FINAL REPORT

Gas Control Inquiry: Cross Submission

Submitted to

Commerce Commission

Prepared by:

Charles River Associates (Asia Pacific) Ltd
Level 11, Mobil on the Park, 157 Lambton Quay
PO Box 1123, Wellington, New Zealand
Tel: + 64 4 473 5080   Fax: + 64 4 473 5090

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1. INTRODUCTION AND EXECUTIVE SUMMARY

A number of issues were raised at the Commerce Commission's conference to discuss the draft report on control of gas pipelines. This cross-submission addresses those issues and clarifies a number of matters.

The Minister has requested the Commission provide advice, including results of a net public benefits and acquirers test, to enable him to make an informed decision on the merits of control. Given all the changes in the gas sector, it is important that all the available economic analysis tools are used in assessing the costs and benefits of control. We consider that in a number of respects the Commission's models do not make best use of available modelling tools and the purpose of this cross-submission is to highlight some of the key difficulties of the Commission's approach and suggest a way forward that allows for a fuller evaluation of the issues.

The key theme of this submission is that uncertainty and volatility are pervasive in the gas market. Even during a period of relative stability in market conditions the data from 1997 to 2002, data show highly volatile revenues, costs and demand. Since the Maui redetermination in 2003, New Zealand has entered a period of considerable uncertainty about future gas prices, future availability of gas and even sustainability of an indigenous gas exploration sector. Combined with climate change policies that are relatively less favourable than in Australia, New Zealand's closest trading partner, regulation has significant potential to distort patterns of investment and behaviour in the gas pipeline sector. In these circumstances, the ability to price and manage risk is likely to be of paramount importance to pipeline providers. Regulation, by its very nature, stifles opportunities to price and manage risk, even according to customer preferences.

A second theme of this submission is that the Commission has not conducted a cost-benefit analysis – and thereby benefits to acquirers, or public benefits test – as this methodology is normally applied for decision-making. A standard cost-benefit approach would be to assess benefits and costs of price control for each year of the control period and discount back to the date at which the decision is to be taken. The Commission has not done this which results in over-estimates of the net benefits of control.

We have put forward an alternative model that is a forward-looking cost-benefit simulation analysis, calibrated with historical data on variation, as an economical, practical and proper alternative that can be implemented in a very short space of time. The model addresses some of our key concerns with the Commission's model, namely that the models are largely deterministic, rely too heavily on point observations from the past, are based on assumptions that have no firm correspondence to actual market performance, and are based on pricing methods that do not reflect current commercial reality, or incentive regulation.

It is important to understand that Monte Carlo analysis need not, and generally will not ignore past data. Indeed, the model we calibrate substantially[1] sets aside the forecasts that NGC has provided the Commission and uses past data, in a much richer way than the Commission. For example, historic data provides valuable information about variation that might be experienced in the market in future and how fixing the path of prices for long periods might interact with that variation.

While we are of the view that the Commission's model does not achieve incorporation of all relevant observable information into an appropriately specified cost-benefit model, there are a number of adjustments to the Commission's modelling approach that would at least make the model more internally consistent, and more informative about the benefits and costs of control at a point estimate. These modifications include:

- The benefits and costs of regulation can only exist in the future. Even if the model uses unadjusted historical information (which it should not) the model should be cast on a forward-looking basis, corresponding to the period of regulation;
- Price cap regulation tends to truncates returns, lowering the *ex ante* probability that returns *ex post* will be sufficient to support investment. Even if the regulator uses the same *ex ante* WACC as the business, investment will still be distorted because of the truncation problem, so there must be proper allowance for behavioural impacts of regulation;
- The Commission has incorrectly applied its formula for calculating 'excess returns';
- The Commission's treatment of the Kapuni Line as providing NGC with excess profits incorrectly ignores the original write-down of the asset; and
- Dynamic inefficiency of control is under-estimated in the Commission's model (both quality and under-investment effects).

The remainder of this cross submission is structured as follows.

- First we deal with framework issues relating to:
  - The use of cost-benefit analysis in the inquiry;
  - The welfare tests applied and distinctions between 'excess' profits and 'functionless rents' for the purpose of a net public benefit test; and
  - The use of historic data in the inquiry.

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1 The only component of NGC's forecasts we have used is to calibrate the mean through-put growth assumption.

- Second, we respond to a number of specific queries from the Commission and its advisors relating to aspects of the modelling approach, including:
  - Impacts of price cap regulation on investment and quality of supply;
  - The scope for regulatory error in setting a price cap;
  - The impacts of hybrid regulatory regimes, such as thresholds approaches on behaviour;
  - Alleged conservatism in the Commission's model;
  - The treatment of stranding and unstranding in the inquiry; and
  - The inconsistent application of the Commission's approach to measuring excess profits.
- Finally, we discuss in more detail the properties of the Monte Carlo simulation analysis provided in our submission on the draft inquiry report.

2. ROLE OF COST-BENEFIT ANALYSIS

2.1. INTRODUCTORY COMMENT

The purpose of this inquiry is to advise the Minister on whether the imposition of control from 2005 would improve welfare to acquirers or the public. Accordingly, the cost benefit analysis of welfare effects is inherently a forward-looking policy decision. While it is, of course, informative to look to the past as an indicator of the future (particularly for the counterfactual of no-control), that view of the past must be tempered by the knowledge of general market conditions. If the past is substantially different from the future, as it is for gas, then cost-benefit analysis must recognise that only limited inferences can be drawn, and other data and evidence must be used to condition the forward-looking analysis.

Incentive regulation inherently involves making forecasts about an uncertain future. Standing at 2004 and looking five years out, it is not even possible to say with certainty that that demand for pipeline services will be higher or lower than at present. Hence, there is substantial potential for actual experience to deviate substantially from forecasts.

Therefore, a cost-benefit analysis must explore the full range of potential outcomes that might result from a price control arrangement, within an appropriately specified behavioural model. The Minister is presumably not just interested in a hypothetical evaluation of the benefits and costs of control, where the regulator is assumed to almost perfectly forecast the future; rather a full evaluation of key risks and uncertainties associated with the imposition of control would best inform the Minister's decision.

2.2. GENERAL USE OF DATA

A cost-benefit analysis is crucially reliant on input data. As far as possible, data inputs should be obtained from relevant observable experiences (either within the industry in question or from relevant comparable studies). It is also important that key assumptions and how they are arrived at are made transparent.

A key concern that we have with the Commission's model is that a number of important data and input parameters do not appear to have any firm basis. These include:

- That 10-25% of the transfer benefits of control may not be realised – there is no discussion of how this range was arrived at, and the range is inconsistent with observable experience of price control in other jurisdictions, and with historic variability in the gas pipelines sector;

- The Commission has not applied its cost-benefit analysis in a consistent manner, by substituting various of its own estimates on an ad hoc basis:

    - without considering how this fits with the concept of the approach; or
    - how this affects other variables in replacing the audited disclosure data; and

- That a constant 0.5% of demand may not be served under price control, because pipeline businesses reduce the level of investment. There is no analysis of why this level would be 0.5%, or why it would be constant over the price path. The assumption is also inconsistent with evidence of customer churn and ongoing growth in the New Zealand economy that will require future investment to meet new customers.

In an evidence-based inquiry assumptions must be capable of being calibrated to some observable information, or plausible ranges of unobservable information. For example, in constructing the Monte Carlo simulation analysis of the impact of a price path, we use actual experience of variation to understand potential for regulatory error and no assumption of scope for regulatory error, or sensitivity ranges are required, as this is uncovered in the application of the sensitivity analysis.

2.3. Recommendations for Commission Analysis

1. Models should be developed to examine the range of potential outcomes under price control. If models cannot be developed or calibrated with data, then the recommendation must be conditioned by the absence of quantification of that welfare impact (e.g. omission of range of quality impacts of control, e.g. lower security, restrictions on pipeline pressures / appliance use).

2. Models should be calibrated to observable data, or external reference points (e.g. scope for regulatory error may be calibrated to overseas regulator's experiences with P_0 adjustments (positive and negative).

3. Models should reflect the pricing approaches used: for example, the Commission has assumed two price control period of 5 years, therefore the model should reflect the fact that five-year forecasts would be required to set a price path and contemplate that there may be forecast error. Alternative regulatory models, such as thresholds-type regimes should be modelled to the extent that these are feasible alternatives.

4. Models must reflect plausible behavioural responses to regulation and be internally consistent (for example, the Commission's model assumes that there are missing markets because NGC reduces investment, but capital expenditure is unchanged in the model between the factual and counterfactual. In addition the size of the missing market is implausibly small (and constant) despite evidence of significant customer churn requiring network investment).

Finally, it is important to recognise that quantitative models are only imperfect representations of the world. It is impossible for any model to assess the full range of behavioural responses to regulation. Regulation involves limiting prices and attempts to minimise the loss of efficiency, as regulated firms react to maximise their value, given the constraint of a price path. Small price adjustments in an industry with turnover of $1 billion per annum, and where there is substantial scope for regulatory error, would not seem to justify the risks involved. The Productivity Commission states:

> *Generally, regulation involving access arrangements with a reference tariff should be considered only where service providers have substantial market power. Where market power is not strong, such as where there is emerging competition in the gas industry, the long run costs of regulatory intervention are likely to outweigh the cost of the market failure that regulation attempts to correct.*[2]

2 Productivity Commission 2003, *Review of the Gas Access Regime*, Draft Report, Canberra, Draft Finding 4.5, pxxxvi.

3. WELFARE TESTS

3.1. 'FUNCTIONLESS' VERSUS 'EXCESS' PROFITS

In applying the net public benefits test, the Commission treats transfers from NGC's foreign shareholders (66% of shareholdings) as a being a benefit to New Zealanders. Aside from this calculation being incomplete because the ultimate beneficiaries are not necessarily New Zealanders, or New Zealand-owned firms,[3] treating 'excess' profits, which in the Commission's model are any profits above WACC, as being 'functionless' is inappropriate.

Profits are a motivator of all sorts of behaviour. They provide the justification for ownership change, where a new owner considers that it has superior information and capabilities to increase efficiency, and motivation for ongoing efficiencies and risky investment.

With or without price-cap regulation, prospect of higher profits is a motivation to improve efficiency. The profits generated by that improvement should not be considered 'functionless,' as they directly motivate efficient behaviour. Weakening the possibility of producing/retaining profit alters incentives and alters behaviour. To treat profits above some standard administratively set WACC as being 'functionless' is simply incorrect for the imposition of controls that remove such profits will affect behaviour and firm and industry performance.

Further, as we discuss below, regulation that truncates the level of returns over time, reduces the *ex ante* expected return and will deter some beneficial, but risky investments (e.g. innovation and those with positive stranding risks). Profits that reflect the bearing of risk are therefore also not 'functionless' (or excessive), since they are a reward for risk-taking.

Price cap regulation will always affect behaviour because of the foregone ability to generate/retain profits and so any such lost profits should not be regarded as "functionless" from the economy's perspective. Despite the lost investment, efficiency and product quality that such regulation engenders, regulation may still go ahead for other reasons: indeed the existence of both costs and benefits of price control of themselves indicate behaviour change and therefore demonstrate that regulatory cream skimming of deemed excess profits has no implications for drawing the threshold on profits that are functionless.

3 For example, six out of NGC's ten largest customers are more that 50% foreign owned and sell into a mixture of domestic and foreign markets.

The Commission deems its excess profits “functionless” and if transferred to foreign owners a loss to the New Zealand public. As we have argued, such profits are in no economic sense “functionless” as the High Court define them. Further as we explained in our submission the Commission’s measurement of excess profits may well scoop off returns to investors that are by no means excessive let alone functionless.

More generally, the benefits to New Zealand of participating in an international capital market, such as skill and knowledge transfers, and risk diversification are likely to be substantial, so treating the flow of profits to foreigners as being “functionless”, and thereby inducing asymmetric treatment of firms under regulation and competition law in markets of relevance to New Zealand on the basis of foreign ownership risks jeopardising the benefits of participating in international capital markets.

Overall, this suggests that there is no argument for treating the Commission’s excess profits as “functionless,” and that a very high threshold for should be set for treating profits as being “functionless”: regulatory excess profits and “functionless” must on all the arguments have very different thresholds.

In the case of NGC, observed profitability remains close to the Commission’s WACC range (particularly as the Commission does not consider productivity improvements as a reason for higher profits, and adopts an assumption of *ex post* pricing that will lead to the highest possible calculation of ‘excess’ profits). In our view the Commission-measured excess profits are not “functionless”, and the transfers to foreigners in the net public benefits test should therefore be omitted as a benefit of control.

3.2. Net Acquirer’s Benefits versus Net Public Benefits

On the basis that the net public benefits test is distorted by the treatment of foreign shareholders, the Commission appears to favour the net acquirers test. This approach does not appear to contemplate that the net public benefits test (sum of consumer and producer surplus differences between the factual and counterfactual) provides valuable information about the overall welfare and resource allocation consequences of control. We do not consider that the test results should determine the test applied, which is what the Commission’s approach implies.

It is feasible that price control would bring about a reduction in overall welfare, as measured by a net public benefits test, but the net acquirers test shows a positive benefit to a narrow segment of the public. It is clearly up to the Minister to decide whether favouring one group of society, potentially at the expense of welfare more generally, is desirable, but the Commission has a role to play in pointing out the trade-offs that must be made. The value of a net public benefits test, setting aside the final incidence of transfers (which are impossible to measure in any event), is that it shows real welfare consequences of the decision.

Our recommendation is that the Commission should report to the Minister the results of the net public benefits test (excluding transfer issues) so that a fully informed judgement may be made about the impact of control. In accordance with the purpose of the Commerce Act and its focus on long-term interests of consumers, the Commission should give high weight to the results of that test.

4. RELEVANCE OF HISTORIC DATA

4.1. OVERVIEW

The Commission's model relies heavily on historic data to inform its estimates of future benefits of price control. At various points in the conference, the Commission noted that at least with historical data, the Commission is able to observe 'hard' evidence and therefore weight should be given to that data in the cost benefit analysis. To draw an analogy, what the Commission has done with the historic data is akin to a macro-economic forecaster in 1997/98 ignoring the then current Asia currency crisis and formulating GDP and other macro forecasts based on historic trends. In a period of structural change, this would almost certainly lead to significant forecast error.

As we have noted previously, historic data do provide some insights into potential future outcomes, or potential behaviours. It is not appropriate, however, to take data that pertains to a particular industry context (strong growth, stable and low prices and no concern about supply availability) and treat it as absolutely representative of likely future outcomes, when the future environment is one of increasing and unstable wholesale gas prices, uncertain long-term outlook for gas supplies and likely decreasing demand.

Not only does the Commission take historic data and treat it as representative of potential future outcomes, the Commission also exaggerates the historic data by compounding it and averaging it with discounted forecast data to determine an average net benefit in 2004. This disproportionately weights the past because of compounding and the fact that seven out of twelve years in the study period for NGC pertain to historic data.

We address each of these concerns in turn and suggest a practical solution.

4.2. USE OF HISTORICAL DATA

In NGC's case, the Commission estimates the costs and benefits of control using data from the period 1997 to 2008. Setting aside the problem of exaggerating the past data by compounding it up (addressed in the next section), in averaging the seven years of historic data, with a point estimate of the future data, the Commission is essentially contending that the future will be 7/12ths more like the past than the forecast projections provided by NGC.

The Commission raised the proposition that in the case of Airports, actual demand growth following the Commission's report was more consistent with historic trends than what the Airport companies had forecast, and that the Commission would therefore have been better to have used the historic data than the company's own projections in the inquiry.[4] While in the case of airports historic data has turned out to be informative, consider what might have happened if SARS had emerged in New Zealand, or conversely New Zealand had retained the America's Cup. Both were possible outcomes and would have resulted in quite different patterns of visitor arrivals, cashflows and profit outcomes for the Airport companies. It is only by chance that demand trends have continued at historic levels.

In contrast to airports, where events such as SARS or winning the America's Cup are essentially unforecastable, it is known with certainty that gas wholesale prices have doubled since 2002/03. In such circumstances, it is highly unlikely that there would not be reductions in demand[5] and increased probability of asset stranding. Accordingly, with a smaller customer and through-put base over which to spread costs, pipeline businesses are likely to be constrained in lifting prices, or do so at much greater risk that this will further deter customers from connecting to gas or maintaining their connections.

As we noted in our original submission,[6] we do not advocate dispensing with historical information – it provides a rich source of information on levels and variability, and insights into attempted future behaviours under continued light-handed regulation, but that analysis must be tempered by the knowledge that the market is fundamentally different to the historic period.

In applying a backwards-looking approach it is also unreasonable to treat behaviours as being unaffected by regulation. For example, price cap regulation has an asymmetric impact on *ex ante* expected returns. Pipeline businesses making long-term investments may perceive that there is greater risk that returns would be brought back to some simple cost of capital estimate of reasonable returns, but bear the downside risks of asset stranding. Accordingly, this would have reduced the incentive to grow the market by the extent that it grew historically. As the Australian Productivity Commission has observed, this truncation problem is present even if the regulator uses a cost of capital that matches the business's.

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4 See for example, Conference Transcript July, 27, 2004, page 212-213.

5 For example, at a long-run elasticity of –0.7 (as the Commission assumes), a doubling of the wholesale price would lead to a 35% reduction in demand over time, assuming that wholesale charges make up 50% of the delivered price.

6 CRA (2004) *Review of the Commerce Commission's Gas Control Inquiry Draft Report* page 50.

Had price cap regulation been imposed in 1997, behaviours would have been quite different. Marketing and investment to achieve growth in demand would not have been at the same level as the Commission's model suggests, and therefore the ability to 'transfer' profits would have been reduced by the fact that there would be a smaller market over which to spread substantial fixed and common costs.

4.3. Illustration of the Compounding Error

As was noted in our original submission, the Commission's model based on compounding up the past is effectively only capable of answering the hypothetical question of "what would the costs and benefits and control have been, if control had been imposed in 1997, valued in 2004 dollars?"

This is not the same as evaluating the forward-looking question "standing in 2004, what would be the net present value of the costs and benefits of control, if control were imposed from 2005 to 2015?"

The distinction occurs because it is not possible to go back into the past to realise productivity gains, or incur expenses associated with implementing price control, or change the prices that have been set historically etc., and compounding up past variables is economically meaningless for the purpose of assessing price control that can only occur in the future: only the discounted future is relevant to the current assessment.

Take, for example, the administrative costs of control. The Commission considers that these would average $508,000 in real terms per annum.[7] Accordingly, at the Commission's discount rate the net present value in 2004 of the future administrative costs of control would be as follows (assuming CPI growth of 1.5%[8]):

Table 1: Forward-looking Administrative Costs of Control[9]

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
	$,000s										
Nominal	508	516	523	531	539	547	555	564	572	581	590
Indexed (2004)	471	443	417	393	370	348	328	308	290	273	257

7 This is in itself an incorrect treatment of these costs, since the point at which the costs would be incurred will affect the present value of the administrative costs of control.

8 As the Commission has assumed for future CPI increases.

9 At the Commission's 75th WACC percentile.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
	$,000s										
NPV (2004)	3,899										

Methodologically, the calculation in Table 1 gives the correct forward-looking present value of the administrative costs of control.

In contrast, the following table reproduces the calculation from the Commission's model, where the estimated annual average cost of control in 2004 of $508,000 is inflation adjusted backwards to 1997 and then compounded up to 2004 and for future periods, inflation adjusted to 2008 and discounted back to 2004:

Table 2: Commission Calculation of Administrative Costs of Control

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
	$,000s											
Nominal	450	458	456	465	480	493	500	508	516	523	531	539
Indexed (2004 $)	796	741	682	638	605	573	540	508	478	450	424	399
NPV[10] (2004)	6,265											
Average NPV[11] (2004)	570											

The Commission's calculation is 58% higher than the calculation of the present value of direct costs of control presented in Table 1. The Commission and pipeline businesses cannot go back to 1997 to spend $450,000 as the Commission's model effectively assumes, so it is clear that the Commission's approach is not correctly computing the forward-looking costs of control. . We note that the average NPV has no relevant meaning and makes no contribution to assessing the net benefits of price control.

The principle that the cost-benefit analysis must be cast on a forward-looking basis applies to all other variables in the Commission's analysis, e.g. dynamic inefficiency, productive efficiency, transfers, etc.

10 Note this is scaled by 11/12 so that it is comparable in number of years in Table 1 above.

11 Note that the concept of an "average NPV" that appears in the Commission's model has no economic meaning. It is preferable to deal with the NPV over the control period.

4.4. Correct Method for Calculating the Forward-Looking Net Benefits of Control

The Commission's method involves the following calculation for each of the variables:

$$x_{04}^{B} = \sum_{i=-7}^{4} \frac{x_i}{(1+r)^i}$$

and its average as

$$\bar{x}^{B} = \frac{\left[\sum_{i=-7}^{4} \frac{x_i}{(1+r)^i}\right]}{12}$$

The correct calculation for each variable should be:

$$x_{04}^{CB} = \sum_{i=1}^{11} \frac{x_i}{(1+r)^i}$$

In words this simply represents that the net present value of the costs and benefits of control involve a forward-looking projection for each year of the control period, discounted back to 2004.

The average conveys no information about per-period net benefits, it is not a meaningful economic concept.

As noted above, the projections of the future should not involve compounded up, unadjusted historic data: rather those projections should be conditioned on known changes in the market (e.g. doubling of gas prices) that might affect trends in historic information.

4.5. Recommendations for Commission Analysis

1. Model should be based on a forward-looking basis only, with future costs and benefits of control for the period 2005 to 2015 discounted back to 2004.

2. Unadjusted historic data should not be used in the Commission's model as it relates to a market period where circumstances were completely opposite to those that are likely to be experienced in future and it is simply a point estimate when the data themselves indicate variability was the norm: even in the past.

5. INVESTMENT INCENTIVES UNDER CONTROL

5.1. INTRODUCTORY COMMENTS

Incentive regulation has been introduced in a number of jurisdictions to combat the poor incentive qualities of rate of return regulation, by transferring elements of risk to regulated businesses and allowing such businesses to benefit from efforts to reduce costs. It is clear from the literature on price cap regulation[12] however, that the intrusive nature of building blocks processes to set allowable prices or revenues has many of the shortcomings of rate of return regulation.

A major criticism of incentive regulation has been that the linking of price paths to the forecast costs of the business distorts decision-making and harms investment incentives, because risks are not fully compensated in the setting of a price path. The dynamic consequences of such under-investment, resulting in poor quality of supply and reduced services, are likely to run counter to the interests of consumers and lower welfare overall.

It is important therefore that an analysis of the impacts of price control has a heavy focus on the consequences of price control on dynamic efficiency. The Commission has clearly devoted significant resources to developing estimates of ‘excess’ profits, but the models used to examine the dynamic consequences of under-investment in network expansion and quality of supply do not appear to have received the same attention. In fact, the models of dynamic efficiency have been estimated using inconsistent[13] and incomplete[14] models that have no discernable reference to actual experience in the gas market.[15]

In contrast, the simulation analysis presented in our original submission explicitly links capital expenditure to growth in customer connections based on a probability distribution of potential customer growth, and calibrates the model to observable experiences with developer resistance to capital contribution requirements. We find that under-investment would lead to substantial reductions in welfare, even without considering any further development of models to examine potential detriments to the quality and reliability of supply that might result from price control.

12 See, for example, OECD (1995) *Price Caps For Telecommunications Policies and Experiences* 37.

13 For example, under-investment makes no difference to capital expenditures in the factual in the Commission’s model.

14 Only one possible quality effect is quantified.

15 No analysis is presented on how the Commission reached the view that a constant 0.5% of demand would not be served under control.

In the remainder of this section, we discuss a number of matters raised by the Commission and its advisors at the conference.

5.2. Sources of Under-Investment Under Price Control

At a number of points the Commission observed that if it were to establish the WACC at the 'correct' level, then pipeline providers would not face incentives to reduce investment.

As a broad comment, pipeline providers will have an internal view about their capital costs, and the asymmetric risks faced in providing irreversible pipeline investments. NGC, for example, has disclosed to investors that it has hurdle rates of between 8.5% and 10%, which only just overlaps with the Commission's stated WACC range, so only the lowest risk investments would be forthcoming if a price path were to be based on a WACC of 8.5%. At lower WACCs NGC would rationally cease discretionary investment entirely.

Even if the WACC used to set the price path coincides with NGC's hurdle rate range, there still exists the problem that returns are observed *ex post* in calibrating and recalibrating the price path. In circumstances where the business is exposed to asymmetric risks of asset stranding and catastrophic events, potential returns are truncated by the price path and therefore *ex ante* expected returns would be lower than what might be required to justify investments.

The problem of truncating returns was widely canvassed in the Productivity Commission's Draft report on Access to Gas Pipelines, the relevant text of which is reproduced here:[16]

> ***The asymmetric truncation effect***
>
> *Under the Gas Access Regime, reference tariffs are effectively based on a cost of service method in which regulators use the building block method to estimate revenue requirements and apply incentive regulation to set reference tariffs for the coming regulatory period (typically five years). However, an investment project has a distribution of possible returns. Before construction, the investor does not know if realised returns will be above (or below) the forecast level. Asymmetric truncation occurs if the service provider cannot earn high returns if the project is successful (that is, if returns are well above the forecast level), yet bears the cost if the project is unsuccessful (that is, if returns are below the forecast level) (appendix B).*

16 Productivity Commission 2003, *Review of the Gas Access Regime*, Draft Report, Canberra.

The regulator might have motivation to asymmetrically truncate returns to satisfy their task of preventing profits made through the exercise of market power. If regulators consider that the returns being earned by a pipeline business are too high, then they might have an incentive to take action that lowers the returns to the investment. Regulators might be risk averse (section 4.6) possibly leading them to truncate returns because the long term effect — the deterrence of investment (see below) — is not felt for a long time.

> *… a regulator, who sets an access price after the relevant investment is sunk, has a strong social incentive to set a low access price. Such an access price will promote efficient use of the facility, competition and social welfare without deterring the investment that has already occurred. (Gans and King 2003a, p. 2)*

…

Regulators might asymmetrically truncate because of the tendency for successful projects with high returns to be covered.

> *If the project is highly successful, regulatory access most likely will be sought. Even if regulators allow investors a 'reasonable rate of return' in these circumstances, unless this return fully compensates investors for the ex ante risk associated with project failure, access regulation will mute investment incentives. Put simply, investors will bear all the downside risk of the investment and face a truncated upside return due to access regulation. (Gans and King 2003b, p. 1)*

…

One reason that asymmetric truncation is a problem is the possibility that demand might fluctuate. Such fluctuations are likely for gas pipelines, which are long lived investments. Fluctuations in demand can be either short term or long term. An example of short term fluctuations would be changes in demand due to weather. During a mild winter, demand for gas heating might be lower, leading to lower than forecast returns. The service provider would have to bear the costs of lower revenues. On the other hand, demand for gas might be high in a cold winter, leading to higher than forecast returns. If the regulator requires the service provider to share higher than forecast returns with consumers, then the average return of the project is decreased. Train noted:

> *If the firm makes less than the allowed rate of return in 'bad' years and yet is not allowed to make more than the [upper bound of] return[s] in 'good' years, the firm's average return over time is less than the allowed return. (Train 1991, p. 105)*

…

Many inquiry participants acknowledged the truncation problem, for both existing and greenfield assets:

> *The weaknesses of the current [Gas Access] Regime in dealing with greenfields projects include the exposure of greenfields projects to 'asymmetric' regulatory risk — where the potential upside of a project is effectively capped by access regulation, but the downside risks of project failure remain borne entirely by the investor. (AGA, sub. 13, p. 60)*
>
> …
>
> *once regulation is injected into the equation, business are not offered the ability to earn higher rates of return on some projects due to the tendency of regulators to cap rates of return at the economically efficient level, as determined by the regulator. This gives rise to regulatory truncation at the efficient rate of return. Regulators have not adopted suitable measures to allow service providers to share sufficiently in the upside risk of successful projects in order to compensate for the downside losses. (Duke Energy International, sub. 21, p. 10)*

Whilst acknowledging the problem, the ACCC suggested it might be mitigated by some features of the gas industry and the Gas Access Regime:

…

> *there are several factors that substantially mitigate the possibility of a 'truncation problem' in the gas pipeline industry. First, pipelines must pass an initial screening process before they are subjected to regulation. Pipelines that do not possess market power are unlikely to be regulated. Moreover, downside risks are truncated for most new pipelines by foundation contracts which guarantee a minimum level of volume and revenue. (sub. 48, p. 13)*

…

Appendix B illustrates, using plausible values of parameters, the probability distribution of total risk for the pipeline asset class. Asymmetric truncation of returns could have a significant effect on the expected value of return (figure B.2). Thus, there is still scope for regulatory truncation to occur for gas asset investments.

…

After considering mixed evidence on investment effects, the Productivity Commission reached the following conclusions:

The Commission's assessment

Many inquiry participants commented on the impact of the Gas Access Regime on investment. Users and regulators presented information about investment taking place, but service providers argued that any investment has been in spite of the Gas Access Regime. Service providers further argued that the nature and timing of investment has been distorted. Low risk or suboptimal pipeline developments might proceed, but not riskier pipelines or pipelines that cater for future growth in the demand for gas pipeline services. Although distorted investment might not be as damaging as noninvestment, such outcomes are socially inefficient and might hinder the development of the Australian gas market.

The Commission faces difficulties in trying to draw conclusions about the effect of the Gas Access Regime on investment based on the information provided by inquiry participants. First, we do not know the 'no regulation' scenario and therefore cannot assess if postponed investments would have proceeded were the Gas Access Regime not in place. Second, the impact of other structural reforms which have taken place in the natural gas sector cannot be easily separated from the impact of the Gas Access Regime.

The Commission, therefore, considers that judgements about the likely effects of the Gas Access Regime on investment must be based largely on conceptual considerations. There is a strong body of literature, which the Commission has drawn on in this section, to support the claim that access regulation has a 'chilling' effect on investment. First, regulatory risk is likely to have very significant ramifications for investment. Second, regulated access terms and conditions might lead to insufficient returns for facility owners. This is particularly the case where there is asymmetric truncation, which reduces the expected return from a pipeline investment by exposing service providers to the downsides of investment returns, but not allowing the upsides.

…

All of these risks mean there is a strong likelihood that the incentive to invest and the nature and timing of investments in the Australian gas market have been affected by the Gas Access Regime. The practical difficulties that regulators face in approving access prices (chapter 7) and the existence of emerging competition in the natural gas sector strengthen this finding.

Draft Finding 4.3

The Gas Access Regime deters and distorts investment, possibly altering the nature and timing of pipeline projects. Pipeline construction might be delayed, for example, or pipelines might be built 'fit for purpose'. Such alterations can delay the emergence of competition in upstream and downstream markets.

Appendix B of the Productivity Commission report, provides further amplification of the asymmetric truncation effects of regulation on returns.

The key point to draw from the Productivity Commission analysis is that even if the WACC used to set the price path coincides with the business's, it is the truncating effect of price cap regulation on returns that leads to under-investment.

5.3. Risk Profiles

The Commission's adviser raised the proposition that the Commission's proposed method of cost recovery and risk profile under control (effectively a rate of return approach where pipeline providers bear no risk because of *ex post* pricing) and NGC's current cost recovery profile and risk management approach (i.e. risk bearing and requiring a premium for such risk bearing) may be equivalent. So the introduction of control on the basis of a rate of return approach would not result in NGC reducing the level of its investment.[17]

It is not clear that this proposition has relevance to the Commission's inquiry. Rate of return regulation has its own set of investment distortions, depending on whether the WACC is higher or lower than the business's. But, more generally, the proposition raised by the Commission's advisor misses the point that the factual that the Commission has described is based on an implementation of incentive regulation, where risks are placed with the regulated business in order to motivate efficient behaviour. It is not possible to combine incentive regulation (setting an *ex ante* path of prices) with *ex post* pricing – they are mutually exclusive regulatory approaches.

Under an incentive regulation regime, compensation for asymmetric risk is paramount: inadequate compensation would lead to under-investment. Accordingly, given the factual of a price cap as the method of control; the Commission's stated WACC range of 6.2% to 8.5%; and NGC's hurdle rate range of 8.5% to 10%, there must be an under-investment effect under price control. The degree of under-investment would be proportionate to the difference between the allowed cost of capital and NGC's hurdle rate.

5.4. Quality Impacts of Price Control

Under a price cap because prices cannot be raised in response to a new demand for 'quality,' there is reduced incentive for a pipeline provider to meet that demand, as there is no financial compensation for providing the higher service. The Commission asked us to comment on the following question in cross-submission:

> *You've suggested that we've under-estimated [the impact on quality] because we haven't taken into account the possibility of infra-marginal customers being bumped off. But surely if we have this increased congestion, the risks to those customers needn't change as long as NGC can manage the increased congestion through greater interruptability of those who volunteer to interrupt. So I don't see that necessarily both those things would increase, you could manage the risks through the voluntary side of things.*[18]

17 Paul Sell, Conference Transcript 27 July, 2004 p 55-56.

18 Sue Begg, Conference Transcript 27 July, 2004, p 59-60.

While we would agree that if under-investment leads to greater potential for network congestion, and therefore the price rationing/discounting may provide an efficient solution to congestion, the point that we make about quality of service is that it is not simply restricted to the provision of capacity.

As we note in our earlier submission[19] we understand NGC to be currently making investments in network redundancy, where the economics justifies providing greater levels of redundancy (e.g. through looping pipelines) and making investments in increasing pipeline pressures on low pressure residential networks, where it is likely to be impossible to implement a workable system of interrupting residential use of gas when network demand is high.

As the tables in Appendix A.2 of our original submission show, consumers are willing to pay a significant premium over gas storage heaters to install instant hot-water heating, but if network businesses are not rewarded under a price path for making investments in raising network pressures to permit the connection of these high-rate appliances then this would be a loss of value to consumers.

Quality of supply is manifest in multiple dimensions, and customers may have idiosyncratic preferences for different levels of quality, reliability and security. The pipeline providers at a micro-level are able to make decisions about quality that pertain to individual customers, that a regulator would not be able to. As a result, regulators inevitably are pushed towards standards that pertain to average measures of quality and those that are capable of measurement' leaving open the possibility that pipeline providers would respond by targeting those measures only at the expense of maintaining or improving other quality and reliability dimensions that customers might otherwise be willing and able to pay for.

We note, in passing, the comment made by Geoff Horton that regulation may be capable of improving quality, because a monopolist has an incentive to under-provide quality.[20] While we would agree that a regulator might be able to induce firms to focus on certain measurable quality measures (although it will always have imperfect information on which to judge what the 'right' level of quality is), other important quality dimensions have no such incentive. Further, overall regulation will tend to reduce the quality of service provided because a regulator cannot replicate the day-by-day business decisions that affect quality in any regulation setting.

19 CRA (2004) p 61.

20 Conference Transcript 22 July, 2004 p 16.

5.5. Construction of Demand Curves For 'Missing Markets'

The Commission observed that its model of missing markets was based on the concept that customers not served would be marginal customers and therefore would not derive much consumer surplus from gas consumption. Indeed, such customers are effectively assumed to have demand elasticity of –50, a sensitivity to pipeline prices that is implausible.

There is no reason to believe that new customers that might want to connect to the gas network might be 'marginal'. A customer in a new residential subdivision, for example, would have similar demand characteristics as an existing customer on the system. Similarly, there is no reason to consider that a new commercial enterprise, that may be an intermediate goods producer, would not gain similar surpluses as existing commercial customers from the consumption of gas. In short, there is no reason to consider that new customers will have different willingness to pay than that implicit in the demand curve for existing customers. Moreover, given the relative immaturity of gas markets, particularly at the residential level, with low household penetration rates, this is not a market where remaining non-connected households are residual / marginal consumers.

It was also suggested that assuming a linear demand curve, as in the CRA model might over-estimate the potential surplus gained from gas. In response, we would note that the price point where demand is equal to zero in the CRA model is still comparable to prices of electricity or LPG, so the assumption of a linear demand curve does not appear to generate unreasonable estimates of willingness to pay.

6. REGULATORY IMPACTS ON PRODUCTIVITY

Although productivity differences between the factual and counterfactual scenarios are not significant in the overall control decision, the issue of productivity goes to the core economics of formal incentive regulation relative to the light-handed regime.

The Commission's model assumes that price cap regulation would improve productivity growth relative to continued light-handed regulation. In support of this proposition the Commission relies on the benchmarking provided by Meyrick and Associates that shows 'on average' New Zealand distribution businesses are less productive than their Australian counterparts.

We reiterate our view that existing benchmarking studies have not provided any reliable evidence that New Zealand pipeline businesses are more or less efficient than comparators from Australia. Both the data and methods used by Meyrick and Associates (Meyrick) are acknowledged to be unreliable, and in such circumstances, the results are not 'indicative' of differing productivity levels as claimed by Meyrick, rather no inferences may be drawn.

Moreover, the Meyrick results do not, in fact, show that regulated Australian pipeline businesses are uniformly more productive than their New Zealand counterparts. The results show a range of productivity levels across both New Zealand and Australian businesses, so the inference that price cap regulation is a superior motivator of efficiency than light-handed regulation is not even supported in the Meyrick analysis. Merely comparing the average in such a small sample does not provide a valid means of testing the hypothesis that price control would improve productivity relative to the counterfactual.

In the absence of any reliable empirical evidence on the relative strengths of price cap and light-handed regulation, it is necessary to develop a theory of incentives created by the various regulatory forms.

Most generally, we note that there is a strong literature on the benefits of privatisation and deregulation as a means of improving organisational efficiency. A brief review of some of that literature is provided in Appendix A.

Among regulatory forms, from rate of return to price cap regulation, it is also generally considered that the purer the profit motive, the stronger the incentive for cost efficiency[21], but price cap regulation is still seen as deficient in promoting efficient behaviour as regulators are unable to completely divorce the process of setting allowable prices from an intrusive building blocks analysis. Price cap regulation then takes on elements of rate of return, particularly around resets, but is likely to affect behaviours more generally.[22]

In terms of developing a theory of efficiency incentives, the first thing to note about price cap regulation is that it relies on the profit motive to encourage firms to make productivity improvements, which is identical to the profit incentive under light-handed regulation: shareholders in pursuit of maximising returns will set incentive structures through the firm to encourage efficiency. These incentives may range from dividend policies that constrain cashflows to the business (as does price cap regulation) to employee performance incentives.

Second, in the case of pipeline businesses, there is significant evidence of at least a degree of competition between fuels and between pipelines. That competitive pressure is likely to focus pipeline businesses on improving efficiency generally across the organisation.

Third, because of the forced sharing of efficiencies with customers at regular intervals under price control, or hybrid regulatory regimes, incentives for cost efficiencies are (at least) distorted around the point of regulatory resets.

Overall, there is a strong theoretical case for price cap regulation to, at best, improve productivity at the rate that would be achieved under light-handed regulation. More likely, as we have modelled, there are likely to be perverse incentives at price cap resets to withhold efficiency gains until following regulatory periods.

The Commission and its advisors noted that 'efficiency carry-over' mechanisms have been introduced in other jurisdictions to attempt to compensate for distortions around regulatory resets. In response, Geoff Horton observed that those kinds of mechanisms are not as straightforward to implement as the Commission might first suspect, and it is interesting to note that such mechanisms are not pervasive, despite their theoretical attractiveness.[23] [24]

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21 See for example Majundar, S.K (1997) "Incentive Regulation and Productive Efficiency in the US Telecommunications Industry" *Journal of Business* v70 n4 (October 1997) 547-76.

22 For example, capital inefficiencies may still be rewarded under a price cap. For example, a regulator will find it difficult to assess whether a capital expenditure to increase peak network capacity could have been avoided through better price signalling. The process of setting allowable revenues based on building blocks costs may therefore incentivise capital expenditure in preference to demand-management.

23 Conference Transcript, July 22, 2004, p 66.

Efficiency carry-overs are not prevalent, because it is difficult to isolate an efficiency gain from a forecast error: if there has been some substantial forecast error in setting a price path, then a regulator would not want to extend the scope of this error through a 'carry-over' mechanism. An example of the difficulty in determining efficiency gains is that the Commission has not been able to determine over the historical period of analysis whether any of the measured profits in excess of WACC are a result of efficiencies.

It is also extremely difficult for regulators to credibly commit to a carry-over mechanism, since ultimately the judgements involved in setting a price path are subjective. A regulator in offering a carry-over mechanism can potentially compensate with a stronger than otherwise price path, so that a company is, in effect, no better off. Regulated businesses cannot determine whether or not a regulator will behave in this manner, so may play it safe by withholding efficiencies in the final years of a price path.

Overall, we recommend that the Commission adopt the approach taken in our Monte Carlo simulation analysis – that is to:

- Assume that productivity gains in the factual and counterfactual are the same in all years; except
- In years 4 and 5, efficiencies are withheld to year 6, when they are realised in full.

We consider this to conservatively treat the loss of efficiency from price regulation.

24 In its recent price cap determination for New South Wales electricity distributors, IPART refrained from providing businesses with an efficiency carry-over mechanism noting that it was unable to bind future Tribunals to the mechanism.

7. MEASUREMENT OF EXCESS PROFITS

7.1. INTRODUCTORY COMMENT

The Commission's method for calculating excess profits is based on a snapshot of returns over the life of an asset. In that approach the measurement of returns is based on a comparison of net earnings (including revaluations) with a quasi-ODV valuation. Returns are judged against an *ex post* pricing assumption and NPV=0 over the snapshot, where effectively all stranding and unexpected cost risks are placed on customers. The Commission's model also assumes that there have been no efficiency gains made, which would rightly accrue to shareholders, at least for a period.

Adoption of these assumptions and method will lead to an upper bound estimate of the historic excess profits, since *ex ante* pricing (the stated and only practically feasible pricing approach) and the achievement of efficiencies means that at least some of the profits that the Commission estimates are not excessive, but due (and efficient) compensation to shareholders. Even if it is not possible to quantify these matters, it is important to note that these factors qualitatively lead to upper bound estimates of returns.

Our earlier report to the Commission on the draft inquiry report covered the issues of *ex ante* pricing and NPV=0 in considerable detail, so in the remainder of this section we simply address and clarifies a number of points made at the conference. These relate to:

- Consistency in applying the 'excess profits' calculation;
- Treatment of the Kapuni North Line; and
- Treatment of revaluations more generally.

7.2. CONSISTENCY IN THE APPLICATION OF THE CALCULATION

As noted above, the Commission's calculation of excess profits involves a comparison of net earnings including revaluations with a measure of the capital value of the business. In a number of instances however, the Commission has been inconsistent in the application of its approach, by substituting reported data for its own estimates, but not making any adjustments to variables that would otherwise have been directly affected by the change in variable.

The Commission's advisor noted the problem of making adjustments to input data in the excess profits calculation without making adjustments to other variables:[25]

25 Conference Transcript 27 July, p 240, lines 11-19

> *…on revisiting the asset valuation for the predecessor company to Vector, …the ODVs that were adopted at that time were audited and accepted by the company as reasonable, and presumably their pricing and behaviour were based on that ODV. So to unwind the ODV itself without looking at what else has changed if there'd been a different ODV, I think that's problematic as a proposition…*

and:[26]

> *if the companies accepted the data as audited we'd be opening a can of worms, I think, if we were to go back and reassess all those sorts of data.*

and further:[27]

> *I think for the reasons Sue has outlined, I would tend to agree. I think it is difficult to reopen or revise the valuation…*

However, this is the inconsistency that arises with the Commission's approach of making ad hoc changes to individual variables in the excess profits calculation without making corresponding changes to other variables that would have been affected by the change. A number of examples of this appear in the Commission's calculations for NGC:

- The valuation of easements is changed from replacement costs to historic costs without making any adjustment to net earnings through the period of analysis;

- The Commission implements its own depreciation approach without considering how this might have affected cashflows or taxes; and

- The gain on sale of the Taranaki assets in 1999 is with reference to an accounting book value rather than its replacement valuation and yet elsewhere the excess profits calculation is based on ODV valuations. Given a pricing approach based on ODV valuation, an accounting reconciliation of the sale of an asset is meaningless to the excess profit calculation (quite apart from the fact that sale of an asset may be completely independent of any impact on consumers, particularly from the sellers perspective where it is no longer responsible for the charges that attend that asset).

Overall, consistency of approach requires that the Commission does not make modifications to reported data, without making compensating changes to variables that would otherwise have been affected by that variable, an exercise that, as the Commission's advisors have correctly pointed out, would be an extremely difficult exercise to perform.

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26 Conference Transcript 27 July, p 240-241, lines 30-02.

27 Conference Transcript 27 July, p 241-242, lines 30-01.

7.3. Kapuni North Line

Since the Maui line commenced transporting gas the Kapuni North Line has been stranded. When NGC first conducted an ODV valuation its value was optimised out of the asset base. We understand from NGC that it does not have the records to show that it did not raise prices *ex* post to cover the costs of stranding. However, the understanding of current NGC staff is that prices were not so raised. Given the quantum of the optimisation it is unlikely that NGC could have recovered the $50 million cost from customers, as the Commission's *ex post* pricing method would implicitly assume. In the year that the stranding was recognised NGC would therefore have realised an economic loss from that stranding.

Proceeding to 2001, when shippers decided that they had a use for the Kapuni North line, the de-optimisation back into the asset base provides an offsetting revaluation adjustment to negate the earlier stranding loss. Because NGC operates an *ex ante* pricing approach, the resulting revaluation gain is simply a symmetric offset to the earlier stranding cost that NGC's shareholders have borne. There are no ‘excess’ profits implied by this revaluation.

The overall problem is that, by virtue of the short assessment period, the treatment of the stranding (loss to NGC) does not enter the calculation, but the unstranding (gain to NGC) does enter the excess profit calculation, and therefore the treatment is asymmetric. To correct for this the Commission can either extend the assessment period back to the original asset stranding (both stranding and unstranding are in), or it can simply not treat the revaluation gain as income (both are out). Either approach would provide a symmetric treatment.

In terms of the analysis in the previous section, where we recommend that changes to reported data should not be made without considering the impact on other variables, we are still applying that rule consistently. By removing the de-optimisation from revaluations we achieve symmetry in the treatment of stranding and unstranding that is consistent with NGC’s pricing approach where its shareholders specifically bear this risk.

7.4. Past Revaluations

The Commission noted that it had been ‘advantageous’ to NGC by excluding from consideration a $110 million revaluation reserve that appears in NGC’s transmission accounts in 1997:

> *…when I turn to what I know we did in the analysis, which is that we took 1997 as the cut-off date for past analysis of revaluation gains and losses, and… at the time you had a revaluation reserve of $110 million that was not taken into account. It suggests to me that you’ve come out well ahead on this front.*[28]

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28 Commissioner Rebstock, conference transcript p 115, 26 July, 2004.

Whether or not that reserve is indicative of any net benefit to NGC from revaluations, or has provided for the earning of 'excess profits' is an entirely ambiguous point. To assess whether NGC has been advantaged by historic revaluations, the Commission would need to know the basis from which the revaluation reserve is referenced to, what the cashflows over the periods of earlier revaluations were, the pricing approaches taken, and the policy considerations surrounding the movement to ODV.

We understand from NGC, for example, that the shift to ODV was part of a package of reforms relating to the pipeline providers providing open access arrangements, with the removal of exclusive franchise areas and unwinding of pre-existing '1980' contracts. So to treat an isolated piece of data relating to revaluation reserves, without considering all of the relevant information may lead to erroneous conclusions.

Finally, in assessing the benefits of price control it is necessary to consider the likely basis for setting the starting point for a price path. If for example, the Commission were to adopt the ODV valuation basis as starting point for regulation, then it is unclear what relevance past revaluations, or stranding and unstranding would have to the forward-looking assessment of the costs and benefits of control.

8. SCOPE FOR REGULATORY ERROR

8.1. INTRODUCTORY COMMENT

The Commission allows for 10 to 25% of the transfer benefits of control not to be realised under price control. The Commission settles on a value of 20% as its preferred estimate. There is no explanation of how this figure was arrived at, or precisely what it represents. At paragraph 5.83, of the draft recommendation, it is noted that it represents an allowance for not being able to establish the "efficient" revenues, but during the conference, it was also noted that this might be an allowance for past efficiency gains.[29]

To place the Commission's assumption of what we assume to be regulatory forecast error in context, the Commission's assumption that 20% of the transfer benefits of control may not be realised equates to 2-3% of revenues on average, or the ability to keep returns within 0.2-0.4% of the WACC over the course of a price path.

Given the importance of this variable in the inquiry, there must be a robust methodology for considering potential for regulatory forecast error, (e.g. through simulation based on probability distributions of variability in key forecast variables, or with respect to deviations from forecast experienced in other regulatory jurisdictions).

In the remainder of this section we illustrate the historic levels of variability in NGC's transmission and distribution data, reference the experience of forecast error in other jurisdictions, and discuss the impacts of hybrid regulatory regimes that attempt to mitigate forecast errors.

8.2. HISTORIC VARIABILITY

As we noted in our conference presentation, the Commission's point estimate and sensitivity testing of regulatory error is extremely conservative in light of international experience with price cap regulation, historic levels of volatility experienced in the market and structural change that the industry will experience in the post-Maui environment.

Figure 1 and Figure 2 for NGC Distribution and NGC Transmission respectively, illustrate the narrow scope for regulatory error in the Commission's model.

29 Conference Transcript, July 26, 2004, p 167 lines 11-17.

Figure 1: Scope for Regulatory Error – Comparison of Revenues: NGC Distribution[30]

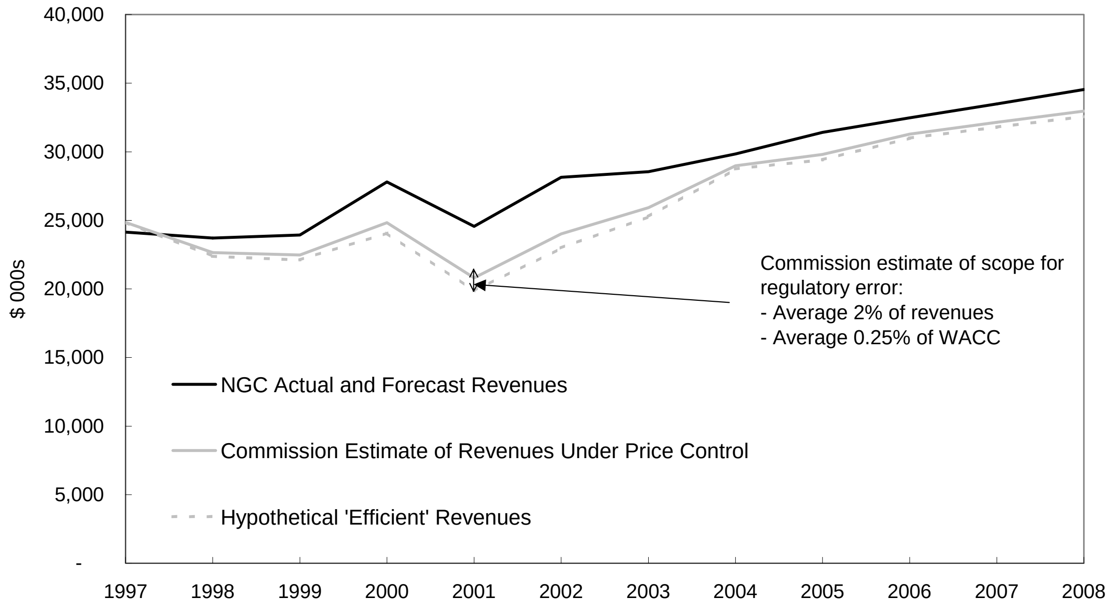
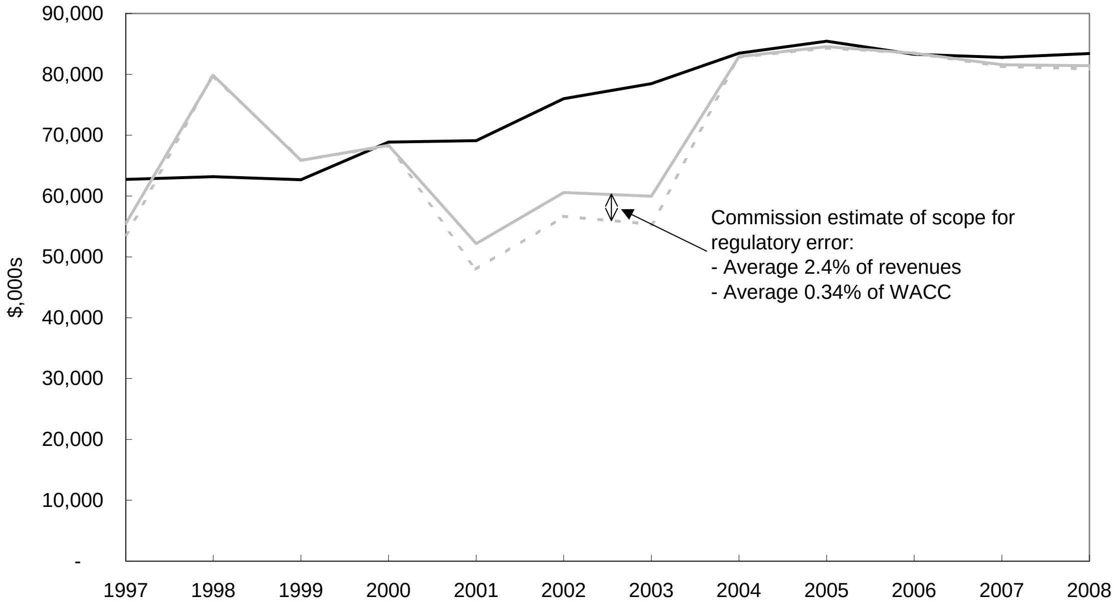


Figure 2: Scope for Regulatory Error – Comparison of Revenues: NGC Transmission[31]



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30 At 75th WACC percentile.

31 At 75th WACC percentile.

Under any form of incentive regulation, a regulator is required to set a price path for a period, based on some kind of forecasting technique. The following charts of the key variables that a regulator would need to forecast illustrate the significant levels of aggregate volatility.

Figure 3: Volatility in Key Building Blocks Variables: NGC Distribution[32]

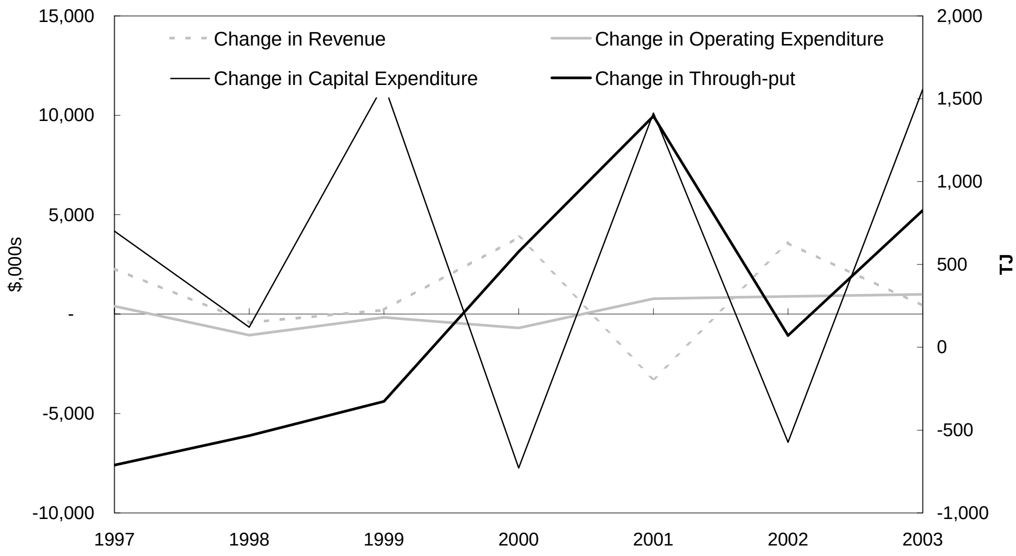
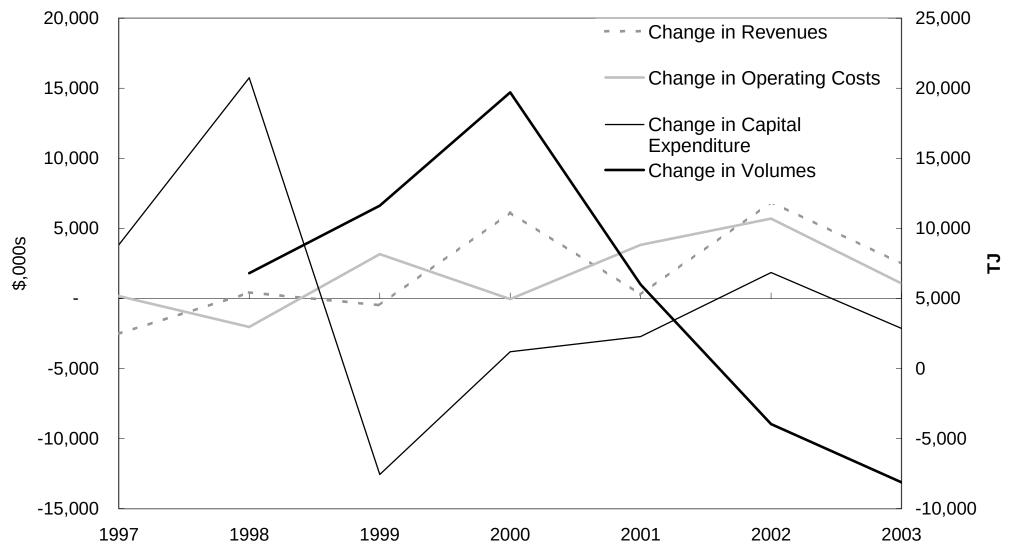


Figure 4: Volatility in Key Building Blocks Variables: NGC Transmission[33]



32 Source: Commerce Commission spreadsheets for NGC Distribution. Actual revenues are reported revenues and exclude 'revaluation spread'.

33 Source: Commerce Commission spreadsheets for NGC Transmission. Actual revenues are reported revenues and exclude 'revaluation spread'.

The above charts show historic levels of volatility in a period where, up to 2002, there was stability in wholesale prices and no apparent market concerns with availability of gas. In the current market, where the wholesale gas price has doubled, and there is uncertainty about available supplies following Pohokura, it is likely that volatility would increase. Historical trends therefore will give little basis for developing future forecasts, since a regulator would be applying price controls during a period of transition to a new high-cost gas / energy environment. How long the transition period will last is entirely unpredictable, and yet incentive regulation would be required to take a single point view on that transition.

Potential for forecast error is also illustrated by price path adjustments in other regulatory jurisdictions. The following illustrate the P_0 adjustments that have been made at price path resets, to correct for unanticipated events in relatively more stable electricity distribution environments (where the markets are much thicker and less influenced by the connection or disconnection of individual customers):

- OFGEM (1999) P_0 adjustments of 4 to 33%;
- IPART (2004) P_0 adjustments of -5 to -7%[34] (with further price increases to avoid 'rate shock');
- ESC (1999) P_0 adjustment of 12.4 to 21.8%; and
- Queensland (2002) P_0 adjustment of -18.8% to -9.5%.

Overall, the evidence from within the gas sector and from overseas jurisdictions suggests that the potential for regulatory forecast error is considerably wider than what the Commission has allowed for in its models. As we discuss in section 10, simulation analysis provides the most rigorous basis for understanding the scope for regulatory error, and avoids the need to make point estimates about its effect.

8.3. Mitigating Forecast Error in the Regulatory Approach

The Commission raised the possibility that some other hybrid form of regulation may be put in place, that could reduce the potential for regulatory forecast error, using the example of the thresholds regime.

Under the thresholds regime, if the price path threshold proves to be too onerous, then lines businesses retain the valuable option to breach the thresholds in order to gain a more favourable price path. Thus, such a regime is able to mitigate the business impact of downside forecast errors. However, it is clear also that the regime is asymmetric, in that if the threshold regime proves favourable to certain businesses, then there is no regulatory re-opener (and rightly so, since this would reduce efficiency incentives) so that 'excess profits' as the Commission terms them may still be earned if forecast error is favourable to the business.

34 A negative P_0 adjustment implies an upward price adjustment.

In other words, under a price cap threshold regime, the problem of downside error is mitigated, but under-forecasting demand, or over-estimating costs is not dealt with and so the possibility of large downwards P_0 adjustments remains.

More generally, thresholds-type regimes fall into the category of earnings-sharing regulation, where there are bounds put on the level of profitability before there is forced sharing of under-recovery or over-recovery with consumers. In the case of the thresholds regime, the lower bounds on profitability that may be permitted is indeterminate, but may be at the level of WACC. There is no upper bound on profitability until the next price path reset.

The Commission raised the proposition that the potential to breach thresholds may induce efficient behaviour, as well as inefficient behaviour.[35] While we can understand that there are certainly benefits to the companies from upside regulatory adjustments, during the course of a thresholds regime, we do not consider that the ability to breach would raise efficiency generally. For example, if a business considers that it is unlikely to be able to meet the conditions of a price path, then it may have an incentive to inflate or bring forward costs prior to threshold breach, in hope of gaining a more favourable price path during the remainder of the price path period. Such behaviour is counter to efficiency and the interests of consumers more generally.

The Commission also observed that under the thresholds regime any adjustments to the price path for businesses that breach are designed to avoid the company re-breaching the thresholds. While that might be possible in electricity, where there is a more stable demand environment (particularly for the larger electricity lines businesses), given the nature of the customer base in gas pipelines, revenues may be materially affected by the loss of individual customers. It would therefore be extremely difficult to adjust a price path to avoid further breaches. Most importantly the costs of breach, and the fact that breaches have to be seen to occur, mean that there will be potentially inefficient *ex ante* behaviour under any regime that has a mechanism for handling/admitting (legitimate) breaches.

Overall, volatility is pervasive and quite extreme in the gas sector. Although regulatory regimes can be designed to mitigate the risk of revenues deviating too far from costs, such regimes will generally weaken the incentives for efficient behaviour, as they increase regulatory risk for the companies involved, and create perverse or weakened incentives for cost efficiency.

35 Conference Transcript, 27 July, 2004, p 18.

A substantial advantage of the Monte Carlo simulation analysis is that it provides a robust framework for dealing with issues surrounding uncertainty and volatility. It also permits examination of mitigation mechanisms in setting regulatory approaches. For example, with very minor modifications, the Monte Carlo simulation analysis developed to examine the range of outcomes under a price path, could also be used to examine thresholds-type regimes, where downside revenue risks are truncated by the potential for price path re-openers, or could examine welfare consequences of glide-paths which only slowly reduce prices to the so-called efficient level.

9. ALLEGED CONSERVATISM IN COMMISSION MODEL

The Commission outlined a list of items that it has not considered in the inquiry, and implied that the failure to consider these items, or not to challenge the information provided by the businesses, therefore was likely to lead to a degree of conservatism in the estimation of net acquirers and public benefits.

The majority of the items listed by the Commission related to the use of historic disclosure data provided by the businesses and use of forecasts provided. We are not in a position to comment on the accuracy of the data used in the inquiry, but simply note that the historic data has been independently audited, and in the absence of demonstrated inaccuracy, provides the most reasonable basis for assessment. In terms of forecast data, we have set that aside in our Monte Carlo analysis (except to calibrate through-put growth). The reason for adopting our own projection method rather than rely on a simple point forecast is that we are interested in the range of outcomes. Also NGC's forecasts only go to 2008, whereas we are interested in the range of outcomes out to 2015, the Commission's proposed period for control.

Aside from data issues, however, there are a number of propositions about model variables that were stated to be conservative, which are not:

- The Commission allows for 10-25% of the transfer benefits of control not to be realised by price cap regulation. Overseas regulatory experience demonstrates that forecast error can lead to over tens times (positive and negative) that amount;

- The Commission uses the 75th WACC percentile. The Commission's WACC range is low compared to other experts estimates, is low compared to NGC's stated hurdle rate range (which is indicative of necessary returns to compensate for risks borne in providing pipeline services);

- The Commission's compounding of historic data leads to an over-estimate of the net benefits of price control by 60 to 80% relative to a forward-looking approach;

- The Commission has made ad hoc replacements of reported data (e.g. easements, depreciation) without making corresponding adjustments to revenues;

- The Commission adopts an extremely conservative view of dynamic efficiency losses from missing markets that does not accord with actual experience of customer churn or customer responsiveness to capital contributions;

- The Commission ignores the threat of future asset stranding in calculating excess profits;

- The adoption of *ex post* pricing in the Commission's model leads to an upper bound estimate of 'excess profits';
- There is no allowance for productivity gains that should accrue to shareholders (at least for a period) in the calculation of excess profits;
- The Commission estimates a narrow example of loss of consumer welfare from under-provision of quality/reliability; and
- The asymmetric treatment of the Kapuni Line stranding and unstranding leads to a significant over-estimate of the net benefits of control of NGC Transmission.

So even if one were to accept that there may be some items where the Commission's approach may have led to an unknown and unmeasured degree of conservatism, there are numerous instances where the approach can be quantitatively demonstrated to lead to over-estimates of the net benefits of control on the Commission's own approach.

On the Commission's own approach, corrected, there is no basis for price control. On the substantial variations and behaviour and cost changes in setting any form of incentive regulation, regulation is also not warranted.

10. MONTE CARLO SIMULATION ANALYSIS

10.1. Simulation as a Modelling Concept

All forms of regulation, including rate of return regulation, involve making forecasts about the future in setting tariffs, or the required change in tariffs over time. Price cap regulation attempts to balance the onerous regulatory process around price path resets, with the need to preserve cost efficiency incentives, but maintain credible levels of prices over time. The fact that forecasts are involved in setting a price path opens up the probability of forecast error in setting prices so that expected revenues are equal to expected costs.

Simulation analysis provides a powerful tool for examining the range of outcomes that may result from a policy decision, and is a widely-accepted tool for public policy analysis. The primary advantage over the deterministic model used in the draft recommendation, is that it allows the modeller to examine the full range of possible outcomes. The Canadian Treasury Guidelines for Cost-Benefit Analysis make the following useful observations:

> *The only practical approach to financial and economic risk analysis is to use simulation. Simulation predicts the possible outcomes of the benefit-cost model, given the variables that influence those outcomes. It enables the analyst to give more comprehensive and realistic advice to the decision-maker. In the older deterministic method of benefit-cost analysis, the analyst offered a single figure for NPV, but it was always unclear what the probability of this single outcome was. The decision-maker did not know how much confidence to place in the figure (especially given the rather esoteric calculations that produced it) and therefore tended to make a subjective judgement.*
>
> *Simulation shows the range of NPVs possible, given the factors that can vary, and provides an overview of the probabilities within that range. Decision-makers know there is risk in every decision. There are no guarantees. Sometimes the right decision doesn't turn out well because the changeable factors turn unfavourable. The decision-maker relies on the analyst to give as full and accurate a picture of the possible risks and rewards as possible.*
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> …
>
> *Financial and economic risk analysis is a technique that enables us to determine how much risk there is in accepting or rejecting a particular project. We can also use it to compare the likely outcomes of two or more alternative projects. It is an important technique because it allows us to use data that are uncertain to obtain results that are a good picture of the likely outcomes. The technique takes into account possible variations in the costs and benefits that we may be aware of but that we ignore when we use single best-guess numbers in an everything-goes-according-to-plan analysis.*
>
> …

A major advantage of a computer simulation is that it can consider a number of uncertain variables (risks) simultaneously, choosing values according to the ranges and probabilities of each. This enables you to model the likely outcome of the benefit-cost analysis more or less realistically. In Chapter 7, we pointed out that sensitivity analysis is a limited technique because it can handle only one or two variables at a time and has to hold all the others constant. Risk analysis goes beyond this limitation by allowing all of the variables to vary at the same time. Their influence and interactions are then simultaneous, just as they are in the real world..

Best practice - analysing uncertainty

Risk arises from uncertainty in the data. The analysis of incremental effects, and the economic analyses of an investment both contribute to assessing risk.

There are three approaches to analysing financial and economic risk; expected values of scenarios, risk-adjusted discount rates, and risk analysis through simulation. Of these three, only simulation offers a reliable methodology for assessing overall risk[36]*.*

Under any form of incentive regulation where a price path is fixed for a period of time based on a forecast, there is the potential for forecast error. Under a pure price cap, where there is no possibility of a re-opener, there would be upside and downside risks of making mistakes in the price path. It is therefore important to understand how variation in key variables that must be forecast would interact with the pricing approach to produce a range of potential outcomes.

The Commission has suggested that forecast risks could also be managed by a threshold-type regime where businesses may breach thresholds if the price path becomes too onerous. As we note in section 8.3, a thresholds regime can mitigate some of the downside forecast risk, potentially at the cost of greater regulatory uncertainty and perverse behaviours, but it does not truncate the upside forecast risks associated with under-forecasting demand growth, or under-forecasting cost growth.

Monte Carlo simulation analysis provides a systematic method for incorporating much more of the available data into a model, that not only provides an *expected* outcome of price control, but evaluates the *range* of outcomes, which is arguably more important as it goes to the risks that businesses and consumers would face. Even if the Commission considers that the model that we have prepared could be improved on, or calibrated with better data than was available to us, the modelling principle itself is the important issue. For example, we have not considered stranding risks, or how volatility might impact on the cost of capital and hurdle rates, but with modification these issues might also be considered. The model may also be readily modified with additional pricing rules and behavioural effects to examine other regulatory approaches such a thresholds-type regime, or earnings sharing.

36 http://www.tbs-sct.gc.ca/fin/sigs/Revolving_Funds/bcag/BCA2_E.asp.

10.2. Further Elaboration of the Modelling Approach

While the model description may appear to be complex, by understanding what remains the same and what differs between the models of price control and models of light-handed regulation it is relatively straightforward to understand what generates the difference in welfare results.

The core elements that result in the differences in welfare come down to two areas.

1. Pricing

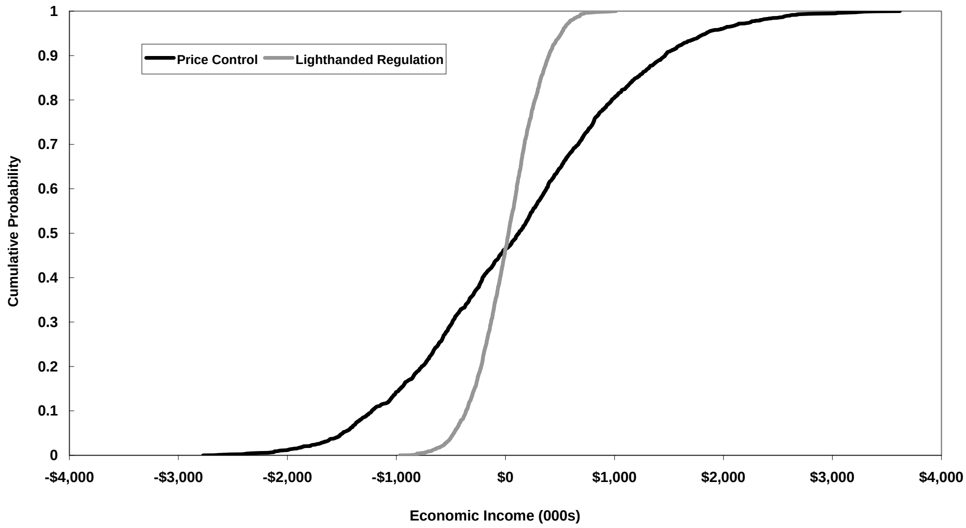
In the model of light-handed regulation NGC retains flexibility over pricing from year to year. Its approach to pricing is on an *ex ante* basis, where it determines a forecast of required revenues and demand and sets prices to deliver a target return on its ODV. Actual revenues and costs will differ from forecast according to a probability distribution of customer connection and throughput outcomes.

Under price control, the pricing approach is identical in terms of the building blocks assumptions, except instead of forming a one year forecast on which to base prices, the regulator comes up with a five-year forecast and fixes the path of prices for five years based on its view of WACC. At the end of five years the regulator makes a P_0 adjustment and repeats the forecasting process, again based on identical assumptions about the components of the building blocks as in the light-handed scenario. The range of revenue outcomes is then determined by probability distributions of customer growth and throughput.

Accordingly, as would be expected, the range of economic profit outcomes would be much wider for the price control scenario than the light-handed regulation scenario: under the latter approach, the pipeline business can adjust prices in response to demand shocks, whereas the price path is fixed under a price control approach.

The following diagram demonstrates that if the price setting difference was the only difference in the models (i.e. there were no investment effects from price control) and the target returns were identical the difference in spread of economic profit outcomes would be as follows:

Figure 5: Economic Profit Outcomes Under Different Pricing Approach Only



2. Capital Expenditure/Customer Growth

In the model of light-handed regulation customer growth drives capital expenditure, with each new customer consuming an average quantity of gas, based on an historical per customer consumption level.

Under price control, the level of capital expenditure depends on the level of WACC that the regulator adopts in setting the price path. Because the WACC range that the Commission adopts is uniformly less than the hurdle rates disclosed by NGC to its investors, NGC reduces the level of investment in proportion to the difference between the WACC and its hurdle rates. This leads to 'missing markets' relative to the light-handed regulation scenario.

There are two effects of missing markets:

- The first is a welfare loss for those customers that would otherwise have been connected to the gas network; and
- The second is a welfare loss for existing customers since the narrower the size of the market, the larger the required contribution from customers to common and fixed costs of the network.

The key point of the modelling approach was to focus tightly and simply on two key areas:

- How variability in throughput and customer growth would interact with a price path, relative to a more flexible status quo, but where the unregulated firm hypothetically targets a high return; and

- How a more realistic behavioural model, where customer growth is affected by capital contributions impacts on welfare through missing markets and narrower market scope.

By effectively holding everything else constant between the factual and counterfactual, this allows us examine how these effects combine to impact on welfare. In terms of the building blocks assumptions for each of the models, there is no difference in the forecast growth rates of operating expenditure, capital expenditure per customer, tax rates, elasticities, tax rates, depreciation rates, growth and variation in demand or customers, etc.

These two simple pricing and missing market effects are the major drivers of the spread and locations of the distribution of welfare outcomes in the Monte Carlo modelling. In other respects the welfare calculations are the same as in the Commission's model (e.g. of producer surplus, quality effects, consumer surplus, etc) except for the productivity growth assumption, which has withholding of productivity gains in year 4 and 5 of the price control model (but this does not materially impact on the conclusions, if we were to adopt the Commission's assumption). All of these other impacts are immaterial relative to the dynamic efficiency effects and variation in revenues.

It would be feasible to introduce more variation into the model and drive particular variables by differences in growth in throughput, customer numbers or other relevant cost drivers. For example, maintenance expenditure could be driven by growth in pipeline length, which could be introduced into the model as another source of variation, although this is highly unlikely to materially affect the model conclusions since maintenance expenditure is only 10% of total costs and incremental differences in this variable would not affect required revenues by any material margin.

Introducing more variation into the model, will only serve to reinforce our conclusions that price cap regulation in the pipelines sector would lead to significant potential for forecast error, and so a regulator would be highly unlikely to meet its objective of equating revenues with costs over the course of a price path.

Overall, relatively simple models, calibrated to observable data and experiences, are capable of demonstrating quite important risks associated with price cap regulation, that are highly relevant to the Minister's decision.

As noted at the conference the model will be made available to the Commission.

10.3. Use of Monte Carlo Simulation Model to Examine Economic Profit Outcomes Under an *Ex Ante* Pricing Approach

The Commission's advisor noted that the problem with *ex ante* pricing is that it is difficult to determine either the WACC margin for bearing asymmetric risks of stranding and unexpected costs, or what the expected value of these costs are, in terms of assessing whether excess profits have been earned.

A further advantage of Monte Carlo approaches is that they permit examination of these issues by allowing for variation in costs and demand and therefore economic profit outcomes. It is still difficult to populate such models with the relevant probability distributions for key forecast parameters, and it may be necessary to rely on historic variation to proxy for the true probability distributions of variation potentially affecting a business.

Figure 5 demonstrates the range of feasible economic profit outcomes under light-handed regulation, assuming that a pipeline business targets a return of 8.5%. Examining variation in through-put and customer numbers only, a 95% confidence interval would allow for a range of economic profit outcomes of ±600,000 per annum on average over a ten year period.

By introducing further potential for variation into the Monte Carlo model we have developed, it would be possible for a given WACC estimate to determine a confidence interval of potential outcomes and compare that with the observed returns of the business. A fulsome analysis of this issue would require stranding risk to be incorporated explicitly, using a binomial distribution of potential stranding risk based on the number of lines that have been optimised out across businesses to date, for example.

However, we submit that the Commission need not go that far. Excluding the sale of the Taranaki assets from the excess profits of NGC Distribution, returns are measured to be 9.5% across the study period using the *ex post* pricing method. Assuming that this is the target return that NGC would seek in future:

- Calibrating the simulation model at the various WACC levels suggested by the Commission; and

- Taking into account NGC's hurdle rate range in examining impacts on investment incentives;

the model demonstrates that variation in throughput and customer number growth would lead to significant risk that price cap regulation would not equate revenues with cost over the ten year period, and that the dynamic efficiency costs would swamp any static benefits to acquirers of lower prices. In such an industry context, refining the method to calculate excess profits would be unproductive.

APPENDIX A: DEREGULATION LITERATURE

There is a broad range of literature that finds empirical support for the view that private, comparatively unregulated companies have strong incentives to improve productivity. OECD (1997)[37] highlights improvements in productivity following deregulation:

> *By sharpening competitive pressures, elimination of economic regulations has encouraged firms to become more efficient and helped to boost the productivity of entire industries:*
>
> - *In Europe, labour productivity growth in the manufacturing sectors most affected by competition enhancing reforms in the Single Market Programme were double those of other sectors (14 percent versus 7.5 per cent for the period 1986-91).*
>
> - *In air transport in the United States, real fares dropped by one-third between 1976 and 1993; more than half of this decline is attributed to deregulation. Following airline liberalisation in 1993 under the European Single Market, 800 new licences were granted in Europe, and more people are using lower-cost economy fares.*
>
> - *Road haulage industries in the United States and United Kingdom enjoyed increases in capital productivity of around 50 per cent after relaxation or elimination of out-dated operational controls. Capital productivity was also boosted in these industries in France and Germany following liberalisation.*
>
> - *Market liberalisation in telecommunications and technological advances led to new services and striking improvements in efficiency. Elimination of monopolies helped stimulate new technologies and increase the number of subscribers of cellular phones in OECD countries from 700,000 in 1985 to 71 million in 1995. After reform, average prices for telephone services fell by 63 per cent in the U.K. and 41 per cent in Japan; long distance prices fell by 66 per cent in Finland.*

Furthermore, private firms have sufficient incentives to improve productive efficiency. In a survey of privatisation literature, Megginson and Netter (2000)[38] conclude:

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37 OECD (1997), *The OECD Report on Regulatory Reform: Synthesis*, Paris.

38 Megginson, W L and Netter, J M (2000), "From State to Market: A Survey of Empirical Studies on Privatization" Draft of Forthcoming, *Journal of Economic Literature*, available: http://ideas.repec.org/p/fem/femwpa/1999.1.html.

> *Research now supports the proposition that privately owned firms are more efficient and more profitable than otherwise-comparable state-owned firms. There is limited empirical evidence, especially from China, that suggests that non-privatizing reform measures, such as price deregulation, market liberalization and increased use of incentives, can improve the efficiency of SOEs, but it also seems likely that these reforms would be even more effective if coupled with privatization.*

Nor does it seem that New Zealand's situation differs. The privatisation and deregulation of Telecom Corporation of New Zealand Limited is credited with tremendous improvements in productive and dynamic efficiency. Boles De Boer and Evans (1996)[39] found that productivity improvements led to an annual compound rate of cost reduction of 5.6% between 1987 and 1993 along with significant improvements in quality and price reductions. On an economy-wide level, Englander and Gurney (1994)[40] found a marked and significant rebound in productivity growth in the 1980s in New Zealand.

Literature specifically related to price cap regulations also indicates that a conservative view should be taken towards the effects of such regulations on productive or technical efficiency. Majumdar (1997)[41] finds a marginally statistically significant positive, but lagged effect on the technical efficiency of US local exchange carriers (LECs) that switch to price caps from rate of return regulation. He finds that the use of earnings share plans, where earnings over a particular limit are shared with the regulator, diminish this effect. This result indicates that reducing the profit incentive reduces the incentive for productive efficiency. Uri (2001)[42] considers 19 LECs for the period 1988-1999 that shifted from rate of return to incentive regulation and finds no improvement in productive efficiency.

Given the literature indicates:

- A relationship between the level of profit incentives and productive efficiency improvements; and
- At best a weak improvement in productive efficiency from incentive regulation relative to earnings sharing or rate-of-return regulation;

39 Boles De Boer, D and Evans, L (1996) "The Economic Efficiency of Telecommunications in a Deregulated Market: The Case of New Zealand", *The Economic Record*, 72: 24-35.

40 Englander, S. and Gurney, A. (1994) "Medium-Term Determinants of OECD Productivity", *OECD Economic Studies*, No. 22, pp. 49- 109. Quoted in Hoj, J.; Kato, T and Pilat, D. (1995) *OECD Economic Studies*, No. 25, pp. 37-74.

41 Majumdar, S. K. (1997) "Incentive Regulation and Productive Efficiency in the U.S. Telecommunications Industry", *Journal of Business* 70, 4, pp. 547-76.

42 Uri, N. D. (2001) "Technical Efficiency, Allocative Efficiency, and the Implementation of a Price Cap Plan in Telecommunications in the United States Source", *Journal of Applied Economics* 4, 1, pp. 163-86.

we believe a very conservative view should be taken on the productive efficiency impact of the introduction of incentive regulations on currently unregulated pipeline companies.