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National Gas Reimbursement Scheme

Department of Resources, Energy and Tourism

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pwc

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Executive summary

PricewaterhouseCoopers (PwC) was engaged by the Department of Resources, Energy and Tourism (DRET) to provide advice on an appropriate National Gas Reimbursement Scheme. The scope of advice sought requested that PwC advice on a suitable design and/or alternative designs for a national gas reimbursement scheme, incorporating the design elements agreed by the NPWG and supported with analysis of the merits of each design.

Design of the gas reimbursement scheme

Reimbursement schemes as discussed in this report address the situation whereby an initial customer (the 'pioneer customer') pays a material customer contribution in order to have the gas network extended to their point of connection, and one or more customers subsequently connect close to the original customer and thus make use of the infrastructure that the pioneer funded. Importantly, it is assumed in this report that a reimbursement scheme would apply where an individual customer (or possibly a small number of customers) sponsored an extension that was designed to meeting their needs, albeit with some spare capacity due to the use of standard diameter pipelines The report is not intended to address major extensions to a new town or other situations where the distributor may choose to install a larger diameter pipe than the initial customer required.

Under a reimbursement scheme, the pioneer customer (and other previous customers who have connected to a pipeline) obtains a rebate of at least some of the capital contributions that the pioneer customer paid to connect to a pipeline if other customers later connect to that extension.

Reimbursement schemes serve two primary purposes. First, they seek to provide for a fair sharing of the costs of an extension between the pioneer customer (and other previous customers) and new customers that may connect to the extension. Second, reimbursement schemes have efficiency objectives, although the full effect on economic efficiency effects may be complex.

The first part of our terms of reference was to recommend the design features of the scheme.

There are a number of issues to be resolved or choices to be made when designing a reimbursement scheme:

1. Term or length of the scheme
2. The assets for which the scheme would pertain to (extension and/ or augmentation)
3. Economies of scale
4. Relative loads
5. The point at which subsequent customers connect
6. The level of any materiality threshold for when the scheme operates
7. Whether administrative costs should be deducted from payments.

Generally, there is trade off between getting additional precision in the reimbursement scheme and the administrative costs of implementing the scheme.

Our preferred option for a national gas reimbursement scheme would have the following features:

- It would operate for a seven year period
- Only extension assets would be included in the scheme, so that the amount that is subject to reimbursement would be the lesser of the original capital contribution and the cost of the extension asset
- The amount of the original capital contribution would not be recalculated to account for economies of scale

- The original capital contribution would be apportioned between connecting customers in proportion to their load and point of connection (or length of pipe that each customer uses)
- No fees to cover administrative costs
- A materiality threshold of $2,000 for residential customers and scaled up for larger customers was proposed, although further investigation was recommended.

Cost benefit analysis

The second part of the terms of reference requested PwC to undertake a cost-benefit analysis of the NPWG's preferred National Gas Reimbursement Scheme.

After considering PwC's recommendations, the NPWG agreed to the following design features of a national gas reimbursement scheme:

- Do not re-calculate the initial capital contribution required to account for economy of scale effects but allow for contributions to be rolled in to the asset base if the extension becomes economically viable
- The amount of any reimbursement should take into account customer's relative loads
- The reimbursement scheme should operate for a seven year period
- The scheme should only apply to extension assets and not augmentation of assets
- Distributors should not be allowed to charge additional fees for administration — these costs should be treated as part of a distributor's overhead costs.

The NPWG decided that the scheme should not adjust the amount of any reimbursement for the point at which customers connect to an extension.

PwC has undertaken the cost-benefit analysis using the design features of a reimbursement scheme as decided by the NPWG. We have also undertaken targeted consultation with stakeholders to obtain their views on the proposed scheme and assist in advising the NPWG on an appropriate materiality threshold.

We note that, by its nature, a cost-benefit test assesses only whether economic efficiency would be enhanced by the scheme; potential equity objective issues are therefore not quantified. However, we have found that customer complaints about 'free-riding' on other's connections (the main equity issue) are minimal, suggesting that the equity-benefit of a reimbursement scheme is not substantial.

Our aim has been to assess whether the economic benefits of the scheme outweigh the costs to the distributors of administrating the scheme. The key potential economic benefit from the scheme is to encourage additional 'pioneers' to connect, that otherwise would not; and where servicing those customers' energy needs with gas that has a lower cost to society than servicing them with electricity.

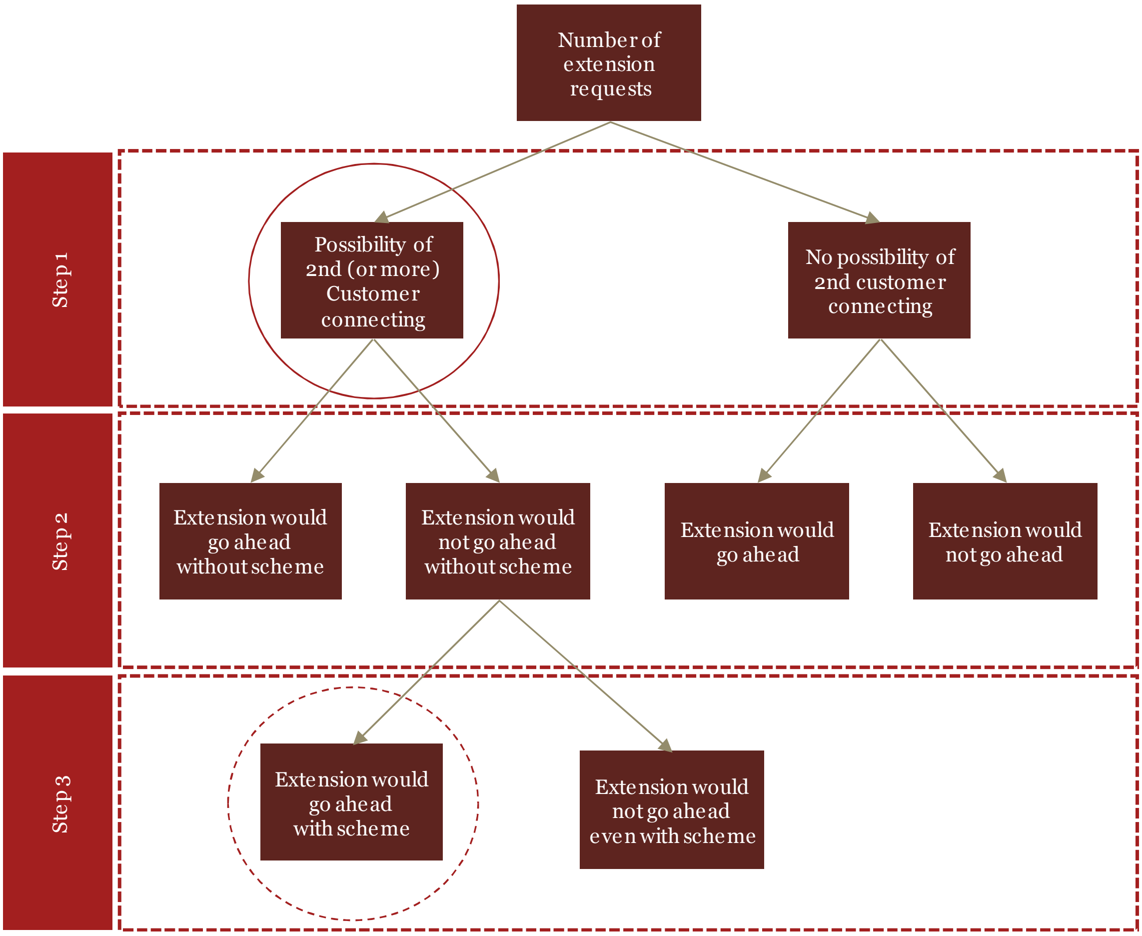
To place a value on these benefits, PwC's approach has been to develop a view on the likely number of extensions that would proceed because a gas reimbursement scheme existed, and the economic benefit from consequently switching from electricity to gas[1]. This reduces to the following questions:

- What is the maximum number of customers that potentially could benefit from the scheme?
- Of that maximum pool, what proportion would connect because there is a gas reimbursement scheme?

[1] Customers could switch from other energy sources (e.g. wood) to gas, but we have assumed switching from electricity for simplicity

- What's the economic benefit of the additional customers?
- What's the cost to implement and administer the scheme?

This thought process is illustrated in the following diagram.



We have relied on the views of distributors and consumer representatives to develop an estimate of the input values for the calculations. To obtain these views, PwC created a questionnaire that was distributed to distributors and consumer representatives. This was followed up with a series of telephone interviews.

We note that the responses obtained are largely based on estimates, rather than actual numbers. This is because there is limited experience with gas reimbursement schemes to date.

Cost of the scheme

Distributors generally expressed a qualitative view that implementing and administering a reimbursement scheme could require a material investment in respect to the IT systems to monitor information and staff to administer the scheme, and that they expected this cost to exceed the benefits.

Of the cost estimates we received (from two distributors operating in Victoria and the NSW distributor), the NSW estimates were much higher. This higher estimate, in turn, reflected the NSW business' view that it would require an automated system to handle the number of connections for which a reimbursement may result. The other estimates – which reflected for most part the conditions in Victoria - a materially lower volume was forecast and a manual system was assumed to suffice.

As a justification for the high cost estimates, the NSW distributor commented that the administrative requirements to handle the scheme are outside the scope of the conventional billing system they currently in place, and would require them to either upgrade or establish a stand-alone IT system with dedicated staff to manage the process. The costs for such administrative requirements increases with the number of potential customers, as well as the complexity of the IT system required. We have used the lower bound of the NSW business' estimate in the calculations below.

Quantitative analysis

As per our terms of reference, our quantitative analysis includes cost and benefits for each jurisdiction. A summary of the results of our analysis are displayed in table 1 below.

Table 1: Summary of cost benefit analysis – expected case

State	*Total benefits of the scheme**	*Cost of implementing and administering the scheme^*	*Net benefit of the scheme*
Victoria	$1,168,538	$3,977,335	$(2,808,797)
SA	$437,804	$1,325,778	$(887,974)
NSW	$4,010,203	$7,814,446	$(3,804,243)
QLD	$77,447	$2,651,557	$(2,574,109)

* Includes the capital cost of the connection

^ The expected cost of the scheme.

The key assumptions that have been applied in this analysis are that:

- the creation of the scheme would imply that:
  - 25 per cent of connections that would not have proceeded would proceed; and
  - for every extra connection, two customers result: the 'pioneer' and a secondary customer using the pioneer's assets
- new pioneers would immediately consume the jurisdictional average amount of gas;
- the economic benefit from the connection have been estimated as the saving in societal cost from using gas rather than electricity; and
- estimates of the cost (in present value terms) of implementing and administering the scheme are derived from information provided by the distributors
- a materiality threshold of $1,000
- an average cost of a new gas connection of $5,000 ($3,000 paid by distributor and $2,000 as the average contribution by customers)

The results suggest that the introduction of a gas reimbursement scheme would not deliver a net economic benefit in any of the jurisdictions. This is because the potential additional connections that would arise from the introduction of the scheme, combined with the likely benefit per connection, is insufficient to offset the estimated costs of administering the scheme as described above.

We emphasise that these results assume a **considerable inducement** of extensions because of the existence of the reimbursement scheme (25 per cent increase in the number of 'pioneer' connections and a second customer for every pioneer). We feel that this assumption is likely to lead to an over-estimation of the benefits of the reimbursement scheme.

In addition, we have tested the effect of raising the materiality threshold for NSW. We have focused on NSW along because it is the only jurisdiction where the introduction of a materiality threshold could reduce the expected costs of the scheme by permitting a manual rather than an automated system to administer the scheme.

However, our analysis suggests that raising the materiality threshold is unlikely to change the conclusion above. While we assumed the higher threshold would reduce costs substantially, the benefits are reduced as the pool of customers who may benefit from the scheme falls and the average 'benefit' from encouraging those customers to switch also falls.

Qualitative analysis

Our qualitative analysis of the benefits of the proposed gas reimbursement scheme reinforces the quantitative analysis summarised above.

A common theme in comments from many stakeholders we consulted was that the potential for a second customer to connect to an extension and 'free ride' on the first customer's capital contribution was not a primary deterrent in a customer's decision to connect. Equally, the prospect of a possible future rebate was unlikely to encourage customers to connect. Of more concern to customers is the amount of the upfront contribution in relation to their own financial situation. For example, it was observed that a low-income customer who is required to make an initial capital contribution of $7,000 is unlikely to be swayed in their decision by the possibility that they may receive a reimbursement, for which the size and timing is uncertain, during the next seven years.

Conclusions and recommendations

In summary, whilst we acknowledge that a reimbursement scheme may address issues in relation to equity and fairness, our analysis suggests the scheme will not promote economic efficiency. This is because the benefits of the scheme are modest when compared to the costs of setting up the scheme.

However, distributors see merit in having flexibility to apply a reimbursement scheme on a project-by-project base as this would give them discretion to apply the reimbursement scheme where it was likely to encourage additional connections and/or 'free rider' concerns were substantial, and may assist to minimise administrative costs. This voluntary scheme may use the characteristics described in Part1 of the report as guidance.

Our view is that providing such flexibility to the distributors is desirable. As the distributors have a financial incentive to connect new customers, a reimbursement scheme should be offered where appropriate.' Additionally, a voluntary scheme will only be applied where the benefits to distributors exceed the cost, and therefore it would not impose unnecessary costs on the distributors (and hence customers). Also, because distributors will make decisions on a case-by-case basis, under a voluntary scheme a materiality threshold would not be necessary.

However, we expect that changes to the National Gas Rules would be needed (or otherwise desirable) in order to ensure that distributors have the power to implement reimbursement arrangements.

Contents

1 Introduction

PwC was engaged by DRET to provide advice on an appropriate National Gas Reimbursement Scheme. The scope of advice sought requested that PwC advice on a suitable design and/or alternative designs for a national gas reimbursement scheme, incorporating the design elements agreed by the NPWG and supported with analysis of the merits of each design.

The scope of advice noted that the proposed scheme will need to incorporate a suitable basis on which reimbursement amounts are to be calculated by the relevant distributor. The proposed scheme will also need to include advice on a materiality threshold.

Part 1 of the assignment required that we develop a suitable design and/or alternative designs for a national gas reimbursement scheme, incorporating the design elements agreed by the Network Policy Working Group (NPWG) and supported with analysis of the merits of each design. The terms of reference noted that the proposed scheme(s) will need to incorporate a suitable basis on which reimbursement amounts are to be calculated by the relevant distributor and include advice on a materiality threshold(s).

The purpose of this report is to set out PwC's views on an appropriate design for a national gas reimbursement scheme. The merits or otherwise of introducing such a scheme will be considered in Part 2 of this assignment which will involve a cost-benefit analysis of the NPWG's preferred National Gas Reimbursement Scheme. Part 2 of the assignment will be undertaken subsequent to this report.

1.1 Our approach

Allens Arthur Robinson (AAR) stated in its report to the NPWG that there was nothing in the NGL or NGR that provides for the reimbursement of capital contributions or envisages the inclusion of reimbursement provisions in access arrangements. They further note that where such arrangements have been put in place, they have been included in distributors' access arrangements which sometimes set out high-level provisions relating to capital contributions.[2]

In designing a potential National Gas Reimbursement Scheme, PwC has assumed that, if adopted, the reimbursement scheme would be provided for under the NGL and/or NGR and would replace the existing arrangements established by approved access arrangements.

In order to develop a potential national scheme, we have reviewed existing or previous reimbursement arrangements established by state energy regulators in Queensland, New South Wales, Victoria and South Australia. As noted by AAR, jurisdictional regulators did not establish reimbursement schemes for the gas sector. However, reimbursement schemes have been developed in the electricity sector and we have drawn on those to frame options for a national gas reimbursement scheme.

We have also reviewed the draft *National Gas (Retail Connection) Amendment Rules 2010* and draft *National Electricity (Retail Connection) Amendment Rules 2010* (both dated 27 November 2009). We have assumed that the provisions set out in the draft Rules relating to negotiated connections will be adopted and thus we have used the draft Rules as our starting point for our analysis.

As instructed by the NPWG, we have assumed that any gas reimbursement scheme adopted will operate for 7 years and that it will only apply to extensions and not any augmentations required upstream of the extension.

2 AAR 2009 National Connections Framework for Gas Distribution Networks, October, p. 4.

1.2 Structure of this report

Our report is structured as follows:

- Chapter 2 provides a short overview of capital contributions and the arrangements proposed by the *National Gas (Retail Connection) Amendment Rules 2010*
- Chapter 3 discusses reimbursement schemes and the features that reimbursement schemes can possess
- Chapter 4 raises options for implementing a national gas reimbursement scheme and provides our recommendation.

Appendix A provides table that sets out a brief summary of the reimbursement schemes established at the jurisdictional level. Appendix B sets out worked examples of the gas reimbursement scheme incorporating economies of scale.

2 Capital contribution arrangements

In this chapter, we set out the background on capital contribution arrangements and our understanding of the proposed arrangements set out in the draft *National Gas (Retail Connection) Amendment Rules 2010* (termed draft Rules).

2.1 Capital contributions

Capital contributions are paid by customers to a gas network operator where the annual network tariffs that the operator charges the customer are not expected to recover fully the costs of connecting the customer to the network and providing its service. These net connection costs are typically considered to be costs that the operator would not have incurred had the customer not wished to connect to the network. The purpose of the capital contribution, therefore, is to recover any shortfall in the future revenue earned from that connection and the incremental cost of providing the customer with the connection.

In setting the amount of the capital contribution, the aim is to establish a price that sends efficient price signals to the customer about the cost of connection so that the customer makes an efficient decision about whether the benefits of connecting outweigh the associated costs. These price signals should signal differences in the long run incremental cost of connecting to different points of the network and difference in the cost imposed by customers with different load profiles.

In the gas sector, customers have typically not been required to make upfront capital contributions – in terms of the analysis above; the incremental revenue expected from a normal connections exceeds the forecast incremental cost (including connection costs). The situations where customers would be required to pay a connection typically would be where the cost of connecting the customer is much higher than average, for example where the connection requires making an extension to a distribution pipeline to reach the customer's premises that would not otherwise have been built.

The NPWG has pointed out to us that distributors will have an obligation to connect customers to a network where a customer requests connection. As a result, the capital expenditure associated with connection will be conforming under Rule 79(2) of the National Gas Rules allowing the distributor to roll the capital expenditure associated with the asset base (net of any customer contributions) into the regulatory asset base.

Despite these provisions, a distributor will be permitted to require that a customer pay a capital contribution. This serves two purposes. First, the contribution (combined with the reference tariff) ensures that the customer faces the full cost of its connection and subsequent use. This encourages efficient connection choices. Second, the incremental revenue from a new customer may be lower than the incremental cost prior to the next price review, dissuading distributors from connecting new customers. The requirement to pay a contribution remedies this incentive problem.

2.2 Capital contributions in the draft rules

The draft Rules treats connections that are not 'basic connection services' as negotiated services[3]. Thus, if a customer is requesting a connection to the distribution pipeline that will involve the distributor building an extension to service the customer's premises, then the customer and distributor must negotiate a connection contract. This contract will include the capital contribution that the customer must make.

The draft Rules propose that the connection charge (or method for calculating connection charges) for a particular connection service must be consistent with the following criteria:

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3 Basic connection service is defined as the service of providing a connection between a distribution pipeline and a customer's premises where the provision of the service involves minimal or no extension to, or augmentation of, the distribution pipeline.

1 If the present value of the expected incremental revenue to be generated as a result of the distributor's capital expenditure for the relevant connection assets exceeds the present value of that capital expenditure, no connection charge may be imposed

2 The connection charge must not exceed the amount by which the present value of the capital expenditure exceeds the present value of the expected incremental revenue.

In determining the expected incremental revenue, Rule 79(4) applies, namely:

3 a tariff will be assumed for incremental services based on (or extrapolated from) prevailing reference tariffs or an estimate of the reference tariffs that would have been set for comparable services if those services had been reference services

4 incremental revenue will be taken to be the gross revenue to be derived from the incremental services less incremental operating expenditure for the incremental services

5 A discount rate is to be used equal to the rate of return implicit in the reference tariff.

The distributor must also be consistent with the relevant provisions of its access arrangement when determining:

- the connection assets required
- the discount rate
- the expected life
- the incremental cost of purchasing and installing
- the expected consumption and relevant tariff
- the expected incremental operating and maintenance cost.

We have used these proposed requirements as our starting point for developing our recommended design of a national gas reimbursement scheme.

3 Reimbursement schemes

3.1 Introduction

Reimbursement schemes as discussed in this report address the situation whereby an initial customer (the 'pioneer customer') pays a material customer contribution in order to have the gas network extended to their point of connection, and one or more customers subsequently connect close to the original customer and thus make use of the infrastructure that the pioneer funded.

Importantly, it is assumed in this report that a reimbursement scheme would apply where an individual customer (or possibly a small number of customers) sponsored an extension. It is assumed that a reimbursement scheme is not intended to be applied to, for example, an extension to a previously unreticulated township.

Under a reimbursement scheme, the pioneer customer (and other previous customers who have connected to a pipeline) obtains a rebate of at least some of the capital contributions that the pioneer customer paid to connect to a pipeline if other customers later connect to that extension.

Reimbursement schemes serve two primary purposes. First, they seek to provide for a fair sharing of the costs of an extension between the pioneer customer (and other previous customers) and new customers that may connect to the extension.

Second, reimbursement schemes have efficiency objectives, although the full effect on economic efficiency effects may be complex.

- First and foremost, without a reimbursement scheme, customers who connect after the pioneer customer would avoid the capital contribution charge and thus 'free ride' at the expense of the pioneer customer. This potential to 'free ride' may discourage any party from 'pioneering' an extension even though it may be beneficial. Society would be worse off because an extension that would have generated more benefits than it cost to build will not be built. The requirement for the subsequent connecting customer(s) to reimburse the pioneer removes this potential for strategic behaviour. Indeed, if there are multiple potential pioneers, then a reimbursement scheme may provide an incentive for all potential pioneers to negotiate their connection arrangements jointly at the outset, which is the most efficient option.[4]
- Second, the existence of the reimbursement scheme may make it more likely that a pioneer would sponsor an efficient extension (that is, one where the total benefit from using the extension – which includes the benefit obtained by the pioneer and all subsequent connectors – exceeds the cost). This would arise if the pioneer expected a subsequent reimbursement and factored this into its decision of whether to proceed.
- Third, offsetting this, once the extension is in place it is a 'sunk investment' and imposing the reimbursement charge on a subsequently connecting customer may dissuade an otherwise efficient connection. In particular, the minimum charge that a customer would normally pay for connecting and using the distribution network is the long run incremental cost, which encourages an efficient choice of whether to connect. A reimbursement scheme would mean that the minimum charge would rise above long run incremental cost by the extent of the reimbursement required. If the application of the reimbursement dissuades a connection, then it is inefficient.

3.2 Jurisdictional approaches to reimbursements schemes

In our survey of Australian jurisdictional experience, we have not identified any reimbursement schemes that have been developed for the gas sector. Where they exist in the electricity sector, the schemes are largely principle-based approaches that set out the objective that the distributor is to achieve in sharing the cost of capital contributions between pioneer and subsequent customers.

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4 This permits the extension to be designed to meet the combined needs of all parties, thus lowering the cost of the required new investment.

For large load and rural customers in NSW, distributors were required to establish reimbursement schemes that:

- reimburse the original customer according to the extent to which new customers will utilise those assets.[5]

The requirements in NSW limit the total reimbursement to the amount of the original capital contribution adjusted for inflation.[6]

Distributors were responsible for establishing and administering the scheme and ensuring that later connecting customers reimburse the current owner of the premises for which the original works were undertaken.[7]

For other customer types, distributors were required to take into account the potential for further network expansion in the customer's locality in the medium term when establishing the initial customer contribution.

In Victoria, the ESCV required that a distributor:

- must allow a rebate to the pioneer customer – of such amount as the distributor determines is fair and reasonable.[8]

Similarly, Energex's Capital Contribution Policy establishes the following principles with regard to capital contributions:

- Equitable treatment of existing customers
- Appropriate pricing signals are sent to potential customers that reflect the true cost of network expansion.[9]

Further detail on the capital contribution arrangements and reimbursement schemes in the jurisdictions is set out in Appendix A.

3.3 Key features of reimbursement schemes

There are a number of issues to be resolved or choices to be made when designing a reimbursement scheme:

1. Term or length of the scheme
2. The assets included in the scheme
3. Economy of scale effects
4. Relative loads
5. The point at which subsequent customers connect
6. The level of any materiality threshold for when the scheme operates
7. Whether administrative costs should be deducted from payments.

Generally, there is a trade off between getting additional precision in the reimbursement scheme and the administrative costs of implementing the scheme.

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5 Independent Pricing and Regulatory Tribunal 2002 Capital Contributions and Repayments for Connection to Electricity Distribution Networks in New South Wales, p. 9.

6 ibid, p. 9.

7 ibid, p. 9.

8 Essential Services Commission of Victoria 2004 Electricity Guideline No. 14: Provision of Services by Electricity Distributors, Issue 1, clause 3.4.4.

9 Energex 2009 Capital Contributions Policy, April, p. 4.

The NPWG has decided that any reimbursement scheme will operate for a period of 7 years and that it will only include extension assets and not the costs associated with augmenting the system upstream of the connection. As such, we have not addressed these issues in this report.

We note that the method for determining the amount of an upfront capital contribution means that an upfront capital contribution would not be expected to be related directly to the extension asset (or to any other asset). Rather, it is the difference between expected revenue and the costs that are caused. As a result, the contribution may be greater than the cost of the extension, or it may be lower. With this in mind, we interpret the decision for the reimbursement scheme to be limited to the extension assets as implying that the amount that is subject to reimbursement is the lesser of:

- the upfront contribution that was paid
- the cost of the extension asset.

It is also worth emphasising that reimbursement schemes assume that the amount that is subject to reimbursement only relates to the shared costs associated with the extension. It is assumed that customer-specific costs, such as the cost of metering installations and any upstream augmentations required, are recovered through the regulated tariff revenue that the customer pays or through any contribution in excess of the cost of the extension asset.

3.3.1 Economy of scale effects

Economy of scale effects are created when additional customers connect to the extension asset. As more customers connect to an extension, the incremental revenue earned by the distributor will increase even though the capital cost of the extension has not changed.

The economy of scale effects mean that more of the cost of the extension asset would be recovered through regulated charges. Thus, the capital contribution by the pioneer customer would have been lower had the additional customers connecting to the extension been known at the outset.

For example, if the capital cost of building a pipeline extension is $1000 and the present value of the revenue expected from the pioneer customer is $150, then the net capital contribution will equal $850 (ie $1000 – $150). If a second customer whose expected revenue equates to $150 connects, then the present value of the total revenue that the distributor will earn from the pipeline is $300 (i.e. $150+$150). Taking the second customer's expected revenue into account means that the original capital contribution should have been $700 (i.e. $1000 – $300) rather than the $850 the distributor originally charged. The difference of $150 is that additional amount that would be funded through regulated charges.

Addressing economy of scale effects in a reimbursement scheme requires a decision about whether:

- future customer growth should be forecast at the time the pioneer customer's capital contribution is calculated
- future customer growth is not forecast but the amount of the original capital contribution is recalculated when a second customer connects to the extension
- economy of scale effects are ignored and future growth is not taken into account when calculating the initial capital contribution or the amount of any reimbursement due.

We do not consider the first option (factoring in a forecast of future use of the extension) to be practicable. The forecast will relate to the future decision of one or few people. This is difficult to forecast and perverse incentive can be created. For example, a neighbour who could connect in the future would have an incentive to overstate the likelihood of that occurring.

The decision about how economies of scale are addressed will determine who benefits from those effects. Under the first practical option (recalculation of the original contribution), the pioneer customer and customers who subsequently connect to the extension capture the benefit of the economy of scale effects. If economies of scale effects are ignored, then the benefits will accrue to the distributor's other customers.

Options

The following options flow from the discussion above:

- *Re calculate the required contribution* – When a customer subsequently connects, calculate the capital contribution that would have been paid in total if the connection of the second customer was known at the time that the pioneer connected. The distributor would pay over the reduction in the required contribution, sharing the amount between the two customers (for example, in proportion to their relative load). The distributor would recover the amount it pays over from the general customer base (by including the amount paid over as an asset in its regulatory asset base). This would ensure that the connecting customers benefit from the economies of scale that they create.
- *Do not recalculate* – Merely divide the original contribution between the subsequently connecting customers.
- *Roll into the asset base* — If a second customer wished to connect to the extension prior to the conclusion of the seven year period, that customer would not pay a capital contribution charge. Instead, the requested connection would trigger the rolling into the asset base of the extension. The value rolled into the asset base would be set equal to the original capital contribution attributable to the extension and the first customer would receive a full refund of its original capital contribution made.

Factors to consider

The recalculate option provides for a fairer treatment of the parties who made a capital contribution as they would capture the economies of scale with respect to the use of the extension that they have funded. It may also increase the chances that a pioneer would commit to an efficient extension, as the pioneer would expect that any reimbursement would be larger than otherwise would be the case.

Against this, the recalculate option has a number of disadvantages.

First, the recalculate option would most likely require substantially more information to be collected and retained by the distributors in order to administer the scheme, as sufficient inputs in order to permit the original connection charge to be replicated and recalculated would be required. It would also be difficult to automate a re-calculation of an original connection charge, and so this option would also most likely require a degree of manual intervention.

Second, the recalculate option relies on a flow of funds coming from the distributor to rebate the original contribution to the pioneer customer. This is because the intent is to pass through part of the original contribution to customers generally and so is paid and borne in the first instance by the distributors.

We also note that the recalculate option would require a number of difficult issues to be resolved, such as how the initial contribution would have been shared between the two customers, although this is common to all options and is addressed further below.

Last, we note for completeness that if two customers negotiated and contracted to connect to the gas network at the same time, then the distributor **would** apply the test for evaluating the connection charge for the customers in aggregate and hence pass on the economies of scale benefit to those customers. Thus, one benefit of **not** trying to factor any economies of scale benefit into a reimbursement is that it would create an incentive for the pioneer to find other potentially interested customers when it is negotiating its connection and also provide an incentive for all customers to sign up at the outset. This would be a desirable incentive to create.

The third option of rolling the asset into the asset base when a second customer connected has the advantage of offering a simple solution for addressing economy of scale effects. However, this option has two shortcomings.

First, it need not be the case that the pipeline would be economically viable if the second customer connected. For example, if the first customer was large and the second was much smaller, then the combined contributions may not cover the cost of the extension.

Secondly, the option would require the distributor to refund past contributions. Until the next price review, the distributor would be earning income from the additional customer but bear the cost of having to refund the original capital contribution. The potential exists for the distributor to be 'out of pocket' until the next price review, although this would only be a material amount if there are many instances where a second customer uses an extension asset that was subject to a material capital contribution.

On balance, our preference is the *do not recalculate* approach. It is a simpler mechanism that avoids the costs and difficulties of the other two approaches. It may also create an incentive for customers to request extensions as a group so that the group receives the economy of scale benefit when the distributor makes the original capital contribution calculation.

The NPWG requested that we consider whether a combination of the options we have raised could be used to account for situations where the number of customers connected makes the pipeline economically viable.[10] A pipeline extension becomes economically viable where the number of connections to the pipeline means that the present value of the expected net revenue earned from the asset exceeds the present value of the cost of constructing the pipe, or at least that there would be sufficient confidence that this will be the case.

An option that could be considered is to combine our preferred option with option 3 so that the original capital contribution is shared between all customers unless a threshold is reached within the seven year time period over which the reimbursement scheme operated. If the threshold were reached then the distributor would pay back past contributions and the regulatory asset base would be adjusted upwards after the next price review to reflect the repayment of past capital contributions.

We consider that this option has some merit, provided that the threshold is set at a level that provides confidence that the extension is economically viable. However, whether it should be pursued will depend upon where the threshold should be set (that is, the level that would be necessary to provide confidence that the project would be economically viable), whether it is likely to be the case that there will be sufficient cases that would meet the threshold to warrant the additional element to the scheme. Our expectation is that there are unlikely to be sufficient cases of multiple future connections to a reimbursable extension asset to warrant creating a more complex scheme. However, this issue could be addressed further in Phase 2 of this project.

3.3.2 Accounting for relative loads

Not all customers that connect to a pipeline will utilise the asset in the same way. Subsequent customers connecting to a pipeline may use the asset to a lesser or greater degree than the pioneer customer.

In the previous example, the second customer connecting had the same load and thus expected revenue as the pioneer customer. If the second customer's load differed from the pioneer customer's load, then the reimbursement scheme needs to account for this difference.

It should be noted that we have assumed that the reimbursement scheme will apply to situations where the pioneer customer does not utilise all of the capacity available within a standard size pipe connection. As a result, spare capacity will be available in the pipe to allow the connection of other customers.

Reimbursement schemes are not intended to address situations where a distributor may decide to install additional capacity beyond the standard size connection in anticipation of further growth in the area of the pipe. In this situation, the capital contribution made by the pioneer customer should only include the net cost of servicing the pioneer customer's load. It is possible that the remaining expenditure would be treated as speculative capital expenditure under Rule 84.

It is important to understand the implications of economic efficiency for this pricing issue. Under our assumptions as to where the reimbursement scheme will be employed the pipeline is designed only to meet the needs of the original connecting customer(s). Therefore, while a subsequently connecting customer will benefit from using the extension, it cannot be said to cause any cost on the extension. It follows that the most direct guidance from economic efficiency for this matter is to ensure that the costs are shared between the first and subsequent customers in a manner that

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[10] Initially, we reviewed the approach to rolling in past capital expenditure into the regulatory asset base set out under Schedule 6A.2.1(f)(8) of the National Electricity Rules. However, our review of the National Gas Rules suggested that they were sufficient for developing a combined option.

encourages all customers to use the same facility (subject to capacity being available) rather that to build their own duplicate (or bypass) facilities.

Options

There are two options for addressing relative loads:

- Ignore relative loads and calculate the amount of the reimbursement by dividing the capital contribution equally between customers irrespective of their loads
- Calculate the reimbursement by apportioning the original capital contribution between customers in proportion to their loads.

Factors to consider

The first option (ignoring relative loads) has the advantage that is simple and lowers the administration costs of implementing the scheme.

However, it also has a key disadvantage in that it may provide an incentive for a smaller second customer to request its own (bypass) extension rather than pay for the cost of connection to the existing connection. That is, if the smaller customer had to pay an equal share of the original extension, then the smaller customer may be better off paying for a new smaller extension than connecting to the first extension. This is inefficient.

As a result, our preference is to apportion the original capital contribution between customers in a manner that reduces the risk of creating a by-pass incentive. A simple means off doing this is to apportion the contribution in proportion to load. This also has the benefit of appearing as an equitable sharing between customers.

In the previous section we used an example of where the capital cost of building a pipeline extension was $1000 and the present value of the revenue expected from the pioneer customer was $150. This means the pioneer customer should pay a capital contribution of $850.

If a second customer with expected revenue of $100 connects, then under our preferred approach (economies of scale not recalculated) the first and second customers should share the cost of the original capital contribution in proportion to the loads that they take off the pipeline. Thus, the first customer should have contributed $510 ($850 x 150/250) while the second customer should contribute $340 ($850 x 100/250). This implies that the amount of the reimbursement paid to the pioneer customer is $340 (the original $850 the pioneer customer paid minus the recalculated contribution of $510).

If a third customer with expected revenue of $125 then connects, then the relative contributions of each customer will be recalculated again. Using load to apportion the contribution, the pioneer customer should have paid $340 ($850 x 150/375), the second customer $227 ($850 x 100/375) and the third customer $283 ($850 x 125/375).

Thus, the pioneer customer should receive an additional reimbursement of $170 (the $510 this customer contributed after receiving the first reimbursement minus $340). The second customer should receive a reimbursement of $113 (the amount of their first contribution of $340 minus their proportion of the revised capital contribution of $227).

We have set this example out in tabular form below with each round representing when a new customer connects to the pipe. We have also set out this example incorporating economy of scale effects in Appendix B.

Round	Customer	Exp revenue	Cap. contribution	Reimbursement by previous customers
1	1	$150	$850	$0
2	1	$150	$510	$340
	2	$100	$340	$0
3	1	$150	$340	$170
	2	$100	$227	$113
	3	$125	$283	$0

In the next example, the Xth customer (in this case, the fourth customer) adds sufficient revenue to make the asset economic. As a result, the Xth customer does not pay a capital contribution and all previous customers receive a refund of their outstanding capital contributions. This is set out in the following table.

Round	Cust.	Expected revenue	Capital contribution	Reimbursement by previous customers	Reimbursement by distributor
1	1	$150	$850	$0	$0
2	1	$150	$510	$340	$0
	2	$100	$340	$0	$0
3	1	$150	$340	$170	$0
	2	$100	$227	$113	$0
	3	$125	$283	$0	$0
4	1	$150	$0	$0	$340
	2	$100	$0	$0	$227
	3	$125	$0	$0	$283
	X	$625	$0	$0	$0

3.3.3 The point of connection

Not all customers may connect to the extension pipeline at the same point. New customers may connect at some point along the pipeline and thus only use a subsection of that pipeline.

Again, it is important to understand the implications of economic efficiency for this pricing issue. While the original customer will benefit from the extension, it cannot be said to have caused any cost, because the extension was sized solely to meet the requirements of the original connecting customer(s). Thus, the most direct guidance from economic efficiency is to ensure that the subsequently connecting customers have an incentive to use the existing asset in preference to constructing their own duplicate (bypass) facility.

Turing to the question of how the incentive to avoid a bypass incentive could be created, there is some flexibility. The cost of installing pipelines does not rise linearly with distance because part of the cost for a project is fixed. This means that:

- it may be possible to avoid creating an incentive for bypass while also allocating the subsequently connecting customer a greater share of the contribution that would result from simply prorating the amounts based on the relative distances of the extension that is used

- equally there should be a high degree of confidence that a bypass incentive will be created if the contribution is simply prorated between the customers based on the relative distances of the extension that is used.

We also note that, as discussed earlier, economic efficiency considerations suggest that care needs to be taken to ensure that taking contributions from subsequently connecting customer does not dissuade their connection. This is because the extension asset by the time of their connection is a sunk asset – If the customer was able or prepared to make any contribution above the future costs that it causes then that is better than the customer not connecting.

In our view, the most appropriate way of dealing with customers who use different proportions of the connection asset is to prorate the contributions by the proportion of the pipeline that each customer uses. This is simple to implement and provides a degree of confidence that an incentive for inefficient bypass will be avoided, while also providing greater confidence that requiring the contribution from the subsequent customer will not dissuade an otherwise efficient connection.

For example, assume in the previous example that the second customer connects half way along the extension pipeline assuming the pipeline is 100 meters long. Thus, the capital contribution of $850 needs to be allocated between the two customers in proportion to the length of pipe that each uses. The second customer only uses the first half of the pipe which it shares with the pioneer customer. Therefore, the second customer pays one third (or $283) of the entire capital cost (i.e., $850 x 50/150). The pioneer customer pays $567 ($850 x 100/150) and thus receives a rebate of $283 from the previous customer.

Options

As with relative loads, the options for addressing the point of connection are:

- Ignore the issue of connection points and calculate the reimbursement by dividing the capital contribution equally between customers regardless of the point at which they connect
- Calculate the reimbursement by apportioning the capital contribution between customers based on their relative points of connection.

Factors to consider

As with relative loads, the first option (ignoring the point of connection) is simple and lowers the administrative costs of implementing a reimbursement scheme.

However, it again raises the possibility that a subsequent customer may be better off paying for a new extension than contributing to the cost of the first extension.

Our preference is to apportion costs between users in proportion to the length of pipeline that they use. This ensures that customers receive an efficient price signal about whether or not to connect to the existing pipeline.

We set out a worked example of our preferred approach in the next table using the example of a pipe that is 100 meters long, including where the Xth customer connecting makes the asset economic.

Round	Cust.	Expected revenue	Point of connection	Capital contribution	Reimbursement by previous customers	Reimbursement by distributor
1	1	$150	100m	$850		$0
2	1	$150	100m	$567	$283	$0
	2	$100	50m	$283	$0	$0
3	1	$150	100m	$378	$189	$0
	2	$100	50m	$189	$94	$0
	3	$125	75m	$283	$0	$0

Round	Cust.	Expected revenue	Point of connection	Capital contribution	Reimbursement by previous customers	Reimbursement by distributor
4	1	$150	100m	$0	$0	$378
	2	$100	50m	$0	$0	$189
	3	$125	75m	$0	$0	$283
	X	$625	25m	$0	$0	$0

3.3.4 Treatment of administrative costs

It is not always clear the approach that the jurisdictions took to the treatment of administrative charges. In NSW, distributors were required to treat administrative costs as corporate overheads recovered through network charges.

There are two primary options for dealing with administration costs:

1. Allow distributors to levy an upfront charge for any administration costs incurred in implementing a reimbursement scheme. In this case, the distributor may deduct an amount for administration costs from a reimbursement payment to previously connected customers
2. Bundle the administration costs in with the distributor's normal overhead costs and recover those costs through regulated tariff revenues. That is, no separate levy for administration is charged.

In deciding how administration costs should be treated, the following principles are relevant:

- The method of recovery should be administratively simple so that unnecessary costs are not incurred in recovering the costs
- Distributors should have incentives to achieve efficiencies in the level of administration costs
- The method of recovery should be commensurate with the degree to which the costs can be attributable to a particular activity or customer.

We prefer treating administrative costs as part of the distributor's normal overhead costs which are recovered through network charges. There are several reasons for this. First, it is very difficult to attribute administrative costs between the activities that distributors undertake. Second, the information requirements necessary to demonstrate an appropriate allocation of costs in setting the administrative charge would impose unnecessary costs upon distributors. Third, including administrative costs in a distributor's normal overhead costs means that they are subject to the incentive effects established by the regulatory framework applying to network charges.

4 Options for implementing a national gas reimbursement scheme

In this chapter, we consider two options for implementing a national gas reimbursement scheme:

1 High level approach
2 Guiding principle approach.

In assessing the various options for an appropriate national gas reimbursement scheme, we have given consideration to the following criteria:

- Efficiency – The scheme should not impose undue cost burdens on the distributors or the connecting customer
- Simplicity – The scheme should be simple to understand and implement
- Equity – The scheme should not unfairly penalise one customer over another
- Consistency – The model should be consistent with and consider its interaction with the remainder of the regulatory framework applying to network pricing.

The merits or otherwise of introducing a national gas reimbursement scheme are not considered in this report. Whether the benefits of introducing a gas reimbursement scheme exceed its costs of implementation will be considered in Part 2 of this assignment. It should be noted that we may refine the details of the NPWG's preferred reimbursement scheme based on the lessons from undertaking the cost-benefit analysis.

4.1 Option 1: High level approach

Option 1 involves establishing a broad principle that distributors must comply with when calculating the contribution of subsequent customers and the amount of any rebate due to the pioneer customer. This is similar in approach to that used in Victoria which requires a distributor to rebate the pioneer customer with an amount that the distributor determines is fair and reasonable.

High level approaches are simple and can be drafted so that they are consistent with the other requirements of the regulatory framework. They also contribute toward efficiency because they allow distributors the flexibility to comply with the principle on a least cost basis while also requiring customers are treated equitably.

However, their less prescriptive nature means that these sorts of approaches are prone to customer dispute where the customer disagrees with the amount of the rebate calculated by the distributor.

Dispute resolution mechanisms have typically been employed in the jurisdictions to address disputes over the amount of the original capital contribution as well as the size of any rebate provided by the customer. Some jurisdictions such as Victoria and South Australia require the licensed distributor to establish approved dispute resolution mechanisms but provide a role for the regulator to arbitrate the matter if the parties cannot come to agreement. By way of example, the arrangements in Victoria provided for the ESCV to determine what was fair and reasonable if any question of fairness of a distributor's estimate was raised.[11]

Thus, a high level approach would have the following features:

1 A requirement that the distributor must allow a rebate to any other customer who has previously made a capital contribution to the extension.
2 A distributor must calculate the amount of any rebate on a fair and reasonable basis.

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[11] Essential Services Commission of Victoria 2004 Electricity Guideline No. 14: Provision of Services by Electricity Distributors, Issue 1, clause 7

3 A distributor is not permitted to charge a fee for administration

4 Customers who dispute the amount of any rebate may access available customer dispute resolution procedures

5 Where a dispute cannot be resolved through dispute resolution procedures, the customer may apply to the AER to make a determination on whether the rebate is fair and reasonable.

As discussed in the previous chapter, a materiality threshold of $2,000 would also be established for residential customer and scaled up for larger customers.

The distributor would have the discretion over how economies of scale, connection points and relative loads are treated.

4.2 Option 2: Guiding principle approach

The second option for a reimbursement scheme is to establish a set of guiding principles on the way that distributors must determine reimbursement amounts. Under this approach, distributors are required to calculate the amount of any rebate and are directed on:

- how economies of scale should be shared between the pioneer customer and customers who subsequently connect to the pipeline
- how the reimbursement amount should take into account relative loads and the relative location of connection between the pioneer customer and subsequent customers
- how a materiality threshold should be established.

Option 2 would prescribe the method by which distributors should recalculate the amount of any reimbursement due to previous customers. The features of this approach are that distributors would be required to:

1 reimburse previous customers if a new customer connects to an extension pipe

2 when calculating the amount of the reimbursement, apportion the capital contribution between customers having regard to utilisation of the extension pipeline and the point of connection

3 not charge a fee for administration.

As discussed in the previous chapter, a materiality threshold of $2,000 would also be established for residential customer and scaled up for larger customers.

We do not believe that any further prescription is required beyond prescribing the factors that a distributor must take into account. The circumstances that surround each extension pipeline and each connection to an extension pipeline will vary. As a result, distributors require flexibility in the way that these requirements are met as this allows them the scope to implement the requirements on a least cost basis.

There are different ways that the approach could be implemented. First, the requirements of the scheme could be set out fully in the gas Rules. Second, a general principle of fair and reasonable sharing could be established in the Rules but thus could be supported by an AER Guideline that prescribed the aspects that distributors must take into account in establishing fair and reasonable sharing.

We do not have strong views on which approach is preferable. There may be a preference for setting out the requirements in a Guideline because this provides greater flexibility to refine the requirements over time as experience with the arrangements evolves.

5 Cost benefit analysis

The second part of the terms of reference received from the NPWG requested PwC to undertake a cost-benefit analysis of the NPWG's preferred National Gas Reimbursement Scheme.

After considering PwC's recommendations, the NPWG agreed to the following design features of a national gas reimbursement scheme:

- Do not re-calculate the initial capital contribution required to account for economy of scale effects but allow for contributions to be rolled in to the asset base if the extension becomes economically viable
- The amount of any reimbursement should take into account customer's relative loads
- The reimbursement scheme should operate for a seven year period
- The scheme should only apply to extension assets and not augmentation of assets
- Distributors should not be allowed to charge additional fees for administration — These costs should be treated as part of a distributor's overhead costs.

The NPWG decided not to adjust the amount of any reimbursement for the point at which customers connect to an extension. The NPWG also noted that it wished to include a materiality threshold but that PwC was to provide further advice on this matter under this part (Part 2) of the assignment.

PwC has undertaken the cost-benefit analysis using the design features of a reimbursement scheme as decided by the NPWG. We have also undertaken targeted consultation with stakeholders to gauge their view on the proposed scheme and assist in advising the NPWG on an appropriate materiality threshold. The parties we consulted with are found in appendix D.

5.1 Background to the cost benefit analysis

On 2 September 2009, the Ministerial Council on Energy Standing Committee of Officials (SCO) released its draft policy position paper on the National Framework for the Connection of Retail Customers to Natural Gas Distribution Networks (the Gas Connections Framework)[12]. The primary objectives of the Gas Connections Framework are to:

- provide a national framework for customers to get a new connection or a modification to an existing connection to a natural gas distribution network
- provide rules that set out a distributor's obligation to connect under the National Energy Retail Law
- harmonise, to the extent practicable, the jurisdictional arrangements governing gas connection processes and connection charges for customers
- simplify the connection process for customers
- apply to covered and uncovered distribution networks
- have commonality with the National Framework for Electricity Distribution Network Connections and Capital Contributions (the Electricity Connections Framework).

[12] The National Framework For The Connection Of Retail Customers To Natural Gas Distribution Networks, MCE Standing Committee of Officials, 2 September 2009

A proposed element of the Gas Connection Framework is the gas reimbursement scheme, for which the underlying policy objectives are fairness (equity) and economic efficiency[13]. According to the draft policy position paper, the reimbursement scheme may:

- result in efficient connections that otherwise might not have been constructed
- minimise distortions that might arise if a number of customers delay connecting so as not to be the first to connect and bear the full extension cost
- protect the initial customer against the risk that the cost and revenue formula used to calculate their contribution underestimates the distribution network revenue facilitated by the connection.

The proposed gas reimbursement scheme, as discussed in this report, addresses the situation whereby an initial customer (the ‘pioneer customer’) pays a material customer contribution in order to have the gas network extended to their point of connection, and subsequently one or more customers connect close to the original customer and thus make use of the infrastructure that the pioneer customer funded.

Hence, under a reimbursement scheme, the pioneer customer (and other previous customers who have connected to a pipeline) obtains a rebate of at least some of the capital contributions that they paid to connect to a pipeline if other customers later connect to that extension.

In line with policy objectives, the gas reimbursement scheme would serve two primary purposes. Firstly, provide for a fair sharing of the costs of an extension between the pioneer customer (and other previous customers) and new customers that may connect to the extension. Secondly, the gas reimbursement scheme has efficiency objectives, although the full effect on economic efficiency effects may be complex.

5.2 Our approach

This chapter gives an overview of the assessment framework we have followed in our analysis. A key consideration throughout our analysis has been to include benefits that are:

- incremental benefits only
- aggregated benefits - benefits to society as a whole

5.2.1 Incremental costs and benefits

It is important when assessing the economic costs and benefits of any project that the incremental costs and benefits be considered. This is often referred to as observing the state of the world without the project in place and comparing that to the state of the world with that project in place.

5.2.2 Aggregated benefits

A project is said to be economically efficient if the aggregate benefits associated with the project exceed its cost; where both the benefits and costs refer to the benefits and costs to society as a whole.

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[13] Advice on Capital Contribution Reimbursement Scheme (Updated for Stakeholder Submissions), Allens Arthur Robinson, October 2009, pg8-9

Therefore, when identifying benefits and costs, it is important to distinguish the benefits and costs that may accrue to individual parties but cancel out in aggregate (which are commonly referred to as transfers) from the net benefits and costs across society. In this report, we have been careful to exclude transfers from consideration as costs or benefits.

5.2.3 Steps followed

Our aim has been to assess whether the benefits of the scheme (encouraging a customer to make a capital contribution for the building of an extension that may otherwise not have occurred in the absence of the scheme) outweigh the costs to the distributors of administrating the scheme.

Our initial step in undertaking the cost benefit analysis was to identify the expected costs and benefits of the scheme. Key research document relied upon were the 'Advice on Capital Contributions Reimbursement Scheme (Updated for Stakeholder Submissions)' prepared by AAR for the NPWG[14] and written submissions from stakeholders.

The next step, and a key part of our analysis, was to undertake targeted consultation with stakeholders (customer groups, distributors and government agencies) as requested by the Department.

Various topics were discussed in consultations including:

- stakeholders' concerns in relation to the reimbursement scheme;
- stakeholders' insights into customers' motivations for connecting or not connecting to the gas networks; and
- the benefits identified in the AAR's report to gauge the stakeholders' opinions.

Once we collated the information described above, we assessed the robustness of the arguments in the light of stakeholders' views and identified key issues. We then consolidated our findings obtained during our research and stakeholder consultation to create a detailed cost benefit model.

In addition to the quantitative cost benefit modelling, we have identified and discussed qualitative reasons which highlight potential issues with the scheme.

5.3 Key issues

During the stakeholder consultations, several key concerns were raised in relation to the possible implementation of a national gas reimbursement scheme, including:

- The reimbursement scheme will only affect a very small proportion of new connections, which translates into low total benefits
- Unlike electricity, gas is not necessarily an essential service. Therefore customers may opt not to connect to gas if they are faced with a capital contribution
- The possibility of a future reimbursement does not necessarily provide an adequate incentive for customers to connect. The predominant deterrent is the size of the upfront contribution, rather than whether the cost will be shared in the future

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14 Advice on Capital Contribution Reimbursement Scheme (Updated for Stakeholder Submissions), Allens Arthur Robinson, October 2009

- Consumers in general cannot estimate the probability of another customer connecting for the reimbursement to be beneficial. Therefore, customers do not generally consider the benefits of a potential scheme in their decision
- The scheme is very costly to implement and to administer.

Of these five issues, the two major issues are: that the reimbursement scheme is applicable only to a small size of total new connections hence the benefits are small; and the complexity and cost of administering the reimbursement scheme. These are discussed in turn.

5.3.1 Small size of the Pool

In order to understand the economic benefits of the scheme, it is important to recognise that the scheme will only benefit those who have an interest in connecting to gas, but who have not (or would not) do so because of the capital contribution required. Since the economic benefits are dependent on the number of people who connect to the gas network, the benefits of the scheme, therefore, would be expected to be modest.

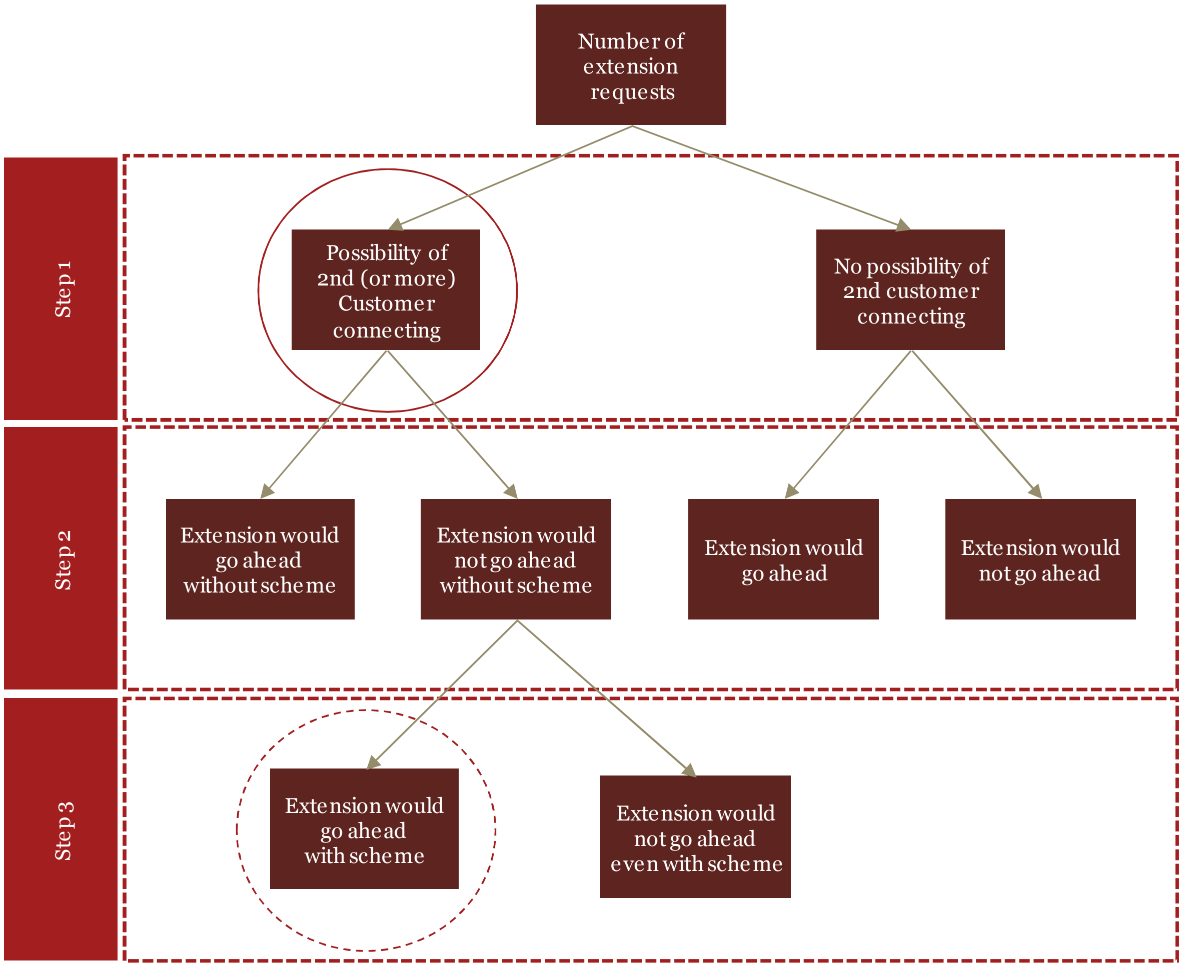
To estimate the number of people who would benefit from the reimbursement scheme, a three-step thought process has been developed to estimate the probability of an extension request going ahead. A graphical representation of the three step thought process is displayed in Figure 1. The steps are:

Step 1: Of the number of extension requests a distributor receives, what is the probability that another customer would request connection (circled in Figure 1 with a solid circle).

Step 2: Of those extensions where there is the possibility of another customer requesting connection, what proportion of extensions would not go ahead because there was no reimbursement scheme.

Step 3: Of those extensions that would not go ahead because there was no reimbursement scheme, what proportion would have proceeded had a reimbursement scheme existed (circled in Figure 1 with a broken circle).

Figure 1: Possibility analysis of the likely number of extension requests that will go ahead with a reimbursement scheme



Distributors were surveyed to ascertain the number of connections that require a minimum capital contribution of $1,000, based on historical data. Based on the information received, we have assumed $1,000 as the materiality threshold for the cost-benefit analysis (see section 5.6). It was assumed that for new connections that require a capital contribution below $1,000, the scheme would not provide the impetus in the decision making process.

Table 2 illustrates that the number of extension requests received by distributors that required a capital contribution as a proportion of total connections. Therefore, the maximum number of customers who may benefit from the scheme (total extension requests that required a contribution that did not proceed) is very small.

Table 2: Total extension requests, extension requests requiring a contribution; and extension requests requiring a contribution that did not proceed

State	Residential connections per annum[15]	Total customer requests for an extension	Total customer requests that required a contribution[16]	Total extension requests that required a contribution that did not proceed
NSW	35,000	846	745	590
SA	9,500	123	91	43

Source: Distributors' submissions

Overall, distributors were of the view that the reimbursement scheme would not be economically viable due to the high costs incurred to set up and manage the scheme, relative to the pool of potential customer that would be require to make a capital contribution and thus benefit from the scheme. We investigate this claim empirically below.

5.3.2 Costs of establishing and maintaining the scheme

A significant concern raised by distributors was the cost of implementing and administering the scheme relative to the benefits. The administration costs of the scheme would include:

- the initial cost of establishing the reimbursement administration arrangements: the NSW distributor estimated the cost of establishing an IT system based on similar complex IT systems
- the annual cost of operating the reimbursement scheme

Estimated costs vary across distributors, depending on the number of potential reimbursable connections that would be required in each jurisdiction. For example, in NSW where the potential number of additional extensions is large due to low levels of reticulated gas, the administrative costs are expected to be larger due to the need to have in place an automated system that is able to process and manage all reimbursements and interact with existing IT systems.

Table 3: Distributors' estimated cost of implementing a reimbursement scheme

State	Number of distributors	Establishment cost per distributor	Annual administrative cost per distributor
Victoria	3	Between $100k and $300k	Minimum of $100k
NSW	1	Between $5m and $10m	$250k

All estimates only, based on consultations with NSW and Victorian distributors

Importantly, we only received cost estimates from distributors in two jurisdictions: NSW and Victoria. Additionally, these distributors have noted that these estimates are based on the historical cost of similar IT projects undertaken rather than a comprehensive analysis of the requirements for the reimbursement scheme. Considering the complexities that may need to

15 New dwellings and existing dwellings converting from electricity to gas.

16 Minimum capital contribution in of $2,000.

be considered, we note that obtaining an accurate estimate of the implementation and maintenance of the mentioned IT system is a material exercise in itself.

VIC

The expected costs submitted by the Victorian distributors were based upon the assumption that only a small number of connections may give rise to potential reimbursement claims, and a relatively simple, manually run system would suffice. The suggested range was between $100,000 and $300,000. In relation to maintaining the system, the expectation was a day's work per week to handle the reimbursement claims which was estimated at around $100,000 per year. We have extended the cost assumptions (per distributor) for Victoria to the other jurisdictions, based on relatively low number of customers estimated to benefit from the scheme (that is, the number of customers who build a connection could be subject to further reimbursement).

NSW

The cost of establishing and maintaining a reimbursement scheme is greater in NSW than in any other jurisdiction due to the differences in the type and sophistication of IT systems required to run the scheme. Due to the large number of potential customers, the assumption is that an automated IT system would be required rather than a manual system. The NSW distributor estimated that to establish a new automated and integrated computer solution that is estimated to cost between $5 million and $10 million dollars up front, with recurring costs of $250,000 a year.

The NSW's distributor noted that the requirements to implement a reimbursement scheme are outside the scope of conventional billing and recording systems which address only one period activity per customer (i.e. recording that period's gas usage). For the reimbursement scheme, a system would be needed which can handle cumulative transactions; e.g. if there are 150 capital contributions per year, then in the second year there would be 300 records to be maintained and so on. By the seventh year, there would be 1,070 records before the original customers start leaving the scheme.

According to the NSW's distributor, in order to introduce the proposed reimbursement scheme, the following steps will need to be undertaken, at a significant cost:

- implement an automated and integrated IT system
- a model would need to be established to determine reimbursement based on relative load, capacity, location etc
- there would need to be an upgrade of systems/processes:
  - every new servicer application will need to be tested against all service applications in the area for the last seven years to see if there is a customer reimbursement due
  - identify applications for a gas connection where the customer has made a contribution
  - an easy way to recognise when a reimbursement may be due
  - the cost of establishing appropriate methodology to support the scheme.

Provisions would also be required to calculate the rebate if new customers connect to the original connecting customer's pipeline.

PwC assumptions

Based on the above, we have made the following assumptions in relation to the costs of the scheme.

1. We used the lower bound of the estimates provided by Victoria in all other jurisdictions, except for NSW, because the number of customers who may be affected is relatively low and we envisage the IT system required will be of a similar nature.
2. We used the lower bound estimate of five million for NSW. We have applied a scenario based approach to these costs, as discussed in the quantitative analysis section.

5.3.3 Past experience

One of the distributors commented that previously Gas and Fuel Corporation had a reimbursement scheme. The distributor commented that the scheme was removed due to proportionate effort for very little benefit for very few customers; which included:

- High level of administrative burden
- Inconsistent application and treatment of customers
- Awkwardness of charging pensioners
- The complexity of the scheme made it difficult to understand.

In relation to gas, they believe that all the reasons that lead to the demise of the original scheme still exist.

5.4 Quantitative assessment

Data sources

In creating the cost benefit model, we have mainly relied on the views of distributors for the cost estimates; and we have relied on publicly available information from retailers, government bodies and regulators for estimating the value of the benefits.

To obtain the views of the gas distributors, PwC created and disseminated a questionnaire to each gas distributor. We received responses from two Victorian distributors, one South Australian distributor and one NSW distributor[17]. A detailed list of stakeholders consulted and the questionnaire can be found in Appendix C. The questionnaire asked for the following information:

- The annual number of gas extensions requests they have received over the last 5 years (excluding requests for connecting unreticulated townships)
- Of that number, what proportion had the possibility of a second (or more) customer connecting
- The number of extension requests that did not go ahead because the customer requesting connection would not receive a reimbursement if a second customer connected
- The annual cost of processing a rebate
- The likely set up costs associated with establishing a rebate scheme and the basis for this estimate.

Along with the data provided, distributors also provided some useful insights into the incentives that connecting customers respond to and the significance of reimbursement schemes in decided whether to pay the initial capital contribution required to have an extension built. We have analysed those comments in the qualitative discussion.

Assumptions

For the quantitative analysis we have made the following key assumptions:

- The total size of the pool has been estimated from the number of customers who made an inquire to connect, but decided not to proceed
- the only deterrent for a customer who made an inquire for a gas connection, but decided not to connect, was the capital contribution
- for every extra connection, two customers result: the ‘pioneer’ and a secondary customer using the pioneer’s assets
- 25 per cent of connections that would not have proceeded would proceed due to the existence of the scheme
- new pioneers would immediately consume the jurisdictional average amount of gas
- the economic benefits from the connection have been estimated as the saving in societal cost from using gas rather than electricity
- the cost of a new gas connection that requires a capital contribution is $5,000, which comprises of: a capital contribution from the customer of $2,000 and $3,000 funded by the distributor (which is recovered via network tariffs charged to the customer)

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[17] We note that the responses received were not comprehensive and, in some instances, there were significant gap in the information provided

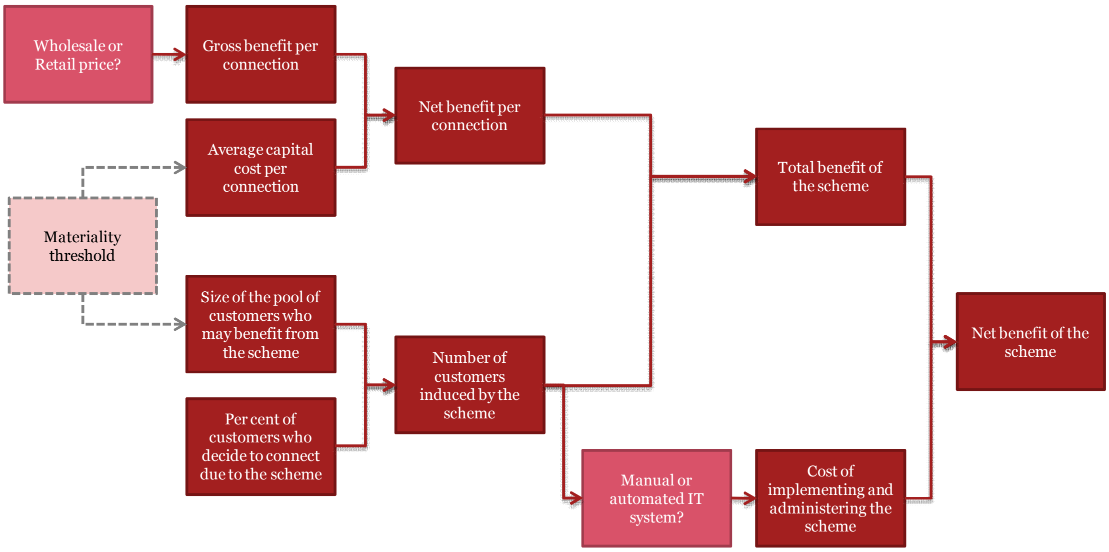
- estimates of the cost (in present value terms) of implementing and administering the scheme are derived from information provided by the distributors

5.4.1 Our approach

Taking into account the data limitations, we undertook a scenario based approach to present the results of the quantitative assessment of each jurisdiction. The analysis of the net benefits of the scheme is complex as there are many interrelated variables involved, as is demonstrated in Figure 2 below.

Importantly, we note that some of the key issues have not been considered in the quantitative analysis, such as is this the potential for a reimbursement scheme to inefficiently deter the second connection? However, we have included a discussion on these issues in the qualitative section.

Figure 2 – Components of the cost benefit analysis



As can be seen from figure 2, in order to estimate the net benefit of the scheme, we estimated the gross benefit per connection and then multiplied it by the estimated number of induced connections to derive the total gross benefit. We then factored in the estimated cost of implementing and administering the scheme to derive the estimated net benefit of the scheme.

In addition, we determined the number of extra connections that would be required to compensate for the cost of administering the scheme and compared the number of connections *required* with the number of extra connections *expected*. We have done this to test the sensitivity of the results of our assumed number of additional connections.

We have presented our findings under different benefit and cost scenarios to demonstrate the sensitivity of our analysis.

A detailed analysis on each of the components described in Figure 2 is provided below.

5.4.2 Analysis of benefits

We anticipate the benefits of the scheme to include the reduction in the forward-looking cost of providing some of a customer's energy demand with gas rather than electricity. Thus, the value of the benefits will depend upon the following assumptions (discussed in turn):

- The difference between the per unit cost to society of providing an energy supply with gas rather than electricity
- The amount of energy use that would transfer from electricity to gas, noting that the customer would continue to use electricity for some purposes
- The number of customers that would be induced to connect to the gas network as a consequence of a reimbursement scheme, for each of the States.

Difference between the per unit cost to society of gas and electricity

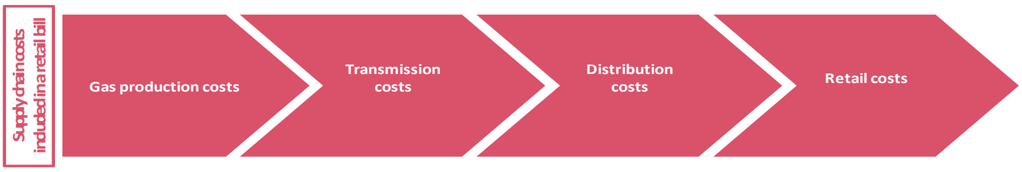
We have estimated the costs to society to produce a unit of electricity and a unit of gas, respectively. For the purposes of this analysis, we have used two proxies: retail and wholesale prices.

Per unit cost to society of providing energy supply with electricity

Proxy 1: retail electricity prices.

Retail prices are one proxy of the economic cost to society of providing electricity. These prices will equate to cost precisely if there is no market power or other market failure and all parts of the supply chain experience constant returns to scale. As parts of the sector exhibit economies of scale, this proxy is likely to overstate the economic cost of providing electricity. We have used this proxy for economic cost to derive our base case estimates of benefits.

Figure 3 Components included in retail bill as proxy for the economic cost to society of providing a unit of electricity



Proxy 2: wholesale electricity prices

Wholesale electricity prices only incorporate the cost of electricity generation and have been taken as the average trading prices for electricity in the subject states.

When using wholesale prices as the proxy for the economic cost to society of producing electricity, we are assuming that the marginal cost of transporting and selling an extra unit of electricity is zero. Hence, there is an assumption that the increase in gas usage (at the expense of electricity usage) will result in a zero net effect to existing infrastructure costs. This proxy, therefore, implies extensive economies of scale in the network elements, arguably understating the economic (marginal) cost of supply. We have used this proxy for economic cost as a sensitivity in our estimates of benefits.

Conversion of electricity process from $/MWh to $/GJ

In order to compare the cost of producing a unit of electricity to the cost of producing a unit of gas, we have converted the electricity price from dollars per MWh to dollars per GJ using a conversion rate of 1 MWh being equivalent to 3.6 GJ[18]. Our findings are summarised in Table 4 below.

Table 4 : Retail gas and electricity price per unit by jurisdiction

State	Retail electricity price		Wholesale electricity price	
	($/MWh)	($/GJ)	($/MWh)	($/GJ)
Victoria	$185.19[19]	$51.44	$49.71[20]	$19.22
SA	$158.02[21]	$43.89	$58.55[22]	$22.66
NSW	$173.50[23]	$48.19	$62.45[24]	$12.23
Queensland	$194.10[25]	$53.92	$50.11[26]	$24.60

Conversion rate of electricity to gas: 1 MWh is the equivalent of 3.6 GJ

Per unit cost to society of providing energy supply with gas

Proxy 1: retail gas prices.

As with electricity, we have used retail gas prices as one proxy of the economic cost to society of providing energy through gas, as displayed in Figure 3 below.

Figure 4 Components included in the net benefit calculation when using retail prices as proxy for cost to society of providing a unit of gas

In order to estimate the economic cost to society of switching from electricity to gas (which involves an extension), we have only included the customer's capital contribution of $2000[27] in the calculation of the incremental cost of using gas rather than the $5,000 capital cost of the connection, as shown in Figure 3. This is because the $3,000 funded by the distributor will be recovered already under the standard retail price.

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[18] Australian Energy Market Operator website

[19] AGL's website

[20] *This is estimated as the price of Victorian electricity futures price, accounting for load shape, transmission losses, NEM fees and green energy fees.*

[21] *AGL's website*

[22] *This is estimated as the price of SA electricity futures price, accounting for load shape, transmission losses, NEM fees and green energy fees.*

[23] *Residential Customer Price List, Effective from 1 July 2010, Energy Australia,* IPART

[24] *This is estimated as the price of NSW electricity futures price, accounting for load shape, transmission losses, NEM fees and green energy fees.*

[25] AGL's website

[26] *This is estimated as the price of QLD electricity futures price, accounting for load shape, transmission losses, NEM fees and green energy fees.*

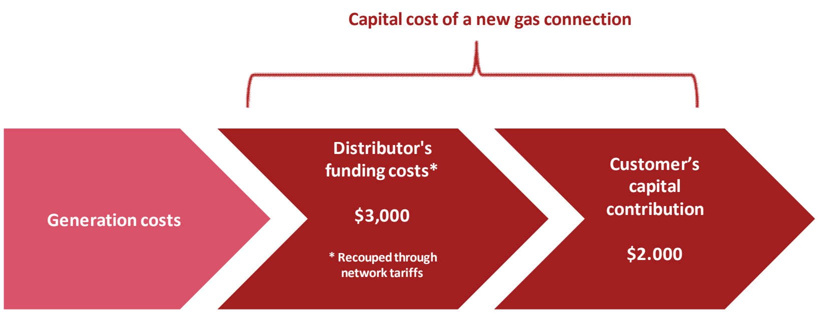
[27] based on responses from distributors

Proxy 2: wholesale gas prices

Wholesale gas prices incorporate the cost of gas production. Unlike electricity, gas wholesale prices are not readily available from publicly available data. Therefore we have used contract prices provided to regulators as a proxy.

As per electricity, when using wholesale prices as a proxy for the cost to society of servicing the gas extension, we have assumed that the increase in gas consumption (at the expense of electricity usage) will result in a zero net change to existing infrastructure costs. Therefore, when using wholesale prices as a proxy for the economic cost to society of providing a gas supply, the total capital cost of the new gas connection is considered an incremental cost to society of transferring electricity consumption to gas in the net benefit calculation, as illustrated below in Figure 5.

Figure 5 Components included in the net benefit calculation when using wholesale prices as proxy for the cost to society of providing a unit of gas



As illustrated in Figure 5, the capital cost of the connection ($5,000), comprises:

- a capital contribution from the customer of $2,000
- $3,000 funded by the distributor, which will be recovered via network tariffs charged to customer over a number of years.

Table 5 illustrates the gas prices used for this analysis.

Table 5 Retail and wholesale gas price by jurisdiction

	Retail gas price		Wholesale gas price	
State	($/GJ)	Source	($/GJ)	Source
Victoria	$19.23	AGL website[28]	$4.00[29]	PwC's analysis
South Australia	$27.11	AGL website[30]	$4.78	ESCOSA[31]

[28] www.agl.com.au

[29] Gas is usually purchased via long-term confidential contracts. As such there is no publically available information available other than estimates provided by regulators. The ESC did not have an estimate for this, therefore we have approximated this cost as the minimum of what is reasonably expected in comparison to wholesale costs of gas in other states, as well as in comparison to the short term gas wholesale price

[30] www.agl.com.au

[31] *2011 Gas standing contract price path inquiry*, ESCOSA

New South Wales	$25.74	IPART[32]	$4.78[33]	ESCOSA and PwC's analysis
Queensland	$41.88	AGL website[34]	$4.08[35]	QCA

Difference between the per unit cost of electricity and gas

As per the methodology described above, we have estimated the per unit savings expected (on average) from transferring energy usage from electricity to gas, which are set out in Table 6. Table 8below.

Table 6 Difference between the per unit cost of electricity and gas

	Retail gas price ($/GJ)			Wholesale gas price ($/GJ)		
State	**Electricity**	**Gas**	**Benefit per GJ**	**Electricity**	**Gas**	**Benefit per GJ**
Victoria	$51.44	$19.23	$32.21	$13.81	$4.00	$9.81
South Australia	$43.89	$27.11	$16.79	$16.26	$4.78	$11.48
New South Wales	$48.19	$25.74	$22.45	$17.35	$4.78	$12.57
Queensland	$53.92	$41.88	$12.03	$13.92	$4.08	$9.84

Note: numbers may not add due to rounding

Amount of energy transferred from electricity to gas per customer

As mentioned previously, we have assumed that customers who connect to gas due to the reimbursement scheme will start consuming the average gas usage in each jurisdiction. We have relied on average consumption patterns reported by State regulators, as listed in Table 7, for this purpose.

Table 7 Average annual gas consumption per customer

State	Average usage per year	Source
Victoria	60 GJ	ESC Victoria
South Australia	24 GJ	ESCOSA
New South Wales	23 GJ	IPART
Queensland	12 GJ	QCA

32 http://www.ipart.nsw.gov.au/files/Energy%20Australia%20Regulated%20Retail%20Price%20List%20-%20July%202010.PDF

33 *This is set to equal the SA gas wholesale price as the IPART's report into estimating gas wholesale prices include transmission costs. In addition gas for NSW is drawn from the same basin as gas for SA, therefore we believe the SA gas wholesale price is a reasonable proxy*

34 www.agl.com.au

35 Review of small customer gas pricing and competition in Queensland, November 2008, QCA

Number of connections induced to connect due to the scheme

As mentioned previously, since the raw data from stakeholder submissions was not comprehensive, we have assumed that out of the pool of customers that may benefit from a gas reimbursement scheme, 25 per cent will make the decision to connect once a gas reimbursement scheme is established. However, we note that in the opinion of most gas distributors, that number is closer to 5 per cent, which means that our estimate of the benefits in the expected case may be optimistic.

Table 8 Responses in relation to the number of gas connections per year encouraged due to a reimbursement scheme

State	*Submissions from gas distributors*		*PwC estimate*		
	Number of connections that may benefit from a reimbursement scheme	*Expected number of extra connections due to the existence of a reimbursement scheme*	*Expected number of extra connections due to the existence of a reimbursement scheme^*		
			Best case	Expected Case	Worst Case
Victoria	18[36]	3 – 6[37]	7	5	3
New South Wales	296[38]	No data	104	74	45
South Australia	43	2	16	11	7
Queensland	No data	No data	16	11	7

^ For the expected case, it assumes that 25 per cent of customer who may benefit from the scheme will decide to connect due to the existence of the scheme. The best case assumes that 35% of these customers will connect; and the low case assumes that this percentage is 15%

Calculation of benefits per connection

To estimate the benefits of the scheme, we calculated the net present value of the energy cost savings through the following steps:

Step 1: Annual benefit – We estimated the annual benefit as the difference between the cost of electricity and gas and multiplied by average gas usage, on a state by state basis, to represent the amount of energy substituted.

Importantly, when using retail or wholesale prices to calculate the benefits of the scheme, we have been consistent and used retail prices for both gas and electricity.

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36 This was estimated based on submissions from a Victorian gas distributor. They said that 6 connections per year may benefit from a gas reimbursement scheme. Given that Victoria has 3 gas distributors, we multiplied 3 by 6 to obtain 18.

37 Similar to footnote 12, the gas distributor said that approximately 1-2 extra connections would occur due to the reimbursement scheme. We multiplied the amount of gas distributors in Victoria by the 1-2 extra connections to obtain a range of 3 -6.

38 This number was derived from the submission from a NSW gas distributor. The gas distributor provided PwC with a table of customers requesting a connection that required a contribution, the number of customers that paid the contribution and the number of customers that didn't, over a 26 month period. This was organised by ranges of contribution that is to be paid by each customer requesting a gas connection. We used the data that had connection costs of greater than $1,000, and annualised the data. We then used the assumption that a gas connection will be shared between two customers, therefore the number of connections required as being half of the total pool of customers who inquire but don't connect.

Step 2: Benefit per connection – We have assumed that for each connection, two customers will benefit: the pioneer customer and a secondary customer.

Step 3: Calculation of benefits per state – We calculated the benefits per state by multiplying the benefits per connection by the estimated number of extra connections incentivised by the scheme.

The gross benefits expected from transferring energy consumption from electricity to gas can be summarised as follows:

Table 9 Average gas usage and NPV of the gross benefit by jurisdiction – Retail gas price

	Retail gas price			
State	***Benefit per GJ***	***Average gas usage per year***	***NPV of the gross benefit per customer ($GJ)***	***NPV of the gross benefit per connection ($GJ)***
Victoria	$32.21	60 GJ	$21,760	$43,519
South Australia	$16.79	24 GJ	$4,535	$9,071
New South Wales	$22.45	23 GJ	$5,814	$11,627
Queensland	$12.03	12 GJ	$1,625	$3,251

Table 10 Average gas usage and gross benefit by jurisdiction – Wholesale gas price

	Wholesale gas price			
State	***Benefit per GJ***	***Average gas usage per year***	***NPV of the gross benefit per customer ($GJ)***	***NPV of the gross benefit per connection ($/GJ)***
Victoria	$34.08	60 GJ	$6,625	$13,250
South Australia	$17.62	24 GJ	$3,254	$6,508
New South Wales	$21.06	23 GJ	$3,103	$6,206
Queensland	$29.32	12 GJ	$1,329	$2,658

We note that the gross benefit per connection is twice as large as the gross benefit per customer. This is because we have assumed that for every connection, there are two customers: the pioneer customer and the secondary customer.

Summary of scenarios used for the gross benefits of the scheme per connection

As discussed above, the benefits of the scheme have been calculated using both retail and wholesale prices as a proxy for economic cost. However, our view is that retail prices better represent economic costs. Accordingly, we have used the benefits calculated from retail prices to estimate the base case and the best case scenario and wholesale prices for the worst case scenario, as illustrated in Table 11.

Table 11 Scenarios used for the gross benefit per connection

	NPV of gross benefit per connection ($/GJ)		
State	***Worst case***	***Expected Case***	***Best case***
Victoria	$13,250	$43,519	$43,519
South Australia	$6,508	$9,071	$9,071
New South Wales	$6,206	$11,627	$11,627
Queensland	$2,658	$3,251	$3,251

5.4.3 Analysis of costs

The economic costs of the reimbursement scheme comprise of two separate components:

- the cost of providing a gas connection to a customer (the capital contribution if retail prices are used or the whole capital cost if wholesale prices are used)
- the implementation and maintenance costs of the scheme

Capital cost of a gas connection

The capital cost of providing a gas connection relates to the total capital cost incurred during a gas extension. The social cost of the connection is the same irrespective of how many additional customers share the gas extension. Hence, if additional customers connect to the extension, they may pay their share of capital contribution to the pioneer customer, but the social/ economic cost of the connection remains the same.

For the purposes of this analysis, we have assumed that the average cost of a gas connection that requires a capital contribution is $5,000. This is based on feedback received from distributors and includes the following:

- a portion absorbed by the distributor up-front and recovered from the customer over a period of time via the network tariffs (assumed to be approximately $3,000)
- the respective capital contribution ($2,000).

Combining the assumed capital contribution or capital cost as relevant provides the following estimates of the net benefit of the scheme, prior to implementation of administration costs.

Table 12 Summary of scenarios – NPV of the net benefit per connection

	NPV of the net benefit per connection^ ($/GJ)		
State	***Worst case***	***Expected Case***	***Best case***
Victoria	$8,120	$41,390	$41,390
South Australia	$1,076	$6,942	$6,942
New South Wales	$1,379	$9,498	$9,498
Queensland	($2,471)	$1,122	$1,122

^This does not include the establishment or administration costs of the scheme

Cost of implementing and administering the scheme

The estimated cost of implementing the scheme is summarised in Table 13. We note that distributors' information was used to determine the costs under the three scenarios. Where a range of costs were provided, we used the average of the costs as the base case scenario; the lower bound as the low cost scenario and the higher bound as the high cost scenario. For some jurisdictions, we didn't have enough information therefore we have made the following assumptions:

- As there was no data for the establishment cost for SA, we assumed the establishment cost would be the same as Victoria given that the potential market for both states is relatively small
- As there was no data for annual administration costs for Victoria, we assumed that the annual cost of maintaining the scheme per distributor would be the same as SA
- As there were no estimated costs provided by Qld distributors, we have applied the Victorian establishment costs and the SA annual administration costs as the climatic conditions in Qld translates to a small potential gas market.

Table 13: Administration cost under each scenario on a state basis

		Scenario costs ($m)		
State		Low cost	Base case	High cost
Victoria	Establishment cost	0.1 m	0.2 m[1]	0.3 m
	Annual administration cost	0.1 m	0.1 m	0.1 m
South Australia	Establishment cost	0.1 m	0.2 m	0.3 m
	Annual administration cost	0.1 m	0.1 m	0.1 m
NSW[2]	Establishment cost	5 m	5 m	5 m
	Annual administration cost	0.25 m	0.25 m	0.25 m
Queensland	Establishment cost	0.1 m	0.2 m	0.3 m
	Annual administration cost	0.1 m	0.1 m	0.1 m

[1] The average estimated costs of two Victorian distributors

[2] We used the lower bound of the NSW distributor's estimates

We note that we have undertaken further sensitivity analysis in relation to the cost of the scheme in the 'Sensitivity analysis – materiality threshold' section.

Calculation of administration and establishment costs

We calculated the administration and establishment costs in a similar manner to the economic benefits:

Step 1: We took the net present value of the average annual administration costs and total capital cost per connection[39].

Step 2: This net present value was added to the establishment cost for the reimbursement scheme to obtain the final total cost.

39 This is achieved by the assumed capital cost per customer, multiplied by the likely customer increase due to the scheme.

5.4.4 Net benefit calculations

Based on the approach taken to calculate the benefits and costs described above, we have undertaken our cost benefit calculations using the following steps:

Net benefit assuming one new connection per annum^
* Number of expected connections per year
= Total benefit of the scheme
- Cost of the scheme
Net benefit of the scheme

^This represents the net present value of benefits for all connections over the life of the extension asset (30 years) and assuming one new connection per annum. Thereby, for the first customer who connects in year 1 there is 30 years of benefits; for the second customer who connects in year 2 there is 29 years of benefits; and so.

In order to give context to the discussion, we have also expressed our results in terms of the number of connections that would be required in order for the scheme to become beneficial.

The results of the net benefits of the scheme have been expressed using a scenario based approach, discussed below.

Other parameters

The discount rate used was 8 per cent pre-tax real.

The analysis was undertaken over a 30 year period to represent the possible asset life of the extensions.

5.4.5 Outcomes of the cost benefit analysis by jurisdiction

Victoria

The results of the modelling under the three scenarios demonstrate that the scheme would not deliver a net benefit irrespective of the cost scenario. This is demonstrated in Table 14.

Table 14 : Cost benefit analysis – Victoria

	Scenarios		
	Best case	***Expected case***	***Worst case***
Additional (induced) connections - % of customers who inquire but don't connect	35%	25%	15%
Net benefit per connection	$232,981	$232,981	$45,707
Number of additional (induced) connections per year	7	5	3
Total benefit of the scheme	$1,630,870	$1,164,907	$137,120
Cost of implementing and administering the scheme	$3,677,335	$3,977,335	$4,277,335
Net benefit of the scheme	$(2,046,465)	$(2,812,428)	$(4,140,215)
Number of connections per year required for the scheme to be beneficial	16	17	94

Source: Stakeholders' submissions to PwC, PwC analysis

Note: Parentheses refers to negative numbers

Even though the net benefits of the scheme are large in Victoria, the scheme is not beneficial due to the small size of the pool of potential customers that may benefit from the scheme.

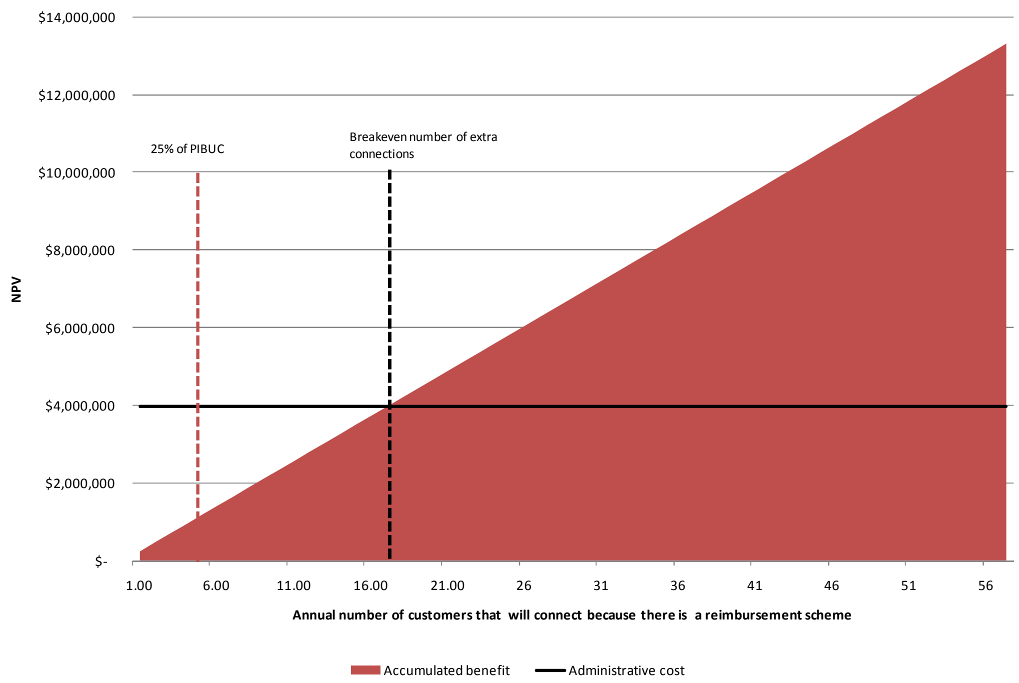
The results are consistent with stakeholders' views and may be a result of the high gas penetration in the State and the high per capita gas usage. Hence, most customers who wish to connect to gas don't need to pay an upfront capital contribution.

We note that in order for the scheme to be beneficial, at best 17 new connections, and at worst 94 new connections, would need to occur every year. Even though this number appears to be low (and achievable), information from distributors suggests the scheme would potentially give incentives to a range of 3 to 7 customers to connect.

Victoria's expected case

The outcomes of the cost benefit analysis for the expected case are illustrated in Figure 6. We note that the expected customer growth scenarios is represented by the red dotted line, the breakeven point is represented by the black dotted line and is the point where the benefits of the scheme exceed the costs of administering the scheme.

Figure 6: Expected case cost benefit analysis for Victoria



Source: Stakeholders' submissions to PwC, PwC analysis

As can be seen from Figure 6, the cost of the reimbursement scheme exceeds the expected benefits and Victoria would require at least 17 additional customers per year for the scheme to deliver a net benefit.

South Australia

The results of the modelling under the three scenarios demonstrate that the scheme would not deliver a net benefit irrespective of the cost scenario. This is demonstrated in Table 15 below.

Table 15: Cost benefit analysis – South Australia

	Scenarios		
	Best case	***Expected case***	***Worst case***
Additional (induced) connections - % of customers who inquire but don't connect	35%	25%	15%
Net benefit per connection	$39,074	$39,074	$6,058
Number of additional (induced) connections per year	16	11	7
Total benefit of the scheme	$625,188	$429,817	$42,405
Cost of implementing and administering the scheme	$1,225,778	$1,325,778	$1,425,778
Net benefit of the scheme	$(600,590)	$(895,961)	$(1,383,373)
Number of connections required per year for the scheme to be beneficial	31	34	235

Source: Stakeholders' submissions to PwC, PwC analysis

Note: Parentheses refers to negative numbers

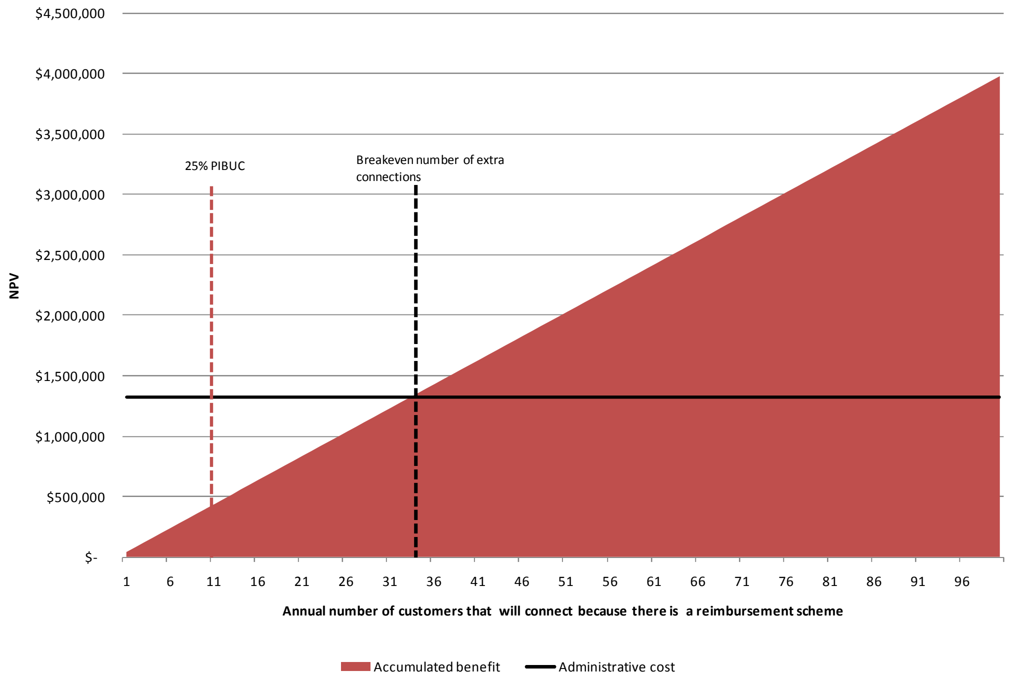
The outcomes indicate that the scheme is not beneficial in SA and this is attributed to the small size of the pool of potential customers that may benefit from the scheme, estimated at 43 customers, and the low gas consumption.

We note that in order for the scheme to be beneficial, at best we would need 34 new connections, and at worst 235 new connections, would need to occur every year. Information from distributors suggests the scheme would potentially give incentives to a range of 7 to 16 customers to connect; therefore the scheme is unlikely to be beneficial.

South Australia's expected case

The outcomes of the cost benefit analysis for the expected case are illustrated in Figure 7. We note that the expected customer growth scenarios is represented by the red dotted line, the breakeven point is represented by the black dotted line and is the point where the benefits of the scheme exceed the costs of administering the scheme.

Figure 7: Expected case cost benefit analysis for South Australia



Source: Stakeholders' submissions to PwC, PwC analysis

As can be seen from Figure 7, the cost of the reimbursement scheme exceeds the expected benefits and SA would require at least 33 additional customers per year for the scheme to deliver a net benefit.

New South Wales

As discussed above, the higher expected cost of connection for NSW is because gas connections are generally higher in NSW.

The results of the modelling under the three scenarios demonstrate that the scheme would not deliver a net benefit irrespective of the cost scenario. Our results are demonstrated in Table 16.

Table 16 : Cost benefit analysis – New South Wales

	Scenarios		
	Best case	***Expected case***	***Worst case***
Additional (induced) connections - % of customers who inquire but don't connect	35%	25%	15%
Net benefit per connection	$53,466	$53,466	$7,764
Number of additional (induced) connections per year	104	74	45
Total benefit of the scheme	$5,560,444	$3,956,469	$349,401
Cost of implementing and administering the scheme	$7,814,446	$7,814,446	$7,814,446
Net benefit of the scheme	$(2,254,002)	$(3,857,977)	$(7,465,045)
Number of connections per year required for the scheme to be beneficial	146	146	1,006

Source: Stakeholders' submissions to PwC, PwC analysis

Note: Parentheses refers to negative numbers

The results indicate that the scheme is not beneficial in NSW and this is attributed to low gas consumption in contrast to that of electricity. Henceforth, since the benefit is derived from the transfer of energy usage from electricity to gas and gas consumption in NSW is low, there is a low amount of energy transferred.

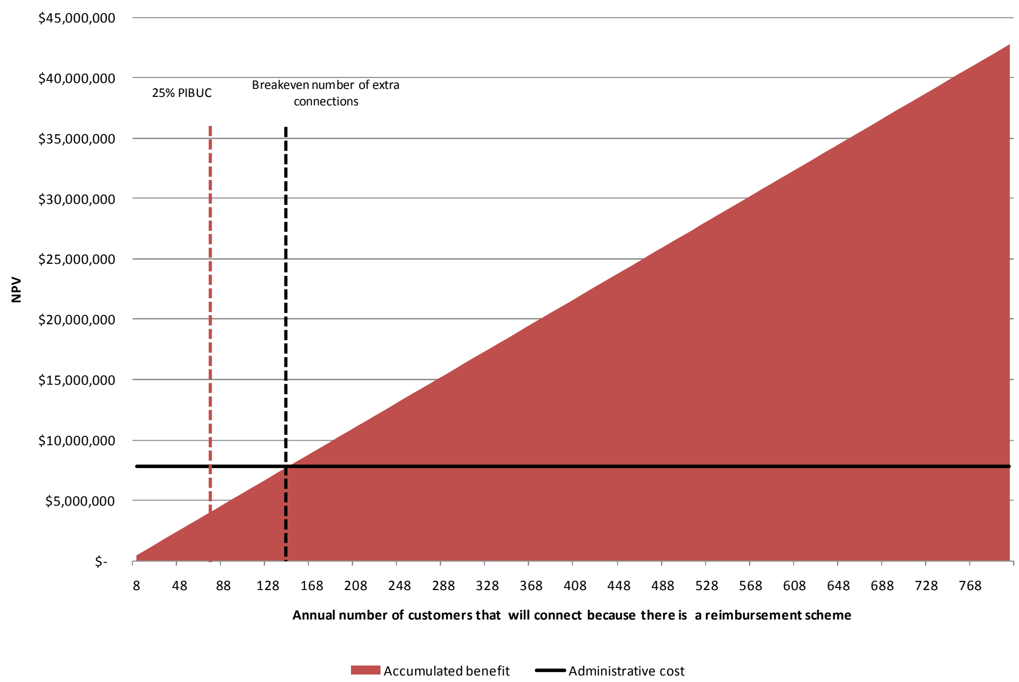
We note that in order for the scheme to be beneficial, at best we would need 146 new connections, and at worst 1,006 new connections, would need to occur every year. Information from distributors suggests the scheme would potentially give incentives to a range of 45 to 104 customers to connect; therefore the scheme is unlikely to be beneficial.

We also note that the scheme would become beneficial in NSW if its implementation costs were under $1.15 million (assuming that 25% of customers who may benefit from the scheme, decide to connect due to the existence of the scheme). Considering the complexities of the system discussed before, we believe this is unattainable.

NSW's expected case

The outcomes of the cost benefit analysis for the expected case are illustrated in Figure 8. We note that the expected customer growth scenarios is represented by the red dotted line, the breakeven point is represented by the black dotted line and is the point where the benefits of the scheme exceed the costs of administering the scheme.

Figure 8: Expected case cost benefit analysis for New South Wales



Source: Stakeholders' submissions to PwC, PwC analysis

As can be seen from Figure 8, the cost of the reimbursement scheme exceeds the expected benefits and NSW would require at least 146 additional customers per year for the scheme to deliver a net benefit.

Queensland

The results of the modelling under the three scenarios demonstrate that the scheme would not deliver a net benefit irrespective of the cost scenario. This is demonstrated in Table 17.

Table 17 : Cost benefit analysis – Queensland

	Scenarios		
	Best case	***Expected case***	***Worst case***
Additional (induced) connections - % of customers who inquire but don't connect	35%	25%	15%
Net benefit per connection	$6,315	$6,315	$(13,908)
Number of additional (induced) connections per year	16	11	7
Total benefit of the scheme	$101,033	$69,460	$(97,358)
Cost of implementing and administering the scheme	$2,451,557	$2,651,557	$2,851,557
Net benefit of the scheme	$(2,350,524)	$(2,582,097)	$(2,948,915)
Number of connections per year required for the scheme to be beneficial	388	420	N/A

Source: Stakeholders' submissions to PwC, PwC analysis

Note: Parentheses refers to negative numbers

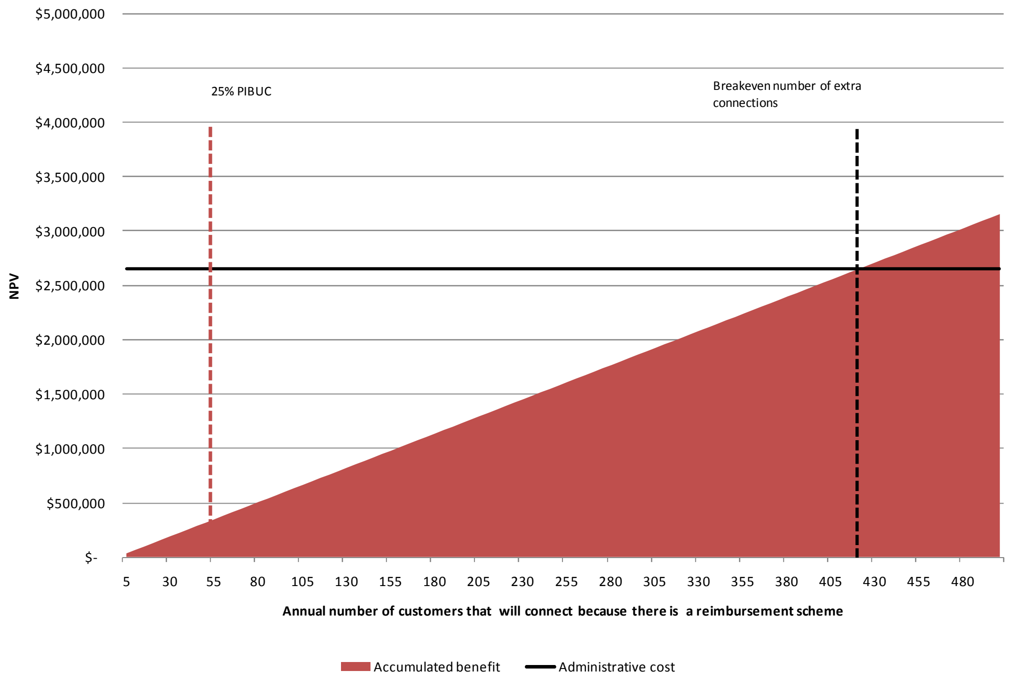
The outcomes indicate that the scheme is not beneficial in QLD and this is attributed to the small size of the pool of potential customers that may benefit from the scheme, estimated at 43 customers, and the low gas consumption.

We note that in order for the scheme to be beneficial, at best we would need 388 new connections would need to occur every year. At the worst, the each connection is not beneficial to the scheme at all. Information from distributors suggests the scheme would potentially give incentives to a range of 7 to 16 customers to connect, therefore the scheme is unlikely to be beneficial.

Queensland's expected case

The outcomes of the cost benefit analysis for the expected case are illustrated in Figure 9. We note that the expected growth scenario is represented by the red dotted lines. The breakeven point is represented by the black dotted line and is the point where the benefits of the scheme exceed the costs of administering the scheme below the black dotted line, the chart shows that in the base case, the reimbursement scheme is not net beneficial.

Figure 9: Expected case cost benefit analysis for Queensland



Source: Stakeholders' submissions to PwC, PwC analysis

As can be seen from Figure 8 the cost of the reimbursement scheme exceeds the expected benefits and Qld would require at least 420 additional connections per year for the scheme to deliver a net benefit.

Summary of the quantitative analysis

The quantitative results would suggest that the introduction of a gas reimbursement scheme would not deliver a net benefit in Victoria, South Australia, New South Wales or Queensland. The chief reason for this is that, for any given level of connection costs, there are insufficient extra customers caused by the reimbursement scheme to compensate for the costs of administering the scheme.

We undertook sensitivity analysis to determine whether changing the methodology to estimate benefits, as well as different levels of scheme administration costs changes the outcome of our analysis. We found that in general, varying the connection cost or administration cost of the scheme do not change the result of the scheme being not net beneficial.

This analysis is consistent with the feedback from stakeholders that the cost of the scheme, as well as the lack of extra connections due to the reimbursement scheme is not going to render the scheme feasible. The primary reason that customers do not connect to the gas network is the large initial upfront capital cost they are required to pay and not the absence of a reimbursement scheme.

A summary of our findings is detailed below in Table 18.

Table 18 Summary of cost benefit analysis – expected case

State	*Total benefits of the scheme**	*Cost of implementing and administering the scheme^*	*Net benefit of the scheme*
Victoria	$1,168,538	$3,977,335	$(2,808,797)
SA	$437,804	$1,325,778	$(887,974)
NSW	$4,010,203	$7,814,446	$(3,804,243)
QLD	$77,447	$2,651,557	$(2,574,109)

5.4.6 Materiality threshold

As per the terms of reference, we have undertaken an analysis on the effect of varying the materiality threshold.

The role of a materiality threshold is to ensure that the scheme applies only to cases where a reimbursement may be effective in inducing additional connections in order to minimise the cost of implementing and administering the scheme.

In consulting with stakeholders, PwC sought their views on the level of a materiality threshold that would be reasonable for residential and non-residential customers. A materiality threshold of $1,000 was seen by regulators and government agencies as a realistic amount. In contrast, distributors were of the view that:

- the threshold should be set to capture customers who do not connect at the moment. The sensitivity level for most residential customers is considered to be around $5,000
- for commercial/industrial customers, the issue of a threshold is less significant as they are mostly concerned with simple economics at the time of connection. That is, they cannot run their business on the hope that another customer will connect along the mains extension at a future (uncertain) date

As discussed above, for the purposes of the quantitative analysis, we have assumed a materiality threshold of $1,000. However, as requested by the Department, we tested the sensitivity of the materiality threshold – including the $5,000 - $10,000 thresholds proposed by the distributors.

We have undertaken a sensitivity analysis only for NSW as it is the only jurisdiction where we have assumed that the volume of potentially reimbursable extensions will warrant an automated system, and hence where a materiality threshold could reduce the cost of the scheme. This is because with a high materiality threshold, fewer customers may be affected by the scheme and hence it could be argued that a manual system may be suffice. These different scenarios are considered below.

An increase in the materiality threshold impacts the three interrelated parameters in our analysis. In particular, a higher materiality threshold will:

- *decrease the expected number of induced connections* as a result of a reduction in the size of the pool of customers who may benefit from the scheme, which in turn will reduce the total benefit of the scheme

- *increase the average cost of connecting the additional customers* – thus reducing the economic benefit per induced connection

- *decrease the cost of the scheme* - as discussed before, there is a substantial difference in the cost of implementing an IT system that is largely manual and one that is fully automated. The main driver as to whether a simple or complex system would be required depends on the number of connection expected under the reimbursement scheme

We have assumed that, with a $5,000 materiality threshold, the NSW distributor would be able to implement the lower cost manual IT solution.

Our inputs and findings of the scenarios for the materiality threshold given this assumption are described in Table 19 below.

Table 19 – New South Wales – Increase in materiality threshold sensitivity analysis

Materiality threshold	*$1,000*	*$5,000*
Cost of implementing the scheme	$5,000,000	$200,000
Annual maintenance cost of the scheme	$250,000	$100,000
NPV of the cost of implementing and administering the scheme	$7,314,446	$1,325,778
Number of expected connections per year based on 25% of customers	74	35
Total benefit of the scheme based on the number of customers who decide to connect due to the scheme	$3,956,469	$936,288
Number of connections per year required for the scheme to be beneficial	146	50

As explained before, when a high materiality threshold is applied fewer customers are likely to benefit from the scheme and the cost of the scheme will also reduce. As can be seen in Table 19 above, we have assumed that the costs will match the costs used across the other jurisdictions. We note that this assumption is for illustrative purposes only and is an unrealistic assumption.

Our findings from this analysis are that an increase in the threshold is likely to reduce (not increase) the efficiency benefits of the scheme. This is attributed to the fact that as the threshold increases, the group of customers to whom the scheme applies to would be required to make a larger capital contribution to connect them to the network, thus reducing the efficiency benefits from transferring their energy use from electricity to gas.

5.5 Qualitative assessment

The cost benefit analysis of the gas reimbursement scheme primarily consists of a quantitative analysis however there are certain aspects of the scheme which are integral to the analysis but are unable to be captured in the cost benefit model.

5.5.1 How many connections will a reimbursement scheme induce?

In the cost benefit analysis above, we have assumed that 25% of customer who inquire but don't connect would be induced to connect, merely as a result of the reimbursement scheme. However, distributors and customer groups consulted emphasised that it is unlikely that the gas reimbursement scheme will increase the likelihood of consumers paying the upfront capital cost as there is no certainty associated with the reimbursement (probability, timing and size) and therefore, consumers are unlikely to accept the risk and proceed to connect on the chance of receiving a reimbursement.

This view suggest that the net benefits of the scheme discussed above, more likely than not, would overstate the benefits of a reimbursement scheme.

5.5.2 Fairness

One of the motivations for a reimbursement scheme is because it avoids the situation whereby the second connecting customers can 'free-ride' on the pioneer's contribution, which may be considered to be inequitable (free-riding also has efficiency implications, which are discussed next).

However, our consultations suggest that this equity issue is not substantial.

Distributors pointed out that the level of complaints in relation to gas mains extensions is minimal. They argued that if customers were really concerned about free-riding issues, complaints would be higher. During the consultations, we contacted the ombudsmen offices in every jurisdiction and were unable to talk to find any officer who had experience in 'free-rider' complaints. We consider that this corroborates the distributor's views.

5.5.3 Efficiency- related free- riding considerations

One of the rationales for the proposed introduction of the reimbursement scheme is the concern that free-riding may deter investment (as well as being inequitable, as addressed above). Without a reimbursement scheme, customers who connect after the pioneer customer would avoid the capital contribution charge and thus 'free ride' at the expense of the pioneer customer, which it is argued may lead both customers to hold off in the hope of being able to free-ride.

This potential to 'free ride' may discourage any party from 'pioneering' an extension even though it may be beneficial. Society would be worse off because an extension that would have generated more benefits than it cost to build will not be built. The requirement for the subsequent connecting customer(s) to reimburse the pioneer removes this potential for strategic behaviour. Indeed, if there are multiple potential pioneers, then a reimbursement scheme may provide an incentive for all potential pioneers to negotiate their connection arrangements jointly at the outset, which is the most efficient option.[40]

Also, the existence of the reimbursement scheme may make it more likely that a pioneer would sponsor an efficient extension (that is, one where the total benefit from using the extension – Which includes the benefit obtained by the pioneer and all subsequent connectors – Exceeds the cost). This would arise if the pioneer expected a subsequent reimbursement and factored this into its decision of whether to proceed.

5.5.4 Effect of free-riders not connecting to the gas network

However, offsetting this, once the extension is in place it is a 'sunk investment' and imposing the reimbursement charge on a subsequent customer may dissuade an otherwise efficient connection. In particular, the minimum charge that a customer would normally pay for connecting and using the distribution network is the long run incremental cost, which encourages an efficient choice of whether to connect. A reimbursement scheme would mean that the minimum charge would rise above long run incremental cost by the extent of the reimbursement required. If the application of the reimbursement dissuades a connection, then it is inefficient.

The existence of a reimbursement scheme can create greater incentives for the pioneer customer to connect as there is a possibility of the capital contribution being reimbursed within the seven year period. Offsetting this however, is the disincentive for secondary customers to connect as they must reimburse the pioneer customer. This offsetting effect may discourage consumers that would otherwise connect to gas. The existence of a reimbursement scheme may mean that secondary customer will delay connecting (for the seven year period) or not connect to gas at all.

Importantly, the effect of the free-riders not connecting to the network has not been included in the quantitative analysis due to lack of information. However, we expect that this effect would basically offset the small benefits expected from the scheme.

5.5.5 Summary of the qualitative assessment

Distributors and customer groups believe that the existence of a gas reimbursement scheme is unlikely provide the impetus for customers to connect to gas as the size and timing of future reimbursements are uncertain.

Distributors acknowledged that there are cases where a national gas reimbursement scheme could apply but questioned if the existence of a scheme would actually alter incentives. The view is that a reimbursement scheme would not have any impact on the pioneer's decision making process as consumers are unlikely to accept the risk and proceed to connect only on the possibility of receiving a reimbursement.

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[40] This permits the extension to be designed to meet the combined needs of all parties, thus lowering the cost of the required new investment.

5.6 Conclusions and recommendations

The quantitative results suggest that the introduction of a gas reimbursement scheme would not deliver a net benefit in Victoria, South Australia, New South Wales or Queensland. The primary reason is that, for any given level of connection costs, there are insufficient extra connections caused by the reimbursement scheme to compensate for the costs of administering the scheme.

This analysis is consistent with the feedback from stakeholders. Distributors and customer groups believe that the existence of a gas reimbursement scheme is unlikely to provide the impetus for customers to connect to gas as the size and timing of future reimbursements are uncertain.

Therefore, based on stakeholder feedback and our own analysis, it appears likely that the scheme will not deliver the expected benefits due to the following:

- Gas is not comparable to electricity as it is not necessarily an 'essential service', especially in jurisdictions where gas has not yet been widely reticulated
- According to customer groups, the key factor in a customer's decision making process relates to the size of the upfront contribution; and not the possibility of a reimbursement
- Customers who are willing to connect, may change their mind when faced with a capital contribution
- The cost of the scheme is likely to exceed the benefits of the scheme particularly given that only a very small percentage of total connections would be eligible under the scheme.

In summary, whilst we acknowledge that a reimbursement scheme will address issues in relation to equity and fairness, we don't believe that the gas reimbursement scheme will achieve its objectives of economic efficiency. This is because the benefits of the scheme are modest when compared to the costs of setting up the scheme.

Allowing flexibility to distributors to apply a reimbursement scheme

During the consultations, distributors suggested the introduction of a voluntary scheme as this would give them discretion to apply the reimbursement scheme where it was likely to encourage additional connections and/or 'free rider' concerns were substantial. This voluntary scheme could have the characteristics described in Part1 of this report.

Based on our analysis, we see merit in allowing distributors such flexibility, instead of introducing a mandatory gas reimbursement scheme. In our view, the Gas Rules may need to be amended to permit the distributors to implement a reimbursement scheme as the intention would be to charge the second customer an amount that would exceed the Reference Tariff and the normally – calculated connection charge. In any event providing clarity that a reimbursement scheme could be implemented would be desirable as it would provide certainty and could usefully set out the minimum requirements the scheme should comply with.

In our view, a voluntary scheme is likely to be beneficial because the incentives of the distributors are in line with the objectives of the 'Gas Connection Framework.' As noted by distributors, they have an incentive to connect as many customers to gas as possible. This is demonstrated by the fact that gas distribution businesses often have marketing campaigns in place, particularly in jurisdictions with low gas reticulation.

We also note that under a voluntary scheme there is **no need for a materiality threshold**.

Appendices

Appendix A Jurisdictional arrangements

The table below sets out a brief summary of the capital contribution and reimbursement arrangements for the electricity industry in the jurisdictions. We have not been able to identify reimbursement schemes in the gas sector and thus capital contribution policies in the gas sector have not been included.

Jurisdiction	*Connection price paid*	*Reimbursement scheme*	*Materiality threshold*
NSW (electricity) Source: IPART 2002 Determination on Capital Contributions.	Customer will pay for the direct costs of establishing the connection up to a defined point of connection to the network. These direct costs are those involved in providing and installing the lines and equipment that are dedicated to that customer. The distributor will pay for all other costs (i.e. augmentation). Exceptions to this rule are customers in rural areas and large load customers. As well as paying connection costs, these customers may be required to contribute to the costs of upgrading network assets (augmentation).	DNSPs are required to establish a reimbursement scheme for customers in rural areas and large load customers. The established schemes must: • reimburse the original customer according to the extent to which new customers will utilise those assets • limit the total reimbursements to the amount of the original capital contribution adjusted for inflation. For all other customer types, the DNSP must take into account the potential for further network expansion in the customer's locality in the medium term (5-10yrs).	None specified.
Victoria (electricity) Source: Essential Services Commission of Victoria 2004 Electricity Industry Guideline 14: Provision of Services by Electricity Distributors, Issue 1.	Customer does not contribute unless incremental cost exceeds incremental revenue from the connection. Charged as the incremental cost of the new connection less the incremental revenue expected from the connection plus a security fee, where incremental cost is the present value of capex, opex and other costs incurred in providing connection and incremental revenue is the incremental distribution tariff revenue the distributor will earn. If a distributor fairly and reasonably assesses that there is a risk customer will not earn expected revenue, then distributor may charge a security fee. Term of the offer is 30 years for domestic and 15 years all other customers.	If a new customer contributes in any way to the capital cost of any new works and augmentation, the distributor must allow a rebate to the pioneer customer, as well as to any other new customers who have also made such a contribution, of such amount as the distributor determines is fair and reasonable. The rebate must be allowed at once in each calendar year after the calendar year in which the connection services are provided to the new customer.	None specified.
Queensland (electricity) Source: Energex Capital Contribution Policy 2009.	The policy aims to: • Ensure the equitable treatment of existing customers, and • Send appropriate pricing signals to potential customers that reflect the true cost of network expansion. Method of calculating capital contributions:	Past contributions are not refundable. New contributions must be shared with past customers – That is, the amounts contributed by additional customers become the basis of any payment to the customer who paid the initial contribution. Energex's policies relating to the sharing of capital contributions are:	Amounts less than $100 will not be refunded.

Jurisdiction	*Connection price paid*	*Reimbursement scheme*	*Materiality threshold*
	1. Forecast Duos revenue using tariff relevant to customer class connecting discounted over twenty years using pre-tax regulatory WACC. 2. Reduce expected revenue by 10% to account for contribution to the shared network 3. Calculate incremental cost including actual cost of connection and additional costs incurred upstream (where upstream costs are material) 4. Calculate the amount of capital contribution by deducting the discounted and reduced incremental revenue from the incremental cost.	1. Initial contribution levels are reduced to zero over a period of five years (20% reduction annually from date supply is available) 2. Subsequent contributions to the initial extension should be calculated proportionate to customer size based on forecast DUoS revenue from DUoS charges applicable to the relevant customer class 3. No sharing of contributions is permitted for additional customers connected to an extension supplied under a Rural Subsidy Scheme.	
South Australia (electricity) Source: Essential Services Commission of South Australia 2009 Electricity Distribution Code , EDC/07.	The total amount that the distributor may require a customer to pay towards the cost of the connection assets, the augmentation and the extension is the greater of zero and the amount calculated by the following formula: CP = (C+E+A+CC) – R where: CP = the customer's payment under this clause; C = the cost of the connection assets as quoted by the distributor E = the cost of the extension A = the customer's allocation of augmentation CC = the amount determined as the customer's contribution to upstream customers; R = the distributor's rebate	When a customer connects to an extension, the distributor must pay to each upstream customer a proportion of a customer's contribution as follows: $Pi = CC_a \ x \frac{EP_i}{\sum EP_i}$ Where: Pi = the payment to be made to upstream customer "i"; CCa = the customer contribution calculated for the customer connecting to the extension; EPi = the extension component of upstream customer "i".	None specified.

Appendix B Tabular examples incorporating economies of scale

In chapter 3, we used an example of where the capital cost of building a pipeline extension was $1000 and the present value of the revenue expected from the pioneer customer was $150. We then set out worked examples of how the capital contribution and reimbursement amounts would be calculated taking into account each customer's relative load.

In this appendix, we use this same example but incorporate the effects of economies of scale.

Incorporating economies of scale and load

The capital cost of building a pipeline extension was $1000 and the present value of the revenue expected from the pioneer customer was $150. Thus, the pioneer customer should pay a capital contribution of $850.

If a second customer with expected revenue of $100 connects, then incorporating economies of scale, the original capital contribution should have been $750 ($1000 – $250). The first and second customers should share this cost in proportion to the loads that they take off the pipeline. Thus, the first customer should have contributed $450 ($750 x 150/250) while the second customer should contribute $300 ($750 x 100/250). This implies that the amount of the reimbursement paid to the pioneer customer is $400 (the original $850 the pioneer customer paid minus the recalculated contribution of $450). $300 of this amount is paid by the second customer and $100 by the distributor.

If a third customer with expected revenue of $125 then connects, then the relative contributions of each customer will be recalculated again. Thus, total expected revenue of the three customers is $375 ($150+$100+$125) meaning that the amount of the total capital contribution paid to the distributor should have been $625 ($1000 – $375). Using load to apportion the contribution, the pioneer customer should have paid $250 ($625 x 150/375), the second customer $167 ($625 x 100/375) and the third customer $208 ($625 x 125/375).

Thus, the pioneer customer should receive an additional reimbursement of $200 (the $450 this customer contributed after receiving the first reimbursement minus $250). The second customer should receive a reimbursement of $133 (the amount of their first contribution of $300 minus their proportion of the revised capital contribution of $167).

We have set this example out in tabular form below with each round representing when a new customer connects to the pipe.

Round	***Cust.***	***Expected Revenue***	***Capital Contribution***	***Reimbursement by previous customers***	***Reimbursement by distributor***
1	1	$150	$850	$0	$0
2	1	$150	$450	$300	$100
	2	$100	$300	$0	$0
3	1	$150	$250	$125[a]	$75[c]
	2	$100	$167	$83[b]	$50[d]
	3	$125	$208	$0	$0

[a] $208 x 100/150 = $125. [b] $208 x 50/150 = $83. [c] ($750 – $625) x (100/150). [d] ($750 – $625) x (50/150)

Incorporating economies of scale, load and point of connection.

In this example, we adjust the amount of the reimbursement for the point of connection. In the example, the pioneer customer uses 100% of a 100 meter pipeline, the second customer uses 50m of the pipeline and the third customer uses 75m of the pipeline.

In the first round, pioneer customer uses 100m of the pipeline and pays a capital contribution of $850 ($1000 – $150). In the second round, the second customer with expected revenue of $100 connects half-way (or 50m) along the pipe. Allowing for economies of scale, the original capital contribution should have been $750 ($1000 – $250).

However, the point of connection and the difference in load means that the two customers are not sharing the first half of the pipe equally. That is, the pioneer is using 60% (100/150) of the first 50m of the pipe and the second customer is using 40% (50/150).

Taking this difference in load into account, the pioneer customer should have paid $600 and receives a reimbursement of $250 — $150 from the second customer and $100 from the distributor. The second customer pays a capital contribution of $150.

If a third customer with expected revenue of $125 connects three quarters (or 75m) along the line, then:

- The pioneer customer's contribution should have been $360 and thus receives a further reimbursement of $140 from the third customer and $100 from the distributor
- The second customer's contribution should have been $90 and so receives a reimbursement of $35 from the third customer and $25 from the distributor.

This is set out in the following table.

Round	Cust.	Expected revenue	Point of connection	Capital contribution	Reimbursement by previous customers	Reimbursement by distributor
1	1	$150	100m	$850	$0	$0
2	1	$150	100m	$600	$150	$100
	2	$100	50m	$150	$0	$0
3	1	$150	100m	$360	$140	$100
	2	$100	50m	$90	$35	$25
	3	$125	75m	$175	$0	$0

Incorporating economies of scale, load and point of connection with the rolling in of the asset if it becomes economic.

In this example, the Xth customer (in this case, the fourth customer) adds sufficient revenue to make the asset economic. As a result, the Xth customer does not pay a capital contribution and all previous customers receive a refund of their outstanding capital contributions. This is set out in the following table.

Round	Cust.	Expected revenue	Point of connection	Capital contribution	Reimbursement by previous customers	Reimbursement by distributor
1	1	$150	100m	$850	$0	$0
2	1	$150	100m	$600	$150	$100
	2	$100	50m	$150	$0	$0
3	1	$150	100m	$360	$140	$100
	2	$100	50m	$90	$35	$25
	3	$125	75m	$175	$0	$0
4	1	$150	100m	$0	$0	$360
	2	$100	50m	$0	$0	$90
	3	$125	75m	$0	$0	$175
	4	$625	100m	$0	$0	$0

Appendix C Questionnaire sent to stakeholders

Part 2 of the assignment is focussing on the merits or otherwise of introducing a National Gas Reimbursement Scheme containing the design features agreed by the NPWG. This will involve an assessment of the benefits and costs of introducing the scheme in the NEM under the NGL/NGR. Part 2 is the part that we now commencing work on.

As I mentioned, we are working with the ENA to collate the information that we require to undertake the cost benefit analysis from gas distributors.

However we would also like the views of customers on how the existence of a reimbursement scheme may influence their decision to pay the capital contribution required for an extension thus connect to a gas distribution network. In other words, over the last 5 years or so, have there been instances where any of the following three scenarios has occurred:
Customers have reported their decision not to pay the capital contribution required to connect because there was no guarantee that they would receive a reimbursement of at least part of that contribution if a second (or more) customers connected
Customers have paid the capital contribution required but raised concerns about the potential for them to end up cross subsidising another customer who might wish to connect later on, or
Customers have paid the capital contribution and noted their concern that they did not receive a reimbursement of some of that contribution when a second customer did connect.

It might also be useful if you were able to provide some information on the typical amount of a capital contribution your members would pay and whether the extensions that major users have built are dedicated pipelines or have spare capacity that could be made available to a second customer. Obviously if the extension has no spare capacity then a second customer cannot connect and thus a reimbursement scheme is redundant.

Appendix D List of stakeholder consultations

State	Stakeholders	Comments
NSW	Industry and Investment	Teleconference conducted
	Jemena	Teleconference conducted
	NSW Energy & Water Ombudsman	Teleconference conducted
QLD	Queensland Competition Authority	Not consulted. Stakeholder was approached however they were not interested in speaking to us as they no longer regulate gas.
	Queensland Energy and Water Ombudsman	Not consulted. Stakeholder was approached however they were did not have time to speak with us.
SA	Envestra Limited	Written submission received
	SA Energy Industry Ombudsman	Not consulted. Stakeholder was approached however they believed this issue was outside of their scope.
	Essential Services Commission of South Australia	Not consulted. Stakeholder was approached however they believed this issue was outside of their scope.
	SA Department for Transport, Energy and Infrastructure	Not consulted. Stakeholder was approached however they couldn't be reached.
TAS	Tas Gas Retail Pty Ltd	Teleconference conducted
	Tasmania Department of Infrastructure, Energy & Resources	Teleconference conducted
	Tasmania Department of Economic Development, Tourism and the Arts	Not consulted. Stakeholder was approached however they believed this issue was outside of their scope.
	Office of the Tasmanian Economic Regulator	Not consulted. Stakeholder was approached however they believed this issue was outside of their scope.
VIC	Department of Innovation, Industry and Regional Development	Not consulted. Stakeholder was approached however they believed this issue was outside of their scope.
	SP AusNet	Face-to-face meeting conducted
	United Energy Distribution/Multinet Gas	Written submission received
ALL	Major Energy Users	Written submission received

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