negative. Note also that for a given series of cash flows, $V(N,L)$ will depend critically on the asset valuation and depreciation methodologies chosen: the present value of the cash flow $(CF_t - CAP_t)$ is invariant but the beginning and end assets values are dependent upon the measurement approach.

For an evaluation of returns over a sub-period to be at all useful in assessing returns over the lifetime of the assets it must be that somehow the asset values (*B*s) and concomitantly the changes in economic value of the assets (*DEP-REV*) are related to the cash flow. In this respect, both the timing of cash flows and the basis for setting of the cash flows from the asset base will be relevant. In sum, assume that cashflow is set at the beginning of each period and so overs and unders occur intra period. It is useful to consider three cases:

- When *CF* and B_i and the associated (*DEP-REV*), are based on historical cost, the:

21 Note that this is the “truncated NPV” of Oxera (2003) *Assessing profitability in competition policy analysis*, Economic Discussion Paper 6, Office of Fair Trading, July, p.48.

- cash flows are based on historical cost and the identity depicts an accounting balance sheet; and
- discount rate determined jointly with the cash flows should reflect historical cost accounting (Evans and Guthrie (2003b and 2004b));

- When *CF* and B_i and in association (*DEP-REV*), are based on replacement cost, the:
  - cash flows are based on replacement cost (ODRC) and the identity depicts economic depreciation;
  - discount rate determined jointly with the cash flows should reflect replacement-cost revenue generation (Evans and Guthrie (2003 and 2004b)) and it will be higher than in the historical cost approach; and
- When the *CF* and B_i are initially based on historical cost and changed in a later period to replacement cost, the NPV calculation should be changed so that the historical and replacement cost approaches are implemented as described above for each sub-period before and after the change.

With respect to revaluations generally, note from (4) that if the process for determining the *Bs* and (*DEP-REV*) is changed but the cash flows *CF* are unaffected, then sub-period values (such as those in equation (5)) will (perhaps materially) change but the total, correct, *NPV* not be at all affected.[22] That is, if B_0 is measured on a different basis from B_p then unless *CF* is *affected* and *changed* the calculation in (4) will not provide any meaningful information on whether or not earnings are excessive or not. This, despite that fact that as the period of measurement tends towards the total life of the asset ($L \to \infty$) the full correct *NPV* is calculated under *NPV(C)* simply because all relevant cash flows are included in the *NPV* calculation.

22 Consider the simple example where in (1) the net cash flow is amortised and set equal to B_0 , NPV = 0 and any depreciation schedule can be applied under (2). In any sub-period the final value of B will depend upon the form of depreciation, and hence so will the level of assessed excess profits via (3).

A further important issue is the extent to which random variations in profit can yield misleading results where returns are volatile but stationary (i.e. exhibit random variation around a mean), as the number of observations become large the purely random overs and unders will tend to net out revealing the expected *NPV*. Observation over short periods, however, will not yield this outcome and may be entirely misleading as to the whether a reasonable return on investment was targeted in the first place.[23] *Ex post* outcomes may differ substantially from *ex ante* expectations.

The implication of this analysis is that extreme caution must be exercised in conducting *ex post* profitability studies. Only under extreme and unrealistic conditions (such as perfect foresight and the ability to perfectly vary prices to achieve target cashflows) would NPV=0 over a sub-period of a project's life be observed. Events such as the stranding of the Kapuni North line (out of study period) and (in-period) unstranding of the line, highlight just how dangerous the inappropriate application of the NPV=0 approach is. It is not appropriate for the Commission to make assumptions about behaviour (such as *ex post* cost recovery) simply to allow calculation of "excess profits" using a simple, but wrong, assumption.

We also note that in a number of instances the Commission has made adjustments to information submitted by NGC pertaining to historic data, for example, changes in the depreciation values and easement valuation approach. However, the Commission does not consider whether this would potentially have impacted on cashflows, had pricing been based on these altered depreciation and valuation approaches. As we establish below, the Commission must adopt an approach to excess profit measurement that is consistent with reality to avoid bias in the calculation, and the approach must be applied consistently.

3.3. *Ex Ante* versus *Ex Post* Approach to Assessing Excess Profits

A crucial assumption – untested in the Commission's analysis – is that pipeline providers recover retrospectively any unexpected costs, such as asset stranding, uninsurable or only partly insured catastrophic events. Therefore, consumers bear all risks of stranding or unexpected costs. The Commission states at paragraph 7.83:

23 Note also that in order for regulation to provide a fair return on investment, where the expected *NPV* equals zero on investment and the cash flow is determined by revenue set on the basis of modern replacement cost, allowance should be made for stranded assets for which there is some probability they will be utilised in the future. (Evans and Guthrie (2003, 2004a) show that this means that the value of the regulated firm should exceed the replacement cost of its assets. Enforcing *NPV* = 0 on the firm on the ORC assets of the firm simply will not enable reasonable regulation.

> *Thus, if businesses raised prices ex post when assets were stranded, optimised or an adverse event occurred, the increased revenues would offset the increased costs and there would be no net effect on profits. Thus, the Commission would not be required to make any adjustments to its assessments. The Commission's view is that* ***assuming*** *businesses act in this way provides the most straightforward way of handling the risks of asset stranding and optimisation in the assessment of excess profits. In relation to stranded assets, this approach* ***assumes*** *that the businesses are able to increase their prices to remaining customers, if a stranding occurs.* **Emphasis added.**

As Lally (2004) observes in his advice to the Commission, if in fact the business accepts these risks (in whole or in part), essentially charging customers a premium for bearing such risks, then if unexpected events or stranding are under-represented in the study period, an excess profit calculation based on an assumption of *ex post* recovery may incorrectly diagnose excess profits (pages 3 to 4):

> *Asymmetric risks present particular difficulties. In so far as the possibility of asset stranding and miscellaneous adverse risks such as natural disasters is dealt with by firms raising their output prices ex-ante,* ***this gives rise to the problem that excess profit assessments will be too high unless such events have occurred****. Corrections for this present considerable informational difficulties to regulators. In addition,* ***the process of regulators optimising assets out for any reason other than indisputable cases of gold-plating requires some form of ex-ante compensation, and failure to provide this implies that excess profits will be overestimated****. Even if an appropriate allowance is provided, this still leaves the problem that excess profits will be over or under estimated if the actual level of optimisations is more or less than provided for in the allowance. The last of these issues involves positive and negative errors, and could simply be ignored if the errors were thought to be slight. The remaining issues will generally give rise to overestimates of excess profits, which is disadvantageous to the firms. I****n so far as these biases were judged to be slight****, the use of a domestic version of the CAPM and use of a WACC estimate from the high end of the range could be considered to be compensation for them.* **Emphasis added**.

The decision to adopt the *ex post* cost recovery assumption appears to be justified by the Commission on the basis that it is a straight-forward method to adopt, without any apparent consideration as to whether this is indeed the method that pipeline businesses use to recover their costs. The Commission may only make the *ex post* cost recovery assumption if pipeline businesses adopt this business practice, or potentially if the risks faced by the businesses are low, which is clearly not the case in the gas industry. Otherwise the Commission adopts a methodology that is highly likely to bias the outcome of the inquiry.

Stranding of the Kapuni Line

In NGC's case, for example, if it were true that it adopts an *ex post* method of recovering costs, then the costs of stranding of the Kapuni line (which has been optimised out since the original ODV valuation in 1991) would either have been followed by an increase in revenues to cover the stranding cost. Only then, would a corresponding fall in revenues be required to reflect the deoptimisation in 2003.[24, 25] In short, the *ex post* method at the low risk WACC assumes either that there is no stranding or that there is not optimisation out of the rate base.

We understand from NGC that prices/revenues did not increase post 1991 to cover the Kapuni asset stranding costs of $50 million, nor is it NGC's pricing approach to *ex post* recover the cost of any other stranded assets. As discussed earlier in this report, this is as we would expect, given the variety of pricing constraints that NGC faces. Rather, we would expect NGC to utilise an *ex ante* approach to covering at least some risks, and in our view it is wholly inappropriate to use the *ex post* cost recovery assumption since this will bias the inquiry outcome towards finding excess profits (as Lally cautions). It is evident from the past history of asset stranding that NGC bears reasonably substantial risks of asset write-downs (and would bear this risk under a price cap regime that places stranding risk with shareholders), so a substantial risk premium is warranted.

To illustrate some of these asset stranding risks we asked NGC to prepare a list of major gas customers and the markets that they operate in (we also present information on foreign ownership to illustrate the point that not all acquirers are New Zealanders, as the Commission assumes).

Table 3: Major Gas Customers, Productive Sector and Foreign Ownership

Company	Site (s) / Sector	Type of Company	Proportion Foreign Owned
Contact Energy	Otahuhu B Power Plant	NZ Publicly Listed	>51% (Edison Mission Energy)
	TCC Power Plant		
	Te Rapa Co-gen Plant		

24 We also note that the Commission spreads the deoptimisation gain in 2003 over the three years between 2001 and 2003, and then compounds up the resulting 'excess profits' to 2004. So not only is the gain from an unstranded asset treated as 'income', excess returns on it are then ramped up by spreading the revaluation back to prior to its deoptimisation.

25 Alternatively the stranding could be accompanied by no change in revenues, and the stranding cost effectively recovered over time. This would be an equally valid way to recover the stranding cost, although over the period of the stranding it will appear as if "excess profits" are being earned if measured against the optimised asset base.

Company	Site (s) / Sector	Type of Company	Proportion Foreign Owned
Genesis	Huntly Power Plant	SOE	0%
	Te Awamutu Co-gen Plant		
Mighty River Power	Southdown Power Plant	SOE	0%
Balance Agri-Nutrients	Kapuni Urea Plant	Part Co-Operative	20% (Norske Hydro)
New Zealand Steel	Glenbrook Steel Mill	Subsidiary of Australian Listed Co	81% (Bluescope Steel - BHP)
Methanex	Taranaki Methanol Plant	Listed on Canadian & US Exchanges	100%
Carter Holt Harvey	Kinleith Pulp and Paper Mill	NZ Publicly Listed	> 51% (International Paper)
	Whakatane Board Mill		
Norske Skog	Kawerau Pulp and Paper Mill	Norwegian Public Co	100%
Svenske Cellulosa	Tissue Mill, Kawerau	Swedish Public Co	100%
Fletcher Building	Fletcher Wood Panels, Taupo	NZ, Australian Publicly Listed	72% NZ, 26% Australian, 2% Other

It is evident from the table that NGC is exposed to a number of customers that operate in risky industries, or in industries where there are opportunities for bypass and interfuel competition. Although the Commission may consider that these customers may not exit New Zealand in the foreseeable future, that risk is not zero, and the loss of revenues from these customers and the exposure to asset stranding as a result, is material. The forestry sector in particular is extremely risky and customers have substantial opportunity to use wood waste in place of gas.

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Stranding Risks and the WACC

NGC has commissioned LECG to examine WACC issues, so we have not conducted any analysis in this area. However, we do observe that New Zealand gas market is very thin and the economic viability of a number of transmission lines is heavily contingent on the existence of a small number of large users. Substantial price increases in the wholesale market means that pipeline providers face significant downside risks of asset stranding and a premium above standard CAPM WACCs must be warranted. NGC has stated to the investment community that it has investment hurdle rates of 8.5 to 10%, so this is indicative at least that the Commission has under-estimated *ex ante* expected returns required to justify investment.[26]

Previously, the Commission has stated that it would add a premium of 0.15% for optimisation risk for electricity lines businesses.[27]A small premium such as this *may* be appropriate (we have not specifically analysed it) given that electricity is essential and the relatively low level of risk in the electricity industry, where there is a more diverse customer base over which to spread costs. Pipeline businesses are at much greater risk of asset stranding given the sensitivity of asset values to the potential loss of single large loads. Furthermore, gas is a discretionary fuel. Accordingly, a much greater premium than 0.15% would be required to compensate NGC for bearing optimisation and stranding risks. We understand, for example, the current ratio of NGC's ODV to depreciated replacement costs is 76% for transmission and 94% for distribution, indicating that NGC has experienced substantial optimisations and asset stranding. This compares with 98% for electricity lines businesses.

26 See NGC 2003 Investor Conference Briefing Slides: http://www.ngc.co.nz/article/articleview/260/1/13/

27 Regulation of Electricity Lines Businesses Targeted Control Regime Implementation Details Draft Decisions 31 January 2003. p 38.

Consistent Treatment of Asset Stranding in the ODV Process

As the Commission has observed[28], if the ODV process is to have any effect in incentivising efficient capital investment decisions, optimisation is a risk that ought to be borne by shareholders. As we outline below, this implies that the unstranding of an asset brought back into service by new demand should not be treated as economic income.

The Commission's calculations have treated all changes in asset value as revaluations that should be treated as income (or losses). It has also assumed that all changes in asset value must be reflected in customer revenues. In particular, the Commission assumes that gains from upwards revaluations should result in an *ex post* reduction in charges, whereas a loss from a downwards revaluation would be recovered by an *ex post* increase in charges. This approach, while theoretically correct for the treatment of revaluation gains and losses, ignores the rationale for the optimisation process. Optimisation ensures that firms are not rewarded for sub-optimal investment or for over-investment ("gold plating"). If firms were able to recover the costs of sub-optimal investment then the entire optimisation and economic value adjustment process in the valuation methodology would be irrelevant.

The different treatment of optimisations and revaluations is illustrated by the Transpower model. Transpower's Economic Value framework splits economic gains and losses from monopoly activities into those attributable to the customer and those attributable to the shareholder. The gains and losses attributable to the shareholder are "asset revaluations arising from adjustment such as optimisations and economic value adjustments". Transpower's annual report notes that these "are not passed on to customers". Transpower's pricing methodology further explains that the shareholder gains and losses are:[29]

- ODV optimisation adjustments;
- ODV "lower cost alternative" adjustments;
- Material inefficient costs; and
- Incremental costs/revenues for non-transmission activities.

28 See December 23, 2002 Decision Paper on Electricity Lines Businesses.

29 Transpower, *Pricing for Grid Connection Services from 1 April 2003*, December 2002, p. 29.

In our view this process is not quite correct, as it does not provide symmetric treatment of gains and losses in asset value that arise independently of the level of service required from the asset. For example, an asset's value may increase because replacement costs have increased. This increase should rightly be attributed to the customer. The same asset's value may decrease because technical change means that a different technical asset configuration can now supply the same level of service at a cheaper cost. This change in value should also be attributed to the customer, although Transpower's methodology attributes this loss to the shareholder. The effect of attribution to the customer is much the same in effect as the TSLRIC and tilted annuity approach that the Commission has adopted in its regulation of telecommunications services.

The changes in asset value that should be attributed to shareholders are:

- changes in value that result from a change in the level of service that the asset is required to provide; and
- optimisations to correct for material inefficient costs.

Attribution of material inefficient costs directly to the shareholder means that the costs of "gold plating" cannot be recovered from customers. Attribution to shareholders of any changes in value that result from changes in the level of service means that shareholders directly take the risk of investment in assets, and the optimisation out of a speculative investment cannot be recovered from customers using other assets. Conversely, if a speculative investment is optimised back into the asset base, the firm should be able to recover a higher rate of return from customers using that particular asset, in order to compensate shareholders for the higher risks that they have borne.

The essence of the proposal above is that customers should bear the risks of technical change, and shareholders should bear the risks of changes in demand. This is a standard feature of modern incentive regulation. As argued by Evans and Guthrie (2003a), such regimes allocate the risk of asset stranding efficiently, and also provide firms with the incentive to reduce this risk to efficient levels.[30]

We note that as a practical matter NGC does not recover the cost of asset stranding and economic value write-downs from other customers. There are therefore two alternative implications for the Commission's analysis:

30 Evans, Lewis and Graeme Guthrie (2003a) "Asset Stranding is Inevitable: Implications for Optimal Regulatory Design", *mimeograph*, NZISCR, 12 November 2003.

- First, if the Commission wants to continue to use the lower asset valuation that results from the inclusion of optimisations and economic value adjustments in NGC's ODV, then revaluations that occur during the evaluation period must be separated into those that should be borne directly by the shareholder and those that should be passed through to customers. General increases in replacement cost should be passed through to customers, as per the Commission's methodology. However, where asset values are written-down due to optimisations or economic value adjustments that occur as a result of a reduction in the required service level (pipeline capacity), then these costs should be borne directly by the shareholder. The corollary of this is that when assets that have been written-down can be written back up again, the effects should be borne directly by the shareholders and not count as excess profits recovered from customers; and

- Second, if the Commission wants to continue with the position that all changes in asset value are recovered from customers (so that the cost of asset stranding is recovered *ex post* from customers) then it must recognise that this means that optimisations and economic value adjustments have no effect. The idea that all optimisations and economic value adjustments are recovered *ex post* suggests that NGC's revenue profile does not change when assets are written-off. This in turn suggests that revenue would be linked to the *unoptimised* depreciated replacement cost of assets, and that the Commission's entire excess profits calculation should be based on depreciated replacement cost rather than on NGC's ODV. This would, of course, significantly lower any supposed excess profits that occur before the optimisation in of the Kapuni line, and would mean that the optimisation back in does not get counted as a source of income.

Our recommendation is that the Commission adopts the first approach. It is clearly the case that the reason for most economic value adjustments is that NGC has ceased to receive a revenue stream that was supporting the value of the relevant asset. Further, NGC does not and cannot recover these costs *ex post* from other customers, so the second approach above is clearly impossible.

Regardless of the approach adopted, however, an internally consistent position requires that the optimisation in of the Kapuni line must be excluded as a source of excess profits. It is either just reversing a loss that shareholders have previously borne (as per the Transpower model), or the initial optimisation out had no effect and neither should the optimisation back in.

Optimisation and Stranding Risks under Price Control

Although we understand that the Commission cannot prejudge the final form of control, it is also instructive to consider the likely treatment of optimisation and stranding risks under price control. The Commission's draft appears to assume that stranding and optimisation risks would not be recovered *ex ante* under price control, since the WACC remains unchanged. Yet as Lally observes a margin on WACC is required to compensate for the price risk that is imposed on price cap regulated businesses.[31]

3.4. NET PRESENT VALUE EQUALS ZERO APPROACH

The Commission assumes that customers bear stranding and other unexpected costs, in the same way that Transpower's customers bear the costs of stranding. We note that Transpower's EVA=0 approach[32] has negligible industry support as prices fluctuate with movements in ODV values and stranding and unstranding of assets, making it very difficult for distributors to set prices to recover transmission charges. In addition, there are substantive questions that the Transpower-pricing methodology precipitates a downward bias in investment.

It is inconceivable that a pipeline business could adopt a Transpower-like pricing method that results in charges to end users fluctuating annually depending on the level of revaluations, stranding, or unstranding experienced in the previous year. Given that a significant percentage of revenues/prices are protected by long-term contracts, bypass and interfuel constraints, unexpected variations in costs may only be recovered from a narrow customer base, if at all.

Targeting NPV=0 – the Case of Transpower
Transpower provides a unique case study of an infrastructure business that explicitly targets NPV=0 by placing all risks on distributors, South Island generators and direct connect customers. We note from Transpower's 2003 Annual Report that it targets zero economic profits over time, by adjusting its annual charges with an Economic Value Adjustment *ex post*. Transpower's Economic Value Statement shows that in 2003 Transpower had an accumulated over-recovery of $68 million, since corporatisation – a substantial over-recovery. Transpower has employed this pricing methodology since 1998, a similar period to that used in the Commission's study.

31 Lally (2003) p 65.

32 Which is similar to the Commission's NPV = 0 approach.

Representative Snapshot

The snapshot of the economic performance of NGC occurs over the period 1997 to 2008. The first half of this period coincides with very low gas prices (especially when compared with other fuels) because of the presence of low-price Maui take-or-pay gas. As a result, strong demand growth has occurred and the New Zealand economy has remained energy intensive relative to other developed nations.[33]

Looking forward, it is likely that gas prices will increase substantially with the run-down in the Maui field and as more costly sources of supply are brought to market. There is uncertainty about future gas supplies beyond Kupe and Pohokura, and there are likely to be increases in fossil fuel prices as a result of emission charges imposed at the start of the first commitment period under the Kyoto Protocol in 2008.

Given only 6-7 PJ of gas are used in non-commercial / non-industrial applications, the gas industry is under considerable threat from reduced energy intensity in the economy, as less energy intensive industries become more favourable, and energy intensive industries, such as steel manufacturing, wood processing, etc move offshore to more favourable energy cost environments.

Hence, there is a highly uncertain and generally unfavourable outlook for the gas sector in New Zealand compared to the Commission's study period of 1997 to 2008. [ ]. It may well prove to be the case that future asset stranding and reduced demand may offset any past higher profits. The Commission has not considered the extent to which these factors might affect the costs and benefits of control.

Efficiency

The third proposition that the Commission relies on in support of its presumption of NPV=0, is that indicative information suggests that "on average" pipeline businesses in New Zealand are not as productive as the average Australian pipeline business. Accordingly, there is no evidence of superior productivity that might be rewarded with higher than normal returns.

We consider that the reliability of the benchmarking study carried out for the Commission by Meyrick and Associates are such that they do not inform about this issue; we return to these below.

33 See NZIER (2002) *The Kyoto Protocol: Issues for New Zealand's Participation: Trade Realities and New Zealand's Response to the Threat of Global Warming* Report to the Climate Change Pan Industry Group

However, we note that the Meyrick distribution productivity study finds that NGC distribution has been making productivity improvements at the rate of 2.5% per annum.[34] Even under price cap regulation shareholders are able to share in the benefits of productivity gains with higher returns for a period. It seems unwarranted that the Commission should therefore consider all profitability higher than WACC as excess profit, since shareholders are rewarded even under a price cap arrangement for achieving productivity gains, even if starting from a position that is considered to be within the efficiency frontier.

Accordingly, the Commission's modelling of excess profits should not treat the productivity gains made by NGC as something that NGC's shareholders should not benefit from.

3.5. Treatment of Gains/Loss On Assets Sold

The Commission treats the gain on the disposal of distribution pipeline assets sold in 1999 of $3.9 million, as economic income that should be passed immediately to remaining consumers on NGC's network. The Commission's measure of the gain is the asset sale price (MV_{1999}) less the book value (BV_{1999}). It is immediately apparent from (1) that the correct impact on the *NPV* is the asset sale price less the present value of the forgone cash flow from 1999, that is:

$$MV_{1999} - \sum_{t=1}^{\infty} \frac{CF_t^* - CAP_t^*}{(1+k)^t}$$

discounted to the first period; where * indicates relating to the assets sold. For the all reasons given in section 3.2 there is no reason why the book value should equal foregone cashflows:

$$BV_{1999} = \sum_{t=1}^{\infty} \frac{CF_t^* - CAP_t^*}{(1+k)^t}$$

particularly where the book value of assets depreciated under tax law is used. Indeed, it is most likely that such a value would understate the cash flows from the date of sale. This case illustrates admirably the point made above, that for the profitability of an asset to be detected from a sub-period of its life via (4), the asset values (*Bs)* must be related to the cash flow in some known way.

34 We have not been asked by NGC to review the rigour of either of these studies. However, we are not surprised by the fact that the latter one finds positive productivity gains; as we have previously submitted to the Commission, we would expect a privately owned firm to improve its productivity in the absence of regulation. (See, for example CRA (2003).

The treatment by the Commission of this sale also highlight the fact that the whole NPV=0 (on tangible capital) approach ignores rights, obligations, intangible capital, synergies and options that attach to ownership and which are central to businesses decisions and values. These factors make up assets and liabilities that are quite different from the value of installed pipes. Arguably the best guess as to the value of the forgone cash flows is in fact the market value (MV_{1999}) in which case the sale has no effect on the excess profit calculation.

Overall, we see no reason why the gain on book value from sale of an asset should be passed to consumers. Because it does not represent economic profit the approach would inhibit efficient capital market transactions, because it would in many instances truncate the return on assets, and limit the sale option. If the Commission maintains the assumption that price control would transfer its value of such transactions to consumers, then it would be appropriate to assume that the transaction would never have taken place: generally, the assets would be worth more on NGC's books. The transfer should not be treated as a benefit of price control.

In the remainder of our analysis we remove the gain on sale of assets from the benefits of price control, as this is the only sensible and workable treatment of sale of assets.

4. BENEFITS TESTS APPLIED BY THE COMMISSION

4.1. Introductory Comments

In this section we address the welfare/benefits tests applied by the Commission. We recognise that the Commission is limited in its discretion as to the tests that it applies. Nevertheless, the Commission may incorporate in its advice to the Minister, the most preferable test to apply, and describe the limitations of the tests that have been applied.

4.2. Net Acquirers Benefits

The Commerce Act requires the Commission to test whether acquirers of gas pipeline services would benefit from price control. Under this test the Commission estimates benefits arising from:

- Reduced transfers from consumers to producers;
- Higher consumer surplus from lower prices and increased demand; and
- Higher productivity, which is transferred to consumers through lower prices.

Costs of control include:

- Benefits of price control not achieved (e.g. transfers not completely eliminated and consumer surplus not fully achieved);[35]
- Reduced incentives to make productivity gains because of forced sharing with consumers;
- Reduced incentives to provide consumers with quality services; and
- Reduced incentives to invest because of the risk that the regulator will suppress prices/returns below the level required to justify investment.

Essentially this test is a consumer welfare test.

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35 Strictly this is not a cost of control, since it is not a cost that is *caused* by imposing control. A more accurate characterisation would be to state the benefits of control calculated on an *expectations* basis, i.e. the expected benefits of control are the hypothetical maximum reduction in transfers less the amount that is expected not to be recovered. To draw an analogy, the costs of playing lotto would not be said to be the $1 million participants expect not to win.

A key element of the net acquirers benefit test is that transfers from producers to consumers are treated as a benefit. In general, surplus transfers have a welfare-neutral impact, as they are simply a reallocation of income, or a reallocation of profit in the case of firms supplying inputs. As a result, from a total welfare perspective, we suggest that this test be given little weight in any decision to regulate and that the Minister should prefer an appropriately constructed public benefits test, since it is possible that society be made worse off overall from price control, even though benefits to a select group are positive.

Most importantly, the focus of the Commerce Act is on the long-term interests of consumers. While immediate transfers of surplus may benefit some consumers in the short-term, it may jeopardise the long-term interests of consumers as a whole if it leads to a reduction in dynamic efficiency.

4.3. Net Public Benefits Test

The Minister of Energy has also asked the Commission to conduct a net public benefits test which includes the costs and benefits derived in the net acquirers benefits test, with the following differences:

- Transfers from New Zealand producers to New Zealand consumers are treated as welfare neutral;
- Transfers from New Zealand producers to foreign consumers are a cost to New Zealand (the Commission omits this analysis in its draft decision, treating all consumers as New Zealanders or New Zealand owned firms);
- Transfers from non-New Zealand producers to New Zealanders are a benefit to New Zealand; and
- Increases in producer surplus are a public benefit.

While we favour the public benefits test as a more appropriate measure of the welfare impacts of price control, and we consider it to be more in accordance with the long title to the Act, the discriminatory treatment of foreigners in the analysis (which we acknowledge the Commission is required to do, under particular circumstances) makes the test much less reliable, since there are wider ramifications of basing a control decision on the treatment of transfers to foreigners.

The Commission cautions that the treatment of foreigners has a significant bearing on the conclusions reached and the analysis has not sought to explain or quantify the economic harm that may come to New Zealand if foreign investors are treated any differently to their New Zealand counterparts. Nevertheless, if the Commission is to report a test of net benefits to New Zealanders then it must document the extent to which various proportions of the gas supply chain are in foreign or domestic control.

4.4. TREATMENT OF FOREIGNERS

4.4.1. Forms and Identification of Economic Rent

Not all "rents" are to the detriment of the long-term interests of end-users. In fact, the economics literature finds that many types of rents serve a valuable social and consumer function.

Conceptually, the literature distinguishes between "pure" rents on the one hand, and quasi-rents and rents to innovation, on the other hand.[36] Sanderson and Winter (2002) provide a definition of "pure rents":[37]

> *Pure rents or profits refer to the excess of revenue over costs that is due to barriers to entry into a market. A firm earns economic profits or pure rents when it acquires and maintains a monopoly position in a market not through particular acumen in meeting the demands of consumers but through anticompetitive, exclusionary practices or through allocation of monopoly rights by a government.*

The economic concept of pure rents appears to be very similar to the term "functionless rents" as used by the High Court in *AMPS A*:[38]

> *We reject any view that profits earned by overseas investment in this country are necessarily to be regarded as a drain on New Zealand. New Zealand seeks to be a member of a liberal multilateral trading and investment community. Consistent with this stance, we observe that improvements in international efficiency create gains from trade and investment which, from a long-run perspective, benefit the New Zealand public.*
>
> *On the other hand, if there are circumstances in which the exercise of market power gives rise to functionless monopoly rents, supra-normal profits that arise neither from cost savings nor innovation, and which accrue to overseas shareholders, we think it right to regard these as exploitation of the New Zealand community and to be counted as a detriment to the public.*

Quasi-rents and rents to innovation are examples of rents that provide a valuable social function, i.e., by encouraging entry, investment and innovation.

In practice, trying to identify and measure pure rents (or any rents, for that matter) is extremely difficult (see, for example, Boyle and Guthrie (2002)[39] and Fisher and McGowan (1983)[40]). The reasons include:

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36 Sometimes other types of rents are also included in this second category of socially valuable rents, such as Ricardian rents and scarcity rents. For a discussion on the various forms of rent, see Rumelt, R. P. (1987) "Theory, strategy, and entrepreneurship", in S Teece (ed) *The Competitive Challenge: Strategies for Industrial Innovation and Renewal*, Cambridge, MA: Ballinger, 137-158.

37 Sanderson, Margaret and Ralph A Winter (2002) "'Profits' Versus 'Rents' in Antitrust Analysis: An Application to the Canadian Waste Services Merger", *Antitrust Law Journal*, 70(2).

38 *Telecom Corporation of New Zealand Limited v Commerce Commission* (1991) 4 TCLR 473.

- Accounting data is designed for a different purpose. As a simple example, economic and accounting depreciation schedules may differ quite significantly; and

- Correct measurement of the economic profitability of any activity involves measurement of the costs and revenues associated with that activity throughout its entire lifetime, not just over a short timeframe: without complete data, expectations of the future are required and these impart very significant subjectivity. For example, shocks to costs or demand can significantly affect short-term profitability that may or may not be important in profitability over the lifetime of the project.

These identification and measurement problems are particularly acute in industries characterised by significant demand and supply-side uncertainty and sunk costs, such as gas. In this type of industry, a focus on attempting to isolate and transfer producer surplus is risky and unlikely to be for the long-term benefit of end-users. In the absence of regulatory barriers to entry the identification of excess profits that are *functionless* is subject to a very considerable probability of a type one error: i.e. probability of finding that excess profits exist when they do not.

To illustrate these issues, suppose that a foreign firm purchases a business in New Zealand and for whatever reason pays more than the replacement cost of that firm's assets.[41] Under the Commission's approach New Zealand has benefited from the initial purchase. An outflow of dividends may simply be recompense for the initial investment: over time the effect is neutral on an accounting basis. However, it is important to note that:

- To treat dividend outflows per se as a cost to New Zealand is to ignore the initial inflow;

- Use of the Commission's methodology to calculate excess profits going to foreigners for this firm, is quite wrong because the Commission's methodology is cost-based and the entry decision was market-value based. Dividends flowing to foreign shareholders may be quite different from the Commission's assessment of excess profits;

39 Boyle, Glen and Graeme Guthrie (2002) "Can Ex Post Rates of Return Detect Monopoly Profits?", New Zealand Institute for the Study of Competition and Regulation.

40 Fisher, Franklin M and McGowan, John J (1983) "On the Misuse of Accounting Rates of Return to Infer Monopoly Profits", *American Economic Review*, Vol. 73(1).

41 A market value higher than replacement cost may or may not reflect elements of monopoly power.

- The fact of the firm entering is indicative of competition in ownership which most regard as efficiency enhancing: it may indeed be the source of an element of the payment above replacement cost. Under the Commission's methodology gains in efficiency may well appear in its measure of excess profits, but:
  - The improved profit is part of the inducement for entry (management change) and improvements in efficiency: it is not on any yardstick behaviourally neutral; and
  - This increment of profit is a specific case that the Commission is enjoined by the High Court's statement to not treat such profits as *functionless*.[42]

The measurement of excess profits attributable to foreign firms is fraught with the measurement issues discussed elsewhere, and its simultaneous classification as functionless when going to foreign firms requires additional assessment. Contribution to a foreign firm's profit of an activity in New Zealand may induce the action in the first place. As the example of a productivity gains makes clear, discriminating against foreign firms will limit competition for ownership and thereby harm the long-term interests of New Zealand citizens.

4.4.2. Transfers to Foreigners

If the concern is the long-term interests of consumers, then penalising foreign ownership may be very harmful, particularly in an economy like New Zealand's that is open to trade and which benefits from openness of other economies.

Furthermore, identifying the incidence of surplus allocations is likely to be virtually impossible. The Commission treats the transfer of excess earnings from NGC's foreign shareholders as benefit to New Zealanders, yet it is clear that there is substantial foreign ownership of the gas industry supply chain and gas acquirers. Where inputs to production, rather than final demand, are being supplied and where effects across time have any importance the credible measurement of incidence is impossible.

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42 To the extent that NGC's productivity growth is induced by ownership and management (i.e. is not exogenous) its contribution to profit should be excluded from "excess profit".

For example, any reduction in transport charges would need to pass through gas wholesalers and retailers, including substantially foreign owned firms such as NGC (wholesale), Contact Energy, Shell and OMV. It is not necessarily the case that such businesses would reduce their prices to end-use customers, or at least it may take a while for the price reductions to flow through. Even if reduced transport charges are passed on to end-users, the commercial and industrial market contains significant elements of foreign ownership. For example, Carter Holt Harvey, Fletcher Challenge, NZ Steel, Contact Energy and other major users have significant elements of foreign ownership. Although competition in these markets may lead to some benefits being passed to consumers, products are sold in a mix of foreign and domestic markets. So it is not possible to simply assume competition results in benefits passing to New Zealand consumers.

Even if it were correct that NGC is earning pure profits, the Commission has not carried out a solid analysis of the incidence of the costs and benefits of price control. If the Commission wishes to count wealth transfers from foreign owned firms as a benefit to the public of New Zealand, then it is incumbent on it to demonstrate that the public of New Zealand will benefit from the transfer; not just at a point in time but overtime as industry players react to the ownership policies.

4.4.3. The Importance of Foreign Investment to New Zealand

There is little doubt that foreign direct investment ("FDI") plays an important part in economies. Empirical evidence suggests that FDI:

- Is an important mechanism for international technology transfers through spillovers;
- May improve labour productivity and therefore wages and stimulate domestic investment; and
- May lower concentration and increase competition in the host country.[43, 44]

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43 For example, see Driffield (2001).

44 Teece (1985) argues that FDI flows are determined by the desire to internalise across national boundaries (vertical FDI), or to exploit assets through foreign production (horizontal FDI). Teece (1985) then points out that vertical integration is a response to market failure. Accordingly, vertical FDI may reduce a monopoly problem in the host country. Cho (1990) cites this effect in the Indonesian banking sector, arguing that foreign presence reduces concentration, particularly where entry barriers deter domestic entry.

This importance of FDI to New Zealand is reflected in Organisation of Economic Co-operation and Development ("OECD") figures. In the thirteen years ended 2002, New Zealand's FDI inward position per capita averaged 153% of the OECD average.[45] Over the same period, FDI inflow averaged 3.8% of New Zealand's Gross Domestic Product.[46]

We expect FDI in infrastructure sectors to be sensitive to the behaviour, or perceived behaviour, of the Commerce Commission or any other agency with an ability to influence property rights. The Commission recognises this itself at paragraph 2.80 of its Draft Report:

> *The Commission notes that its net public benefits assessment, based on the above analytical approach, has not taken into account any detrimental impact on foreign investment in New Zealand if it is perceived that foreign firms are discriminated against compared with New Zealand owned firms.*

There is a significant body of research that demonstrates that departures from the fundamental concept of protection of private property rights can have a significant effect on FDI. Globerman and Shapiro (2002 and 2003) find that a country's governance infrastructure has a significant affect on the level of FDI received.[47]

Likewise, failure to protect private property rights of foreigners may also affect the price of capital. Bubnova (2000) analyses international cross-sectional and time-series infrastructure bond risk premium and credit rating history data to show that investor risk perceptions can be affected by government policies and inflate the cost of borrowing for essential infrastructure. For instance, across Budnova's complete sample of countries, a one unit increase in the an average BERI rating measure of regulatory risk leads to a statistically significant decrease in infrastructure bond spread of 47.4 basis points. While the impact is not statistically significant in the sample of stable countries, the result outlines the importance of the appropriate treatment of private property rights.

45 OECD foreign investment statistics are available from http://www.oecd.org/dataoecd/14/3/8264806.xls while population statistics are available from http://www.oecd.org/dataoecd/62/38/2698549.pdf.

46 OECD gross domestic product data are available from http://www.oecd.org/document/28/0,2340,en_2825_495684_2750044_1_1_1_1,00.html.

47 Globerman and Shapiro (2002 and 2003) define a beneficial governance infrastructure as being characterised by "an effective, impartial and transparent legal system that protects property and individual rights; public institutions that are stable, credible and honest; and government policies that favour free and open markets."

Non-discrimination of FDI was also the core concept of the Multilateral Agreement on Investment developed by the OECD in the late 1990's (OECD (1997)).[48] Indeed, The World Bank and OECD (1999) notes that it:

> *… may violate international obligations to require that foreign-owned firms attain greater efficiency gains from a merger than domestically owned firms to avail themselves of an efficiency defense.*

48 We note that negotiations over the agreement broke down in 1998.

5. WELFARE EFFECTS OF PRICE CONTROL

5.1. INTRODUCTORY COMMENTS

In this section we assess the key elements of the quantitative approach adopted by the Commission.

Our key concern with the Commission's model of the benefits of price control is that it does not really address the difficulties of implementing price control. The model of price control is more akin to rate of return regulation where in every year prices are varied to ensure revenues are equal to costs. The model is highly deterministic and does not consider any of the uncertainties that a regulator would confront in imposing price control.

Under a building blocks price control arrangement, the usual process is for the regulated business to establish forecasts of future costs, investments and demand, and then for the regulator to scrutinise those forecasts and establish a price cap, based on its views. From that point, a conventional price cap (e.g., those applied in Australia, Canada and the UK) will generally fix the weighted average of prices for five years. The success or otherwise of a price cap is therefore critically dependent on the ability to forecast future – given the substantial degree of uncertainty about the future gas market in New Zealand, risks of a regulator mis-forecasting may be substantial.

In forming a view of the future shape of the gas market the Commission should be cognisant of the following:

- As gas prices increase, the number of viable alternatives to gas will increase;
- Intensive gas users operating in internationally competitive markets will weigh up options to relocate to other countries as New Zealand becomes relatively less attractive as a low energy cost environment;
- Pipeline businesses will come under increased pressure to negotiate special transmission and distribution arrangements that discount pipeline charges to price sensitive customers that will either exit New Zealand or substitute to other fuels. [ ]; and
- Businesses that make largely sunk capital investments will be wary of investing in infrastructure that uses gas, given the longer-term uncertainty about gas prices and future availability.

Accordingly, there are considerable downside risks to pipeline businesses under a light-handed regulatory environment, which will affect future revenues, and potentially leave NGC and other pipeline businesses with significant stranded assets.

Within this context we examine the core elements of the Commission's quantitative approach.

5.2. TIMEFRAME

Determining the potential costs and benefits of control is essentially a forecasting exercise: if the factual of control were imposed in, say, 2006 how would profitability and efficiency be affected relative to a counterfactual of continued light-handed regulation?

In developing estimates of the benefits and costs of control, it is necessary to develop an internally consistent qualitative view of both the factual and counterfactual, that acknowledges the real world difficulties of operating a pipeline business, and the difficulties a regulator would encounter in setting the parameters of price control. Forecasting uncertainty would be a significant issue for a regulator, who would also have to make a number of important decisions in terms of determining the extent that pipeline businesses would bear stranding risks relative to consumers, dealing with investment discretion, etc.

A crucial aspect of the Commission's cost-benefit analysis is the choice of timeframe and modelling approach. The Commission's approach is to use a mix of historic and forecast data to estimate the benefits and costs of control, in an attempt to determine the 'average' annual impact that price control would have on welfare.

The Commission justifies its approach of using past and historic data in para 5.124:

> *The period of analysis typically ranged from 1997 – 2008, with the exception being for Vector whose analysis covered the period 2000-2008. In all cases the analysis period includes both actual and forecast outcomes.* ***The Commission considers that equal weighting should be given to the past and forecast information.*** *While as a general proposition it may be true that past information is not a good guide to the future, it is also true that forecast information by its very nature is uncertain. For example, it is difficult to know how expenses or prices may change in the future despite the businesses providing their best estimates at this time. Accordingly, treating both past and forecast outcomes equally is considered to be a reasonable approach to take. Including both past and forecast outcomes in the assessment also has the benefit of extending the period of analysis, so that short-term events do not have undue influence on the overall results.* **Emphasis added.**

While we understand the Commission's intention to calculate the average effect of price control, the actual quantitative analysis distorts the benefits and costs of control in the historic data. The problem emerges with the compounding approach, whereby historic data is compounded up to a value in 2004. This has the effect, for example, of treating $1 of excess profits in 1997 as $1.70 of excess profits in 2004. To then treat the elimination of the historic $1.70 of excess profits as a future benefit of control exaggerates the benefits of control and has the effect of giving greater weight to past excess profits than forecast profits.

The Commission's approach effectively ends up addressing the question: "what would the costs and benefits of control have been if control had been imposed in 1997, valued as at 2004?" It does not, however, address the forward-looking question of "what would be the future benefit of imposing control, if control were imposed in 2005, valued in present day terms?"

The problem created by compounding up past excess profits to 2004 is that it effectively implies that a regulator would be making interest payments (within the revenues implied by a price cap) for past excess profits. We suspect that this is not actually the intention of the Commission, since the introduction of price cap regulation is on the basis of making a P_0 adjustment at the start of the price control period to equate expected revenues with expected costs.

Compounding up also leads to other distortions – for example, the indexing factor is applied to the direct costs of control in 1997 of $450,000, which is present valued as a future cost of control of $796,000, but this is really quite economically meaningless, since control can only be imposed prospectively.

The magnitude of the effect of compounding up past profits and treating the elimination of these as a future benefit of control is illustrated in the following tables:

- Table 4 illustrates the Commission's compounding approach. Past excess profits are compounded up to 2004, and future excess profits are discounted back to 2004; and
- Table 5 illustrates a prospective valuation of benefits of price control in eliminating future excess profits, using an identical stream of excess profits as in Table 4, and present valued in 2004.

Table 4: Example of Impact of Choice of Timeframe for Estimating Benefits of Control – Commission's Approach

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Profits	100	100	100	100	100	100	100	100	100	100	100	100
Efficient profits	90	90	90	90	90	90	90	90	90	90	90	90
Excess profits	10	10	10	10	10	10	10	10	10	10	10	10
WACC	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%
WACC index (2004 value)	1.7	1.5	1.4	1.3	1.2	1.2	1.1	1.0	0.9	0.9	0.8	0.7
Indexed Profits	16.6	15.4	14.4	13.4	12.4	11.6	10.8	10.0	9.3	8.7	8.0	7.5
Consumer Benefits: Commission's calculation (1997 to 2008) valued in 2004 dollars												**137.96**

Table 5: Example of Impact of Choice of Timeframe for Estimating Benefits of Control – Valuing Future Benefits of Price Control Only

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Profits	100	100	100	100	100	100	100	100	100	100	100	100
Efficient profits	90	90	90	90	90	90	90	90	90	90	90	90
Excess profits	10	10	10	10	10	10	10	10	10	10	10	10
WACC	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%
WACC index (2004 value)	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.4
INDEXED PROFITS	9.3	8.7	8.0	7.5	7.0	6.5	6.0	5.6	5.2	4.9	4.5	4.2
Consumer Benefits: Prospective calculation (2005 to 2016) valued in 2004 dollars												**77.4**

The difference in calculated benefits of control using the Commission's mixed historic and forecast method, and an entirely prospective approach is substantial. Using an identical stream of excess profits the NPV calculations show that the Commission's compounding up approach over-estimates the transfer benefits of control by 78% in this example, which is likely to be reasonably indicative of the overstatement of benefits in the Commission's actual model given the use of a WACC of 7.5%.[49]

To be clear, we are not saying that past information is irrelevant for the purpose of the inquiry. The past is potentially indicative of future behaviour, and the models we develop in Section 7 are based, in part, on observed historic information. Extrapolating past cost and demand trends and examining past profitability as a portent for the future is reasonable in establishing a baseline for behaviour under continued light-handed regulation, but it is important that behavioural assumptions are fully incorporated into any model of control[50] and projections of the future are conditioned by the structural changes known to be affecting the gas industry.

Finally, we observe the Commission's comment in paragraph 5.125 that its model "cannot test outlying scenarios, for example, the effect of a doubling or halving of current prices." But this is exactly the current situation in the gas market, where wholesale prices are at least doubling from Maui prices, which underpin most of the Commission's study period. So it is necessary to directly address the potential impact of structural change on the market, including growth assumptions for the market and likely level of future volatility in throughput and potential for asset stranding.

The distortions introduced by the compounding up approach are not able to be rectified within the Commission's model approach. Accordingly, it is necessary to develop a forward-looking approach, which can take account of past behaviour, but also recognise the substantial uncertainty moving forwards. This is what we achieve in the Monte Carlo framework developed in section 7.

49 The Commission's average WACC is 7.7% in the middle scenario.

50 For example, the Commission's model shows investment is completely invariant to price control, and the level of WACC that a regulator might use, in spite of the Commission's subsequent quantitative analysis of missing markets that arise because NGC reduces investment.

5.3. Modelling the Welfare Impacts of Price Control

The Commission's model of price control is based around its excess profits calculation. Price control is assumed to set prices at a level where returns are exactly equal to the cost of capital. The corresponding transfer reduction is treated as a benefit to acquirers, in the net acquirers benefits model, and a welfare gain to New Zealand in the net public benefits model, to the extent that transfers from foreign shareholders flow to New Zealand consumers.[51] Transfer benefits of control are reduced by 20%, which is the Commission's assumption of the potential for regulatory error.

Prices are calculated in the Commission's model on a fully variable basis by calculating an average price derived from required revenues (under price control) divided by total volumes. Prices in the counterfactual are also based on average revenue yield per GJ throughput, with revenues based on historic and forecast revenues.

Allocative efficiency is then separately modelled as an increase in consumer and producer surplus (the latter in the net public benefits model only). Consumer surplus is calculated using the standard deadweight loss triangle using the difference in average prices under control relative to the counterfactual. The producer surplus component of the deadweight loss calculation is based on a 'long-run' model, which effectively assumes that NGC's networks are capacity constrained, so any increase in demand is assumed to increase revenues by the efficient price (P_c), but costs are assumed to increase by an identical amount. In the reverse case where factual prices (P_c) are above the counterfactual prices (P_m), producers are assumed to save costs of $P_c - P_m$ with a fall in demand.

Productivity growth is assumed to be 1% per annum in the factual and 0.33% in the counterfactual. The higher rate of productivity growth assumed in the factual is conditioned on findings from reports from Meyrick and Associates, which purports to provide 'indicative' evidence that regulated Australian gas networks are more productivity than New Zealand gas utilities.

Dynamic efficiency is calculated using two models:

- Quality effects, where some consumers are assumed to be forced on to interruptible contracts; and
- Missing markets arising because pipeline providers reduce their level of investment.

Direct costs are based on reported control inquiry costs and the Commission's costs of administering the price control regime for electricity lines businesses.

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51 Note that the Commission only completes half the analysis of transfers between foreign owned gas pipeline businesses and New Zealand acquirers, as the Commission assumes that all acquirers are New Zealanders, or New Zealand-owned.

The net contribution of these benefits and costs to the welfare measures are summarised in the following tables:

Table 6: Net Acquirers Benefits Evaluated at 75th Percentile of WACC range (1997 to 2008)

	NGCT	NGCD
	$,000s	$,000s
Excess profits	5,323	2,328[52]
Profits not recovered	-1,597	-486
Consumer surplus gain	68	44
Consumer surplus not achieved	-47	-16
Productive efficiency gain	839	307
Productive efficiency loss	-268	-98
Dynamic efficiency cost – quality effect	-427	-162
Dynamic efficiency cost – under-investment effect		-270[53]
Direct costs of control	-570	-570
Net acquirer benefits	**3,322**	**1,077**

52 This falls to $2,717,000 when the gain on sale of disposed assets is deducted from NGC's excess profits. This is a gain that legitimately rests with shareholders, as we discuss in section

53 Corrected value. The Commission has a value of -$1,000 for dynamic efficiency costs of control.

Table 7: Net public Benefits Evaluated at 75th Percentile of WACC range (1997-2008)

	NGCT	NGCD
	$,000s	**$,000s**
Consumer surplus gain	68	40
Consumer surplus not achieved	-47	-16
Producer Surplus	61	1
Productive efficiency gain	839	307
Productive efficiency loss	268	-98
Dynamic efficiency cost – quality effect	-427	-162
Dynamic efficiency cost – under-investment effect	-	-270[54]
Direct costs of control	-570	-570
Net public benefit	**-342**	**-780**
Transfers from foreigners	2,459	1,215
Net NZ public benefit	**2,117**	**435**

To place these projected benefits in context, the total value of the New Zealand gas market is around $ 1 billion per annum, and price reductions implied by the calculated benefits are around 4% of the average delivered price of [ ].

In the following sections we examine the models used by the Commission.

5.3.1. Transfer Benefits

We have already discussed transfer benefits of control in the context of our discussion of excess profits in section 3. In that section we note that the Commission’s model of excess profits and, by implication, transfer benefits to acquirers of control is inappropriate.

54 Corrected value. The Commission has a value of -$1,000 for dynamic efficiency costs of control.

The Commission discounts the hypothetical maximum transfer benefits of control by 20% to give the expected transfer benefit of control. The Commission notes that this figure reflects the proposition that price control may not be able to perfectly achieve the efficient price level. The Commission adopted a figure of 25% in the Airport's inquiry, but because the Commission estimates more of the costs of control independently of the scaling approach adopted for Airports it is reasonable to reduce the scale factor.

The difficulty we have with the scaling approach is that it is entirely arbitrary – yet it is clearly a significant part of the Commission's analysis. The 20% figure is taken to represent the difficulties that a regulator would have in imposing control, uncertainties in constructing forecasts, and volatility in key variables that affect future financial performance. Selecting 20% to represent the broad range of uncertainties provides no insights into the range of potential outcomes that may eventuate under price control and does not provide any meaningful framework on which to consider the range of regulatory risks.

In the Monte Carlo analysis we undertake in section 7 we are able to directly examine the range of potential outcomes under price control, given uncertainties in key variables that would affect financial outcomes. This allows us to dispense with the arbitrary point estimate of 20% and examine the real risks and uncertainties that a regulator would confront in imposing price control.

5.3.2. Allocative Efficiency

Consumer Surplus

The Commission's model of allocative efficiency is based on an average revenue yield approach for practical reasons, with prices determined by costs (factual) or achieved revenues (counterfactual) divided by quantities. As we observed in our comments on the Commission's draft framework paper, this will potentially lead to overstatements of the allocative efficiency impacts of control, where pipeline businesses use multi-part tariffs to recover revenue requirements. Nevertheless, we acknowledge that the control recommendation is unlikely to be conditioned on short-term allocative efficiency effects and refinements are unlikely to change the Commission's findings, because the welfare effects are so small.

It is important, however, to recognise that allocative efficiency is a static concept and takes many elements (e.g., investment and risk management) as given. Empirical analysis of allocative efficiency is relatively simple, but also relatively unimportant at any single point in time. What is more important is the absolute size of the market and how regulation affects incentives for pipeline providers to invest. Expansion of the market is likely to be accompanied by a degree of sharing of the benefits of an expanded network across all customers, since the more customers and volumes transported, the greater the potential for sharing fixed and common costs across consumers/consumption.

In the Commission's quantification methodology, it ignores the quantity effect of missing markets on the efficient prices that would be set over time. Efficient prices are determined by dividing efficient required revenues by counterfactual quantities. In fact, if missing markets emerge, then prices will need to be higher than what the Commission estimates, because there are fewer customers/volumes to spread costs over. Under the Commission's assumption that 0.5% of the counterfactual quantity (Q_m) would not be served in the factual, this has little effect on the accuracy of the results. However, under the more realistic missing markets that emerge in our Monte Carlo modelling, the effect is significant. To rectify this mistake the factual quantities need to be reduced downwards by the quantities in the missing market.

Producer Surplus

The Commission's formula for the producer surplus componenet of the allocative efficiency calacultion is based on a long-run model where P_c is deemed to be the long-run marginal cost of providing an additional unit of gas. While this would be appropriate where there were major changes in gas demand, resulting from a decrease in prices, the actual volume effects are at most 6%, which would almost certainly be within the capability of any network. The Commission also observes that there is currently sufficient transmission capacity to deal with foreseeable future demands, with the possible exception of capacity into Auckland.

It is therefore more realistic to model the producer surplus component of dead-weight loss effects with a short-run marginal cost model. This has the effect of raising the potential benefits of control, since an increase in demand, would increase producer surplus. In our subsequent modelling we use short-run marginal costs of $0 per GJ and $0.05 per GJ for distribution and transmission respectively.

5.3.3. Benchmarking and Productivity Analysis

The Commission commissioned two reports from Meyrick and Associates[55] that examine productivity achievements made by NGC distribution over the past 7 years and benchmark New Zealand distribution businesses against regulated pipeline businesses in Australia. The Commission takes from these reports the following findings:

- NGC distribution has on average made productivity gains of 2.5% per annum; and

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55 Meyrick and Associates (2004) *Comparative Benchmarking of Gas Networks in Australia and New Zealand*, Report prepared for the Commerce Commission, May 2004 and Meyrick and Associates (2004) Productivity Growth in New Zealand Gas Distribution Networks Report prepared for the Commerce Commission

- Because on average the New Zealand pipeline businesses appear less productively efficient than the average regulated Australian businesses this is 'indicative' evidence that the imposition of price control would improve productivity by more than what shareholders and management would otherwise achieve.

In preparing these reports Meyrick and Associates make a number of observations about the quality of data available, and the fact that it was not possible to assemble a data set that would allow computation of the ideal model where throughput, customer numbers and system capacity would form network outputs, and a standardised measure of capital inputs could be used. Instead proxy approaches were utilised. Meyrick and Associates make no comment on the likely accuracy of these proxy approaches, but we note the following.

- Capital inputs are measured by depreciated replacement costs. Because of the safety issues involved with gas networks the services provided by gas pipelines are likely to be very similar over the life of the asset. Different stages in asset life will result in a different value, but similar delivered service.

- The omission of a system capacity variable in the model is a severe deficiency. It is not possible to draw any conclusions about relative productivity levels from such a model with this variable omitted. Its inclusion could completely change the results of the model and relative rankings.

- The results of the modelling demonstrate that it is unsafe to draw any conclusions from the models. It is implausible that:

  - There can be a 47% difference between the best and worst performer in what appears to be the preferred Model 3 of distribution performance; and

  - In the transmission model the worst performer is over 400% less productive than the best performer.

Even if the results of the modelling are accepted, it is obvious that New Zealand businesses are not uniformly less productive than their regulated Australian counterparts. Wanganui Gas is third most productive and Powerco sixth most productive out of 14 businesses. In the transmission model, out of eight transmission businesses there are three Australian pipeline businesses that are less productive than NGC, one of which appears to be 58% less productive. Hence, the proposition that price control would be likely to improve productive efficiency is not supported by the productivity studies

Overall, the only reasonable conclusion to draw from the Meyrick reports is that with current data and models it has not been possible to determine reliable estimates of productivity.

The Meyrick reports claim that the results should be taken as 'indicative' and not determinative. In our view, this overstates the reliability of the results. It is impossible to substantiate a view that the severe data constraints and data quality issues that have affected the analysis would not have a bearing on the results.

The Commission uses the Meyrick reports to substantiate its view that under price cap regulation businesses would become more productive than under light-handed regulation. The Commission does not explain why it considers this would occur. Under light-handed regulation, pipeline businesses' shareholders and management face strong incentives to make efficiency gains, since they are able to gain the benefits of cost reductions. Exactly the same mechanism is relied upon under price control to make efficiency gains, with the exception that:

- One year out of every five, senior management are distracted from ordinary running of the business to engage in the price path reset process; and
- There is diminished incentive in years 4 and 5 of a price path to make efficiency gains, since more of the benefits pass to consumers than shareholders than if efficiency gains are 'saved up' until the start of the new price control period.[56]

In terms of the Commission's later assumptions that under price control productive efficiency would improve by more than under light-handed regulation, we take the view that:

- The Meyrick reports cannot be relied upon as indicative evidence that regulation improves productive efficiency;
- Both price cap and light-handed regulation rely on exactly the same mechanism for businesses to make efficiency gains. If anything the incentive under light-handed regulation is stronger because there is no risk of confiscation of efficiency gains at the end of each price path period; and
- The most reasonable assumption for the Commission to make is that there is no difference in productive efficiency achieved in the first three years of a price path, but in years four and five efficiency gains are saved up for the next price path period.[57]

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56 Overseas regulators have contemplated introducing efficiency carry-over mechanisms so that efficiency gains may be kept for a period of five years regardless of when they have been incurred.

57 See Erhardt 2000 for a discussion of the incentive effects of price control on saving up efficiency gains.

If the Commission wishes to adopt the contrary assumption that productive efficiency would be improved under price control, then it should make transparent the assumptions it makes on the institutional arrangements that would bring about these gains and why light-handed regulation fails to achieve these same benefits, when exactly the same mechanism is relied on. Moreover, as the Commission recognises, NGC faces competition in bypass markets, a number of customers are subject to interfuel constraints or are price elastic, so NGC has every incentive to ensure that costs are contained in order to maintain these customer's connections.

In our alternative modelling, we adopt the following assumptions:

- Under light-handed regulation, pipeline businesses improve efficiency at 1% per annum. (We adopt the Commission's assumption of 1% for convenience);
- Under price control, in the first three years productive efficiency improves at 1% per annum. In years 4 and 5, productive efficiency gains are saved up for the next price path period. In year 6 the 'saved' efficiency gains are realised; and
- In years 7-10 efficiency gains of 1% are achieved, as there is no incentive to save them up, since control is assumed to end at year 10.

5.3.4. Dynamic Efficiency

Industry Dynamics

Dynamic efficiency refers to allocative and productive efficiency over time. A state of the world is dynamically efficient when firms have the appropriate incentives to invest, innovate, improve the range and quality of services, and increase productivity and lower costs through time. Put simply, it may be described as the highest present value of efficiency (producer plus consumer surplus) into the foreseeable future.

In an industry such as gas pipelines, static efficiency is unlikely to be maximised at any point in time because custom is not guaranteed and there may be large exposures to particular customers, industries, and even economic conditions in particular regions. Because investment lead times are lengthy and investments are largely sunk, the optimal capital stock is likely to be a moving target - assets may shift between being stranded and unstranded over time as economic and social /demographic conditions change. In such circumstances, dynamically efficient market outcomes are associated with gas pipeline businesses adopting appropriate investment strategies (e.g., expected payback periods, pricing arrangements, risk-sharing, capital contributions, etc).

In the context of a price control inquiry, the issue is what impact the imposition of price control would have on the incentives described above, and what the resultant welfare implications would be. Constraint on a pipeline businesses' ability to price flexibly is likely to significantly affect dynamic outcomes. For example, an important consideration in the pipelines inquiry is the fact that gas use for most customers is discretionary. For residential and small commercial customers there are relatively large up-front, sunk costs for the pipeline business to connect a customer to the mains. For the customer there are also higher up-front appliance costs compared to electric appliances. Therefore network investment, marketing and customer education campaigns are required to convince customers of the benefits of gas use over electricity: investment that at its discretion the pipeline business need not make.

To increase gas penetration has required a concerted marketing effort from pipeline businesses. For example, Vector has invested in the Pure Energy brand to increase gas penetration in the Auckland market to all classes of consumers. Such marketing investment is sunk and risky and may be deterred if risk-adjusted returns are not sufficient to justify the marketing investment.

If pipeline businesses are to undertake risky marketing activities to increase the connected customer base, then there must be the possibility of upside returns to compensate for undertaking the marketing risk. Such returns would likely be truncated under a price cap based on a simple cost of capital methodology, that does not recognise asymmetric risk bearing, and would therefore have significant potential to deter investment.

As we understand it, the majority of distributors offer residential customers a free connection for the first 25m of connection pipeline. This costs the distributor approximately $1,000 on average and is an important part of the marketing cost to get a consumer to switch to gas, since it could otherwise deter customers (who will already be connected to electricity) from switching. An average residential gas customer, however, only pays gas pipeline charges of around $200 to $300 per annum, so it would take 3 to 5 years just to pay the pipeline owner's connection costs, before any contribution to distribution assets or other marketing costs is made.[58] If the reset of a price path then re-establishes prices at a level designed to equate returns to a simple cost of capital estimate, then there is effectively no benefit to the distributor from increasing the penetration rate through marketing activities, since upside returns from risky marketing will be truncated, but the pipeline owner bears all the risks of marketing and customer education campaigns.

58 NGC informs us that investment decisions are based on a payback period that materially exceeds the five year period of a typical price path. Therefore under a five year price path approach there would be little incentive to undertake risky network expansions since upside returns would be truncated before the end of the payback period.

Example of Risky Investments

A core part of NGC's investment programme is its reticulation to new subdivisions. NGC has a standard investment decision tool which is used to evaluate the business case for the investment based on forecasts of customer connections and household demand. If an investment does not pass an investment hurdle rate at the expected level of tariffs within a certain payback period then customers are required to meet the expected shortfall with an upfront capital contribution. This is usually by the developer of a subdivision.

In NGC's experience the strike-rate (the number of acceptances) for subdivisions where a customer contribution is required is considerably less than the strike-rate on subdivisions where NGC fully funds the expansion. Over the most recent 18 month period, NGC has experienced a 50% strike rate on proposed developments where a customer contribution is required, compared to a 100% acceptance rate where no contribution is required.[59] If regulation were to lower prices, this would require NGC to lower the threshold for requiring a customer contribution, which would directly impact on strike rates and limit the overall size of the market for gas.

Where NGC makes the investment, it has no certainty that its forecasts will turn out to be accurate. For example, a reticulated development at [ ] was projected to be self-funding without a customer contribution. NGC's forecasts were for customer uptake of [ ] of potential connections, and household demand of [ ] GJ per annum. Although the customer uptake forecasts turned out to be accurate, household demand has been 10% less than forecast, reducing the present value of returns by [ ] on a [ ] investment.

Network growth strategies to larger customers involve significant risks due to uncertain long-term demands from such customers. For example, sales to firms in the forestry, horticultural, and dairy industries, etc, depend critically on competitive conditions, relative opportunities for each sector and interfuel substitution possibilities. A price path that truncates the level of returns available from such investments will almost certainly lead to under-investment in entrepreneurial expansions to such customers.

Option Creating Investments

NGC is currently investing in a designation of a route between Rotowaro and Auckland for a possible future pipeline expansion. NGC estimates that the cost of designation will fall between [ ]. Of course, there is no guarantee that the pipeline investment will take place, as it is contingent on another gas-fired power station connecting near Auckland. But it provides NGC and customers with a valuable option to cost-effectively build efficient new pipeline capacity in future, by protecting an access corridor for a new pipeline.

Without this designation, there would be no guarantee that in 3-4 years when the demand will potentially materialise that it would still be possible to use the corridor, and therefore a lengthier pipeline route could be required.

59 Source: NGC data.

Option Creating Investments
From society's point of view, it is desirable that pipeline owners undertake such investments that provide valuable future options, but in order for NGC to accept such risks, the possibility of upside returns must be present. Price cap regulation, which generally makes no allowance for investment in valuable options, and seeks to constrain profits to simple cost of capital estimates would materially discourage such investment – thereby raising costs over the longer term to consumers.

Commission's Analysis of Quality Effects

The Commission computes two models of potential dynamic efficiency losses. The first calculates the costs of customers moving from a firm supply contract to an interruptible contract. The calculation assumes that 5% of sales shift to an interruptible contract and receive a 10% discount for accepting the interruption risk. The discount is assumed to be equal to the value that customers lose from firm supply.

The Commission observes that this may overstate the effect because regulation can provide incentives not to reduce quality. However, this fails to recognise that:

- Regulation of quality is highly imperfect. It inevitably focuses on averages (as does the Commission's regulation of SAIDI and SAIFI for electricity lines) and there are a myriad of quality aspects that cannot be readily measured;
- Demand for quality may be increasing. It is extremely difficult for a regulator to forecast demand for 'quality of supply' and set appropriate prices; and
- The discount that customers receive from moving to an interruptible tariff is voluntary. Interruptions imposed on gas customers are likely to impose significantly greater welfare losses.[60]

NGC informs us that it is currently making the following investments for quality:

60 The Commission observes that "the costs of unplanned interruptions imposed on infra-marginal customers are likely to be higher, but are not considered".

- Increasing pipeline pressures in distribution networks to accommodate appliances such as instant/continuous hot-water heaters. The alternative is to issue a notice prohibiting installation of such appliances. The Household Energy End-use Project (HEEP) studies show that consumers with instant hot water heating use more hot water, and the higher cost of the instant heater[61] compared with electric or gas hot water heating systems indicates that consumers derive greater value from such appliances[62]; and

- Network redundancy investments that improve security of supply to customers in the event of an outage.

If NGC were to scale back the level of investment in its networks such that customers were exposed to greater risks of involuntary outages, and restrictions on the appliances that can be installed, this would have considerably more severe effects than the welfare losses from 'voluntary' reductions in reliability, accepted by customers who shift to interruptible contracts.

Measuring quality effects is obviously an area where it is difficult to acquire data on consumer willingness to pay. The Commission observes that it has been unable to acquire information on value of lost load (VOLL) for gas. Nevertheless, VOLL for electricity may provide a reasonable benchmark for the potential loss of welfare during an outage. Scale factors to represent the potentially less time-critical use of gas can be used to test sensitivity of results to different reasonable estimates of VOLL.

Omission of a broader estimate of quality effects of control potentially biases the outcome of the inquiry. The Commission's model of welfare reductions from voluntary switching to interruptible tariffs provides a lower limit estimate of the potential impact of control on quality. In a market with turnover of over $1 billion per annum (consumer surplus will be considerably more), suggesting that the loss of quality under regulation would have an effect measured in the hundred's of thousands of dollars, is unrealistically conservative.

The Commission's Analysis of Missing Markets

The other dynamic efficiency cost of regulation is the potential for 'missing markets' to emerge as a result of diminished incentives to invest. Missing markets emerge where a producer fails to provide a good or service, because the regulator suppresses prices, yet consumers would be willing to pay for the service at higher than the regulated price.

61 See the comparison of appliance costs in A.2.

62 http://www.branz.co.nz/main.php?page=HEEP.

The Commission assumes that under price control, a constant 0.5% of demand (Q_m) would not be serviced. The Commission's model contains an error in calculating the slope of the demand curve in the missing market. The slope (rather than the elasticity) is transferred from the existing market, resulting in demand in the new market falling to zero with a 2% increase in the gas pipeline charge (i.e. a demand elasticity of –50). The correct method is to use a price elasticity, which we simply adopt from the Commission's assumptions of –0.3. Demand falls to zero when distribution pipeline charges increase to $10-14/GJ. Correcting the Commission's formula leads to a reduction in surplus under price control of $270,000 per annum on average.[63]

The trivial dynamic efficiency cost of regulation emerges because the Commission assumes that only 0.5% of total counterfactual demand would occur as a missing market. The Commission justifies its extremely conservative assumption at paragraphs 5.108 to 5.110:

> *The Commission agrees in principle that such an approach could provide some 'feel' for the potential efficiency costs of a failure to supply new customers. Its preliminary view is that even if regulation were to have an adverse effect on new investment, such costs would be likely to be modest given the likely limited growth in demand.*
>
> *As Maui gas runs out, the higher cost of gas relative to other energy sources may reduce the demand for network rollout irrespective of regulatory risk. Many of the submissions to the Commission on the Draft Framework Paper noted that increasing gas prices were likely to have a negative impact on gas demand. The companies themselves are forecasting little growth in demand over the next five years.*
>
> *Some expansions of the network, such as the rollout in new subdivisions, are undertaken by developers, and may not be significantly affected by regulatory risk. Investments in new pipelines dedicated to particular customers are likely to be governed by individual contractual arrangements and may not be subject to price cap regulation, particularly if developed under conditions of contestability. Customers could themselves own such dedicated assets. Expansion of the network by new entrants and by Nova Gas would likely continue to be outside the scope of regulatory control, as would investments by developers of new gas fields. Overall, these observations suggest that the impact of regulatory risk on new investment in the gas industry, and the subsequent loss of value to customers willing to pay for services, may be modest.*

From these paragraphs we infer that the Commission believes that:

- There is unlikely to be much investment in future because the supply of gas will be limited and gas prices will increase; and

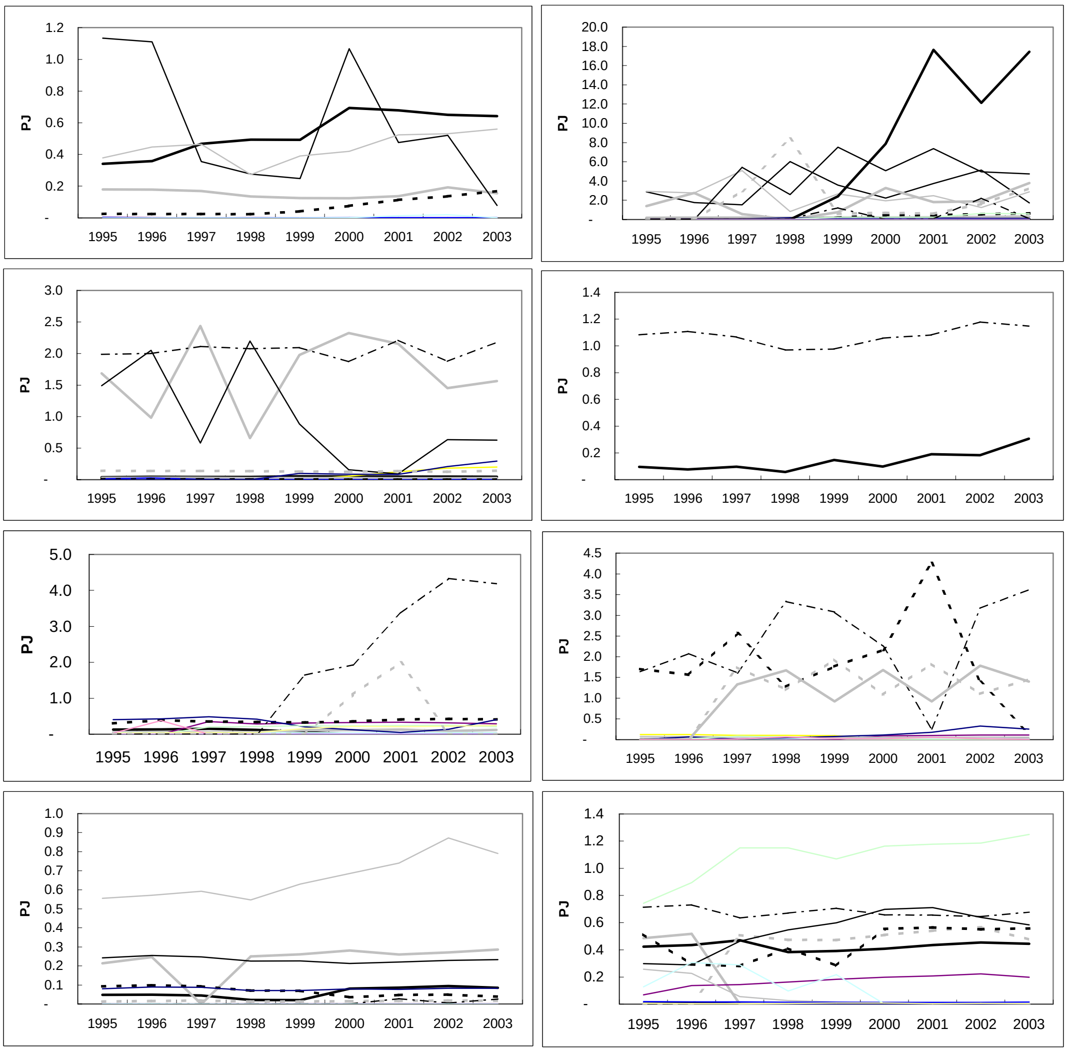
- If regulated businesses do not invest then someone else will.

63 The Commission's incorrect model has dynamic efficiency costs of $1,000 per annum.

In regard to the first point, NGC informs us that its forecasts are for declines in some loads to be offset by investments to connect new loads.[64]

The charts on the following two pages show demand variability on NGC's networks. NGC's networks are divided into 16 discrete regions, with each line representing demand at each gate-station.

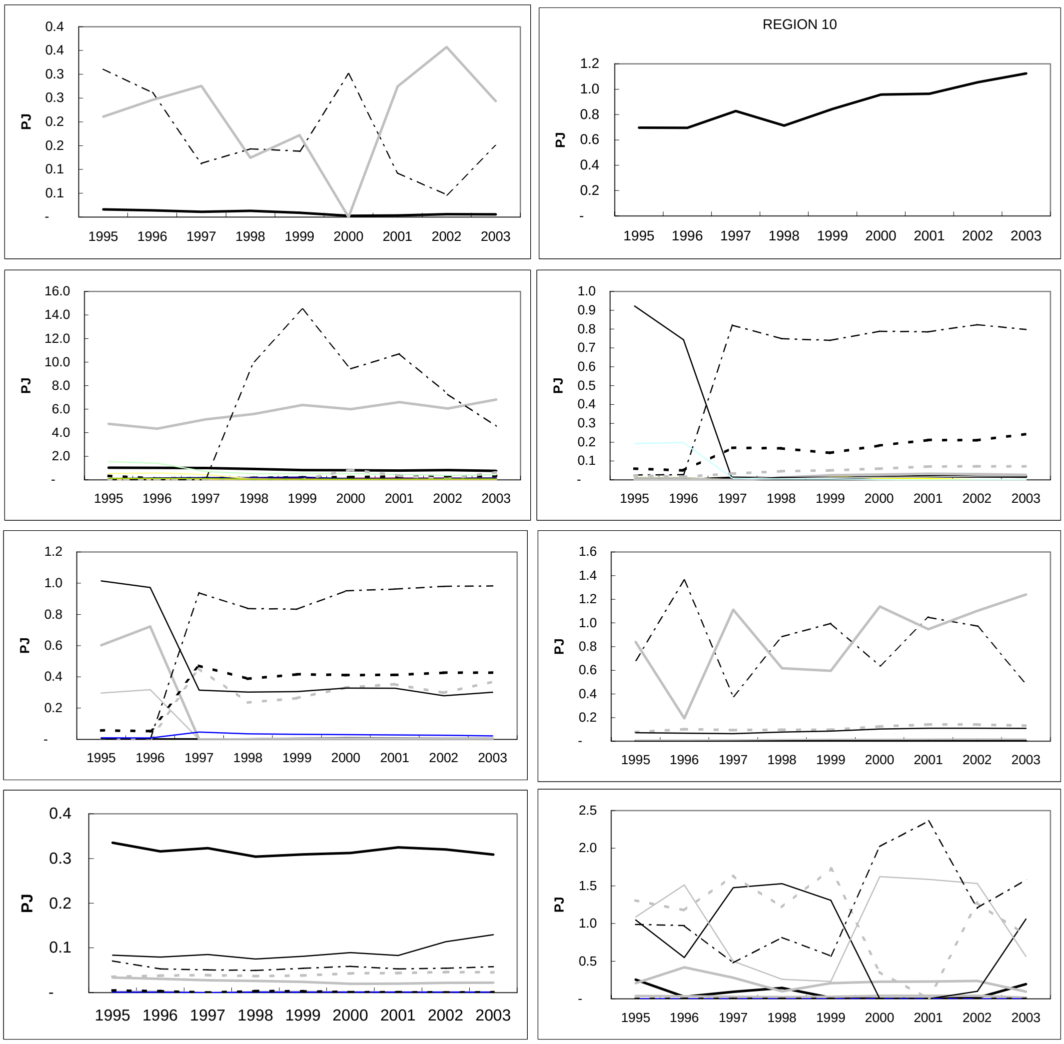
Figure 7: Demand Variability on NGC's Networks, Regions 1-8[65]



64 [.]

65 Source: NGC Data.

Figure 8: Demand Variability on NGC's Networks, Regions 9-16



The charts illustrate the significant changes in demand that have occurred over time at the disaggregate level, with new loads coming on to the system and existing loads dropping off. To the contrary, there is likely to be greater pressure on NGC to market gas to potential new sources of demand to replace loads that drop off the network in response to rising wholesale gas prices.

In regard to customers owning the pipeline assets themselves, capital contributions are a significant deterrent to connecting to gas, since gas is not a necessity. Based on a sample of instances where a capital contribution has been required by NGC, in [ ] of cases the developer decided not to proceed with gas reticulation. The connection strike rate falls to zero when capital contributions exceed a threshold of [ ] per project – a relatively trivial sum in the overall cost of a residential subdivision.

It is also dynamically inconsistent to assume that if regulation causes NGC to stop investing that Nova, for example, will. Another pipeline investor will have investment hurdle rates similar to NGC, so would expect that if the Commission observes rates of return that have led to NGC being regulated, then regulation would also be imposed on it. Accordingly, it is not reasonable to assume that another pipeline investor would invest in NGC's place given the lengthy cost recovery profiles for infrastructure assets.

In the Commission's transmission model, it assumes no dynamic efficiency impacts of control, as it is difficult to foresee that there will any further investment in gas transmission lines in future. We observe that the Commission's model of price control is based on an approach where the unstranding of assets is accompanied by a revaluation gain, which is treated as income which must be shared with consumers. At present, NGC has optimisations accounting for around 24% of depreciated replacement cost, which would place NGC at extreme risk of assets being unstranded by renewed demand for the asset, and being forced to pay consumers for the unstranding. Under such circumstances, NGC will be incentivised to prevent unstranding from occurring. This could potentially be through scrapping, or failing to maintain stranded assets.

As the example of the designation of the potential pipeline route to Auckland also demonstrates, NGC currently invests to provide valuable future options to expand capacity. Without designation, customers would be exposed to the costs of paying for potentially costlier pipeline routes. At present the risks of such investments are borne by NGC's shareholders. The value of the designation is not recognised in NGC's ODV and it does not currently earn a return on the investment. NGC will require an above-average return if future demand does materialise to cover the risk that demand does not eventuate. Regulation at a simple cost of capital will deter NGC from making such investments, which will destroy option values likely to be highly valued by society. Accordingly, the Commission must give some recognition, even if qualitatively, to the risks that price cap regulation would deter efficient investment behaviour on the transmission system.

Overall, the evidence strongly points to the Commission's model under-estimating the dynamic efficiency costs of control. To more realistically model the effects of control on dynamic efficiency within the Commission's model framework, we assume that the size of the missing market grows cumulatively at 0.5% per annum, leading to a reduction in the size of the market in year 12 of 6%, which remains an extremely conservative assumption, given the evidence of connections and disconnections of loads at a much greater level than this over the period 1995 to 2003.

Modelling Approach

A further concern with the Commission’s model is the inconsistency between the model of ‘missing markets’ and investment. Although NGC is assumed to reduce the level of investment, which leads to customers not being served, there is no consequential impact on the level of investment. NGC is assumed to invest at the same level regardless of the level of WACC.

The problem emerges because there is simply no linkage between growth in the number of customers and volumes and investment in the Commission’s model. Our Monte Carlo analysis rectifies this problem by linking the level of capital investment to the number of new customers connected, which in turn is linked to the level of WACC used in each simulation run of price control.

5.4. Direct Costs

The Commission assumes that the costs of the pipeline inquiry to the pipeline businesses are indicative of the administrative costs of control. The Commission also excludes inquiry costs from NGC’s costs under light-handed regulation.

In our view, it is unreasonable to take the inquiry costs out of NGC’s operating cost figures, as they are causally related to the existence of light-handed regulation. If control is not imposed, NGC will still need to recover those costs. The test for inclusion is whether the cost is incurred as a result of being under the particular form of control. Clearly inquiry costs are causally related to light-handed regulation.

We also consider that using the current inquiry costs as evidence of the costs of price cap control is inappropriate. The level of detail involved in a control inquiry pales into insignificance relative to price cap regulation. To suggest that NGC's costs of compiling expert reports on forecast investments, demand, costs, inflation, cost of capital, etc, from engineers, economists and accountants not to mention drafting of substantial submissions, appearing at Commission conferences and procuring legal advice, would amount to $400,000 is simply not realistic. For example, the Commission may consider the volume of publicly available evidence on the recent New South Wales price cap determination, based on a building blocks approach.[66]

66 www.ipart.nsw.gov.au.

NGC inform us that AGL, its major shareholder, spends around [ ] million in a review year for its regulated Australian pipeline businesses. While there is a scale difference between AGL and NGC, regulatory costs are not likely to be affected much by scale economies - the costs of preparing a demand forecast, for example, would be little different regardless of the gas delivered or customers connected. Nevertheless, given that we have limited evidence on this, we adopt a conservative estimate. In variations to the Commission’s model we assume that direct costs of $NZ1 million would be incurred by each of NGC’s transmission and distribution business units in a price control review year, and adopt the Commission's assumptions for non-review year costs.

6. IMPACT OF CORRECTIONS AND VARIATIONS ON CALCULATED WELFARE IN COMMISSION MODEL

6.1. Introductory Comments

As we discuss in the previous section, there are a number of areas in the Commission's model that can be improved. However, three key aspects of the Commission's model cannot be readily corrected without substantial modification, which we achieve in our Monte Carlo simulation modelling. These are:

- The distortions introduced by compounding up historic data, and treating these exaggerated variables as representative of the benefits and costs of control;
- The lack of facility in the model to examine investment behaviour and impacts on welfare. Investment in the Commission's model remains implausibly constant no matter what the WACC under price control, and is inconsistent with the modelling of the reduction in the size of the market under price control; and
- Inability to examine the impact of uncertainty and volatility that will affect welfare outcomes. Price control is critically dependent on an ability to reasonably predict future costs, investment and demand – these variables have been extremely volatile in the past and will only become more so in future as the market goes through a period of structural adjustment.

Nevertheless, for completeness, we have attempted to test within the Commission's model framework, the effect of various corrections and variations in assumptions that are more representative of reality. We set out the individual impacts of these variations from a baseline and then combine the variations into a 'final' model, which we consider reflects the most reasonable assumptions to make based on the evidence available.

In section 7 we then introduce our own (Monte Carlo) model, which we believe to be a further improvement on prediction of expected outcomes of price control.

6.2. Baseline Benefits

The baseline results are taken from the Commission's model and corrected for the computational error in the dynamic efficiency calculation in the distribution model. We also use updated ODV information from NGC on the distribution system, which we understand contained errors in NGC's original section 70E return. The transmission model remains as provided by the Commission. We report results for each of the Net Acquirers Benefits (NAB), Net Public Benefits (NPB) and Net New Zealanders Public Benefits (NNZPB) tests.

It is important to note that we do not endorse the NNZPB test; the results are provided for completeness only, using the Commission's incomplete model of incidence of transfer benefits between New Zealanders and foreigners. We stress that if the Commission is to use this test, then it must develop a framework for tracing the incidence of transfers.

Results are presented for the mid, 75th percentile and high WACC figures adopted by the Commission in its modelling. This should not be taken as an endorsement of the Commission's WACC range. Our view is that these figures understate NGC's likely cost of capital, given the risk profile of the gas industry.

Table 8: Baseline Results for NGC Distribution

	Mid	75th %	High
NAB	1,796	1,077	337
NPB	-756	-780	-800
NNZPB	918	435	-58

Table 9: Baseline Results for NGC Transmission

	Mid	75th %	High
NAB	5,714	3,322	714
NPB	-324	-342	-354
NZNPB	3689	2117	409

It is notable that in all three of the Commission's WACC scenarios, in both the distribution and transmission models, net public benefits are negative. As we illustrate in the following sections, in general the variations we make to the Commission's model reduce net public benefits further, and ultimately lead to negative benefits across all three tests.

6.3. TREATMENT OF SALE OF TARANAKI ASSETS

For the reasons set out in section 0 the sale of Taranaki assets should not be treated as economic income that would benefit future consumers. Deducting that income from the revenues earned in 1999, provides the following results:

Table 10: Effect of Removing Gain on Sale of Taranaki Assets from Revenues

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	Excluding gain	Difference	Baseline	Excluding gain	Difference	Baseline	Excluding gain	Difference
NAB	1,796	1,371	-425	1,077	620	-456	337	-153	-490

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	Excluding gain	Difference	Baseline	Excluding gain	Difference	Baseline	Excluding gain	Difference
NPB	-756	-758	-2	-780	-779	1	-800	-797	3
NNZPB	918	639	-279	435	139	-296	-58	-372	-314

As would be expected, removal of the gain reduces the benefits to acquirers. On the net public benefits test, welfare increases from control because in the Commission's long-run model of producer surplus, when P_c exceeds P_m (i.e. there are insufficient revenues) a reduction in volumes that accompanies a price increase, increases producer surplus because the business is considered to avoid the loss on each unit sold.

There is a slight increase in net public benefits in some models, as a result of the elimination of the gain on sale of Taranaki assets. This arises because NGC had under-recovered revenues in 1999 and therefore the reduction in quantities that would have occurred if prices had been at the efficient level would reduce the marginal losses NGC would have made on units sold.

6.4. Allocative Efficiency

The Commission states that it adopts a 'long-run' model for calculating the producer surplus component of the deadweight-loss calculation. This assumption is inconsistent with the observation that there is generally spare capacity on networks, and is particularly inconsistent with the fact that networks are sunk. An expansion in demand thus provides no producer surplus benefit, and a reduction in demand that occurs in some years when P_c exceeds P_m, leads to a positive producer surplus gain, as the Taranaki asset sale example demonstrates.

The preferable assumption to use is a short-run model, especially as we are looking at differences between Q_m and Q_c of typically less than 6%, a variation that any gas network would surely cope with.

We adopt a short-run model approach, with marginal cost on networks equal to zero and $0.05/GJ on transmission.

Table 11: Effect of Changing to a Short-Run Producer Surplus Model NGC Distribution

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	Producer surplus variation	Difference	Baseline	Producer surplus variation	Difference	Baseline	Producer surplus variation	Difference
NAB	1,796	1,796	0	1077	1,077	0	337	337	0
NPB	-756	63	819	-780	-172	608	-800	-424	376

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	Producer surplus variation	Difference	Baseline	Producer surplus variation	Difference	Baseline	Producer surplus variation	Difference
NNZPB	918	1,737	819	435	1,044	608	-58	318	376

Table 12: Effect of Changing to a Short-Run Producer Surplus Model NGC Transmission

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	Producer surplus variation	Difference	Baseline	Producer surplus variation	Difference	Baseline	Producer surplus variation	Difference
NAB	5,714	5,714	0	3,322	3,322	0	714	714	0
NPB	-324	94	418	-342	-166	176	-354	-454	-100
NZNPB	3,689	4,107	418	2,117	2,293	176	409	309	-100

The effect of this change is to raise the expected benefits to the public, but not acquirers, as changes in producer surplus from changes in demand are assumed not to pass to consumers in the net acquirers test. In contrast to the Commission’s long-run approach, an increase in quantity accompanied by a decrease in prices in the factual leads to an increase in producer surplus.

6.5. Productive Efficiency

As discussed in section 5.3.3, the Commission’s assumption of higher productivity under regulation is not supported by the Meyrick analysis, which is inconclusive. Overall, we consider that incentives on NGC to reduce prices under control are likely to be relatively similar to those under light-handed regulation, since exactly the same mechanism (shareholder pursuit of higher profits) drives improvement in productivity, and it remains true that NGC faces competition in bypass markets and from other fuels.

Accordingly, we model the rate of productivity growth under both the factual and counterfactual as being the same (for convenience, using the Commission’s assumption of a 1% gain per annum), except that under control NGC has incentives to ‘save up’ efficiency gains in years 4 and 5 of the price path until year 6, the first year of a reset price path, when the gains are fully realised.

Table 13: Effect of Adopting More Realistic Assumption of Productivity Behaviour NGC Distribution

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	Productive Efficiency	Difference	Baseline	Productive Efficiency	Difference	Baseline	Productive Efficiency	Difference
NAB	1,796	1,589	-207	1,077	867	-210	337	124	-213
NPB	-756	-963	-207	-780	-990	-210	-800	-1,013	-213
NNZPB	918	711	-207	435	225	-210	-58	-271	-213

Table 14: Effect of Adopting More Realistic Assumption of Productivity Behaviour NGC Transmission

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	Productivity Growth	Difference	Baseline	Productivity Growth	Difference	Baseline	Productivity Growth	Difference
NAB	5,714	5,156	-558	3,322	2,757	-566	714	141	-573
NPB	-324	-882	-558	-342	-907	-566	-354	-928	-573
NZNPB	3,689	3,131	-558	2,117	1,552	-566	409	-165	-573

Across all tests the effect of the variation in productivity reduces the benefits of control relative to the baseline.

6.6. Forward Looking Effects of Control Only

As discussed in section 5.2, the timeframe adopted for estimating the benefits and costs of control is inappropriate. It leads to a compounding up of past ‘excess profits’ so that future consumers are assumed to receive compensation in the form of interest payments implicit in the prices that would be set. For example, a $1 excess profit in 1997 is treated as a $1.70 benefit of control.

Price control would likely be implemented on a forward-looking basis, so to better mimic this we recast the model to be more representative of the fact that control would be imposed to eliminate future excess profits. To achieve this we assume that 1997 represents 2005 data, 1998 represents 2006 data, and so on. This is obviously a ‘rough and ready’ way of handling this problem, which is why our forward-looking Monte Carlo analysis is superior in handling this issue.

The results presented here should not be taken as a view on what is the correct means of handling this problem within the Commission's model, rather it is illustrative of the severe problems that the mixed backwards and forwards looking approach creates for assessing the forward looking costs and benefits of control:

Table 15: Effect of Recasting the Model on a Forward Looking Basis - NGC Distribution

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	Forward looking character-isation only	Difference	Baseline	Forward looking character-isation only	Difference	Baseline	Forward looking character-isation only	Difference
NAB	1,796	1,059	-737	1,077	609	-468	337	183	-154
NPB	-756	-445	310	-780	-441	339	-800	-434	367
NNZPB	918	541	-377	435	246	-189	-58	-32	27

Table 16: Effect of Recasting the Model on a Forward Looking Basis - NGC Transmission

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	Forward looking	Difference	Baseline	Forward looking	Difference	Baseline	Forward looking	Difference
NAB	5,714	3,368	-2,345	3,322	1,878	-1,444	714	387	-327
NPB	-324	-191	133	-342	-193	149	-354	-192	162
NNZPB	3,689	2,175	-1,514	2,117	1,197	-920	409	221	-187

The effect of recasting the model on a more forward-looking basis is to reduce the transfer benefits of control, because past excess profits are not compounded up. The variation increases the public benefits of control, because the direct and indirect costs of control are affected more by discounting (since these costs are relatively constant) than consumer surplus benefits which are higher in the earlier years, so subject to less discounting.

A further alternative would be to rely purely on the forecast data for 2005 to 2008, as an indication of future benefits and costs of control. While this is potentially problematic as it reflects only the views of the pipeline businesses, the forecasts for NGC do appear to us to be reasonable given that:

- Supply constraints are likely to constrain net growth in demand (although individual customers are likely to change their consumption patterns); and

- The significant rise in wholesale gas prices would constrain NGC's ability to lift prices and, in reality, NGC is observed to be reducing prices to a number of customers that are transitioning to higher wholesale gas costs to maintain their connection.

As far as we are aware, the forecasts provided by NGC to the Commission were created for internal commercial purposes, not for regulatory purposes, and as such are likely to reflect management's true views.

The following tables illustrate the benefits and costs of control using 2005 to 2008 data only:

Table 17: Effect of Recasting the Model on a Forward Looking Basis - NGC Distribution 2005 to 2008

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	Forward looking only 2005-2008	Difference	Baseline	Forward looking only 2005 - 2008	Difference	Baseline	Forward looking only 2005 - 2008	Difference
NAB	1,796	651	-1,145	1,077	27	-1,050	337	-590	-927
NPB	-756	-630	126	-780	-627	153	-800	-620	180
NNZPB	918	210	-708	435	-201	-636	-58	-605	-547

Table 18: Effect of Recasting the Model on a Forward Looking Basis - NGC Transmission 2005 to 2008

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	2005-2008	Difference	Baseline	2005-2008	Difference	Baseline	2005-2008	Difference
NAB	5,714	2,276	-3,438	3,322	496	-2,827	714	-1,451	-2,164
NPB	-324	-284	39	-342	-289	53	-354	-284	70
NNZPB	3,689	1,404	-2,285	2,117	229	-1,888	409	-,1052	-1,461

6.7. Alternative Dynamic Efficiency Estimates

As discussed in section 5.3.4, we examine a scenario where a cumulative 0.5% of the market is not serviced per annum. At the end of the 12-year period of analysis this leads to 6% of the counterfactual quantity not being served, which remains a conservative assumption. The effects on the quantum of costs and benefits of control are illustrated in Table 19 and Table 20.

Table 19: Cumulative Increase in Size of 'Missing Market' (0.5% p.a.) - NGC Distribution

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	Improved dynamic efficiency estimate	Difference	Baseline	Improved dynamic efficiency estimate	Difference	Baseline	Improved dynamic efficiency estimate	Difference
NAB	1,796	447	-1,349	1,077	-269	-1,346	337	-1,006	-1,343
NPB	-756	-2,105	-1,349	-780	-2,126	-1,346	-800	-2,144	-1,343
NNZPB	918	-431	-1,349	435	-911	-1,346	-58	-1,401	-1,343

The Commission's model of transmission shows no change in welfare arising from missing markets. However, this is not consistent with the analysis of missing distribution markets, since the gas must be delivered via the transmission system. Accordingly, there is a producer surplus impact on NGC transmission, because the loss of revenue exceeds savings in short-run marginal costs, which NGC inform us are $0.05/GJ on the transmission system.[67]

Table 20 shows the effect of adding in the producer surplus effect using the Commission's constant 0.5% of counterfactual volumes assumption. Table 21 shows the effect of cumulative growth in the size of the missing market on producer surplus of NGC transmission.

Table 20: Impact of Missing Market - NGC Transmission 2005 to 2008 – (Constant 0.5% of Q_m as 'Missing Market')

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	Corrected dynamic efficiency	Difference	Baseline	Corrected dynamic efficiency	Difference	Baseline	Corrected dynamic efficiency	Difference
NAB	5,714	5,652	-61	3322	3,322	0	714	637	-77
NPB	-324	-669	-346	-342	-743	-401	-354	-684	-329
NNZPB	3,689	3,344	-346	2117	1,716	-401	409	79	-329

67 Note that this is not a double-counting of producer surplus impact of missing markets, since the supply curve for the distribution market is defined statically, rather than representing any equilibrium supply curve.

Table 21: Effect of Cumulative Emergence of Missing Gas Services - NGC Transmission – (Cumulative 0.5% p.a. Increase in Size of 'Missing Market')

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	Corrected dynamic efficiency	Difference	Baseline	Corrected dynamic efficiency	Difference	Baseline	Corrected dynamic efficiency	Difference
NAB	5,714	5,714	0	3322	3322	0	714	714	0
NPB	-324	-2,713	-2,390	-342	-2732	-2390	-354	-2746	-2392
NNZPB	3,689	1,300	-2,390	2117	-273	-2390	409	-1983	-2392

As illustrated, the emergence of a modest missing market of 6% of counterfactual demand at the end of 12 years, has a material impact on the benefits and costs of control. All tests in the distribution model show negative welfare, and in the transmission model, although some tests remain positive, in general, the loss of welfare from missing markets leads to substantial reductions in the benefits of control. Net acquirers benefits in the transmission model are not affected by the reduction in producer surplus, as changes in producer surplus are not treated as a cost to acquirers.

6.8. Treatment of Kapuni Line Unstranding

As discussed at various points in this report, we believe that it is unreasonable to treat the unstranding of the Kapuni line as income. Accordingly, we deduct the revaluation gains from NGC's net earnings in the transmission model and recalculate the benefits as follows.

Table 22: Effect of Correct Treatment of Kapuni Line Unstranding - NGC Transmission

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	Correct treatment of Kapuni Un-stranding	Difference	Baseline	Correct treatment of Kapuni Un-stranding	Difference	Baseline	Correct treatment of Kapuni Un-stranding	Difference
NAB	5,714	1,806	-3,908	3322	-624	-3947	714	-3271	-3985
NPB	-324	-387	-63	-342	-396	-54	-354	-399	-44
NNZPB	3,689	1,089	-2,601	2117	-506	-2623	409	-2237	-2645

As Table 22 indicates, the Commission's conclusion that benefits would exceed costs, rests heavily on the treatment of the Kapuni unstranding. The correct treatment shows negative net public and acquirers benefits under the 75th percentile and high WACC cases.

6.9. MORE REALISTIC WACC ESTIMATE

The Commission uses a WACC range of 6.2% to 8.5% (in the forecast years) to establish the benefits and costs of price control. We understand that LECG has prepared a submission on cost of capital issues, where they determine a potential range for WACC of 8.3% to 10.5%. In additional, LECG observe that this range would not compensate for stranding risks, or the additional risks posed by price cap regulation.

We note that NGC has publicly disclosed to investors an investment hurdle rate range of 8.5% to 10%, which is consistent with LECG's estimated range, although NGC have informed us that additional factors are used to consider investment decisions, such as limiting payback periods for positive NPV projects to occur, and to pursue those projects which have a more positive upside potential relative to baseline estimates. If incorporated explicitly into an investment hurdle rate rather than through other project evaluation factors, the effective investment hurdle rate would be higher.

Nevertheless, it seems to us that the most reasonable evidence available for us to use as an estimate of NGC's cost of capital would lie somewhere in the WACC range of 8.5 to 10%. Under price control, a margin would need to be added to this to compensate NGC for the additional risks imposed by fixing prices for five years in the face of significant demand variability.[68]

In the following tables we examine the effects of assuming WACC is equal to 9.25% (being the mid-point of NGC's WACC range) and 10% as representative of the full range of cost of capital and asymmetric risks facing NGC.

We recognise that these may be high on international comparisons of WACCs used by other regulators. However, as the Commission, observes, the New Zealand gas industry is considerably different to overseas industries.[69] The materiality of stranding risk, given the very thin market and exposure to a small number of large customers, is likely to be high, and exacerbated by the degree of uncertainty about future gas supplies.

68 Lally (2003) p 65.

69 See also CRA (2004) ***The Implications for Governance of the Distinctions Between Gas and Electricity*** Submitted to NGC, January 2004, for a summary of the distinctions between the gas and electricity sectors in New Zealand and comparisons with overseas markets.

Table 23: Effect of WACC at 9.25% - NGC Distribution

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	More appro-priate WACC scenario	Difference	Baseline	More appro-priate WACC scenario	Difference	Baseline	More appro-priate WACC scenario	Difference
NAB	1,796	91	-1,705	1077	91	-986	337	91	-246
NPB	-756	-802	-46	-780	-802	-22	-800	-802	-1
NNZPB	918	-221	-1,139	435	-221	-656	-58	-221	-163

Table 24: Effect of WACC at 9.25%- NGC Transmission

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	More appro-priate WACC scenario	Difference	Baseline	More appro-priate WACC scenario	Difference	Baseline	More appro-priate WACC scenario	Difference
NAB	5,714	12	-5,702	3322	12	-3311	714	12	-702
NPB	-324	-358	-35	-342	-358	-16	-354	-358	-4
NNZPB	3,689	-59	-3,748	2117	-59	-2176	409	-59	-467

Table 25: Effect of WACC at 10% - NGC Distribution

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	More appro-priate WACC scenario	Difference	Baseline	More appro-priate WACC scenario	Difference	Baseline	More appro-priate WACC scenario	Difference
NAB	1,796	-847	-2,643	1077	-847	-1924	337	-847	-1184
NPB	-756	-819	-63	-780	-819	-39	-800	-819	-18
NNZPB	918	-837	-1,755	435	-837	-1273	-58	-837	-779

Table 26: Effect of WACC at 10%- NGC Transmission

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	More appro-priate WACC scenario	Difference	Baseline	More appro-priate WACC scenario	Difference	Baseline	More appro-priate WACC scenario	Difference
NAB	5,714	-3,182	-8,896	3322	-3182	-6504	714	-3182	-714
NPB	-324	-364	-40	-342	-364	-22	-354	-364	354
NNZPB	3,689	-2,135	-5,824	2117	-2135	-4252	409	-2135	-409

6.10. More Realistic Direct Costs

As we note in section 5.4, the Commission's calculation of the direct cost of control is too conservative. Our calculation uses $1 million as the basis for costs in a price reset year and the Commission's estimate of direct costs in non-control years, of $105,000 per annum, per business unit.

We also add back into NGC's operating costs the costs of the current inquiry, as these are legitimate costs of light-handed regulation and are causally related to the light-handed regime.

Table 27: Effect of Higher Direct Costs - NGC Distribution

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	More realistic direct costs scenario	Difference	Baseline	More realistic direct costs scenario	Difference	Baseline	More realistic direct costs scenario	Difference
NAB	1,796	1,710	-86	1077	989	-88	337	247	-90
NPB	-756	-842	-86	-780	-868	-88	-800	-890	-90
NNZPB	918	832	-86	435	347	-88	-58	-148	-90

Table 28: Effect of Higher Direct Costs - NGC Transmission

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	More appro-priate direct cost estimates	Difference	Baseline	More appro-priate direct cost estimates	Difference	Baseline	More appro-priate direct cost estimates	Difference
NAB	5,714	5,396	-317	3,322	3000	-323	714	386	-328
NPB	-324	-641	-317	-342	-665	-323	-354	-683	-328
NNZPB	3,689	3,372	-317	2,117	1794	-323	409	80	-328

6.11. Treatment of Easements

The Commission considers that easements should be treated on an historic cost basis. Accordingly, it discounts back NGC's replacement cost valuation of easements by the CPI to 1974 values, which the Commission notes is when NGC received the majority of its easements. We note that the Commission should not make arbitrary changes to asset valuations without also considering how that may have affected NGC's price setting behaviour and cashflows.

Setting the arbitrary adjustment to one side, NGC inform us that it is not in fact correct that the majority of easements were acquired in 1974. The current length of the NGC's transmission system is 2,280 km. In 1974 the system was only 615 km long (less than one third its current length). NGC also inform us that after the initial construction of assets in 1974, the next major growth phase was through the 1980's. Thus a more reasonable approach to calculating the historic cost of the assets would be to take one third of the replacement cost and deflate to 1974 values and then take the remaining two thirds and deflate to 1983 values, as an average of the historic costs expended during the 1980's on easements.

Using this approach to historic valuation of easements we calculate that the value of easements would be $11.3 million, compared to $4.4 million, used by the Commission. Making this adjustment (but not making any adjustment to cashflows, which is strictly necessary if NGC had been using historic cost valuation methods) has the following impact on the benefits tests for NGC Transmission.

Table 29: Effect of Correction of Easement Value – NGC Transmission

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	More appro-priate easement value	Difference	Baseline	More appro-priate easement value	Difference	Baseline	More appro-priate easement value	Difference
NAB	5,714	5,517	-196	3,322	3,085	-237	714	387	-327
NPB	-324	-315	9	-342	-332	10	-354	-343	12
NNZPB	3,689	3,565	-124	2,117	1,969	-149	409	205	-204

6.12. Composite Measure of Benefits and Costs of Control

In this section we combine the variations we suggest above into what we consider are the most reasonable set of assumptions that can be made within the Commission's modelling framework.

We stress, however, that fundamentally the Commission's model does not address the core question of whether acquirers or the public would benefit from price control, as it is founded on a deterministic model that more closely resembles rate of return regulation.

It is important to note that we exclude from the combined effects any modification to deal with the compounding issue created by the backwards and forwards looking approach. In our view, without substantial modification, such as in our Monte Carlo analysis, there is no ready way of correcting the Commission's model for the exaggerating effect compounding up has on the results.

As before, we report results for the mid, 75th percentile and high WACC scenarios in Table 30 and Table 31 for NGC Distribution and Transmission. In Table 32 and Table 33 we report results for a more realistic estimate of the cost of capital at 9.25%.

Table 30: Combined Effect of Variations on Estimated Costs and Benefits of Control- NGC Distribution

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	Final	Difference	Baseline	Final	Difference	Baseline	Final	Difference
NAB	1,796	-272	-2,067	1,077	-1,023	-2100	337	-1,799	-2,136
NPB	-756	-1,722	-966	-780	-1,973	-1192	-800	-2,243	-1,443
NNZPB	918	-326	-1,244	435	-1,054	-1489	-58	-1,818	-1,760

Table 31: Combined Effect of Variations on Estimated Costs and Benefits of Control - NGC Transmission

	Mid WACC			75th Percentile WACC			High WACC		
	Baseline	Final	Difference	Baseline	Final	Difference	Baseline	Final	Difference
NAB	5,714	953	-4,761	3,322	-1,548	-4,870	714	-4,275	-4,989
NPB	-324	-3,181	-2,858	-342	-3,455	-3,113	-354	-3,680	-3,326
NNZPB	3,689	-1,838	-5,528	2,117	-3,733	-5,850	409	-5,734	-6,143

Table 32: Combined Effect of Variations on Estimated Costs and Benefits of Control- NGC Distribution

	WACC = 9.25%		
	Baseline	Final	Difference
NAB	1077	-2,073	-3,150
NPB	-780	-2,327	-1,547
NNZPB	435	-2,091	-2,526

Table 33: Combined Effect of Variations on Estimated Costs and Benefits of Control - NGC Transmission

	WACC = 9.25%		
	Baseline	Final	Difference
NAB	3,322	-5,019	-8,342
NPB	-342	-3,704	-3,362
NNZPB	2,117	-6,248	-8,365

The tables show that the combined effect of the variations made have a net effect of lowering the benefits to acquirers, the public and the New Zealand public, both across the Commission's mid to high WACC range, and at more reasonable estimates of the cost of capital. Apart from the mid-WACC case for NGC Distribution across all tests, the results show negative welfare impacts of price control.

Furthermore, there are a number of instances where the assumptions used and modelling approach is still very conservative (for example, negative quality impacts of control, and loss of welfare from non-supply) and therefore reason to believe that these models significantly underestimate the negative welfare consequences of price control. We reiterate, however, that these variations although more appropriate within the Commission's modelling framework, do not address the key issues a regulator would confront in imposing price control, or incorporate any reasonable model of behavioural effects.

7. ALTERNATIVE MODELLING APPROACH

7.1. Monte Carlo Simulation

Price control involves setting prices for a period of typically five years, based on forecasts of the future. However, the more uncertain is the future, the greater is the risk that a regulator would fail to achieve the objective of setting prices in a way that leads to revenues being equal to costs. Fixing prices for five years may therefore lead to prices being too high or too low, relative to what the regulator would have preferred.

As we illustrate below in Table 34, standard deviations, a measure of volatility in key variables that a regulator would need to forecast, are very large, and it is likely that in future such volatility will increase as the effects of the higher wholesale gas prices affect customer behaviour. Accordingly, it is crucial that the Commission tests the impact of volatility on the likelihood of being able to achieve satisfactory prices under a price path. If the risks are significant, and shareholders need to be compensated for bearing the risks of such volatility on revenues, then regulation may fail to improve welfare.

Table 34: Variation in Key Variables[70]

Variable	Mean	Standard deviation	Expected growth over five year period
Change in gas volumes	2.55%	8.06%	12.7%
Change in customer numbers	3.93%	1.85%	19.6%
Change in operating costs (nominal)	1.78%	8.08%	8.92%
Investment	$4.7million	$2.6 million	$23.4 million

In Monte Carlo simulation the distributions of possible values of variables representing the assumptions of interest are specified. Then these variables are repeatedly randomly sampled from these distributions and inserted into models which then calculate the corresponding impacts of such variation on outcomes of interest (e.g. welfare, earnings, etc). This produces a range (distribution) of net present values that results from the underlying distribution of the critical variables. It thus is a useful means of testing the effect of *combinations* of variable settings. Monte Carlo methods allow a somewhat more accurate estimate of expected NPV than does calculation of NPV at the fixed levels of assumptions, because it allows for joint variation in the levels of elements which are uncertain.

70 Source: NGC Disclosure Data. (1997 to 2003).

To limit model complexity, we focus on customer and volume uncertainty as the sources of uncertainty that a regulator would face. In turn these affect the level of investment in the model and the prices and revenues that would result. Other sources of uncertainty such as stranding risks and operating cost uncertainty have not been modelled, so our results should be seen as understating the risks that setting a price path for five years would have on NGC and on welfare.

The important advantage that the Monte Carlo analysis has over the Commission's model, is that it provides a methodology for assessing the effect of regulation that allows us to dispense completely with the arbitrary assumption that regulatory error would be 20%. In fact our model demonstrates that 20% substantially understates the potential for regulatory error because demand is so volatile.

The other important improvement of our model over the Commission's model is the treatment of capital expenditure. The Commission's model assumes that capital expenditure is completely invariant to the imposition of regulation. Regardless of the level of WACC that would be used to set prices, NGC is assumed to continue investing at exactly the same rate. Yet the Commission also assumes that some customers would not be served, and missing markets would emerge. In that regard, the Commission's model is internally inconsistent.

In the next section we describe the Monte Carlo Simulation model developed for NGC Distribution. [71]

7.2. Distribution Model

Fundamentally, the models described here reflect the fact that setting a price path involves setting prices for five years, while under light-handed regulation NGC is able to vary prices in each year in response to observed changes in the market – in the manner described below. The Commission's model does not capture this key aspect of price cap regulation – instead prices are varied every year so that there is effectively an *ex post* price reset every year so that revenues exactly equal costs.

The following diagrams illustrate how we more accurately represent the potential range of outcomes under price control, relative to light-handed regulation.

71 Given time constraints we have not yet calibrated a similar model for NGC transmission, but expect to provide the Commission with results for this prior to the Commission's conference. We also note that the model can be readily customised to the other pipeline businesses to examine similar effects.

Figure 9: Monte Carlo Simulation of Revenue Outcomes Under Price Cap

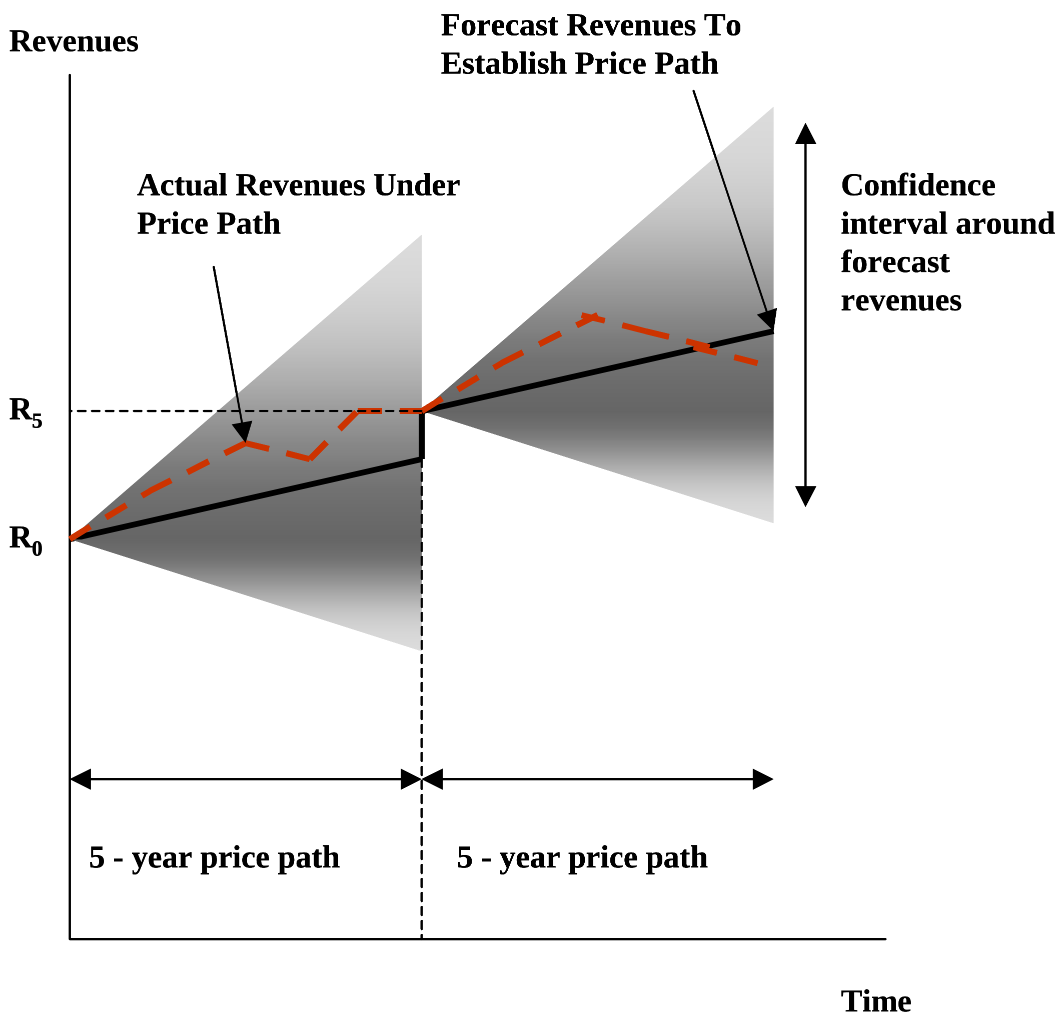


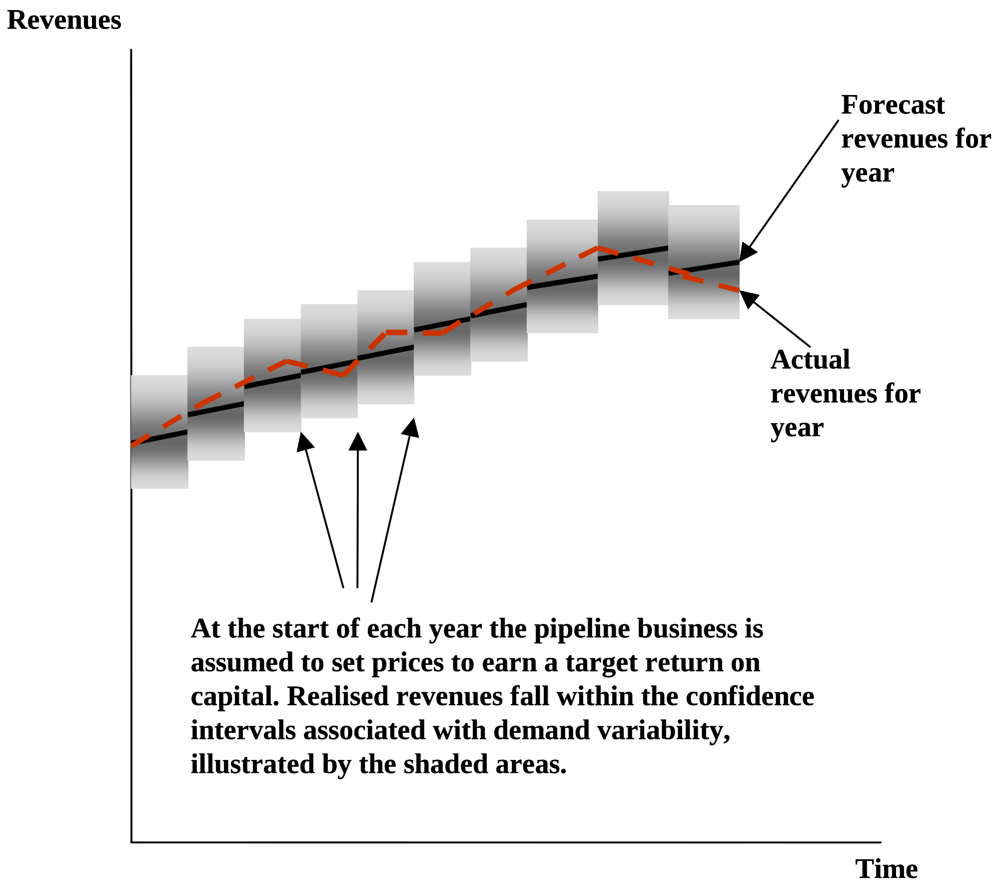
Figure 9 illustrates the range of outcomes under the factual of price control. A price path is set at the beginning of the first price path period for a five-year period. The price path is designed to equate expected revenues with expected costs, based on forecasts at the start of the price control period. The solid line in Figure 9 illustrates the expected required revenues. Actual revenues (denoted by the dashed line) will depend on realised through-put and revenues from fixed charges.

The range within which actual revenues may fall depends on the probability distribution of volume and customer growth. The further through the five year price path period, the greater the potential for error, which is why the confidence interval (indicated by the shaded area in Figure 9) expands the further away from the start of the price path period.

At the start of the sixth year the price path is recalculated with new forecast information, and a P_5 adjustment is made to equate expected revenues with expected costs.

Revenues outcomes under light-handed regulation in our Monte Carlo analysis are illustrated in Figure 16:

Figure 10: Revenue Outcomes Under Light-Handed Regulation



We assume that at the start of each year NGC forecasts all the key cost, demand and investment variables and determines the revenue requirement for the year. Prices are set and revenues vary according to whatever customers are connected to the network and volume through-put. Consistent with the *ex ante* approach that NGC takes to recovering its revenue requirement, shareholders bear the risk that demand is different to forecast.

The assumption that NGC is able to vary its prices to all customers overstates NGC's ability to change prices, since many customers are on long-term contracts, special deals, or are at risk of bypass. Accordingly, the approach is likely to understate the downside risk that NGC faces with volume reductions and asset strandings, associated with the loss of major customers. This would mean that the models overstate the potential to raise prices if necessary to achieve target revenues. For example, if demand fell by 20%, because of the lift in wholesale gas prices, it is unlikely that NGC would be able to raise prices by 20% to cover the shortfall in revenues. Hence, the model is likely to under-estimate the negative consequences for NGC's revenues of a fall in demand.

We also note that risk is intrinsic and what the different schemes do is share the risk in different ways. Long-term contracts shift risk to the firm for which it should be compensated: in sharp contrast the Transpower model shifts it entirely to consumers. As Evans and Guthrie (2003) have argued one set of parties bearing the entire risk is unlikely to be welfare optimal, almost certainly where the parties assuming the risk are small end-use consumers.

The Monte Carlo analysis simulates feasible customer and volume growth scenarios from probability distributions taken from the history of the New Zealand gas industry and runs each scenario through the light-handed regulation and price control model. We then compare each scenario’s results between the models and calculate each of the key welfare measures that comprise the net acquirers and net public benefit tests.

Using this method we are able to develop an internally consistent view of the range of potential allocative, productive and dynamic efficiency effects of control, which allows us to dispense with the Commission’s arbitrary assumption that 20% of the benefits of control may not be realised through regulatory error and uncertainty. We run 2000 simulations of demand and customer connection outcomes for each of the assumed ten years of the price control regime to establish a statistically representative range of potential outcomes.

A limitation of both the Commission’s and our model is that they do not account for the significant structural changes affecting the energy industry. However, subjective distributions of potential outcomes could be assessed and incorporated.

In a full-blown price control determination a regulator would attempt to improve on the level of forecasting accuracy implied in this model. However, we do note that forecasting in a period of structural change is extremely difficult, and no forecasting approach will be able to limit forecast errors associated with the doubling in the gas wholesale price and the uncertainties created in investors around emissions taxes. If anything, the forecasting uncertainties implied in our model are conservative, and a wider range of outcomes is feasible. Most likely we have over-estimated the likelihood of “best case scenarios” by assuming a normal distribution for customer and demand growth. The actual probability distribution is likely to be negatively skewed towards the downside and NGC at greater risk of failing to earn a reasonable return on its capital invested: this would be very likely if stranding were modelled. Although, investment is discretionary to NGC and the stranding issue is not as acute as it would be otherwise, nevertheless volatility within the network and for the network as a whole is such that it is a prospective cost for most investments.

Overall, the discipline of developing a Monte Carlo simulation model is in many ways akin to developing or testing regulatory forecasts. It brings sharply into focus the extreme difficulty that a regulator would face in developing a median scenario of likely future costs, demand and investment that would form the building blocks basis for a price path in an industry as volatile and uncertain as gas.

7.2.1. Detailed Model Description

The distribution model is developed as follows.

- 2005 is the base year from which forecasts for 2006 to 2015 are developed. Two price control periods are used, assuming prices are set for five years in 2005 and reset in 2010. We use a combination of simple linear forecasts of past trends in some operating/common costs and hold constant others to set their level under both the control and light-handed regulation scenarios.[72]

- In the counterfactual of light-handed regulation, at the commencement of each year NGC Distribution is assumed to target revenues consistent with earning a rate of return commensurate with average profitability in the Commission's model of 9.5% (excluding the gain on sale of Taranaki assets, which has a one-off effect on profitability that is a legitimate shareholder recompense for the exchange of a revenue stream for the associated asset).

- We consider that this is an optimistic view of future profitability, given the increasing price pressures that NGC is likely to come under, as customers consider alternative fuels. Nevertheless, our conclusions would only be reinforced by a lower estimate of target profitability, since in almost all scenarios control leads to negative acquirers and public benefits;

- Observed growth in customer numbers and volumes are 3.9% and 2.6% per annum, respectively over the period 1997 to 2003. In our modelling we reduce the expected growth in volumes to 1.1% per annum, consistent with NGC's growth forecast for 2005 to 2008, but maintain the customer-volume growth estimates.

- We link actual investment to growth in customer numbers on the basis that the costs of providing connections to individual customers drive investment. The investment cost per customer is derived from historic investment costs associated with new customer growth over the period 1997 to 2003, where on average $3,100 is spent per new connection;

- Operating costs are forecast to change at the trend rate of growth for 1997 to 2004.

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72 Including volatility in operating costs in the model framework would enhance the realism of the model further. Including it as a static variable will tend to understate the potential for variability in economic income: more so in the price control model, as prices remain inflexible in the face of variability in operating costs. We use different approaches to setting operating cost 'trends' to keep the levels within realistic bounds, but nothing turns on this as they are constant in both models.

- Forecasts of fixed charges are determined by taking the proportion of revenues NGC currently derives from fixed charges (30%), multiplying forecast required revenues by this percentage and dividing by total forecast customer numbers. The remaining 70% of required revenues are recovered through variable charges per unit of through-put.

- Once prices are set at the commencement of each year, actual financial performance is determined in simulation runs, where demand and customer number growth are randomly generated from the normal distributions derived from the following:

  - Gas demand: Mean 1.1% (per annum), standard deviation 8.06%; and

  - Customer numbers 3.93% (per annum), Standard deviation 1.85%.[73]

- Each new customer is assumed to consume 0.19 TJ per annum, based on average demand per customer over the period 1997 to 2003. This means that changes in gas volumes consumed are a composite of demand from new customers and volatility across the customer base. There is volatility in both the new and existing customer base.[74]

- In the price control model, the regulator is assumed to set a price path for five years based on a forecast of the future using the trends in costs, and demand described above. Prices are determined for the five year period based on these forecast values commencing in 2005. At the end of the first price path period a 'P_5' adjustment is made to re-establish revenues at a level consistent with earning WACC looking forward in the next period and the price path is reset at a level consistent with trend rates of cost, investment and demand growth. The models are calibrated using the Commission's WACC range of 6.5%, 7.2% and 8.5%.

- Actual financial performance in the control model is simulated with identical volume and customer growth scenarios, except investment incentives are affected by the level of WACC. We have not, at this point, incorporated in our WACC the historical evidence of volatility in the presence of irreversibility. Financial variable setting includes:

  - NGC's publicly disclosed investment hurdle rates under light-handed regulation are 8.5% to 10%[75];

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73 Derived from variability in disclosure data from 1997 to 2003.

74 Investment in this model is essentially irreversible, as the variation around customer growth is such that customer numbers never fall. If modifications were made to the model to contemplate falls in customer numbers then constraints would need to be imposed to ensure that the asset base did not decline.

75 See NGC 2003 Investor Conference Briefing Slides: http://www.ngc.co.nz/article/articleview/260/1/13/.

- NGC is therefore assumed to reduce discretionary investment over the Commission's WACC range, as this is under NGC's investment thresholds;

- Although customers themselves may invest in pipeline assets by making capital contributions, a sample of investment proposals provided by NGC shows that customer capital contributions are a significant deterrent to connecting to gas. Of the sample of proposed projects, only [ ] of projects that required a capital contribution actually proceeded. Above a threshold of somewhere between [ ] per project, incentives to connect to gas were completely eliminated[76];

- We assume that at WACCs of 6.2% and 7.2% required capital contributions are such that all but 10% and 25% of potential new customers are deterred from connecting to gas. At a WACC of 8.5% 50% of customer connections that would be made in the counterfactual are assumed to occur in the factual as the gap between investment hurdle rates and the permitted return reduces some required capital contributions to an acceptable level to developers[77];

- Tax is calculated as 33% of net earnings (revenue less depreciation less operating expenses); and

- Depreciation is calculated as a fixed 3.5% of ODV, consistent with average observed historic rates of depreciation.

To limit the complexity of the model, we adopt the Commission's method of computing quality effects of control where a proportion of sales are assumed to shift from a firm to interruptible tariff, and adopt the Commission's direct costs of control estimates. It is important to note that we consider the Commission's assumptions on both these issues are too conservative, which will generally mean that we under-estimate the costs of control. Nevertheless, given that our results show that under most circumstances control will deliver negative net acquirers and public benefits, this only reinforces the conclusions reached.[78]

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76 This behaviour is consistent with the behaviour predicted in Evans and Guthrie (2003) *Asset Stranding is Inevitable: Implications for Optimal Regulatory Design* ISCR, November 2003. Customers receive the valuable option of being able to exit at will, but must pay a premium for the regulated business to bear this risk.

77 The Commission comments that developers install gas pipelines. This is not correct. NGC requires developers to provide an open trench (usually available for multiple utility services such as water, telecommunications, electricity etc) and NGC funds and installs the actual pipeline assets.

78 Benefits remain negative if quality effects are excluded.

Our calculations of producer surplus are based on a short-run approach, as opposed to the Commission's long-run approach, which assumes that NGC is assumed to be capacity constrained. Under our short-run approach an increase in demand leads to an increase in producer surplus of price less marginal cost (which we set equal to zero on distribution networks).[79]

As we discuss in section 5.3.3 we therefore adopt the assumption that productivity growth in the factual and counterfactual is the same in all years except that in years 4 and 5 under control, efficiency gains are saved up and realised in year 6, at the start of the new price control period.

We adopt, for convenience only, the Commission's average value for direct costs of control. We consider the control year costs are likely to be higher, but they are not important relative to welfare costs.

Simulation Results

The following charts illustrate the range of potential outcomes derived from Monte Carlo simulation of gas demand and customer numbers and the consequent impacts on investment, revenues and financial outcomes.[80] In each chart, the vertical axis represents the cumulative probability distribution and on the horizontal axis we measure each aspect of financial performance/welfare.

Two scenarios are illustrated in Figure 11: the first models price control and light-handed regulation when the true WACC is 8.5% (which we consider to be too low); the second models price control and light-handed regulation when the true WACC is 9.5%. In both price control scenarios the WACC that the regulator is assumed to use is 8.5%.[81]

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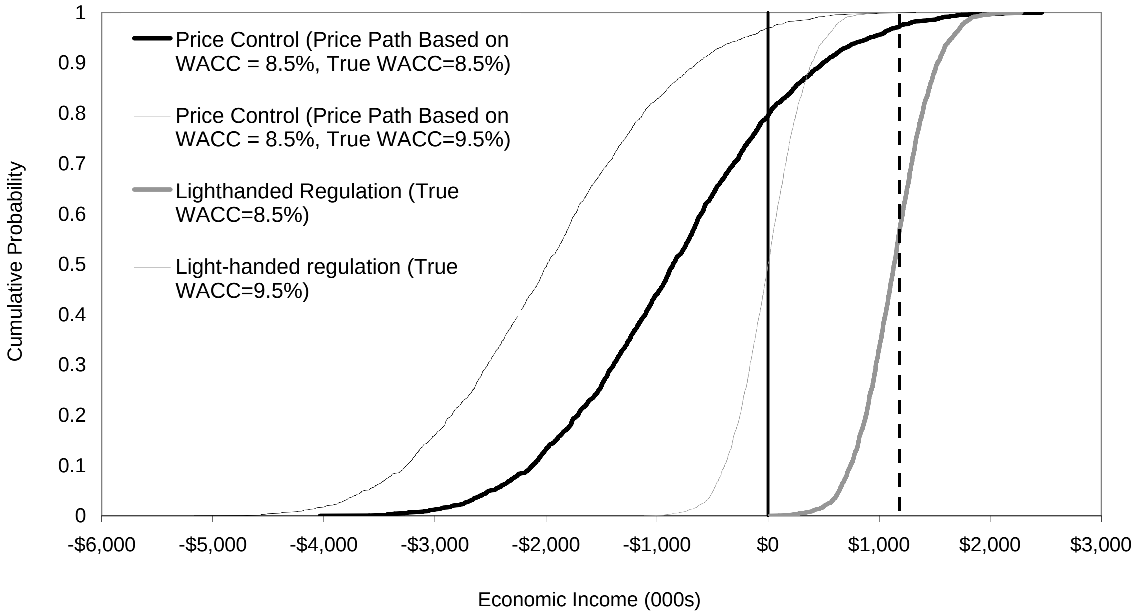
79 If we were to adopt the Commission's long-run approach, this would generally lead to lower benefits of control, since, under the long-run assumption there is no producer surplus benefit of increased demand resulting from price reductions as marginal cost is assumed equal to the 'efficient' price.

80 Economic income depicted in Figure 11 represent the average level calculated over two five year price path periods, discounted to 2005 dollars. Economic income is defined to be revenues less costs including a return on the true cost of capital.

81 The true WACC is defined as the business's actual cost of capital.

Figure 11: Distributions of Economic Income – Light-handed Regulation Compared to Price Control (Annual Average Over 10 Years)



If the true WACC is 8.5%, then, on the assumption that NGC is able to target a return of 9.5%, then economic income will be positively distributed above zero.[82]

If the true WACC is 9.5%, then economic income is symmetrically distributed around zero under light-handed regulation.[83] This particular example illustrates the points we make in section 3.2 and 3.3 that if a business is *ex ante* targeting a particular rate of return, observed *ex post* rates of return may differ because of volatility. Here we find that even though we model volatility in only two variables, *ex post* economic income may exceed the target return by around $1-2 million per annum over a ten-year period. If we were to include volatility in other variables this figure may increase. This demonstrates the fundamental point that it is unreasonable to treat every single dollar of economic income above zero as an "excess profit." It is necessary to test whether *ex post* outcomes are statistically compatible with targeting a reasonable rate of return.[84]

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82 Note this ignores potential for asset stranding, so in reality would not be above zero, even with a WACC of 8.5%.

83 Throughout this analysis it is important to recognise that the models in their current form only deal with volatility in volumes and customer numbers. They do not address other sources of uncertainty and asymmetric risks such as asset stranding. This will generally mean we understate the spreads in the distributions, but the degree of understatement will be greater for the price control scenarios.

84 It would not be appropriate to take the figure of $1 million we report here to adjust the Commission's own assessment of NGC's returns as we consider a narrow range of variability only.

A firm using an investment threshold of 9.5% may yet have a WACC of 8.5% even on average. Where there is irreversibility and discretion in investment such a difference may arise because from time to time. Indeed, within a network on a continuous basis, there may *ex post* over-investment in the form of excess capacity, despite an investment rule in which a certain amount of excess demand is required to trigger demand. Accordingly, even if the WACC is 8.5% the evaluation of economic income should be evaluated with reference to the dashed line, illustrating the point at which *ex ante* expected returns are equal to some positive threshold/hurdle rate. The positioning of the dashed line will be contingent on the asymmetric risks borne by the firm.

Figure 11 illustrates two important points.

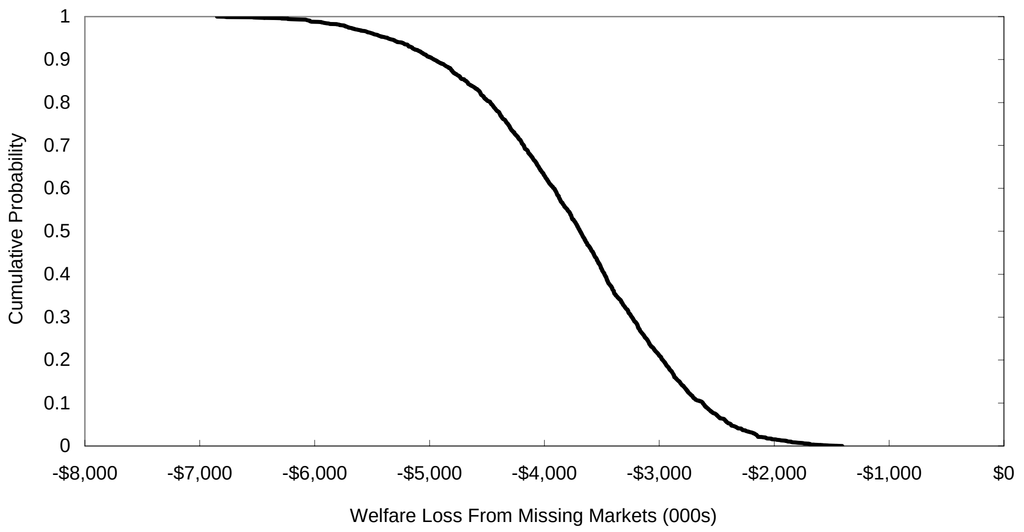
1. The curves representing the spread in economic income under light-handed regulation are considerably more concentrated than the range of potential outcomes under price control. While we have reason to believe that both distributions are conservative on the downside, because we do not model asset stranding, it will remain true that NGC will be heavily exposed to revenue risk under price control, since prices cannot be adjusted to reflect changes in through-put, numbers of customers, costs, etc. that differ from forecast.

2. Under price control, NGC will be exposed to significant downside risk, if the cost of capital is set below the level that will justify further investment to connect new sources of demand. In this model, we assume that the regulator does not adjust its volume and customer growth forecasts to compensate for the fact that NGC reduces the level of investment, so the distribution of economic income is negatively skewed. Nevertheless, if the regulator were to adopt a more conservative forecasting strategy, this will shift the distribution of potential economic income under price control to the right, increasing the potential for what the Commission terms ‘excess profits.’

Overall, Figure 11 casts considerable doubt that price control would necessarily improve outcomes, and provide excess profits for taxation and transference to consumers: let alone profits for owners acting as investors or consumers. Plainly the results are sensitive to the WACC and therefore prices. When this is combined with the likelihood of structural change it is likely that the regulator would be at material risk of setting an inappropriate level of prices.

As we note above, the model simultaneously calculates the degree to which missing markets may emerge as NGC reduces the level of investment to avoid losses on incremental funds invested. Consumers surplus from non-users that would otherwise be connected is lost. In this scenario run, where the regulator is assumed to set WACC at 8.5% as the basis for establishing the price path, NGC is conservatively assumed to reduce investment by 50%, as its publicly stated investment hurdle rates are 8.5% to 10%. This results in some customers being denied service, as they are unwilling to accept the stranding risk associated with an upfront capital contribution and ‘missing markets’ emerge. The missing market outcomes for this scenario are illustrated in Figure 12.

Figure 12: Consumer Surplus Losses from Under-investment (Annual Average Over 10 Years)[85]



The simulation models also estimate welfare effects on allocative efficiency based on the customers that are served, negative quality impacts of control, and differences in productivity. As with the Commission's model these effects are relatively trivial in comparison with effects of control on economic income and dynamic efficiency of missing markets. These effects are illustrated in the following figures.

85 This welfare calculation is based on the loss of consumer surplus on throughput, using a demand curve with elasticity –0.3, evaluated at the counterfactual price P_m as in the Commission's model.

Figure 13: Allocative Efficiency (Consumer Surplus Component) Effects of Control (Annual Average Over 10 Years)[86]

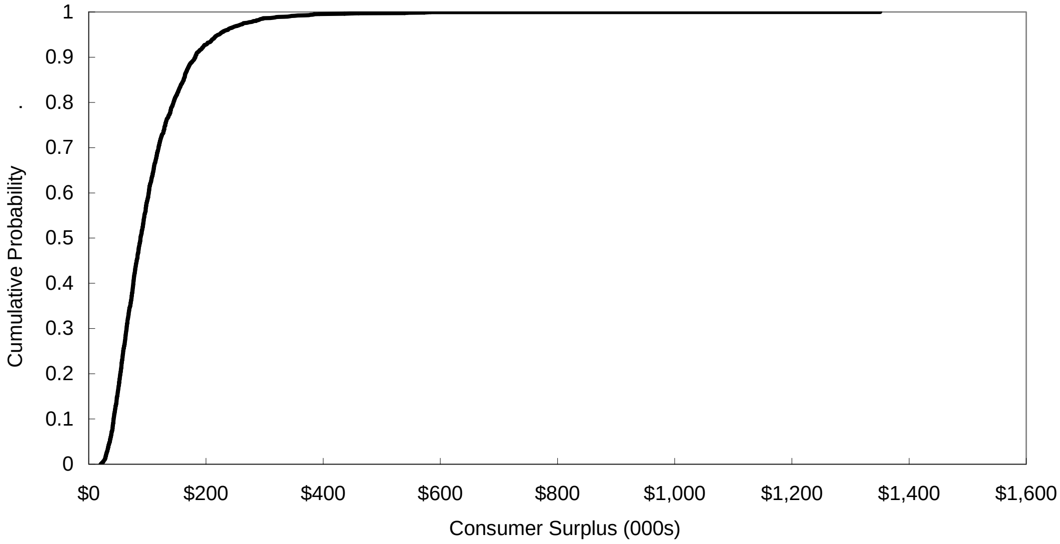
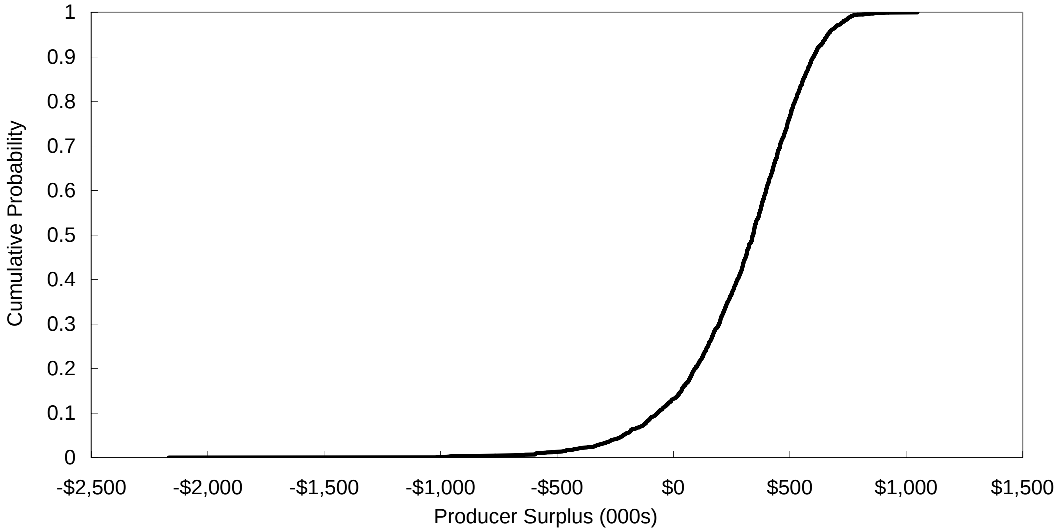
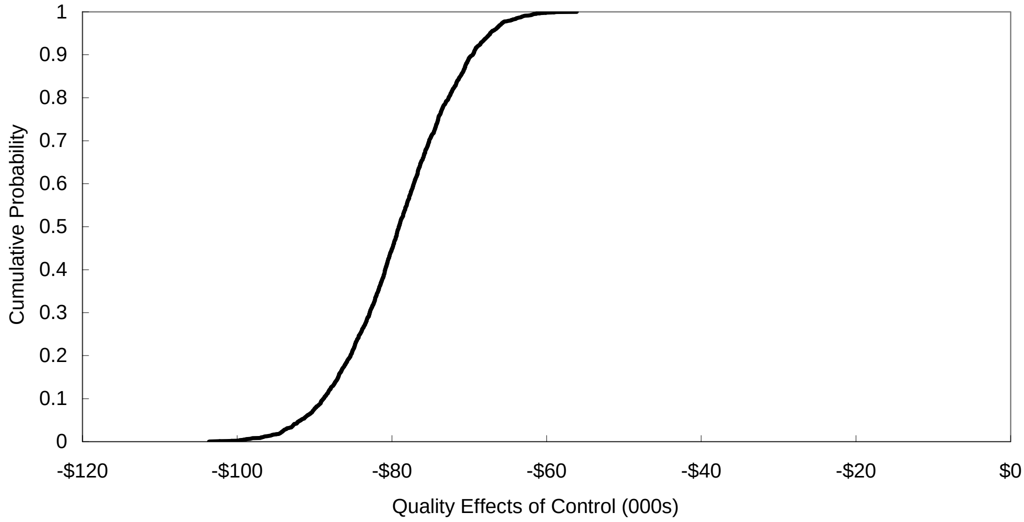


Figure 14: Allocative Efficiency (Producer Surplus Component) Effects of Control (Annual Average Over 10 Years)



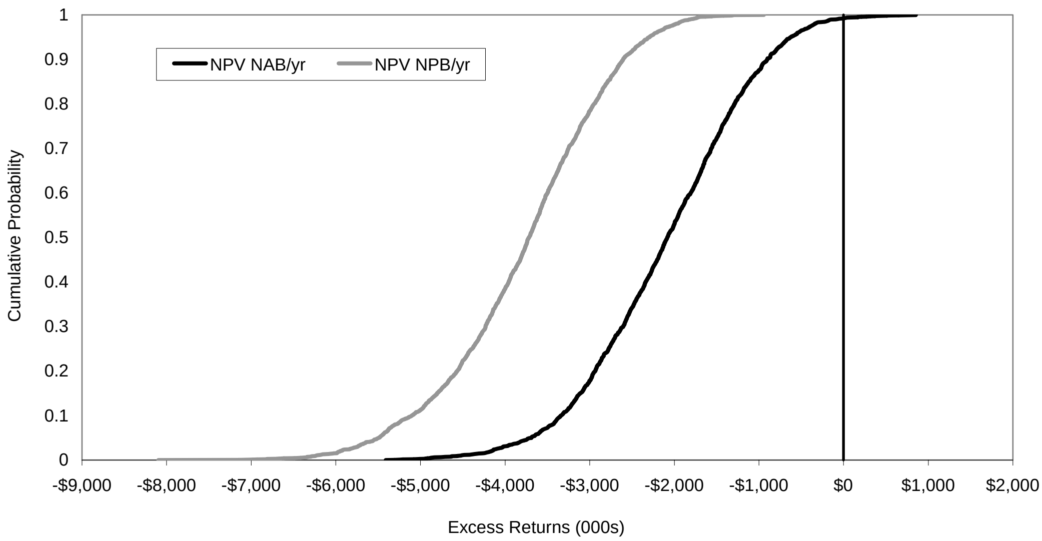
86 The consumer surplus calculations here are based on the welfare change on customers served, and are derived from a calculation of the price difference between the factual and counterfactual, evaluated at an elasticity of –0.3, for convenience adopted from the Commission's model.

Figure 15: Quality Impacts of Control (Annual Average Over 10 Years)[87]



Combining all these welfare measures into the Net Acquirers and Net Public Benefits Tests, we calculate the potential range of welfare losses from control. These results are presented in Figure 16.

Figure 16: Net Acquirers and Net Public Benefits Tests (Annual Average Over 10 Years)



87 Note: to reduce modelling complexity we simply adopted for convenience the Commission's model of quality impacts of price control. This approach looks at a very narrow range of effects only, and is likely to substantially understate the impact of control on reduced quality/reliability of supply. The approach assumes that 5% of the quantity served in the factual would lose value equivalent to 10% of the price, as a result of switching from a firm to interruptible tariff option.

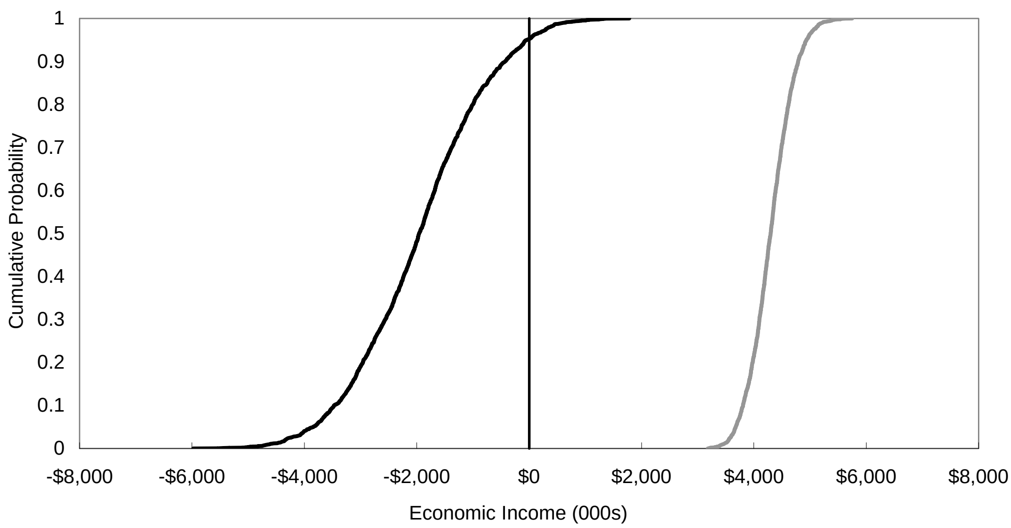
The results show that in all but 0.8% of cases, net acquirers benefits are negative, and in all cases net public benefits are negative.[88] The average loss of welfare to acquirers is $2.1 million and loss of welfare to the public is $3.7 million. The results stem from the fact that the loss of welfare arising from the reduction in investment and therefore denial of service to some consumers offsets the benefits of transfers and lower prices.

We also present the results of scenarios for the low WACC point in the Commission's analysis, to illustrate the link between under-investment and suppressing NGC's returns below its cost of capital.

In the low case the regulator is assumed to use a WACC of 6.2% to set prices. For the sake of analysis only, we assume that this is the true WACC. We continue to assume that NGC targets a return of 9.5%, so on average NGC will earn 3% more than its cost of capital. However, because NGC's hurdle rate range remains in the 8.5% to 10% region, NGC is assumed to reduce investment and raise required capital contributions for any investments that do proceed. Accordingly, because required capital contributions are so high, customers themselves are unwilling to take the stranding risk, and new investment/demand falls to 10% of the counterfactual levels.

The simulation results are as follows.

Figure 17: Economic Income (Assuming WACC of 6.2%, Annual Average Over 10 Years)



88 Note that this is not a full welfare measure because we do not examine the welfare impact on existing customers from a larger market in the counterfactual (i.e. prices are generally lower for all customers because the market is larger allowing for fixed and common costs to be spread over a larger customer base.) So these results should be seen as conservative estimates of the welfare losses from control.

Figure 18: Loss of Welfare From Under-investment (Annual Average Over 10 Years)

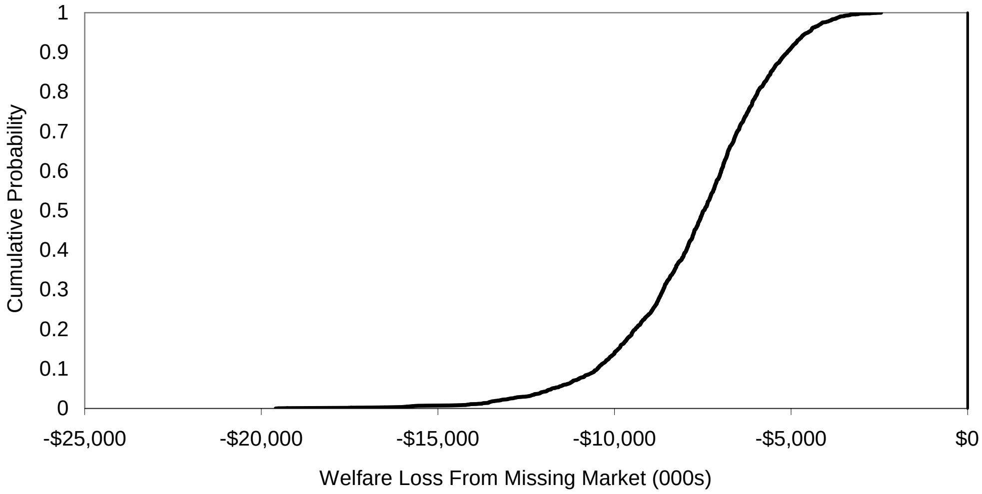
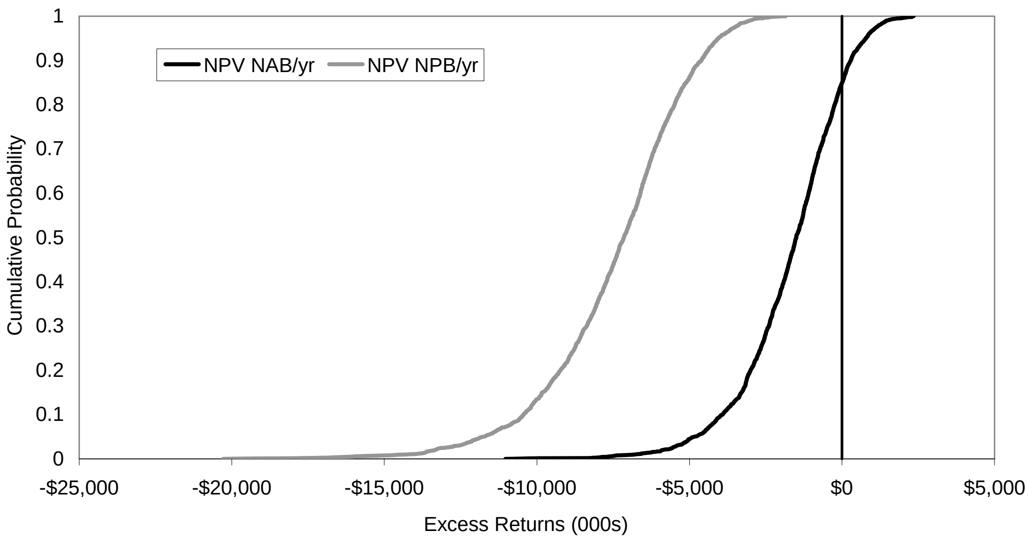


Figure 19: Net Acquirers and Net Public Benefits (Annual Average over 10 years)



Despite the fact that the model shows NGC is seemingly earning excessive incomes (Figure 17), (in the absence of stranding) the consequent reduction in investment by NGC, as a result of suppression of returns, leads to increases in the likelihood of missing markets developing, and losses of welfare from non-supply. The effect of assuming a lower WACC (which we emphasize is for illustrative purposes) provides higher transfer benefits of control, but this is offset by the large losses of welfare from non-supply. Net acquirers benefits are negative in all but 15% of cases and net public benefits are negative in all cases (Figure 19). The average loss of welfare is $1.5 million under the net acquirers test and $7.2 million in the net public benefits test.

7.3. CONCLUDING COMMENTS

In contrast to the highly deterministic results that the Commission derives from its model, the Monte Carlo analysis that we have conducted to date, illustrates the extreme difficulty a regulator would have in meeting the objective of setting prices in a way that attempts to set NGC's revenues exactly equal to costs. We find that exploring the effects of variability of only two variables (through-put and customer numbers) will lead to a wide distribution of economic income, and NGC would be exposed to extreme levels of revenue risk.

Moreover, integrating a more realistic behaviour model of investment behaviour, illustrates that the Commission has substantially under-estimated the welfare consequences of under-investment and the consequent non-supply to customers who would otherwise be willing to pay for service.

Inevitably such models can be refined, and be made more elaborate, but the results of our analysis here are driven by the substantial variability in gas demand in New Zealand and rates of customer growth. Any Monte Carlo analysis that is underpinned by such volatility, which we calibrate from actual market data, will deliver similar results.

In our view, the Commission must use such models to develop its estimates of changes in welfare that would result from price control. The New Zealand gas industry is undergoing a period of rapid structural change, and demand will only become more volatile as the market adjusts to the higher wholesale gas prices. Deterministic, static models are simply not capable of addressing the core issues a regulator would confront in imposing price control.

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APPENDIX A: COMPETITION ANALYSIS

A.1 THE IMPLICATIONS OF A RISING GAS PRICE

The Commission concludes that, in general, competition in the relevant gas transport markets is limited. For the reasons expressed in our previous submission, we continue to doubt that this is an appropriate finding, and we briefly outline some further relevant evidence below. However, the main point that we wish to emphasise here is that the competitive constraints on gas pipeline companies are increasing as the price of gas rises. This is an immensely important fact for the Commission's inquiry, as it means that historical performance of gas pipeline businesses is of limited informational value looking forwards. In particular, if it is the case that pipeline businesses have been earning "excess profits" historically (which we dispute), then the future is much more bleak for them.

In the remainder of this appendix, we return again (briefly) to the issue of competitive constraints on gas pipelines. We also comment on the Commission's discussions of demand elasticity and ODV reports. We then discuss the Commission's finding that the Maui pipeline does not constrain NGC's transmission pipeline. Finally, we consider the Commission's treatment of metering.

A.2 OTHER COMPETITIVE CONSTRAINTS

As we observed in our comments on the Commission's Draft Framework Paper, a holistic view of the constraints on gas prices is required. There is unlikely to be any single type of constraint that limits the ability to raise prices above the competitive level, but rather the constraints arise from a combination of:

- Interfuel competition;
- Long-term contracts;
- Bypass; and
- Customer price sensitivity, e.g., those customers that compete in international markets.

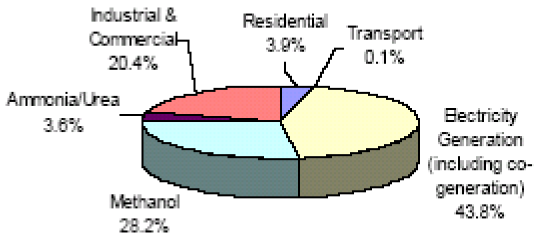
It is the combined weight of these potential constraints that must be considered in determining whether or not competition is limited.

We make the following observations based on the Commission's evidence and own conclusions.

- Gas is a discretionary fuel; it is not the same as electricity.

Figure 1.3 "Gas Use by Sector" illustrates the sectoral use of gas:

Figure 1.3: Gas Use by Sector (2003)



- The Commission concludes that long-term contracts would "provide a measure of protection from the use of market power, provided that the user has fuel and/or location options at the time it entered the contracts." NGC informs us that all of the electricity generators (who accounted for 43.8 percent of demand in 2003) are on long-term contracts, negotiated prior to build, and each had location and fuel options at the time (and of course the option not to build at all).

- While we do not know its contractual position, we would expect Methanex to also have a material level of countervailing power. Methanex is continually assessing its production options in other countries, and is a very large user of gas.

- This leaves the residential and industrial/commercial users (including ammonia and urea producers), which make up the remaining 27.9% of the market. The Commission observes that:

> *The Commission recognises that in other markets the threat of bypass entry can have an important competitive impact, but it considers that this threat (and impact) exists in only small pockets of the area covered by the incumbent's network. This competitive threat in these pockets is mainly limited to the supply to industrial and commercial customers, albeit these customers are the largest users of distribution services in the pockets.*

We are not aware of what evidence the Commission has on the geographic location of customers and their relative revenue contributions, but given the dominance of industrial consumption we would expect these pockets to be a substantial proportion of revenues.

- We also note that NGC has entered into [ ] special transmission agreements with customers that have viable interfuel substitution possibilities, an increase of [ ] since August 2003. With the increase in gas wholesale costs, there will doubtless be increased pressure on NGC to accept further price reductions. These special agreements cover firms in the following industries: meatworks, malting, asphalt, dairy, sawmills, grain, hospitals, food processing, pulp and paper and wool scouring. Outside of cogeneration and generator consumers (which are covered by separate contracts), revenues covered by special TSAs are [ ] per annum and [ ] per annum.

In respect of the residential sector, we reiterate ACIL's findings[89], which the Commission appears to accept, that prices in the residential market for gas and alternative forms of energy are comparable. We have also calculated the costs of installing different types of appliances, and note that gas appliances are considerably more expensive than their electric equivalents.

Figure 20: Relative Costs of Space Heating Appliances

Space Heating	Electric $	Gas $
Freestanding Heater (approx 2200-2400W)	29 to 619	1,349
Flue Kit (3.6m)		350
Pipe installation and material (10m)		220
Installation of Heater and Flue		240
Gas Certification		85
Total Cost	29 to 619	2,244

Figure 21: Relative Costs of Water Heating Appliances

Electric and Gas Storage Water Heating			Instant Gas Water Heating	
	Electric $	Gas $		$
Water Heater	830	1,424	Water Heater	1,480
Flue Kit (3.6m)		350	Controller Kitchen and Bathroom	250

89 ACIL Consulting (2001) *Review of the New Zealand Gas Sector: A Report to the Ministry of Economic Development*

Electric and Gas Storage Water Heating			Instant Gas Water Heating	
	Electric $	Gas $		$
Pipe installation and material (10m)		220	Electrical point with RCD	300
Installation of Heater and Flue	240	240	Installation - labour and materials	800
Gas Certification		85	Gas Certification	85
Council Permit		100	Council Permit	100
Total Cost	1,070	2,319	Total Cost	3,015

For it to be economic to install gas appliances in residential applications, assuming a 10% discount rate for consumers and depreciating the asset over 10-15 years, delivered gas costs will need to be around $200 less per annum than the equivalent electricity charges (ignoring quality differentials).

Overall, there seems to be a significant amount of evidence that interfuel competition and bypass potential places a constraint on a reasonably significant proportion of gas customers and volumes transported. Whether this is sufficient to constrain prices to the workable or effective level of competition is of course, still an empirical question, but it is clear that many customers have real alternatives to gas.

Furthermore, the Commission’s task is to look forward to predict whether or not price control would be appropriate. As the price of gas rises, the pressure on gas transporters can only increase.

A.3 Elasticities of Demand

- The Commission also takes as evidence that overseas studies show that, on average, the demand for gas is ‘inelastic’. While, of course, these studies are relevant, in particular to calibrating quantitative models, they do not provide evidence in the New Zealand market that demand is inelastic, or would be in the future.

- Although the Commission notes the limitations of elasticity studies, it concludes that the studies "do not add support to any argument that network charges are strongly constrained by interfuel competition".[90] This portrays a misleading review of the evidence that the Commission cites. Dahl (1995), in a comprehensive review of gas demand elasticities, finds significant variation, ranging from elastic to inelastic estimates, and observes that (page 111):

> *Young markets appear to have higher own price elasticities. One young market in New Zealand is the residential market. I would expect in most countries such a young market* ***to have an elastic own price response*** *with electricity and/or oil to be at least weak substitutes depending on relative prices.* [91]

We agree with this observation, and reiterate the discretionary nature of gas in New Zealand, and the immaturity of the sector: in our view, simply assuming the market is inelastic and therefore competition is limited, is inappropriate.

A.4 Inferences Drawn from ODV Reports

- The Commission also observes that NGC's ODV reports show that [.] This is not a test of whether there are practical competitive considerations that make it more sensible for NGC to maintain its prices at the levels it does. For example, if it is true that NGC could raise its prices to particular existing customer groups by [ ], why doesn't it do so? If not by the full [ ]? A reasonable explanation would be that the longer-term loss of customer base through attrition, and disincentive that would be provided to new customers to join, constrains prices. For example, Dahl states (page 111):

> *Young markets appear to have higher own price elasticities. One young market in New Zealand is the residential market. I would expect in most countries such a young market* ***to have an elastic own price response*** *with electricity and/or oil to be at least weak substitutes depending on relative prices. For example, in Australia with a somewhat similar share in the residential-commercial sector, the study done on the early residential gas market suggests there is no evidence of substitution by oil, but we see electricity is a strong substitute for gas. Although I do not have a fuel oil price in the residential sector in either country to determine fuel oils competitiveness relative to natural gas, oil is a similar share in both Australia and New Zealand in this sector indicating perhaps somewhat similar substitution effects.*

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90 Para 3.101.

91 Dahl, C (1995) ***Final Report A Survey of Econometric Estimates of Natural Gas Demand Elasticities: Implications for Natural Gas Substitution in New Zealand*** **August 1995.**

> *New Zealand has a large share of residential energy served by electricity and a relatively cold climate leaving natural gas with a large potential market. But with such cheap residential electricity prices in New Zealand, the electricity market may be a more difficult market for natural gas to crack in New Zealand.* ***However, if natural gas were priced cheaply enough to penetrate more heavily the residential market, the initial own price response might be elastic with the elasticity falling as the market matured*****. Emphasis added.**

It therefore seems unreasonable for the Commission to take as evidence the fact that 'technically' prices could be increased that therefore competition is limited. Rather this should be taken as evidence that competition to grow the market practically constrains NGC's pipeline charges. The ODV test is not a competition test.

A.5 Transmission Market Between Taranaki and Huntly

The Commission argues that despite the fact that there are two separately owned pipelines running from Taranaki to Huntly, these pipelines are not considered to compete. The logic appears to be that because the NGC pipeline is smaller than the Maui pipeline it would not constrain the prices that could be set on the Maui pipeline, since, for anything other than small loads, NGC would not be able to compete. While this suggests that the Maui pipeline may not face vigorous competition, this does not prove the reverse case that the larger Maui pipeline would not constrain prices that NGC could set for its smaller pipeline.

The Maui pipeline is significantly larger than NGC's and therefore is likely to have a considerable scale economy advantage over the NGC pipeline. Most of the cost of laying a pipeline is in digging trenches, installing the pipeline and then covering it over. The cost of the pipe itself is much less material. So NGC's capital costs of providing the line will not be significantly different to the Maui line, yet it has one tenth the capacity over which it is capable of recovering those capital costs. It seems inconceivable, therefore, that the Maui line would not constrain prices on NGC's pipeline, even though the reverse may not be true, because of the capacity limits on NGC's pipeline.

A.6 Metering

The Commission reaches the view that meters owned by distributors are part of the inquiry, but otherwise are not. This creates the unusual situation where meters may be regulated based on ownership rather than a benefits test applied equally across all providers of metering services. In the event that the Minister makes an order for control, regulation would potentially be avoided by transferring ownership of the meters to a non-pipeline business, regardless of its efficiency or otherwise in providing this service.

If there are genuine concerns that meter owners are able to exert monopoly power, then regulatory tests must be applied independent of ownership type.

We suggest that if meters are to be included in the inquiry on the ownership basis that the Commission suggests, then the theoretical benefits of control of meters must be set equal to zero, since the logical response to regulation is to sell the meters to an unregulated provider.

APPENDIX B: INCORRECT DYNAMIC EFFICIENCY CALCULATION

The error in this calculation occurs in Row 16 of the sheet NGCD CC. The Commission makes the error of translating the slope (not the elasticity) of the demand curve for the entire market to the new market. This results in an implied demand elasticity for the new market in excess of –50. For example, a six cent increase (2%) in the average distribution price in 2008 results in a 100% fall in demand in the new market. This is clearly not correct.

This formula should be replaced with one based on a price elasticity, for example –0.3 (as used in the rest of the distribution market), to derive the demand curve in the new market.

The formula for calculating P_x (the price at which demand is zero) should be consistent with the following:

$$E_d = \frac{\frac{(Q_x - Q_m)}{Q_m}}{\frac{(P_x - P_m)}{P_m}}$$

From this formula it is possible to determine the slope of the demand curve, which may then be used to calculate the price at which demand (consistent with the market that the slope applies to) falls to zero. Equivalently, the top line of this equation is equal to –1 as $Q_x = 0$ and rearranged the formula for P_x is:

$$P_x = P_m(1 - \frac{1}{E_d})$$

The Commission also errs in not calculating the consequent impacts of the missing distribution markets on surplus in the transmission market. The gas must be transported via the transmission system to the distribution markets, accordingly there is a producer surplus effect in the transmission market which the Commission must also calculate for the net public benefits calculation.