



Report to

Department of Infrastructure and the Sustainable Energy
Authority Victoria (SEAV)

Economic Analysis of Impact of BCA and Plumbing Regulations on Gas Supply to New Estates

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McLennan Magasanik Associates Pty Ltd

242 Ferrars Street
South Melbourne Vic 3205

Tel: (03) 9699 3977
Fax: (03) 9690 9881
Email: mma@mmassociates.com.au
Website: www.mmassociates.com.au

Ref: J1099

TABLE OF CONTENTS

EXECUTIVE SUMMARY	I
1 INTRODUCTION.....	1
2 BACKGROUND.....	2
3 APPROACH.....	3
3.1 REVENUE.....	3
3.2 RETICULATION REQUIREMENT.....	4
3.3 COST OF RETICULATION.....	4
3.4 OPERATING EXPENDITURES (OPEX)	5
3.5 OTHER ASSUMPTIONS	6
4 OUTPUTS.....	7
4.1 VOLUME.....	7
4.2 LINEAL DENSITY.....	8
4.3 DISTRIBUTOR TARIFF COMPARISON FOR 2003 AND 2004	9
4.4 SUPPLY DISTANCE	11
4.5 TRENCHING – METRO AND COUNTRY	11
4.6 NO OF HOUSES.....	12
4.7 DISCUSSION.....	13
4.8 CASE STUDY – LARGE ESTATE WITH DISTANT SUPPLY.....	14
4.9 POLICY OPTIONS	15
APPENDIX A - OUTPUT TABLES.....	18

LIST OF TABLES

Exec Table 1: Impact of key variable	iii
Table 1: Capital costs assumed.....	5
Table 2: Impact of proposed new tariffs on breakeven volume	10

Table 3: Impacts of variables on IRR 13

LIST OF FIGURES

Exec Figure 1: Impact of average consumption on IRR iii

Figure 1: Impact of average consumption on returns..... 7

Figure 2: Lineal density versus volume 8

Figure 3: 2003 Distribution Tariffs versus Volume 9

Figure 4: 2003 and proposed 2004 TXU Central and Envestra Central versus Volume 10

Figure 5: Distance from Supply versus Volume 11

Figure 6: Cost of Mains: Common Trenching and Single Trenching 12

Figure 7: Number of Houses versus Volume 13

Figure 8: Number of Houses versus Volume 15

EXECUTIVE SUMMARY

Background

Proposed changes to regulations will require all new homes built in Victoria from 1 July 2005 to achieve a minimum five star energy rating and install either a water tank or a solar-gas hot water system in areas with gas reticulations.

While these regulations are expected to have a beneficial environmental impact overall, they also have the potential to significantly reduce average gas consumption for new houses. Gas distributors have expressed concern that such a reduction in demand may make reticulations to new housing estates uneconomical.

The Department of Infrastructure (DOI) and the Sustainable Energy Authority Victoria (SEAV) have commissioned McLennan Magasanik Associates (MMA) to assess the likely economic impact of the new regulations on reticulation to new housing estates.

Brief

DOI/SEAV have indicatively estimated that the key impact of the regulations will be a reduction of gas usage in new homes from, on average, 60-70 GJ per year now to 30-55 GJ per year after the regulations are introduced.

MMA has been asked to evaluate the internal rate of return (IRR) achievable by the distributors (Envestra, TXU and Multinet) across a wide range of average volumes and housing scenarios.

Apart from average consumption, the key parameters assessed include:

- € Density of housing, calculated as the lineal density or number of meters of mains required per house, which is inversely related to block size;
- € The tariffs chargeable by the distributor, which vary significantly between distributors and distribution zone;
- € The distance from supply, being the distance from the nearest suitable connection point;
- € The costs of reticulation: mains, services (pipelines connecting the mains in the street to individual houses) and meters depending on location and whether common or single trenching is used; and
- € Number of houses in the estate.

Methodology

MMA has constructed a model which calculates the costs of “greenfields” reticulation of new housing estates, the revenues earned according to average volume and distributor tariff and the internal rate of return, on a cash flow project basis, across a range of average volumes.

Almost all new housing estate reticulations in Victoria are carried out by Envestra or TXU, generally in the metropolitan fringe areas. We have therefore concentrated on reticulations by these distributors at Envestra Central and TXU Central tariffs.

The revenues have been based on assumed appliance penetration rates and monthly consumption profiles. Greenfields costs have been provided independently by an experienced distribution consultant. Lineal densities have been determined from maps and distances for three sample new housing estates.

The base case assumptions used for comparisons are:

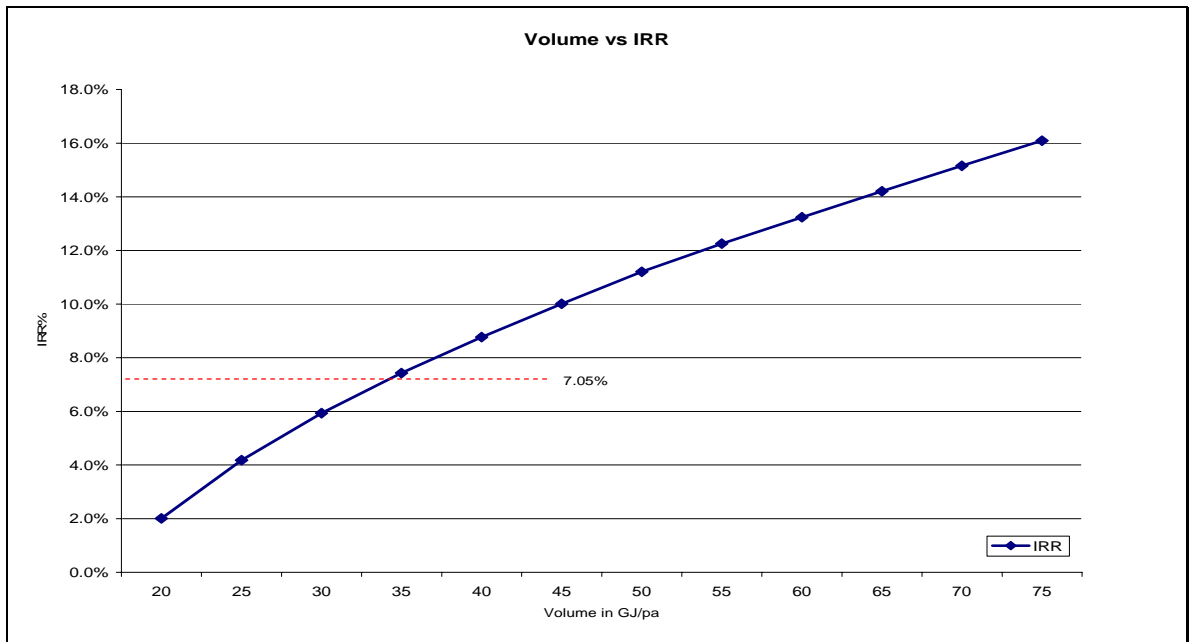
- € A range of average consumption from 20 to 75 GJ per house;
- € An estate of 500 houses;
- € “Medium” lineal reticulation density of 14 metres per house;
- € 500 metres from the nearest supply point;
- € 2003 tariffs for Envestra Central;
- € Common trenching; and
- € 20 year project analysis

The IRRs have been compared against a real pre-tax weighted average cost of capital (WACC) of 7.05% which we understand accords with the value most recently approved by the regulator.

Impact of volume

The impact of volumes on the base case model is shown in Exec Figure 1. As can be seen the average volume has a very significant impact on the returns expected by a distributor. Whereas a distributor might be expected to earn a return of more than 13% at the current new house average consumption of 60 GJ or more, it would earn a return of only about 9% at an average consumption of 40 GJ. The “breakeven” consumption is about 35 GJ per year.

Exec Figure 1: Impact of average consumption on IRR



A reduction in average annual consumption by 20 GJ would reduce expected distribution IRR by 4.5% - a very significant amount.

Impacts of other variable

The indicative impact of the change in volumes and other key variable is provided in Exec Table 1.

Exec Table 1: Impact of key variable

Variable	Extent of change considered	Change of IRR
Average consumption	Reduce by 20 GJ	-4.5%
Lineal density	From medium to low	-1%
Distributor	From Envestra Central to TXU Central	+1.5%
New Tariffs	From Envestra 2003 to proposed Envestra 2004	+0.3%
Supply distance	From 500 m to 1000 m	-1%
Trenching	Common to single trenching	-1.7%
Number of houses	500 to 1000 houses	+0.7%

Conclusions

Key conclusions are:

- € At an average consumption of 35 GJ per house or above most reticulations in medium and high density estates using common trenching should be economical for Envestra.
- € TXU is in a better position than Envestra with respect to reticulation of new housing estates because its tariffs are higher. TXU can break even at a volume of about 30 GJ.
- € Reticulation to lower density housing estates could mean that the breakeven volume increases by 2-3 GJ while the converse applies to reticulation to higher density estates.
- € Common trenching is clearly vital. Most new housing reticulations now apply common trenching.
- € The distance from supply is also important. If the closest supply point is greater than 500 metres the breakeven volume will increase by 2 – 3 GJ for every additional 100 metres of supply.
- € The number of houses reticulated is only an important consideration when the supply distance is large.

Policy implications

So long as average volumes after the regulations are implemented exceed 35 GJ per house in the Envestra Central zone or 30 GJ per house in the TXU Central zone the reticulation of new housing estates should remain economical unless housing densities are particularly low or distances to supply large.

If the average volumes after the regulations are implemented are below the breakeven values then the distributors may see reticulation as uneconomical. For example, if the volume consumed in the base case analysis is 30 GJ rather than the breakeven volume of about 35 GJ this results in a shortfall of about \$60,000 for the 500 house base case. This might require policy options to be adopted such as:

- € Capital injection by either a state, local or federal government of about \$60,000. Alternatively developers may contribute such an amount (about \$125/house) in order to achieve the benefits of gas supply to the estate or house owners may be asked to contribute this amount.
- € Governments may be asked to contribute in “difficult” situations, for example if distance from supply exceeds 500 metres.

- € Retailers may be willing to pay more for these new customers rather than the alternative of no gas to the estate.
- € Increased tariff payments by housing estate residents. The shortfall could be met by an increase in distribution tariffs of about 8% to residents in the new housing estate, resulting in increased retail prices of about 4-5% or about \$0.40 - \$0.50/GJ, or \$15/year for these customers.
- € Increased tariffs to all users in the zone. We have not calculated the amount here but it would be only a fraction of the increase for the housing estates alone.
- € Charging for connection for low usage customers, such as those who do not have gas heating) although this may have a perverse effect by reducing overall penetration.

While all of these options are possible and can be explored, they all present difficulties under current regulatory and institutional arrangements and should not be required if average usage after the regulations are implemented exceed 30-35 GJ per house.

1 INTRODUCTION

Proposed changes to plumbing regulations through amendments to the Building Code of Australia (BCA) will require that with effect from July 2005, all new homes in Victoria will have to be 5 star energy efficient. Additionally, the proposed Plumbing (Water and energy savings) regulations (2004), will require all new homes to have AAA taps and fittings and a pressure reduction valve, and either a water tank or a solar hot water system. The solar water heater, if that option is adopted, will be required to use gas as a boosting fuel, where gas is available.

It is expected that the combined effect of these two regulations will result in a reduction of the consumption of gas for new homes compared to the current situation. There are concerns in some parts of the gas industry (principally the gas distributors) that reduced gas consumption will make it uneconomic to reticulate gas to new housing estates under current network tariffs.

The Department of Infrastructure (DOI) and the Sustainable Energy Authority Victoria (SEAV) have asked McLennan Magasanik Associates (MMA) to conduct an economic analysis of the impact of changes to average consumption on returns to reticulators of new estates. The required output of the evaluation is an estimate of how the internal rate of return (IRR) to gas distributors for reticulating new housing estates changes with different levels of gas consumption across a range of scenarios.

Specifically, the economic evaluation indicates the sensitivity of the IRR of gas reticulation to gas consumption. A number of key variables in gas reticulation that impact on economic viability are analysed, among them the following:

- € Distance of the estate from the nearest gas supply mains;
- € The number of homes in the estate;
- € The lineal density of houses in the housing estate – expressed as how many metres of mains reticulation is required per house;
- € The distribution tariff; and
- € The cost of mains.

The results of the evaluation lend themselves to an understanding of the impact of the key variables and consideration of policy options that would bring the IRR to acceptable levels.

In this report the background to the project is discussed, followed by the methodology we have used to derive the IRRs for various scenarios. We discuss the major assumptions made in deriving revenues and cost estimates. We then present the results before offering policy options and conclusive remarks.

2 BACKGROUND

On 4 July, 2003 the Victorian Government announced the introduction of new mandatory regulations that will require all new homes to have 5 star energy rating for the building envelope and install major water saving devices from 1 July 2005. Where a gas connection is available, the optional solar water heater must be gas boosted. The new regulations will be implemented through the amendment to the Victorian provisions of the Building Code of Australia (BCA) and the Plumbing (Water and Energy Savings) Regulations.

Besides anticipated energy cost savings to households, a primary driver of for the introduction of the regulations is to moderate the impact that household energy use has on greenhouse gas emissions. A primary rationale underpinning the use of mandatory regulations is that competitive markets for energy and building services have not responded to cost-effective opportunities for consumers to benefit from reduced energy use that more than offset the incremental cost of complying with the regulations.

The implementation of these regulations is expected to result in reduced annual household gas consumption, which is currently estimated to average between 60 and 70GJ for new homes. Although the extent of the reduction due to the measures is uncertain, initial DOI estimates are that the average for new households could reduce to between 30 and 55GJ depending on the assumptions made with respect to house size and gas appliance installed.

Given this background, the Government has sought independent analysis to inform policy responses to the concerns of the gas industry. The next section discusses the approach taken to evaluating the economic impact of the regulations on returns to gas distributors, as measured by project real pre-tax cash flow IRRs.

3 APPROACH

We have developed an economic model that calculates IRR as a function of:

- € Distance of the estate from the nearest gas supply mains;
- € The number of homes in the estate;
- € The lineal density of the housing estate (inversely related to block size);
- € Distribution tariffs; and
- € The cost of mains.

The model assesses costs based on common trenching or single trenching in both metro and country areas. We have calculated IRRs using a range of gas consumption between 20 and 75GJ per annum per household. The base model is premised on the following parameters:

- € An Envestra Central tariff was used to calculate revenues;
- € 500 houses were to be reticulated;
- € A distance of 500 metres from supply mains;
- € A medium lineal density of 14 metres per house;
- € Common trenching;
- € Metro fringe suburbs are assumed to be the estates to be reticulated; and
- € Approved year 2003 distribution tariffs were used.

3.1 REVENUE

Revenue was derived by applying distribution tariffs to assumed volumes within consumption bands/blocks as per the distributor tariffs for peak and off-peak periods and the number of connected households. As required in the project brief we did not model volumes as such, but assessed outcomes across a range of volumes. We have assumed the industry norm of 95% meter penetration for new estates. We used assumed consumption per appliance and penetration rates for cooking and gas-solar hot water heating with the balance of the load based on heating load. We have applied MMA profiles for monthly appliance consumption for these appliances. The combined profiles then provide the total load per household.

We used the 2003 tariffs as a base for our calculations. The 2004 tariff is yet to be approved by the Essential Service Commission. We have for Envestra and TXU also modelled the sensitivity to new proposed tariffs.

3.2 RETICULATION REQUIREMENT

The natural gas reticulation infrastructure typically includes:

- € Mains extension from existing distribution network including street reticulation within the new estate;
- € Supply mains (depending on the distance between the existing network and the mains extension and/or the need to augment the capacity of the network) feeding the mains extension;
- € Service pipes between the mains and the consumer meter; and
- € A consumer meter (incorporating service isolation valve, pressure regulator, meter).

We have based our assessment on the following types of infrastructure:

- € 50 mm PE mains;
- € 100 mm steel for the supply (0 – 3 km from existing mains);
- € 125 mm PE/100 mm steel for the more trafficked areas;
- € A meter for each house connected;
- € A service line for each house connected; and
- € A proportion of field regulators required for the network as a whole.

Maps of three new housing areas with measurements of road lengths and house blocks marked were provided by DOI/SEAV. We have from these, evaluated average lineal density in terms of metres per houses of rational reticulation required¹.

3.3 COST OF RETICULATION

We have sought external advice as to the current cost of greenfields reticulation to new housing estates. The costs provided below include a component for overheads. The costs for new estates with and without common trenching are shown in Table 1.

¹ We have, for example, excluded reticulation past areas such as parks.

Table 1: Capital costs assumed

CAPEX	Cost Object	Metro		Country	
		Common Trenching	Single trenching	Common Trenching	Single trenching
Mains	50mm PE	\$47	\$57	\$37	\$47
	125mm PE	\$75	\$85	\$75	\$85
	100mm ST	\$118	\$130	\$118	\$130
Services		\$475	\$525	\$425	\$475
Meters		\$200	\$200	\$200	\$200
Regulator	\$/km mains	\$2426	\$2426	\$2426	\$2426

In our analysis we have built up the capital cost of reticulation as:

- € Mains: the number of houses x the lineal density x cost of 50 mm PE;
- € Larger mains: the number of km of 50 mm PE x 1.26% x cost of 125 mm PE;
- € Supply: the supply distance x the cost of 100 mm steel;
- € Field regulators: \$2426 x km of 50 mm mains;
- € Services for houses with gas x cost/service; and
- € Meters for houses with gas x cost/meter.

We have assumed these costs remain constant in real terms.

3.4 OPERATING EXPENDITURES (OPEX)

Based on discussions with external sources and internal MMA information we have assessed the operating cost, including O&M, general and administrative and meter reading as \$24.20/customer/year. We have assumed this stays constant in real terms. The cost of meter reading of \$4.20 is included in the OPEX estimate.

3.5 OTHER ASSUMPTIONS

3.5.1 Timing and staging for new estates:

New estates are commonly developed in stages with each stage typically consisting of anywhere between 45-200 housing lots. Large developments may total about 2000 housing lots. As a rule-of-thumb average there is one housing lot per 12-17 metres length of gas main, allowing for 'dead space', corners, schools etc. Development often starts with an open paddock. Then developers come in and form roads, crossings etc. Water mains are then laid with gas in a common trenching operation. Typically, it takes 9 months before households start using gas. We have thus assumed that mains are laid 9 months before gas consumption starts, services 3 months before and meters 1 month before gas uptake begins.

3.5.2 Project life

The project life and hence the discount time horizon for IRR calculation is assumed to be 20 years. We have, however, included a capability in the model to extend it to 30 years.

3.5.3 IRR analysis

We have conducted the IRR analysis on a real pre-tax project cash flow basis.

3.5.4 Discount rate

We have used a figure of 7.05% real pre-tax as the discount rate on cash flows. We understand this to be the weighted average cost of capital (WACC) most recently regulated for gas distribution businesses by the Essential Services Commission.

4 OUTPUTS

The key objective of this project is to evaluate the likely impact of the increasing energy efficiency of new homes under the 5-star and requirements and the proposed changes to the plumbing regulations on the economic returns available to gas distributors for reticulating gas to new housing estates. The economic model we have built calculates the changes in IRR as a function of:

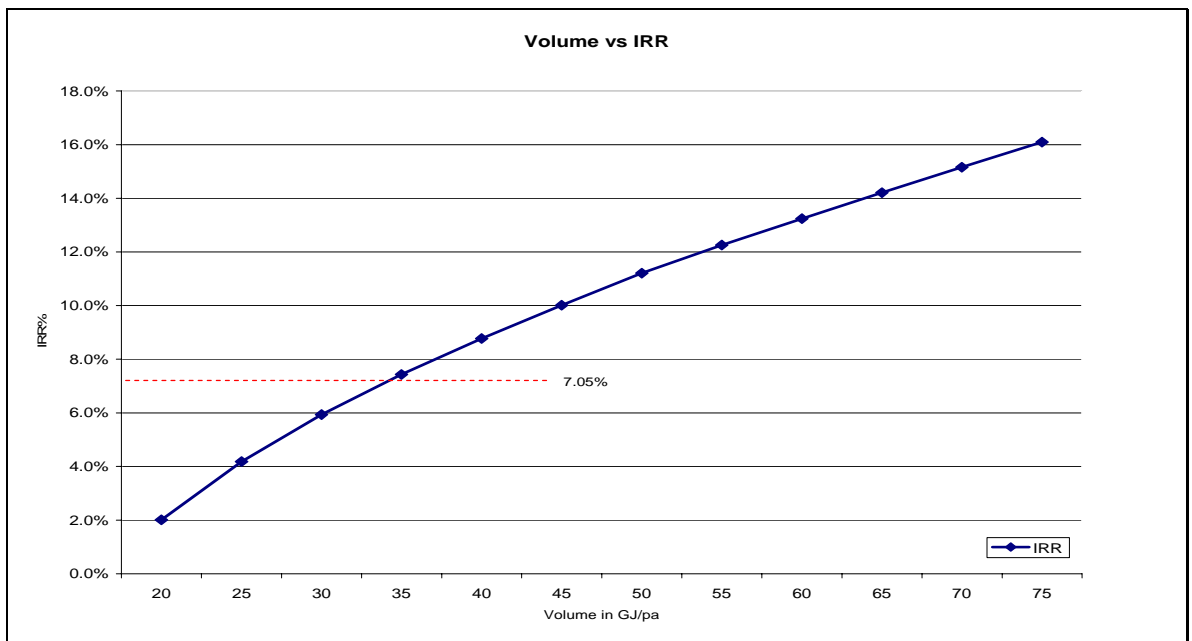
- € A range of estimated gas consumption per household;
- € Distance to the nearest suitable gas supply;
- € Number of homes in the new estate;
- € The type and level of distribution tariff; and
- € Common or single trenching.

The results of the economic modelling exercise are discussed in this section.

4.1 VOLUME

Current average consumption by new homes is estimated to be some 60 to 70 GJ per house. The changes to the regulations are expected to have a significant impact on this. As can be seen in Figure 1, the impact of reduced consumption on returns to the distributor can be very significant.

Figure 1: Impact of average consumption on returns



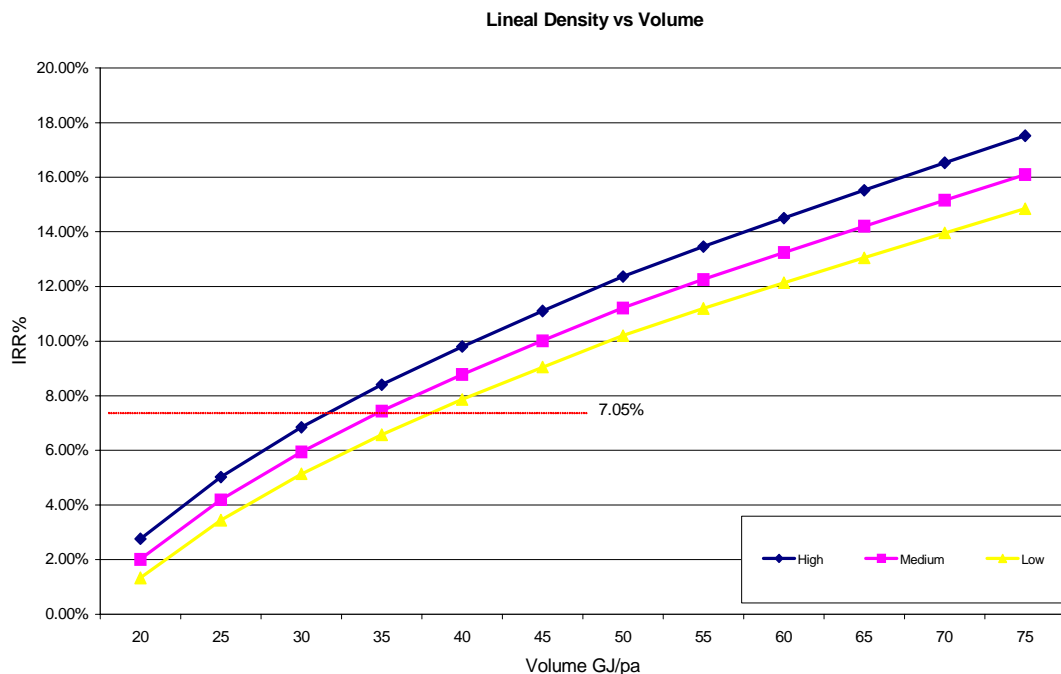
For the comparison we have used Envestra Central 2003 tariffs, 500 houses, a distance of 500 metres from supply, a lineal density of 14 metres (medium) and common trenching in a metro area.

A reduction in average demand by 5 GJ has a significant impact on the returns of a distributor, with the IRR dropping by about 1.2% for each such change. If the regulations were to result in a reduction of average demand from 60 GJ to 40 GJ the impact would be a reduction in IRR from 13.2% to 8.8%.

4.2 LINEAL DENSITY

The lineal density of houses in the housing estate – expressed as how many metres of mains reticulation is required per house has a significant impact on the IRR. Three levels of lineal density, 12 metres (high), 14 meters (medium) and 16 metres (low) were modelled. Figure 2 shows the relationship between lineal density at different volume levels and IRR.

Figure 2: Lineal density versus volume



For the comparison we have used Envestra Central 2003 tariffs, 500 houses, a distance of 500 metres from supply and common trenching in a metro area.

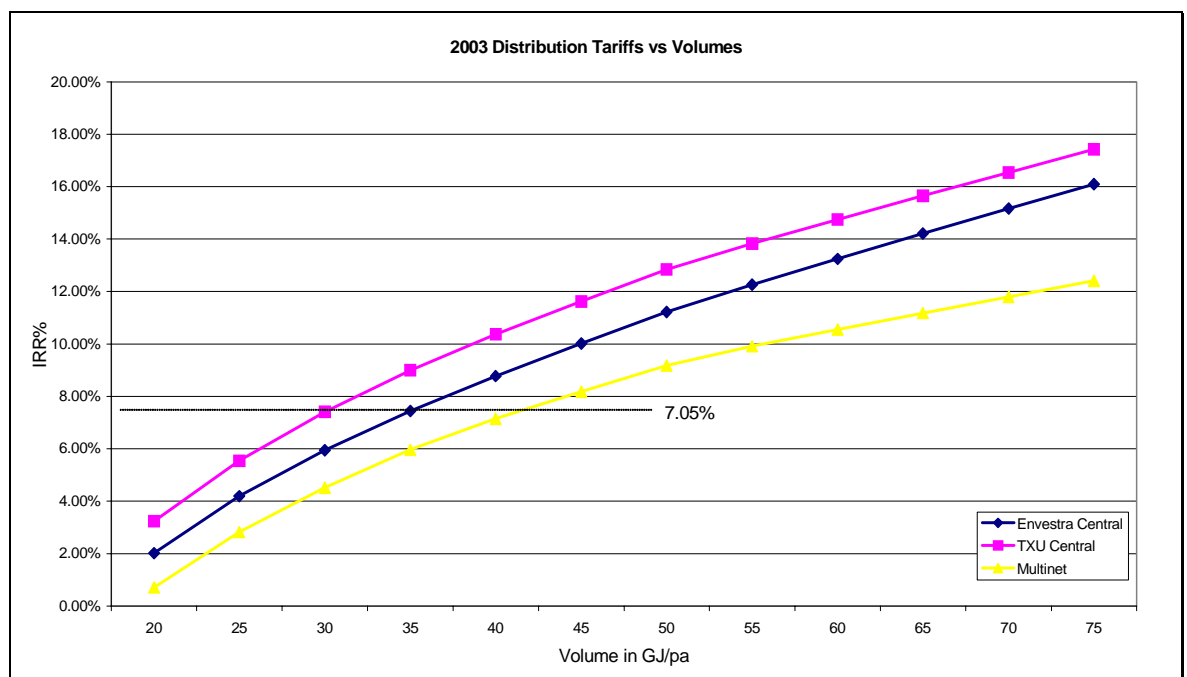
As would be expected the returns are sensitive to lineal density. Lower lineal density adds to the cost of reticulation and hence results in a reduction in returns to distributors. Moving from low to medium or medium to high density changes the IRR by about 1%.

At an average volume of 40 GJ per home, the IRR is above 7.05% across all lineal densities. At 30 GJ per house or below, however, the IRR is less than 7.05% across all densities. To achieve a breakeven IRR of 7.05% using Envestra Central tariffs for 2003, the lineal density required is 11.5 metres.

4.3 DISTRIBUTOR TARIFF COMPARISON FOR 2003 AND 2004

The regulated tariff has an impact on the profitability of reticulating new estates. The three Victorian distributors have different tariffs for domestic consumers. The TXU Central tariff is the highest followed by the Envestra Central tariff and then the Multinet tariff. For the purposes of this project, the TXU Central and Envestra Central tariffs are more relevant as the two distributors have network envelopes that are amenable to new estate reticulation on the fringes of the metro area. Mutinet’s network on the other hand is in built-up urban areas. Figure 3 shows the relationship between the TXU Central tariff, Envestra Central tariff and the Multinet tariff at different volume levels.

Figure 3: 2003 Distribution Tariffs versus Volume



For the comparison we have used 500 houses, a distance of 500 metres from supply, a lineal density of 14 metres (medium) and common trenching in a metro area.

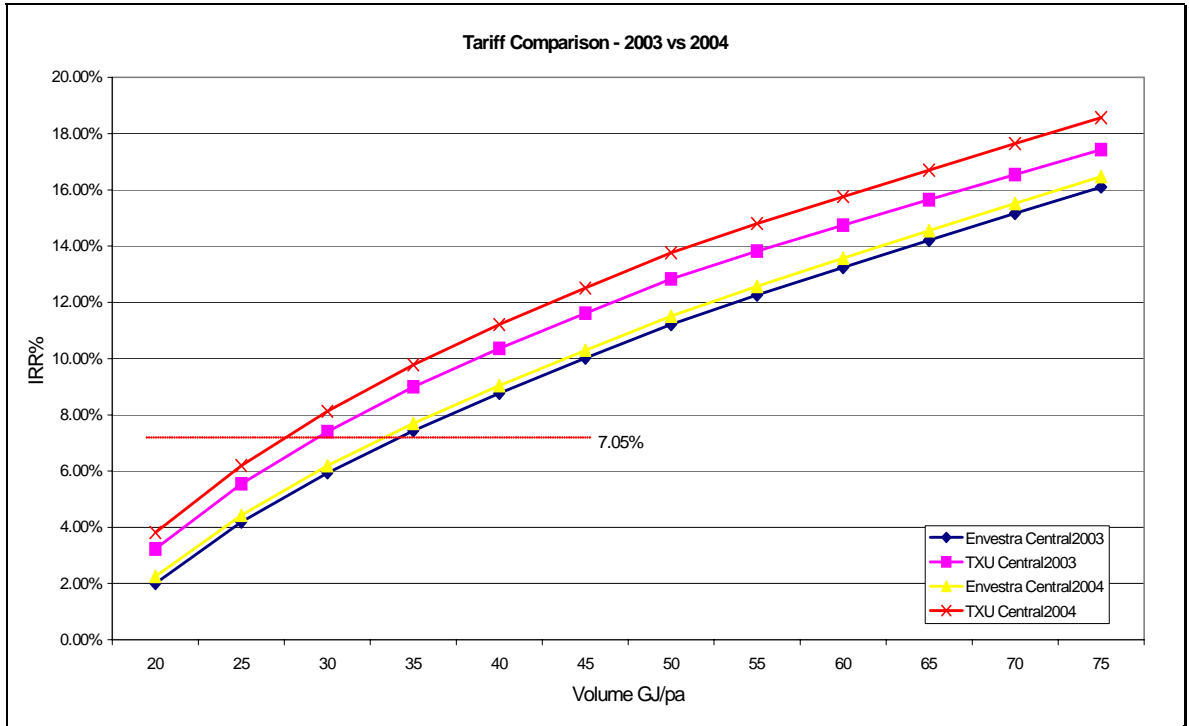
The distributor doing the reticulation is very important because of the different tariffs chargeable. As almost all of the new housing estates are reticulated by Envestra or TXU near the metropolitan fringes we confine our discussion to these two. Using Envestra Central tariffs result in outcomes to distributors some 1.5% lower than would be the case using TXU Central tariffs.

For an IRR of 7.05% the TXU Central tariff gives breakeven volumes of about 30 GJ, the Envestra Central tariff about 35 GJ and Multinet about 40 GJ.

The regulated tariffs are set to increase in 2004 and proposed increases are available on the ESC website but have not yet been approved by the Regulator and as such have no official status.

A comparison of the results for both 2003 tariffs and tariffs proposed for 2004 for TXU Central and Envestra Central is provided in Figure 4.

Figure 4: 2003 and proposed 2004 TXU Central and Envestra Central versus Volume



For the comparison we have used 500 houses, a distance of 500 metres from supply, a lineal density of 14 metres (medium) and common trenching in a metro area.

As can be seen in Table 2, while the impact of the proposed changes is of some relevance for TXU Central, changing the breakeven volume by 2 GJ, it is relatively small for Envestra Central, changing the breakeven volume by only 1 GJ.

Table 2: Impact of proposed new tariffs on breakeven volume

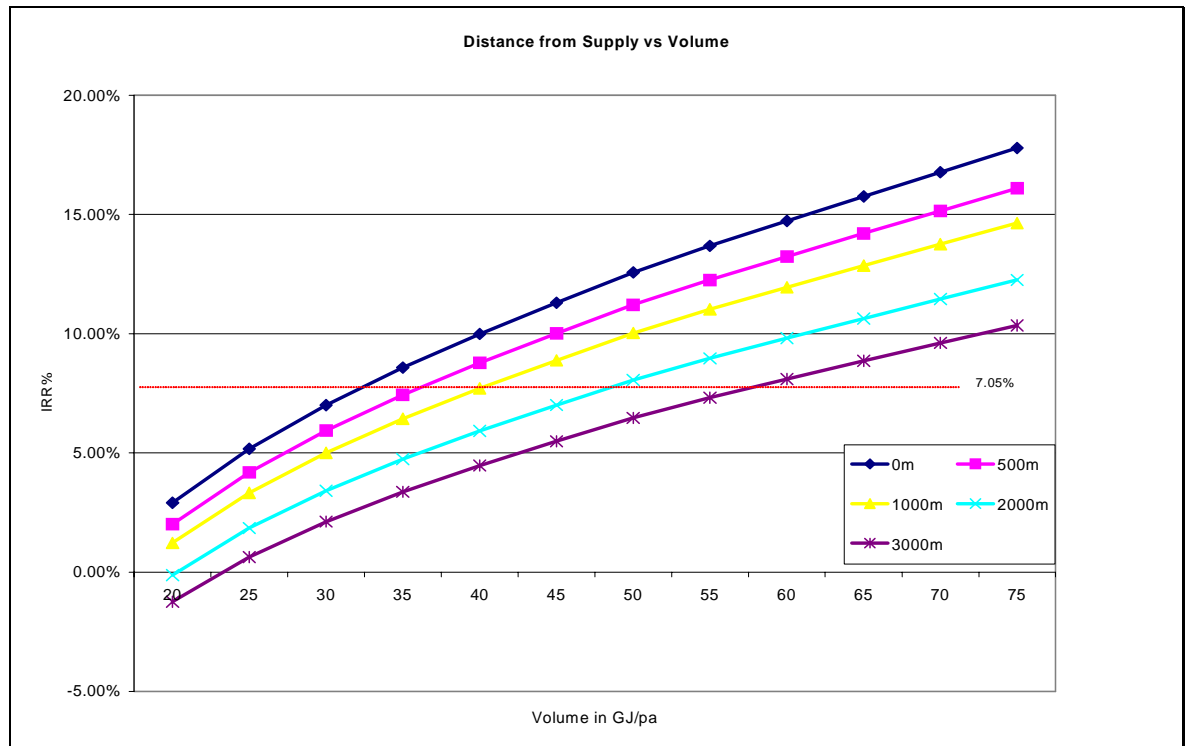
DB Tariff Type	Breakeven Volumes @ 7.05%	
	2003	2004
TXU Central	29GJ	27GJ
Envestra Central	34GJ	33GJ
Multinet	39GJ	31GJ

The proposed tariff increase that Multinet is seeking for 2004 is substantial (up to 20%) and hence the sizeable reduction in the required breakeven volume.

4.4 SUPPLY DISTANCE

The distance from supply impacts on the profitability of reticulating new estates for distributors. The longer the distance from supply, the higher the cost of reticulation and the lower the IRR all other factors held constant. Longer distances therefore require higher consumption per household. Figure 5 shows the relationship between the distance from supply and volume and IRR.

Figure 5: Distance from Supply versus Volume



For the comparison we have used 500 houses, Envestra Central 2003 tariff, a lineal density of 14 metres (medium) and common trenching in a metro area.

The distance from supply is important. Increasing the supply distance by 500 metres results in a reduction of IRR by of the order of 1%. However this number is also very sensitive to the number of houses reticulated. It is unlikely that reticulation at a distance of greater than 0.5 to 1 km from a supply point will take place for only 500 houses. If a greater number of houses is reticulated the resultant impact will obviously be less.

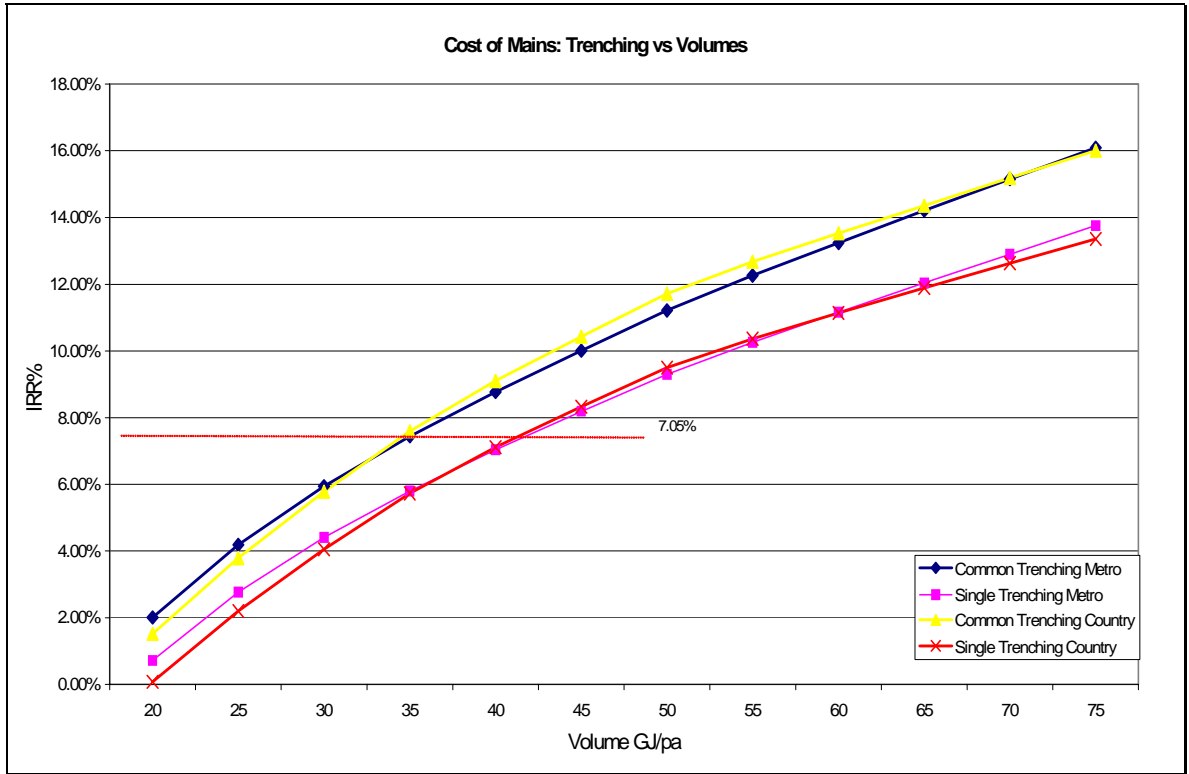
If the distance from supply increases from 500 metres to 1000 metres, the average consumption would have to increase from about 35 GJ to 40 GJ per house for the distributor to break even.

4.5 TRENCHING – METRO AND COUNTRY

In new estates, common trenching involves laying the mains in conjunction with other infrastructure lines, typically water mains. Common trenching therefore involves shared costs by gas distributors and other companies – hence it is the cheaper option. Figure 6 shows the impact of using common trenching against single trenching in metro and

country areas. Typically country areas are cheaper to reticulate than metropolitan areas, but have lower tariffs as well.

Figure 6: Cost of Mains: Common Trenching and Single Trenching



The results are very sensitive to whether common trenching is used, with single trenching typically resulting in a reduction of IRR by about 1.5 to 2%.

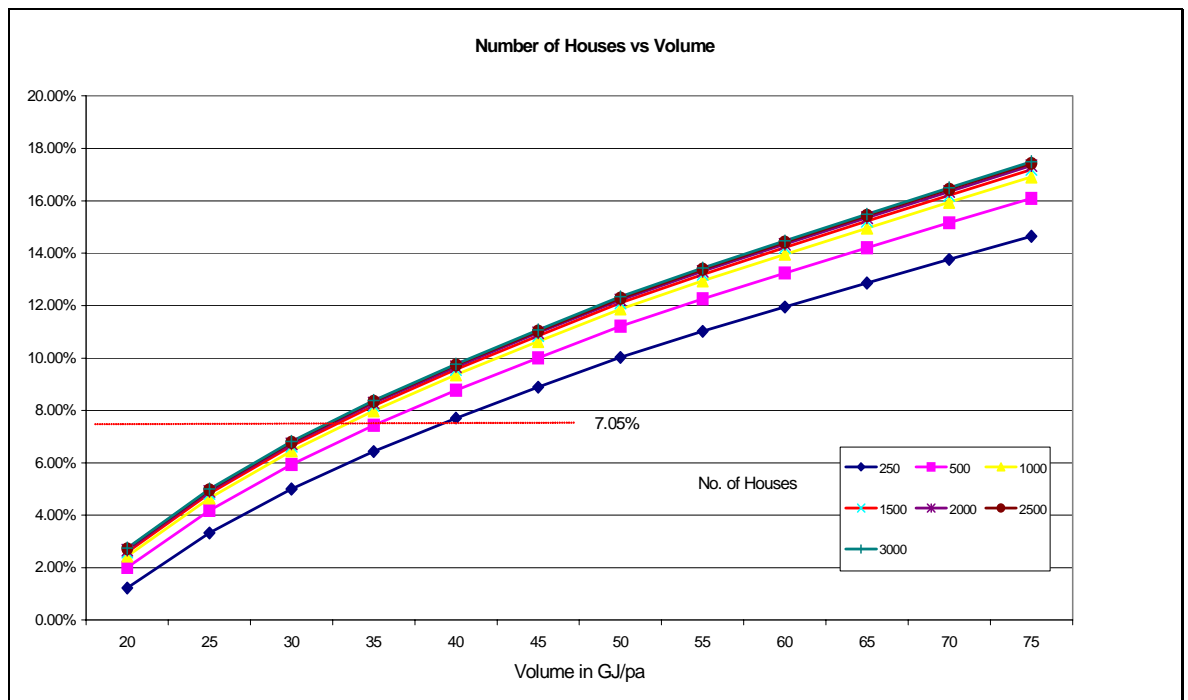
Using Envestra Central tariffs for metro and Envestra North tariffs for country, the breakeven volumes at 7.05% are shown in the panel below.

	Common Trenching	Single Trenching
Metro	34 GJ	40 GJ
Country	33 GJ	40 GJ

4.6 NO OF HOUSES

While it would be expected that the number of houses in the estate would have an impact on costs through economies of scale, our modelling is in essence modular on a per home basis. This means the only impact is the amortisation of supply distance costs over a greater or lesser number of houses.

Figure 7: Number of Houses versus Volume



For the comparison we have used 500 houses, Envestra Central 2003 tariff, a lineal density of 14 metres (medium) and common trenching in a metro area and 500 metres of supply.

The largest impact of the assumed supply distance of 500 metres is in the increase of houses from 250 to 500. Beyond this the impact of increasing house numbers is limited. We have not considered the phasing of housing developments in a large estate.

The breakeven number of houses at Envestra Central tariffs, 35 GJ and 7.05% WACC is about 475 units. The number of houses per se does not, however, appear to have a substantial impact compared to other factors such as lineal density and supply distance.

4.7 DISCUSSION

4.7.1 Key sensitivities

The impacts on IRR of the variables modelled compared to the base case for a new estate modelled: Envestra Central tariff, 60 GJ average consumption, medium lineal density, 500 homes and 500 metres of supply are shown in Table 3.

Table 3: Impacts of variables on IRR

Variable	Extent of change considered	Change of IRR
Average consumption	Reduce by 20 GJ	-4.5%
Lineal density	From medium to low	-1%

Variable	Extent of change considered	Change of IRR
Distributor	From Envestra Central to TXU Central	+1.5%
New Tariffs	From Envestra 2003 to proposed Envestra 2004	+0.3%
Supply distance	From 500 m to 1000 m	-1%
Trenching	Common to single trenching	-1.7%
Number of houses	500 to 1000 houses	+0.7%

The potential change in volume is, of course, of most concern. However, our results show that, so long as the average volumes consumed are 35 GJ or more for Envestra Central reticulations (30 GJ for TXU Central reticulations) it should still be economical for the distributors to reticulate.

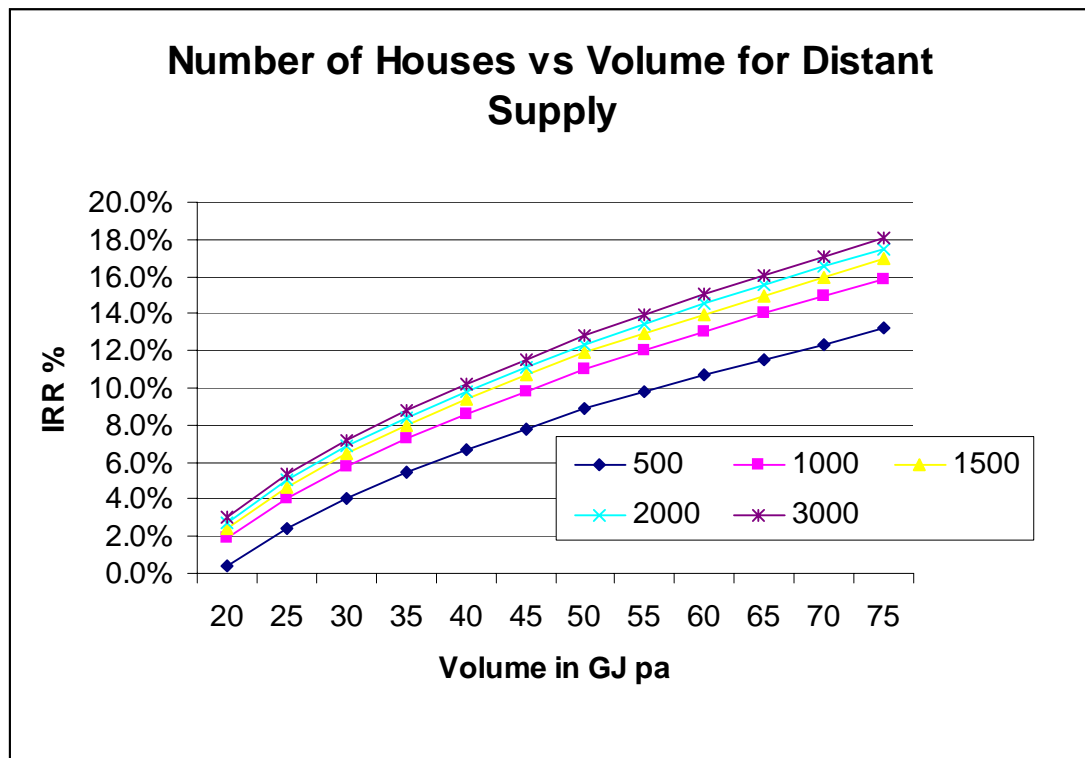
If the average volumes drop slightly below these values then the lineal density would need to be higher than average, or the distance of supply less than 500 metres for the reticulation to be economical. If average volumes drop below these values then the Government may need to consider policy options to make the reticulation attractive to distributors.

4.8 CASE STUDY – LARGE ESTATE WITH DISTANT SUPPLY

We have carried out a case study of a new housing estate reticulation with:

- € A supply distance of 2 km
- € High lineal density; and
- € Between 500 and 3000 houses.

The results of IRR versus volume for this case study are provided in Figure 8 with the numbers provided in Appendix A.7. In the case study example, and assuming that all the houses are constructed at the same time, about 1000 houses are required for the distributor to achieve a return of above 7% at an average volume of 35 GJ. The same return can be achieved at an average volume of 30 GJ for a large estate of 3000 houses, again assuming they are all constructed at around the same time.

Figure 8: Number of Houses versus Volume

For the case study we have used: Envestra Central 2003 tariff, a lineal density of 12 metres (high), a supply distance of 2000 metres and common trenching in a metro area.

4.9 POLICY OPTIONS

The legislated introduction of the five star energy ratings and solar-gas water heater has raised concerns among gas distribution companies. It is expected that the effect of the regulations will result in a reduction of the consumption of gas for new homes compared to the current situation. There are concerns in some parts of the gas industry (principally the gas distributors) that reduced gas consumption will make it uneconomic to reticulate gas to new housing estates under current network tariffs.

The economic evaluation that has been conducted enables us to answer some policy questions and to suggest some options. The key issue for distribution companies will be the reduction in the space/central heating load, which is estimated at 30-50 GJ per appliance per annum.

Using Envestra Central 2003 tariffs, 500 metres distance from supply, 500 houses, medium lineal density of 14 metres, common trenching (metro) and a target IRR of 7.05%, we briefly consider below capital injection, tariff upscale and asking for contributions from low usage households as policy options. These options are discussed in turn.

4.9.1 Capital Injection

Using the base model assumption of Envestra Central tariffs, 7.05% required WACC, 14 metres lineal density, 500 houses, 500 metres from supply, common trenching in metro areas, and 30GJ annual consumption the capital injection that would be needed to make reticulation viable is \$62,000. This is equivalent to about \$125 per house reticulated.

Recovery of such capital injections can be done in a number of ways, for example:

- ∓ The state government or councils may meet the shortfall from their treasuries to support the environmental cause. This does, however, raise difficulties in terms of precedents and calculating “subsidies”.
- ∓ The Federal Government may be asked to contribute on the basis of reducing overall greenhouse gas emissions compared to an all-electric house, although there is yet no precedent for such a proposal.
- ∓ Asking developers to pay the shortfall. We estimate this to be only about \$125/house and may be worthwhile to developers to ensure that houses have the benefit of gas which would tend to raise house prices.
- ∓ User pays: In this case owners of households that are connected to gas would be required to make a contribution to the shortfall of about \$125/house. This may well be worthwhile to householders to ensure that houses have the benefit of gas at uniform tariffs. This approach is used by distributors for mains connections in metro in-fill cases. However, critical issues are to determine the extent of contribution allowable, who is a ‘user’ and the potential impact of reduced penetration rate.
- ∓ Rolling the capital shortfall into future reference tariffs. This may be achievable at the next regulatory review, however, is not theoretically allowable unless it passes the economic test. A further disadvantage with this approach is that existing users effectively cross-subsidise the new estates that might otherwise be unviable. An undesirable aspect of the across the board ‘smearing’ of the shortfall is that tariffs to other users will rise by the amount of the shortfall.
- ∓ Depending on individual retailer margins, retailers may be amenable to bearing some of the “pain” for low-using households. This may well be attractive compared to the alternative of no gas customers on the estate. This would have to be negotiated between retailers and distributors.

4.9.2 Up-scaling the tariffs paid by new housing estate residents

Again using the same base model assumptions discussed above, we calculated the average tariff up-scale that would be needed to make the project viable at an average usage of 30

GJ per house. The average tariff up-scale is 8% from an average tariff of \$5.27/GJ to \$5.69/GJ, an actual increase of 42c/GJ. However, this would only impact the average retail tariff by about 4 to 5%. Overall, gas costs would increase by some \$15 per household per year.

However, in order to follow this policy it might then be necessary to create new tariffs for new estates, an unwieldy administrative proposition given the number of new estates and hence new tariff orders. It might also be contrary to maximum uniform tariff positions generally adopted by Governments.

Alternatively, tariffs to all users in the zone could increase by a much smaller amount. This amount has not been calculated for the current assignment. Such zone-wide tariff up-scales present some problems. Regulators using incentive regulation principle (CPI-X regulation) often do not change tariff intra-regulatory periods.

4.9.3 Increased charges to low-use customers

In some states distributors will not connect low-use customers (eg cooker only) , or charge a premium to do so. For example, builders or users who do not connect space or central heating may be charged a gas connection fee of (say) \$200.

This may be a valid policy option to consider, however, may have a perverse impact on gas penetration rates, overall averages and IRRs.

4.9.4 Summary

If the average volumes after the regulations are implemented are below the breakeven values then the distributors may see reticulation as uneconomical. For example, if the volume consumed in the base case analysis is 30 GJ rather than the breakeven volume of about 35 GJ this results in a shortfall of about \$60,000 for the 500 house base case or \$125 per house.

This shortfall, if it occurs, can be funded through a number of sources and means, by Government, developers, house-owners, housing estate users, developers, retailers or all gas customers, either through a capital injection, surcharge or increase to tariffs.

However, institutional, procedural, calculation and precedence issues must be well considered before any approach is decided. In any case, the average usage after the shortfall may well exceed the break-even values.

APPENDIX A - OUTPUT TABLES

A.1 IRR by volume by lineal density

	High	Medium	Low
20	2.76%	2.01%	1.33%
25	5.02%	4.19%	3.44%
30	6.84%	5.94%	5.13%
35	8.40%	7.44%	6.57%
40	9.80%	8.77%	7.86%
45	11.10%	10.01%	9.05%
50	12.36%	11.21%	10.20%
55	13.46%	12.26%	11.19%
60	14.50%	13.24%	12.13%
65	15.52%	14.21%	13.05%
70	16.52%	15.16%	13.96%
75	17.52%	16.10%	14.85%

A.2 IRR by volume by distributor and zone

	Envestra Central	Envestra North	TXU Central	TXU West	Multinet
20	2.01%	0.17%	3.23%	0.78%	0.71%
25	4.19%	2.30%	5.54%	2.97%	2.82%
30	5.94%	4.16%	7.40%	4.84%	4.51%
35	7.44%	5.84%	8.99%	6.53%	5.96%
40	8.77%	7.23%	10.36%	7.95%	7.14%
45	10.01%	8.46%	11.62%	9.24%	8.18%
50	11.21%	9.64%	12.83%	10.48%	9.18%
55	12.26%	10.51%	13.83%	11.48%	9.91%
60	13.24%	11.28%	14.74%	12.40%	10.55%
65	14.21%	12.04%	15.65%	13.29%	11.18%
70	15.16%	12.79%	16.54%	14.18%	11.80%
75	16.10%	13.52%	17.43%	15.05%	12.41%

A.3 IRR by volume by distance of supply

	0	500	1000	1500	2000	2500	3000
20	2.90%	2.01%	1.22%	0.52%	-0.12%	-0.71%	-1.24%
25	5.17%	4.19%	3.32%	2.54%	1.85%	1.21%	0.63%
30	7.01%	5.94%	5.00%	4.17%	3.42%	2.74%	2.12%
35	8.58%	7.44%	6.43%	5.54%	4.75%	4.03%	3.37%
40	9.99%	8.77%	7.71%	6.77%	5.93%	5.17%	4.48%
45	11.30%	10.01%	8.89%	7.90%	7.01%	6.22%	5.49%
50	12.58%	11.21%	10.03%	8.99%	8.06%	7.23%	6.47%
55	13.69%	12.26%	11.02%	9.93%	8.97%	8.10%	7.31%
60	14.74%	13.24%	11.95%	10.82%	9.81%	8.91%	8.10%
65	15.77%	14.21%	12.86%	11.69%	10.64%	9.71%	8.87%
70	16.78%	15.16%	13.76%	12.54%	11.46%	10.49%	9.62%
75	17.79%	16.10%	14.64%	13.37%	12.25%	11.25%	10.35%

A.4 IRR by volume by number of houses

	250	500	1000	1500	2000	2500	3000
20	1.22%	2.01%	2.44%	2.59%	2.67%	2.71%	2.75%
25	3.32%	4.19%	4.66%	4.83%	4.91%	4.96%	5.00%
30	5.00%	5.94%	6.45%	6.63%	6.73%	6.78%	6.82%
35	6.43%	7.44%	7.99%	8.18%	8.28%	8.34%	8.38%
40	7.71%	8.77%	9.36%	9.57%	9.67%	9.73%	9.78%
45	8.89%	10.01%	10.63%	10.85%	10.96%	11.03%	11.07%
50	10.03%	11.21%	11.87%	12.10%	12.22%	12.29%	12.34%
55	11.02%	12.26%	12.95%	13.19%	13.31%	13.38%	13.43%
60	11.95%	13.24%	13.96%	14.21%	14.34%	14.42%	14.47%
65	12.86%	14.21%	14.96%	15.22%	15.35%	15.44%	15.49%
70	13.76%	15.16%	15.94%	16.21%	16.35%	16.44%	16.50%
75	14.64%	16.10%	16.91%	17.19%	17.34%	17.43%	17.49%

A.5 IRR by volume by trenching

	CT	ST	CTC	STC
20	2.01%	0.72%	1.52%	0.08%
25	4.19%	2.77%	3.79%	2.20%
30	5.94%	4.41%	5.78%	4.05%
35	7.44%	5.80%	7.59%	5.73%
40	8.77%	7.04%	9.10%	7.11%
45	10.01%	8.19%	10.43%	8.33%
50	11.21%	9.30%	11.72%	9.50%
55	12.26%	10.26%	12.68%	10.37%
60	13.24%	11.16%	13.53%	11.14%
65	14.21%	12.04%	14.36%	11.89%
70	15.16%	12.90%	15.19%	12.63%
75	16.10%	13.76%	16.00%	13.36%

CT = common trenching metro
 ST = single trenching metro
 CTC = common trenching country
 STC = single trenching country

A.6 IRR by volume by distributor by Tariffs 2003 versus 2004

	Envestra Central 2003	TXU Central 2003	Envestra Central 2004	TXU Central 2004
20	2.01%	3.23%	2.25%	3.81%
25	4.19%	5.54%	4.43%	6.20%
30	5.94%	7.40%	6.19%	8.13%
35	7.44%	8.99%	7.70%	9.78%
40	8.77%	10.36%	9.05%	11.21%
45	10.01%	11.62%	10.30%	12.50%
50	11.21%	12.83%	11.51%	13.77%
55	12.26%	13.83%	12.57%	14.80%
60	13.24%	14.74%	13.57%	15.76%
65	14.21%	15.65%	14.55%	16.70%
70	15.16%	16.54%	15.52%	17.64%
75	16.10%	17.43%	16.47%	18.56%

A.7 IRR by volume by number of houses for 2000 m distance of supply

	500 houses	1000 houses	1500 houses	2000 houses	3000 houses
20	0.4%	1.9%	2.5%	2.8%	3.1%
25	2.4%	4.1%	4.7%	5.0%	5.4%
30	4.1%	5.8%	6.5%	6.8%	7.2%
35	5.4%	7.3%	8.0%	8.4%	8.8%
40	6.6%	8.6%	9.4%	9.8%	10.2%
45	7.8%	9.8%	10.7%	11.1%	11.6%
50	8.8%	11.0%	11.9%	12.4%	12.9%
55	9.8%	12.1%	13.0%	13.5%	14.0%
60	10.7%	13.0%	14.0%	14.5%	15.0%
65	11.5%	14.0%	15.0%	15.5%	16.1%
70	12.4%	14.9%	16.0%	16.5%	17.1%
75	13.2%	15.9%	16.9%	17.5%	18.1%