Ewbank Preece
Level 8
256 Adelaide Terrace
Perth
Western Australia 6000 Australia

Telephone +61 8 9825 5644
Facsimile +61 8 9325 9948

Report to IPARC on Technical Review of AGL(ACT)'s DORC and Capex for ACT, Queanbeyan and Yarrowlumla

2 May 2000
Reference A333.01
Revision 5

APPROVAL STATUS

Prepared by: S. Campbell	Signed:	Date: 2 May 2000
Verified by: J. Elkins	Signed:	Date: 2 May 2000
Approved by: J. Bowers	Signed:	Date: 2 May 2000

REVISION STATUS

Rev No.	Description of Revision	Date	Approved
01	Draft	23 June 1999	
02	Revised Draft	15 October 1999	
03	Final Draft	24 February 2000	
04	Revised Final Draft	20 March 2000	
05	Final	2 May 2000	

Recipients are responsible for eliminating all superseded documents in their possession.

Table of Contents

1. Executive Summary

AGL Gas Company (ACT) Limited and AGL Gas Networks Limited (jointly referred to as AGL(ACT)) submitted an Access Arrangement (AA) and Revised Access Arrangement Information (RAAI) documents to the ACT Independent Pricing and Regulatory Commission (IPARC) on 5 January 1999 and 8 February 1999 respectively. These documents covered the ACT, Queanbeyan and Yarrowlumla regions. Similar documents have been submitted to IPART by AGL Gas Networks Limited (AGLGN) for the NSW system.

IPARCis in the process of reviewing the gas transportation charges from the AA and RAAI for the ACT, Queanbeyan and Yarrowlumla gas distribution networks. As part of this review, IPARC must consider amongst other things the forecast Capital Expenditure (Capex) and Depreciated Optimised Replacement Cost (DORC) pertaining to network assets.

The NSW Independent Pricing and Regulatory Tribunal (IPART) on behalf of IPARC have commissioned Ewbank Preece (EP) to conduct a technical appraisal of parts of the proposals submitted. This report details our review of the ACT, Queanbeyan and Yarrowlumla networks.

EP has also prepared a separate report for IPART covering a more extensive review of the NSW system.

The National Third Party Access Code for Natural Gas Pipeline Systems (the Code) forms the basis of the review process by IPARC. The Code sets out several specific issues that the Regulator must consider when assessing the AAs (refer to Appendix E for details on the Codes requirements).

EP were engaged by IPART on 31 May 1999 to review:

1. AGL(ACT)'s DORC Asset Valuation as at 1 July 1999 including:
   - reasonableness of the approach used by AGL(ACT) to estimate system replacement cost
   - comparison of replacement cost and optimised replacement cost
   - asset lives used for depreciation purposes

2. AGL(ACT)'s Capex for:
   - efficiency and sufficiency of actual Capex in the past five years
   - adequacy of forecast growth Capex over the next five years
   - appropriateness of the project evaluation process and outcomes

3. Contract Stand-Alone system including:
   - reasonableness of DORC optimisation methodology
   - assumed asset lives
   - forecast Operating and Maintenance (O&M) Expenditure
   - forecast Capex

In undertaking this study we considered a wide variety of information sources. These included:

- Asset Valuation Report prepared for IPART by JP Kenny Pty Limited, 27 June 1996;
- AGL(ACT), Revised Access Arrangement Information for ACT, Queanbeyan and Yarrowlumla Network, February 1999;
- Background documentation provided by AGL(ACT); and
- Other asset valuation studies completed for other regions of Australia.

These sources are referenced in detail in Appendix A.

Our review follows the format of the more detailed review of the NSW gas distribution network DORC and Capex undertaken for IPART. As the NSW and ACT gas distribution assets are owned and operated by AGL, essentially as one business, many of the concepts, methods and findings of the NSW review are applicable to the ACT system. This facilitated a much shorter and simpler study of the ACT system once the NSW review was complete. At the client's request we have not considered:

- alternative valuation approaches;
- asset valuation uncertainty ranges.
- supplementary work being conducted by AGL(ACT) for the DORC valuation

On behalf of AGL(ACT), Kinhill/PPK have undertaken another DORC study which was submitted to IPARC in October 1999. Assessment of this new DORC report is outside the scope of this report. There are a number of areas within this report where it is stated that further work will need to be carried out by AGL(ACT). Some of this additional work may have been undertaken by Kinhill/PPK.

The review is constructed in three sections and considers the scope of work under the following headings for convenience:

- asset valuation as presented in the AA and RAAI;
- Capex; and
- Contract Stand-Alone system.

A summary on the various sections of this review follows.

1.1 Asset Valuation

AGL(ACT) has proposed in its asset valuation of the ACT, Queanbeyan and Yarrowlumla networks a DORC as at 1 July 1999 of $252 million. Their DORC value is based upon:

- the 1998 AGL(ACT) technical network optimisation methodology;
- adoption of JP Kenny unit rates for Newcastle and Sydney;
- the use of economic asset lives for depreciation purposes; and
- impending Capex of $4.36 million for the 1998/99 financial year.

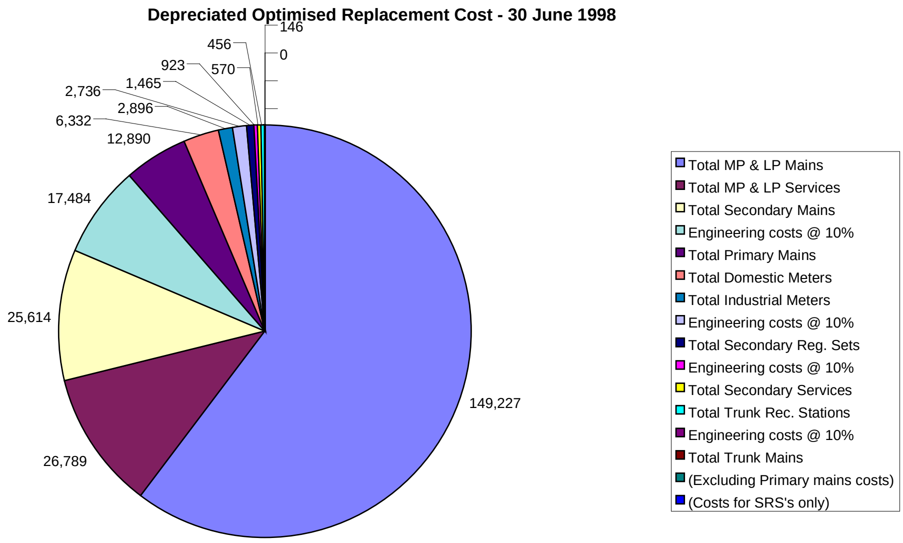
In undertaking this review we have focussed our attention on specific areas of the DORC valuation process. These are namely:

- cost element identification and appraisal;
- unit rate determination and comparisons with other studies;
- a physical reconciliation of AGL(ACT)'s assets;
- modern engineering equivalent (MEE) consideration by AGL(ACT) in the valuation;
- network optimisation;
- adopted asset life – depreciation considerations; and
- impending Capex.

The AGL(ACT) proposal is also reviewed with respect to its robustness and Code compliance for IPARC.

Figure 1-1 below summarises the valuation and contribution of each asset class to the 30 June 1998 DORC value of $248 million.

Figure 1-1 Depreciated Optimised Replacement Cost



An important feature of the valuation is the dominance of the medium pressure (MP) distribution network and customer services in percentage terms. This asset class contributes more than 70% of the total DORC valuation and is a result of servicing a large base of domestic tariff customers (approximately 72,000).There is only a small number of contract, and tariff industrial and commercial customers (approximately 1,100).

We have observed that the network is constrained at the city gate by a low delivery pressure from EAPL, and has a very temperature sensitive demand from a large "peaky" domestic load in winter.

The AGL(ACT) optimisation of network mains assets reflects these design considerations, and has resulted in an Optimised Replacement Cost (ORC) as at 1 July 1999 of $325 million. The importance of the ORC valuation is that in arriving at an optimum design outcome, AGL(ACT) proposed that the replacement cost (RC) valuation was equivalent to the ORC at $325 million, indicating that the current network design is optimal.

To our knowledge, this equivalence of ORC with RC has not been found in any other network asset valuation undertaken in Australia.

We then considered the valuation processes in more detail. In particular we addressed the:

- potential for variation in AGL(ACT)'s adopted unit rates;
- assumptions on market growth forecast;
- project management and administration costs; and
- AGL(ACT)'s new methodology for the optimisation of network mains.

These issues have confirmed a level of uncertainty in the valuation of AGL(ACT)'s network assets, which will require further investigation to quantify precisely.

Our review of AGL(ACT)'s 1999 valuation concludes that the adoption of some 1996 JP Kenny unit rates for Newcastle and Sydney does not appear to reflect (after CPI adjustment) a "New Entrant" RC for the ACT, Queanbeyan and Yarrowlumla gas networks.

In our view, AGL(ACT) has not provided a robust DORC valuation. They have advised that further work is to be carried out to more accurately reflect today's RCs and calculate a robust DORC value AGL(ACT) have developed a more extensive costing model which provides the mechanism for a robust valuation to be undertaken. This model has not yet been used by AGL(ACT). EP have not been able to fully consider the outcomes of this model at this time.

In regard to depreciation, EP agree with the asset lives and depreciation schedule proposed by AGL(ACT).

EP believe that it would be prudent if actual capital additions for the 1998/99 financial year are used, instead of the "impending assets" currently proposed by AGL(ACT).

1.2 Capital Expenditure

We undertook a review of AGL(ACT)'s:

- project evaluation methodology;
- capital expenditure decision making process;
- actual historical capital expenditure; and
- forecast capital expenditure.

Our findings in these areas are summarised below.

1.2.1 Project Evaluation Methodology

AGL(ACT) develops network models which are regularly reviewed and validated against measured quantities, which is a good practice. The options developed by AGL(ACT) are generally sound engineering solutions. The planning criteria used by AGL(ACT) are generally sound, although there may be an opportunity to revise the minimum pressure on the secondary system.

We have some concerns about the "severe winter" forecasts for tariff customers, and development of more robust forecasting models is warranted. Collection of the necessary data is likely to take several years. In the interim period, continuing to use the existing approach is the only practical course of action.

1.2.2 Capital Expenditure Decision Making Process

AGL(ACT) has published procedures which cover the evaluation of proposed capital expenditure. The authority levels for approving expenditure should be adequate to ensure adequate review prior to expenditure being authorised.

AGL(ACT)'s automated processes for evaluating minor projects consider only the direct costs and benefits and use a hurdle rate of 15%. This seems to result in prudent investments.

The documents seeking approval of capital expenditure, which we reviewed, did not provide sufficient detail to enable an informed comment to be made on the prudence of those projects.

1.2.3 Historical Capital Expenditure

Our review of the prudence of AGL(ACT)'s historical capital expenditure included:

- checks of unit rates;
- comparison of actual loads with previous forecasts;
- a review of project post audits;
- a generic analysis; and
- a review of performance indicators.

Due to the lack of information in a suitable form, we had difficulty assessing the prudence of the majority AGL(ACT)'s historical capital expenditure. In particular, we were unable to determine meaningful unit rates.

Our review of the domestic customer load projections for Canberra, which was prepared in 1995 by AGL, indicates that the projections do not align with historical data prior to their development or subsequent actual data. Also, the domestic customer projections in the most recent review of the Canberra high-pressure gas network do not align with those on which the forecast Capex in the RAAI is based. Consequently, we are not confident of the accuracy of AGL(ACT)'s domestic customer load forecasts.

AGL(ACT) does not routinely carry out project post audits as it can take many years to obtain sufficient data to make an informed assessment. No information on post audits, which may have been carried out, was available.

The generic analysis indicated that overall, the connection of additional customers and the associated upstream developments were prudent. However, we can make no comment on the prudence of individual projects.

While AGL(ACT)'s internal performance indicators, and those we derived, were not sufficiently extensive to give a complete picture, some of them did show encouraging trends.

For future reviews, the availability of cost data, such as that from an expansion of the existing activity based costing system, will be necessary to enable the prudence of capital expenditure to be assessed by IPARC.

In particular such information should enable:

- assessment of prudence of individual significant projects;
- meaningful unit rates to be calculated;
- a suite of performance indicators to be developed; and
- generic analyses of the prudence of connecting particular categories of customers to be developed.

1.2.4 Forecast Capital Expenditure

AGL(ACT)'s forecast capital expenditure has four components:

- growth related;
- system reinforcement;
- renewal/replacement; and
- contestability.

The growth related expenditure is based on forecasts of future customer connections, on which we make no comment as we understand that this is the subject of a separate consultancy. The unit rates for services and meters, which are used in conjunction with the connection forecast, are generally in the ranges we would expect. Insufficient information was available on forecast mains costs to allow us to comment definitively, although the forecast did satisfy a very broad "reality check".

AGL(ACT) proposes six system reinforcement projects, one of which, connection of the Canberra network to the EGP, we comment on in a separate report. While insufficient information was available to be able to comment on the prudence of the other five, all appear to be sound projects.
Overall, the forecast Renewal/Replacement expenditure is around what we would expect. The expenditure for Meters/Regs/Filters satisfies a broad "reality check". Other than for Leasehold Improvements, on which we make no comment, the components of the Non System assets expenditure are comparatively small and within the range expected. Consequently, we consider them to be reasonable.

A generic analysis, similar to that undertaken for the historical Capex, indicated that, based on AGL(ACT)'s forecasts, the IRR achievable by the forecast Capex should exceed that achieved by the historical expenditure and is reasonable.

1.3 Contract Stand-Alone System

AGL(ACT) have proposed a concept for regulatory tariff setting purposes of a hypothetical gas distribution system to exclusively supply the current contract customers. As a Stand-Alone system it can be theoretically valued and attributed a DORC value, Capex and O&M to allow a reasonable allocation of network costs to individual contract customers.

There is no specific references in the Code requiring an analysis of a Contract Stand-Alone concept, although its relevance pertains to the allocation of total revenue amongst services.

AGL(ACT) have provided an ORC valuation for the Contract Stand-Alone system of $14.69 million and a DORC of $11.5 million (as at 1 July 1999).

There are thirty-nine contract customers in the ACT, Queanbeyan and Yarrowlumla networks. Our specific comments follow.

1.3.1 Asset Valuation

The RC of the Contract Stand-Alone system is subject to the same variability inherent in the JP Kenny Newcastle and Sydney unit rates which have been adopted by AGL(ACT) for this valuation.

We have reservations and concerns on the application of the unit rates for both the high pressure (HP) and medium pressure (MP) network mains assets.

The effects of the adopted unit rates on the Contract Stand-Alone system valuation are uncertain and requires further investigation by AGL(ACT). A comparison of unit rates has been presented in Section 3.4, which considers current construction costs tabled during this review.

A statistical analysis is required to form a view on the adequacy of the Newcastle unit rates for the Contract Stand-Alone system valuation in the ACT.

Further, the concepts behind the DORC asset are unsubstantiated and inconsistent. This is due to AGL(ACT)'s application of an overly constrained optimisation methodology. These constraints produce a conceptual asset that too closely resembles the present system. Examples of the constraints include:

- use of existing design pressure levels;
- no consideration of MEE units that consider PE 100 pipework or small sizes in steel; and
- not selecting a least cost optimised solution from an array of technically achievable solutions.

1.3.2 O&M Budgets

We reviewed the revised proposed O&M budget for the contract Stand-Alone system. AGL(ACT) have proposed a largely arbitrary cost allocation and what is proposed is not unreasonable. However, it would be premature to assess it until the nature of the DORC asset is clearly known.

It could equally have been presented with greater or lesser costs attributed to the system. Our overall view from the desktop analysis is that the proposal is reasonable at this point in time.

1.3.3 Capex

AGL(ACT) have not identified Capex for the Contract Stand-Alone system in the next AA period.

2. Introduction

2.1 General

The ACT Independent Pricing and Regulatory Commission (IPARC) is in the process of reviewing, for the first time, the gas transportation charges over the ACT, Queanbeyan and Yarrowlumla gas distribution networks. As part of this review IPARC must consider amongst other things the forecast Capital Expenditure (Capex) and Depreciated Optimised Replacement Cost (DORC) pertaining to network assets. IPART on behalf of IPARC have commissioned Ewbank Preece (EP) to conduct a technical appraisal of parts of the proposals submitted.

AGL Gas Company (ACT) Limited and AGL Gas Networks Limited (jointly referred to as AGL(ACT)) submitted Access Arrangement (AA) and Revised Access Arrangement Information (RAAI) documents to IPARC on 5 January 1999 and 8 February 1999 respectively. These documents covered the ACT, Queanbeyan and Yarrowlumla regions. Similar documents have been submitted to IPART by AGL Gas Networks Limited (AGLGN) for the NSW system. EP has prepared a separate report for IPART covering a more extensive review of the NSW system.

This report summarises our review of the ACT, Queanbeyan and Yarrowlumla networks.

The National Third Party Access Code for Natural Gas Pipeline Systems (the Code) forms the basis of the review process by IPARC. The Code sets out several specific issues that the Regulator must consider when assessing the AAs (refer to Appendix E for details on the Codes requirements).

The importance of a robust DORC asset valuation and prudent Capex is reflected in the tariff setting methodology specified in the Code. The Code specifies a suite of items for consideration by the relevant regulator in setting the Initial Capital Base (ICB) for future AA Periods. In particular, the Code states that for existing pipelines the ICB should fall within the range defined by Depreciated Actual Cost (DAC) and DORC. Therefore, the DORC valuation assists IPARC in determining the ICB to be rolled forward in future AA Periods as the asset value which AGL(ACT) is reasonably entitled to use for tariff setting.

We make no comment on the application of DORC in establishing the ICB as this is outside our terms of reference.

Conservative (high) Capex forecasts have the effect of setting higher tariffs, whereas too aggressive (low) Capex forecasts can negatively affect safety and standards of service. For these reasons, it is important to confirm the reasonableness of the DORC valuation and Capex proposed by AGL(ACT).

AGL(ACT) have also proposed a cost and tariff allocation concept based upon a hypothetical distribution system for Contract customers only. This was in a similar manner to the concept proposed for the NSW network. Consideration of a Contract Stand-Alone system is required to provide IPARC with guidance on revenue allocation proposed by AGL(ACT).

The comments made by EP are the result of a review of information contained in many documents and provided verbally by AGL(ACT) staff. A complete list of references is provided in Appendix A of this report. Unless otherwise stated in this report we have assumed all information supplied by AGL(ACT) has been supplied in good faith and is bona fide.

Unless otherwise stated, the definitions and abbreviations of terms used in this report are as provided in Appendix A and Appendix B.

2.2 Overview

EP were engaged by IPART on 31 May 1999 to review and analyse parts of AGL(ACT)'s AA and RAAI (with supporting documentation) against the principles of the Code.

In particular, the aspects considered in this engagement were:

1. AGL(ACT)'s proposed DORC asset valuation as at 30 June 1998 including:
   - Queanbeyan assets
   - escalation of JP Kenny's Newcastle/Sydney unit rates and comparison with Victoria, Wagga Wagga and Albury
   - optimisation processes and assumptions
   - assumed asset lives
   - forecasts of impending Capex for the financial year ending 30 June 1999

2. AGL(ACT)'s Capex including:
   - efficiency and sufficiency of actual Capex in the past five years
   - Capex necessary to maintain safety and service standards most efficiently over the next five years
   - asset management practices in relation to the timing of renewal/replacement Capex
   - consistency of forecast growth Capex (ie. new connections) with growth forecasts over the next five years
   - appropriateness of the project evaluation process and outcomes

3. AGL(ACT)'s Contract Stand-Alone methodology:
   - reasonableness of DORC optimisation methodology
   - assumed asset lives
   - forecast O&M
   - forecast Capex

These terms of reference were agreed with IPART and are further detailed in the relevant report sections.

2.3 Format of this Report

This report is organised as follows:

- Section 3 The Asset Valuation Review contains an analysis of AGL(ACT)'s current asset valuation proposal for ACT, Queanbeyan and Yarrowlumla.
- Section 4 The Capex Review assesses AGL(ACT)'s historic and forecast Capex in respect to their internal decision making processes, Code requirements and studies completed.
- Section 5 The Contract Stand-Alone System Review provides a technical appraisal of AGL(ACT)'s adopted Contract Stand-Alone methodology in the areas of asset valuation, forecast O&M and forecast Capex.

2.4 Reference Documents

Reference was made to a number of documents provided by AGL(ACT) and IPART. These are listed in Appendix A. A selection of these documents are reproduced in the Appendices.

2.5 Limitations

2.5.1 General

This report is addressed to and for the sole benefit of the Independent Pricing and Regulatory Tribunal (IPART).

Ewbank Preece (EP) accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any party other than IPART.

It is not possible to make a proper assessment of the report without a clear understanding of the terms of engagement and the scope of the instructions and directions given to the engineer who has prepared the report.

2.5.2 Cost/Budget

EP has examined information contained in the AA, RAAI and other reference documents made available to EP relating to historical trends of cost, future predictions of cost and other cost information provided by AGL(ACT).

The opinions on cost or budgets are not based on comprehensive investigations. A more comprehensive investigation would need to be made if more accurate opinions or estimates are required.

The opinions are provided by EP on the basis of EP’s experience and qualifications and represent EP's best judgement as an experienced and qualified professional engineer familiar with this industry based on limited information and in a short time frame.

EP has no control over the cost of labour, materials, equipment or services furnished by others, or over contractors' methods of determining prices, or over competitive bidding or market conditions.

EP cannot and does not guarantee that proposals, bids or actual construction costs will not vary from the opinion it has provided.

2.5.3 Engineering Codes and Standards

Engineering Codes, Regulations and Standards are in a state of continuous change and may have changed since the original construction. Systems constructed in accordance with the codes and regulations in force at the time may not comply with current codes and regulations. The assets were constructed to comply with recognised Codes, Regulations and Standards. Buildings and other facilities therefore may not comply with current Codes, Regulations and Standards. The report does not provide an analysis of compliance with current codes and regulations.

2.5.4 Year 2000 Compliance

Our terms of reference did not require any assessment of Year 2000 compliance by AGL(ACT) and consequently this report offers no comment in this regard.

2.5.5 Software

A person using EP drawings and other data accepts the risk of:

- using the drawings and other data in electronic form without requesting and checking them for accuracy against the original hard copy version;
- using the drawings or other data for any purpose not agreed to in writing by EP.

3. Asset Valuation Review

3.1 Terms of Reference

The objective of the consultancy was to review and provide comment on the DORC value for the AGL(ACT) gas distribution network in the Australian Capital Territory (ACT), and Local Government Areas (LGAs) of Queanbeyan and Yarrowlumla. We are of a view that a DORC value is that depreciated value, calculated for the idealised asset that is optimised to just supply the required gas to the expected suite of customers at current service standards. To quote a particular asset value requires careful qualification of the approach adopted (and the reasoning behind that approach) in calculating the value. A DORC value is only valid (and can only be considered reasonable) within the constraints within which it was defined. Thus, a review of any asset valuation exercise requires a review of how the assumptions adopted meet the reasonable expectations of users. It has not been necessary or possible to conduct a review of the full extent of the physical network for assessing the DORC valuation. We have restricted our review to consideration of the optimisation processes, databases and assumptions used by AGL(ACT).

IPARC nominated the terms of reference for this review prior to receiving the initial AA and AAI submissions from AGL(ACT).

The scope of work executed in this review of the AGL(ACT) asset valuation included:

1. A review of AGL(ACT)'s 1998 DORC asset value, having regard to:

    - The extent of optimisation of the primary, secondary mains and medium pressure (MP) mains (in terms of diameter and length) in light of the current and projected utilisation of the system based upon information supplied from AGL(ACT);
    - The unit rates used to estimate asset value;
    - Asset lives adopted;
    - Impending assets to roll forward the existing assets as at 30 June 1998 to 30 June 1999; and
    - The unit rates used by JP Kenny to establish the 1996 DORC asset value for the Newcastle/Sydney region. In particular, consider the unit rates adopted in recent asset valuation studies for the following networks:
        - The Victorian gas distribution networks;
        - Great Southern Energy Gas Network in Wagga Wagga; and
        - Albury Gas Company Network in Albury.

2. Regard to current and projected utilisation of the system, with respect to redundant capital and optimisation methodology.

This review was conducted over the whole asset base, by LGA and asset class where possible. In some instances the information available from AGL(ACT) has not allowed analysis and reporting at this level.

EP makes no comment on the use of the full network or Contract Stand-Alone DORC valuations for Regulatory purposes.

In undertaking this "review", EP has only considered the AGLGN methodology, its applications and outcomes. We have not been directed to produce a parallel DORC calculation ourselves to compare with AGLGN's value. At this time of writing this report (June 1999) the review found some areas of uncertainty and deficiency in the AGL(ACT) process. We have not been directed to undertake this work, however we understand that many of the issues are currently being addressed by AGLGN.

3.2 National Access Code Requirements

A full extract of the applicable section of the Code is contained in Appendix E. Important requirements are highlighted below.

The Code provides a framework for Regulators to control the tariffs charged by pipeline owners. For existing pipelines, one of the elements of consideration in determining “allowable revenue” is the Initial Capital Base (ICB) for the pipeline asset. A regulated rate of return is then annually applied to a “rolled forward” capital base (to take into account new/redundant assets and depreciation) in determining one component of Total Revenue. In approving the ICB to be “rolled forward” the Code stipulates that the relevant Regulator consider, amongst other things, the value that would result from applying the “depreciated optimised replacement cost” methodology. Furthermore, under the Code the ICB should not normally be greater than the calculated DORC . At present, the Code does not attempt to provide a definitive DORC methodology to be adopted.

In any valuation methodology (under the Code), including DORC the valuation process should remove any assets not specifically utilised in providing the “Reference Services”.

Depreciation to be applied under the requirements of the Code should be based on the “economic life” of the asset or group of assets.

3.3 Overview of Asset Valuations

3.3.1 General

In July 1997 IPART released the AGLGN Limited Access Undertaking (as varied) Determination which applies to the NSW network (including Queanbeyan) until 30 June 1999. For the AA period commencing 1 July 1999, the LGA of Queanbeyan is to be bundled with the ACT and LGA of Yarrowlumla for consideration by IPARC. This is the first time an AA has been proposed for ACT and Yarrowlumla.

EP have extracted asset values from the following documents:

- JP Kenny Pty Ltd, Asset Valuation report prepared for the Tribunal, June 1996
- AGL(ACT) Limited, Revised Access Arrangement Information for ACT, Queanbeyan and Yarrowlumla Network, February 1999

Generally, valuation of AGL(ACT)’s assets have been presented on a tiered level as follows:

1. Network Distribution Assets
   - Replacement Cost (RC)
   - Depreciated Replacement Cost (DRC)
   - Optimised Replacement Cost (ORC)
   - Depreciated Optimised Replacement Cost (DORC)

2. Non-Network Distribution Assets
   - For example, vehicles, property, furniture, IT equipment, etc

3. Net Working Capital
   - To account for a funds employed approach to asset valuation

For our review purposes, the valuations have not been separated into ACT, Queanbeyan and Yarrowlumla network regions, as this level of detail was not made available by AGL(ACT).

Historically, non-network assets have been a small proportion of the total asset value. For example, non-network assets account for $5 million as at 1 July 1999. In other valuation exercises of this nature little effort has been employed in valuing non-network assets. AGL(ACT) have applied a depreciated actual cost (DAC) methodology to their non-network assets. EP offer no detailed comment as to the condition of non-network assets and their assumed accounting lives. However, we acknowledge that a DAC approach is widely used and is more logical than a DORC approach for non-network assets. In particular, a DAC approach does not incorporate the subjectivity surrounding a DORC based valuation.

EP also offer no comment on the consideration of net working capital in the asset valuation proposed by AGL(ACT).

In 1996 the Gas Council commissioned JP Kenny to conduct an ORC valuation of AGLGN's NSW network assets (including Queanbeyan). This study provided a schedule of unit rates for Sydney, Newcastle, Wollongong, Country Western and Country Southern for the purposes of valuing network assets. Country Southern unit rates were applied to the Queanbeyan assets for the purposes of network valuation. AGL(ACT) have now assumed Newcastle unit rates (with some Sydney rates) for valuing the aggregation of ACT, Queanbeyan and Yarrowlumla network assets.

AGL(ACT) propose a DORC for their assets as at 1 July 1999 of $252 million (network assets). This DORC is based upon:

- the 1998 AGL(ACT) optimisation (for 1998 assets);
- AGL(ACT) utilisation of JP Kenny unit rates for Newcastle and Sydney;
- the use of economic asset lives for depreciation purposes; and
- impending assets of $4.36 million for the 1998/99 financial year.

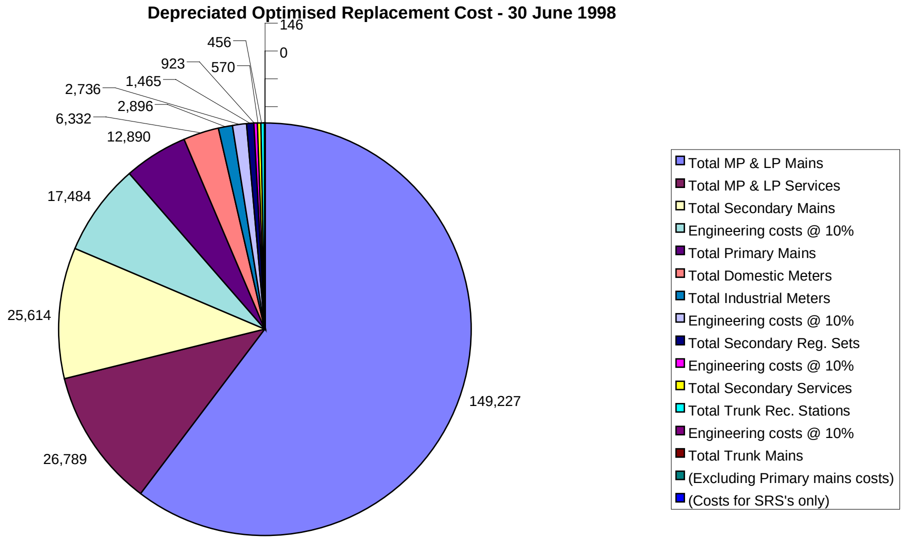
The 1999 AGL(ACT) proposal is reviewed in later sections in terms of Code compliance and is documented in the AGL(ACT) RAAI February 1999. The spreadsheets used for asset valuation purposes are reproduced in full in Appendix C. EP have considered AGL(ACT)'s processes and assumptions in the remaining portions of Section 3.

Figure 3-1 illustrates the contribution of each asset class to the 30 June 1998 DORC value of $248 million (network assets). This shows, amongst other features, that the MP distribution network and services accounts for more than 70% of the network's DORC value. The importance of this proportion is highlighted in later sections.

The AGL(ACT) gas distribution network predominantly serves domestic tariff customers. Only a small number of contract customers exist on the network at present. Of the larger loads, the customers are largely commercial as opposed to industrial in nature.

The network is also characterised by its low supply pressure at the city gate station.

Figure 3-1 Depreciated Optimised Replacement Cost



In reviewing the 1999 asset valuation, EP has appraised the methodologies, inputs and assumptions used in determining the DORC of their assets.

It is of importance to both AGL(ACT) and IPARC that a review of the 1999 valuation be undertaken:

ε to determine the RC, ORC and DORC valuations;
ε form a view on the reasonableness of using the 1996 Newcastle and Sydney base “unit rates” (developed by JP Kenny) in rolling forward AGL(ACT)’s valuations to June 1999; and
ε establishing AGL(ACT)’s ICB for future AA Periods.

The discussion, which follows, attempts to highlight departures or observed inconsistencies with the approaches to network optimisation, asset valuation and capitalisation.

3.3.2 Network Description

Gas Distribution Pressure Levels

Natural gas is delivered to the ACT, Queanbeyan and Yarrowlumla (via the city gate) at the Watson TRS via a 58 km trunk main that has a diameter of 250 mm. This lateral is owned and operated by Eastern Australian Pipelines Limited (EAPL).

The minimum delivery pressure guaranteed by EAPL is 1,200 kPag at the AGL(ACT) city gate.

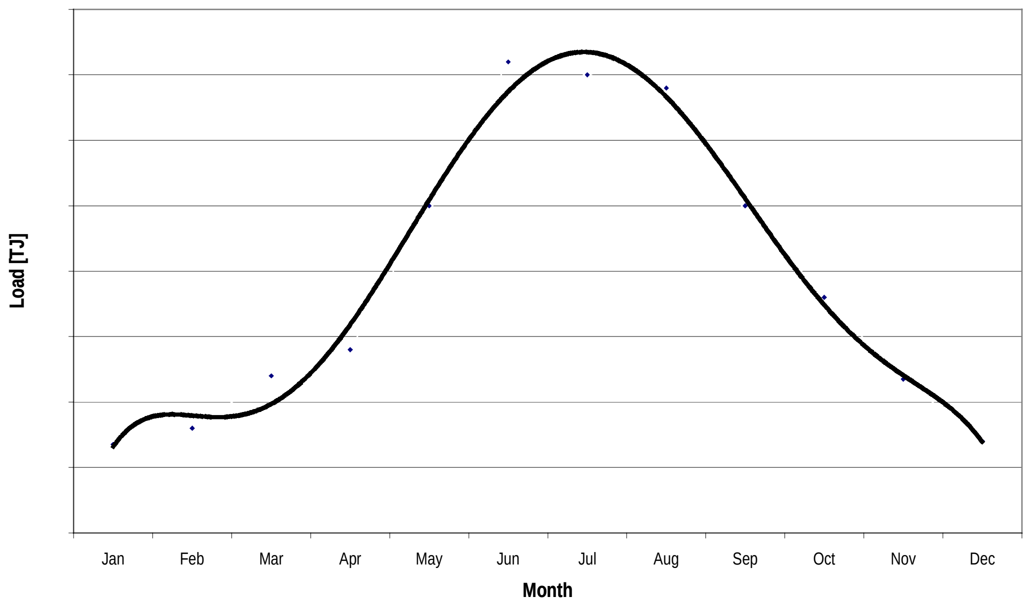
AGL(ACT) does not have a HP primary system like Sydney, and as such the TRS city gate feeds directly into the HP secondary steel system. This system has a maximum allowable operating pressure (MAOP) of 1050 kPag and is the main feeder into the medium pressure (MP) networks which operate at 210 kPag (refer Figure 3-4).

Gas Usage

The AGL(ACT) gas distribution HP steel network, which was constructed in the early 1980s is performing very closely to its original design capacity. The load growth that was forecast in 1981 has been exceeded earlier than originally anticipated. This has been confirmed by AGL(ACT) in several studies (from 1992 to 1997). Analysis of the supply capacity of the secondary system shows that it is not able to support the current winter load demands due to the EAPL minimum supply pressure at the city gate, and the load composition being mainly domestic customers.

A notional load profile for the city gate TRS is shown in Figure 3-2, which illustrates the seasonal load variation on the network.

Figure 3-2 ACT Monthly Load Profile

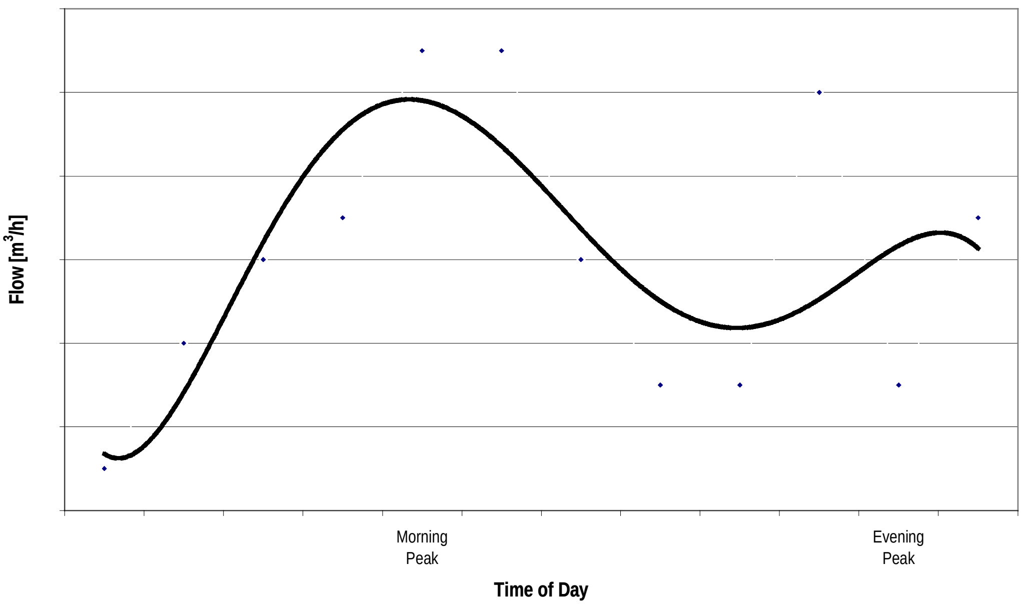


Clearly, the network capacity is required in the winter months (June/July). This is directly attributable to the load composition and the number of “degree days” (a measure of expected space heating load) at these times.

As the domestic market dominates the load demand in winter, it is useful to understand the duration of the daily load.

A notional daily load profile for winter is shown in Figure 3-3.

Figure 3-3 ACT Daily Load Profile

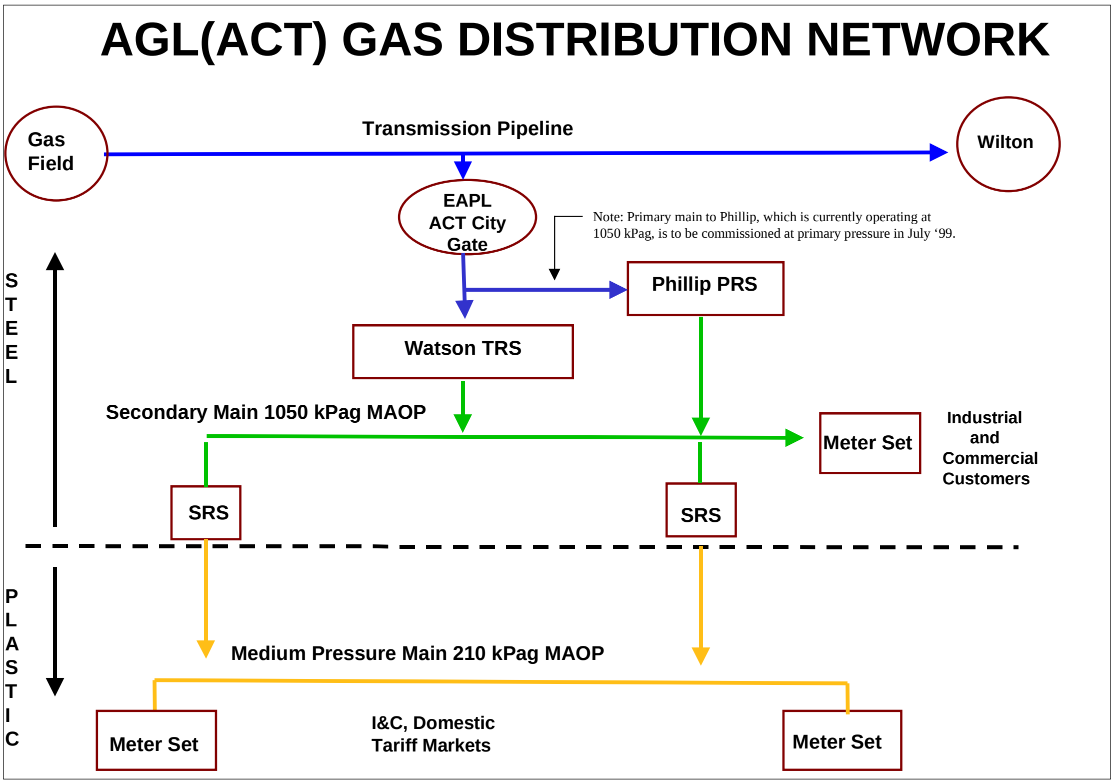


The significance and unusual feature of Figure 3-2 and Figure 3-3 is that the network design must have sufficient capacity to meet the peak hourly demands. This peak demand occurs in the AGL(ACT) network between 7.00 am and 8.30 am during winter months. The magnitude of the peak demand is dependent on the number of domestic customers, load diversity, appliance types and daily temperature. AGL(ACT) have considered the impact of the load growth predictions (historically based) on the optimisation process.

3.3.3 Identification of Cost Elements

The 1999 asset valuation identifies several asset classes from AGL(ACT)'s high and medium pressure networks as the principle cost elements valuing AGL(ACT)'s network systems. These are depicted in Figure 3-4 and described in Section 3.3.2.

Figure 3-4 Elements of AGL(ACT)'s Gas Distribution Network



The asset classes used by AGL(ACT) for valuation purposes include:

(a) High Pressure Networks:

- Primary mains
- Secondary mains

AGL(ACT) have installed 31.5 km of primary main in the high-pressure network for future augmentation purposes. This main is currently operated as secondary main (MAOP 1050 kPag). By July 1999, 25 km of main will be operating at primary main pressure (MAOP 3800 kPag) to provide additional supply capacity to the Tuggeranong area.

(b) Medium Pressure Networks:

- MP mains

(c) Engineering Costs (10% estimates):

- Associated with engineering asset classes ((a) and (b) above);
- Network control facilities for trunk, primary and secondary systems; and
- Installation of customer services and meters.

(d) Network Control Facilities:

- Trunk Receiving Stations (TRSs)
- Primary Reduction Stations (PRSs)
- Secondary Reduction Stations (SRSs)

(e) Customer Services:

- ε Contract meters and services
- ε Industrial and Commercial Tariff meters and services
- ε Domestic Tariff meters and services

At the time of reporting in February 1999, the asset classes identified above for network asset valuation were considered comprehensive and reasonably complete by AGL(ACT). Our review has revealed that other important costing elements may have been overlooked in the valuation. These include the following assets:

(f) MP – Mains Isolation Valves:
The mains isolation valves are integral network components, which control the Tariff market gas flows for maintenance and emergency isolation. There is a number of these control valves, which appear to have been overlooked in the 1999 valuation.

(g) Easement Acquisitions (HP mains):
This refers to the costs to establish and acquire a perpetual “right of way” for gas mains infrastructure, referred to as an “easement”, which have been incorporated in previous studies (refer Gas & Fuel ODRC Methodology March 1996 in Appendix G). The AGL(ACT) valuation appears to have overlooked the cost impact of this element in determining RC.

(h) AGL(ACT) Network RCs (capitalising internal operating costs):
The AGL(ACT) 1999 RC valuation identifies (non-specific) engineering as a separate cost element, applying a level of judgement to add 10% to certain asset classes in capitalising “project management and design”. This was previously estimated and applied by JP Kenny in their 1996 valuation of NSW network assets.

In our review, it was clear that other project management, network design and engineering costs incurred by AGL(ACT) could have been considered in determining the RC of certain assets. Following discussions with AGL(ACT) personnel responsible for project management and contract administration, EP are of the view that a significant amount of administrative overhead could be attributed with gas network installations in the ACT. This is the result of a tiered (and complex) approval process which exists for the majority of excavation related works in the ACT. As a result of the “streetscape” emphasis in the ACT, it is possible that the 10% allowance understates the project management and design elements of the network RC that would be incurred by a “New Entrant”.

“Total Revenue” for regulatory purposes considers asset value, Capex and O&M expenditure amongst other things. Often, expenditure elements are reasonably treated as either Capex or O&M in nature for costing purposes. It is important that costs such as project management and contract administration be considered more closely to ensure that those elements considered perhaps as O&M, are not also capitalised (in terms of Capex), and vice-versa.

There has been a level of judgement employed by AGL(ACT) in the capitalisation of project management and contract administration costs. Our preliminary comments below highlight the macro view obtained during our review of AGL(ACT) documentation.

AGL(ACT)’s practice is to capitalise expenditure, which can be directly related to Capex projects. This includes:

- ε Payments to contractors and equipment suppliers;
- ε AGL(ACT)’s direct labour costs; and

- ε AGL(ACT)'s project management costs (these costs are allocated across all projects in proportion to the project cost).

Design activities are usually expensed, although for some major projects for which cost centres are established, these costs may be capitalised.

EP offer no comment as to the degree to which such costs should be reasonably capitalised.

Due to the limited assessment undertaken we are unable to quantify, at this stage, the level of uncertainty surrounding the 10% currently proposed by AGL(ACT) from a "New Entrant" point of view.

It is important for regulatory purposes that this issue is considered further in terms of its impact on "allowable revenue".

3.3.4 Review Methodology Adopted by EP

In undertaking this review EP have focussed upon the methodologies, assumptions and unit rates used by AGL(ACT) in their determination of a DORC. This follows the determination and development process of:

(a) replacement cost;
(b) the "optimisation" of this asset; and
(c) the application of depreciation to the optimised asset.

The use of specific assumptions and methodologies by AGL(ACT) has the effect of producing a particular outcome that may not have resulted from a less constrained approach. This same comment was made in regard to the NSW valuation processes.

The asset valuation components are:

(a) Replacement Cost

In undertaking this review we have considered:

- ε the robustness of the asset register;
- ε identification and determination of cost elements or asset classes;
- ε methodologies employed in determining "unit rates" for each asset class and cost element from a "New Entrant" point of view;
- ε accuracy in valuing non-standard assets;
- ε application of escalation factors, assumptions and accurate costings to the valuation of assets; and
- ε identification of inconsistencies in the uses of asset classes.

(b) Optimisation

In considering the optimisation of network assets previous studies have adopted dissimilar approaches for optimisation resulting in different and conditional outcomes. This occurs because there are a number of possible outcomes depending upon the input assumptions, constraints and methodologies adopted to optimise the network. In order to arrive at a meaningful level of optimisation for valuation purposes, the following definitions were adopted by EP to assess the AGL(ACT) optimisation processes, methodologies and outcomes. The two primary objectives were used to define the base case for the optimisation process were:

- the conceptual optimised design that would be adopted by an aggressive “New Entrant” design which is unconstrained from a network design and MEE standpoint; and
- the achievement of a least cost optimised designs.

Both these objectives should produce an asset that lies on the boundaries of being “just feasible” and should meet the market’s expectations and requirements for gas supply and services over the AA period. AGL(ACT)’s methodology of assuming an asset configuration identical to the installed asset is not consistent with these requirements. In particular other operating pressure levels (eg 400Kpa as suggested by PPK) might produce a lower cost asset for DORC purposes.

(c) Depreciation

The Code requires the depreciation of network assets to consider the expected economic life of individual asset classes.

Individual asset classes include the following primary functional elements of the gas network:

- gas mains (HP steel, MP plastic networks);
- gas services to customers (inlet service pipework);
- metering facilities and equipment (I&C, domestic systems);
- network control facilities (TRSs, PRSs, SRSs and DRs).

In setting evaluation criteria for these assets we have adopted industry practice and assumed the technical life of assets as being equivalent to their economic life. We envisage the technical lives of the assets to be shorter than the expected availability of natural gas for the system.

The technical life adopted for network assets is dependent on a number of issues which amongst other things, includes:

- material selection and construction (plastic, steel technologies);
- network operating practises (cathodic protection);
- level of protection on mains from external and internal effects (coatings, syphoning considerations);
- level of in-situ inspection, repair and remediation;
- management practices and future plans;
- capital expenditure levels on asset management/replacement;
- industry adopted technical lives (comparison and benchmarking);

- manufacturer's warranties; and
- regulatory requirements (meter life).

These three areas are discussed in more detail below.

3.4 Replacement Cost

3.4.1 Asset Base

Section 3.3.3 outlines the cost elements used by AGL(ACT) in calculating RC. These cost elements represent the physical asset classes that comprise the AGL(ACT) gas distribution network. AGL(ACT)'s distribution network asset updating process is jointly coordinated from the offices at French's Forest and Fyshwick. Their systems employ a quality assurance system, which is well coordinated and organised to provide reliable information. EP have conducted a preliminary review of AGL(ACT)'s procedures for maintaining their asset register. The following points summarise our comments:

(a) New Assets

Network additions made by contractors are verified by AGL(ACT) staff. "As Built" documentation is analysed to produce weekly, monthly and annual asset statistics. These statistics are used to ensure the "currency" of the asset register maintained by AGL(ACT) and used for asset valuation purposes.

(b) Redundant Assets

In instances where AGL(ACT)'s network assets have been made redundant due to disconnected services and mains re-routing, the asset register is updated to reflect such changes.

(c) Mains Mapping

"As Built" information is also used to generate detailed digital representations of physical asset installations for ACT (including Yarrowlumla).

Redundant assets for ACT are also digitally recorded as another category in a cadastral database. Thus, for ACT there exists detailed mains (and major services) information for pipe size, location, material and installation date in a digital geographic format.

For Queanbeyan, detail to this extent does not exist digitally, however, an accurate asset register is still maintained and manually updated. While ACT (including Yarrowlumla) networks have been the responsibility of ACT staff, Queanbeyan assets have been the responsibility of Sydney staff. Thus, the development of mapping databases for ACT (including Yarrowlumla) and Queanbeyan have evolved separately. Sydney staff currently maintain responsibility for the network validation of all AGL(ACT) networks. Consequently, all Stoner network models for AGL(ACT) are located in Sydney.

(d) Overlooked Assets

There are several assets that have been excluded from the RC valuation. The expected effect of this omission has not been investigated.

(e) Engineering and Management:

The AGL(ACT) valuation includes an additional 10% cost element for engineering and management on top of the construction costs for certain asset classes (see Section 3.3.3). As with the NSW Network, these costs should be included for a "New Entrant", however at this stage we are unable to quantify precisely the uncertainty surrounding the proposed "10%" value.

We have not conducted a detailed review of the AGL(ACT) asset registers as it is outside our terms of reference. Throughout the review, EP has been provided with information which we have regarded as accurate and provided in good faith by AGL(ACT).

We have no reason to suspect AGL(ACT)'s asset register accuracy.

3.4.2 Unit Rates

Overview

The gas industry has adopted standard and widely accepted costing methods to determine "average costs" for the replacement, acquisition, construction and installation of identifiable components within asset classes. The "average cost" is termed the "unit rate" for an asset class or activity and is well defined within specific limits.

For example, one such activity for AGL(ACT)'s business is the laying of gas mains. It's derived unit rate is expressed as a cost in $/m for specific pipe materials and diameters (eg. 100 mm - Steel, Nylon or PE pipe).

The unit rate is then applied uniformly across the relevant asset class to determine it's total RC. (Refer to recent studies – Albury Gas Company, Revised Report on Infrastructure Asset Valuation at June 1997, October 1998 and Review of the optimised replacement cost of the natural gas distribution network in Albury, prepared for the Tribunal by Kinhill Pty Ltd, 1 February 1999).

It is important that the methodology used for deriving the "unit rate" is robust because under certain circumstances small variations in its value can result in large proportional changes in the asset's RC.

AGL(ACT) have largely implemented the Newcastle unit rates, as documented by AGLGN, in valuing the RC of the AGL(ACT) network. Table 3-1 summarises the asset classes, unit rates adopted and escalation of unit rates applied by AGL(ACT) in valuing their network assets (refer to the NSW report for comments).

EP offer no specific comment as to the CPI assumption of 2.5% used for the escalation of unit rates from 1998 to 1999.

Given the uncertainty surrounding the unit rates (and the relatively large influence on total network valuation) there is little merit in commenting in depth on the expected escalation of the true average unit rates over time. It will suffice to understand that the escalation is indeed small in this period of historic low inflation rates.

Table 3-1 Summary of Unit Rates (AGL(ACT) Valuation)

Components		1996 Unit Cost Newcastle/Sydney (JP Kenny)	ACT Unit Cost 1999
Mains	Diameter (mm)	$/m	$/m
Primary	250	410	426
Secondary	50	90	93
	100	120	125
	150	150	156
	200	220	228
	250	250	259
	350	300	311
	450	500	519
Medium	various	58	61
Services			
Secondary		2,123	2,204
MP		478	496
SRS		30,000	31,135
Meters			
Industrial	various	various	various
Domestic		184	191

In reviewing the work that was undertaken by JP Kenny in establishing the unit rates for the NSW valuation, it is apparent that JP Kenny was confronted with some uncertainty, particularly with mains laying restoration charges.

Even though large variations may result from this uncertainty, the NSW valuation used a series of precise values for mains laying by asset class, in order to present a firm outcome. These unit rates have been applied by AGL(ACT) without further qualification.

The following subsections contain our specific comments on the unit rate assumptions adopted by AGL(ACT).

MP/LP Mains

Shown in Figure 3-5 is a reconciliation of unit rates for the various pipe sizes determined by AGL(ACT) for the MP networks in the ACT, Queanbeyan and Yarrowlumla areas (which shows the adopted Newcastle unit rates and “New Entrant” costs for comparison). The “New Entrant” cost structure is derived from AGL(ACT)’s contracted schedule of rates for materials and labour, additional elements for restoration and historical costings for project management and material purchase discounts from AGLGN’s Goldline projects. Figure 3-5 also shows AGL(ACT)’s current contractor schedule of rates in isolation for the various asset classes.

Figure 3-5 MP Mains RC Unit Rate Comparisons (ACT, Queanbeyan and Yarrowlumla)

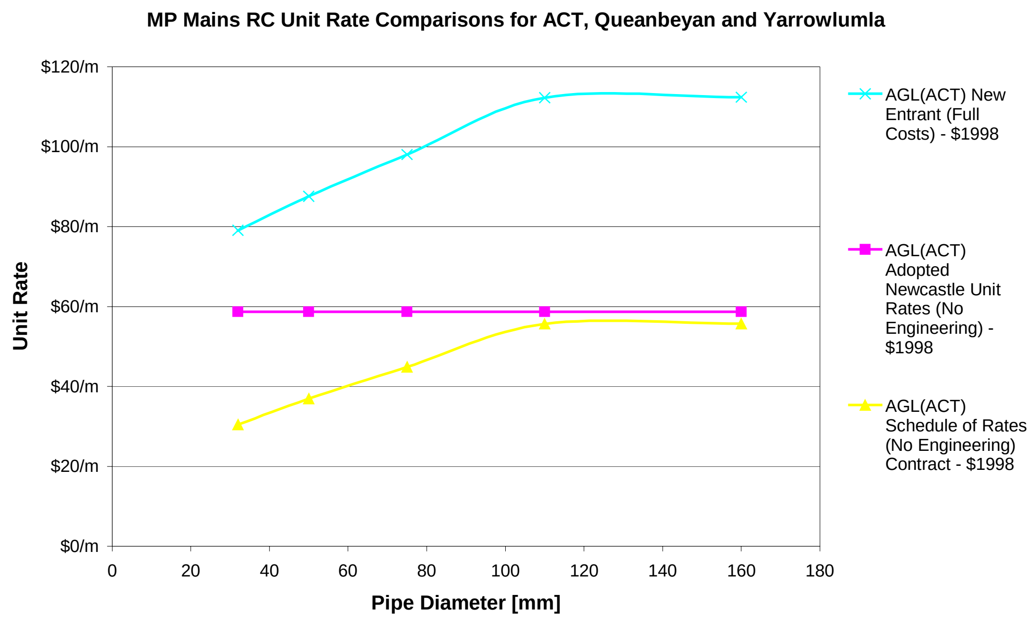


Figure 3-5 illustrates that there is a large variation in unit rates for each pipe size, or individual asset class. This shows that, in some instances the unit rate variation may be up to 150% above the lowest installed cost, depending upon the soil conditions and type of restoration required.

To determine a strict average unit rate for each category it would be necessary to statistically analyse the full range of applications. There is insufficient data available from AGL(ACT) and their accounting system to allow this analysis to be made. Consequently there exists for each asset class a range of values with no certainty of the likely distribution of values within this range.

Further data and analysis would be required to enable AGL(ACT) to determine an "average" value accurately for each asset class. Given that the MP mains asset value is a large proportion of total asset value this exercise may be warranted.

As an indication of unit rate uncertainty, Table 3-2 itemises the principal cost elements to be considered in mains laying and the variability range for the various costs elements.

Table 3-2 Unit Rates (Cost Element Considerations for Mains Laying)

Cost Elements (major costs)	Dependence upon;	Likely variation in costs as (%) of material & labour scheduled rates - (indicative %'s)
Materials	Engineering standards, Service, considerations, Operating pressure Lowest life-cycle costs	Low + (2% to 5%)

Cost Elements (major costs)	Dependence upon;	Likely variation in costs as (%) of material & labour scheduled rates - (indicative %'s)
Labour	Materials selection, technologies Steel – welding Plastics - electro-fusion, gluing Trenching & Installation methods Semi-automated mains laying	Low Medium + (5% to 10%)
Soil conditions & bedding requirements	- Geology of route Rock Clay Sand	Highly variable + (10% to 150%)
Restoration	- Existing surfaces, soil conditions (as above), State & Local Government requirements Roads (concrete, bitumen, verge) Footpaths (concrete, paving, asphalt, grass verge)	Highly variable + (10% to 150%)
Easement acquisition & planning	Land title, local government, other utilities	Case by case + (5% to 30%)
Crossings (rail, road, water)	Avoidance, Alternative Technology – directional drilling	Case by case (< 5%)
Construction economies (a) Large projects >$1,000,000 (b) Small projects <$100,000 (c) Purchasing discounts (d) Project Management (e) Administration, Cathodic Protection Mapping, etc	Greenfield operations (new projects) Large projects Small projects Brownfield additions (incremental) Large projects Small projects	Low Med + (5% to 10%) Low + (3% to 5%) Medium + (10% to 25%) High Med + (10% to 25%)
Environmental Impact Assessment & Mitigation	State, Local Government requirements	Case by case + (5% to 15%)
Engineering design	Project complexity, network integration & size	Low Medium + (5% to 10%)
Commissioning	Project size	Low + (3% to 5%)

It can be seen from Table 3-2, there can be a high level of uncertainty in determining a precise "unit rate" for mains laying (in all pressure classes) because several cost elements will vary depending upon the project scale, location, soil type and restoration costs, etc. In particular, for the ACT region there may be significant costs associated with project administration and restoration due to the rigid government requirements.

The mains unit rates in Table 3-1 (adopted by AGL(ACT)) were determined by two methods (also used in the NSW asset valuation):

- JP Kenny evaluating recent costs associated with a small sample of pipeline projects; and
- AGLGN providing documentation on insurable property, recent project costs, small mains extensions, schedule of rates for mains laying, council restoration charges and customer service connections for Sydney and country regions.

Based on our review the unit rates for MP mains appear unqualified and not cost reflective from the perspective of a "New Entrant".

Given the relative value of the MP mains system in the total asset valuation, this has a substantial effect on the asset RC.

From the review of the NSW AGLGN system and the corporate similarities between the two AA's we are of a view that the unit rates used are presently not substantiated by AGL(ACT). Their use is therefore not recommended. Further analysis by AGL(ACT) would be required to provide robust, auditable unit rates for the DORC valuation or to determine a range of these values.

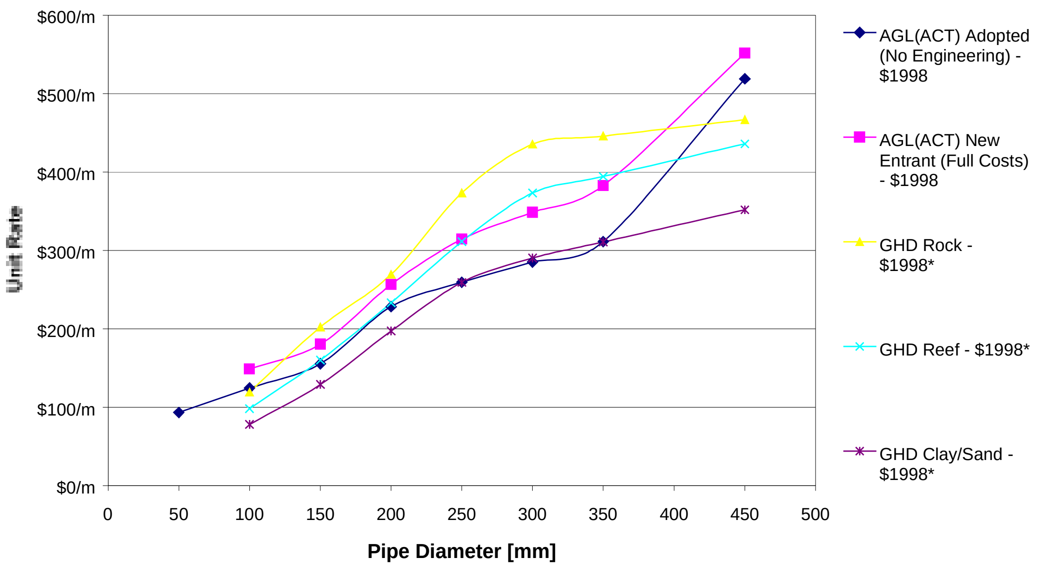
Other Mains Unit Rate Comparisons

Shown below in Figure 3-6 and Figure 3-7 is a comparison of unit rate costs for various gas mains asset classes (eg. steel, plastic) from independent valuation studies in Victoria, Albury and Wagga Wagga. The important points to consider from all these figures are:

- upward price trends in unit rates from small to large diameter pipe;
- larger diameter pipes are generally laid in high cost areas (ie. roadways);
- soil conditions influence trenching costs; and
- no two studies will achieve exactly the same unit rates; a range of unit rates is a more logical presentation of the average without a thorough statistical analysis being undertaken.

Note: The GHD and Kinhill reports should be referenced when comparing unit rates for similar asset classes as some definitions were found to vary from study to study (although the terms of reference for the unit rates were essentially identical).

Figure 3-6 HP Mains RC Unit Rate Comparisons - AGL(ACT) and GHD



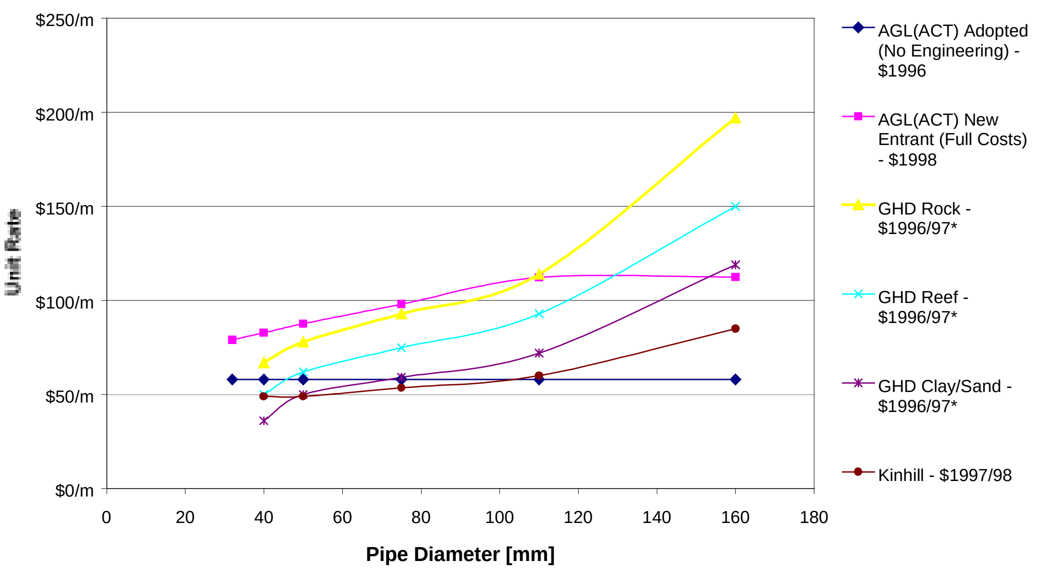


Figure 3-7 MP Mains RC Unit Rate Comparisons - AGL(ACT), GHD and Kinhill

Figure 3-6 and Figure 3-7 show that there is a large variation in the industry's view on unit rates. It is not possible from current AGL(ACT) data to accurately determine the "average" unit rate for an asset class for the whole system. Average unit rates will depend upon the weighted average costs developed from the schedule of rates applied over the whole asset. It will also depend upon the terms of reference used for the calculations.

JP Kenny adopted "actual values, escalated values and average values" for some components of the unit rate for certain asset classes in the Newcastle region. A mixture of values was finally used and not precisely specified. Consequently, the unit rates applied to the AGL(ACT) network suffer the same inherent unqualified nature as those presented in the JP Kenny study.

IPARC have queried the unit rates used in Victoria for DORC valuation purposes. We understand that the unit rates used in the Victorian studies included:

- materials and labour;
- restoration and easement costs; and
- project management and design costs.

We have not conducted a thorough audit of the actual unit rates statistics in Victoria so are unable to comment on the expected range of uncertainty that may exist with these unit rates.

Unit Rates for Tariff Customer Services and Meters

The second largest component of the June 1998 DORC, shown in Figure 3-1, are MP services. The majority of MP services are for tariff customers, particularly domestic customers.

The unit rates used by AGL(ACT) to determine replacement values and those used in other asset valuations are compared in Table 3-3.

Table 3-3 Unit Rates for Services and Meters

	AGL(ACT)/JP Kenny ($1996)	Albury/GHD Metro ($1996/97)	Albury/GHD Country ($1996/97)	Wagga / GHD ($1997/98)
Meters				
Residential	$184	$189	$189	$190
Business	Various	$1,100 to $9,900	$1,100 to $9,900	$1,500 to $8,000
Services				
Residential	$478	$625	$725	$550
Business	$2,123	$999 to $16,767	$1,030 to $16,767	$1,000 Commercial $4,000 Industrial

Kinhill used unit rates of $1,156 per service in their Wagga Wagga valuation and $660 per service in their Victorian valuation (Note: Kinhill adopted uniform unit rates for both residential and business categories).

The unit rates used by AGL(ACT) for residential meters are consistent with those used in other valuations. A variety of unit rates were used for business tariff meters, however the total value of these is small. As meters make up less than 5% of the June 1998 DORC, the accuracy of the rate is not considered material to the study.

The unit rates for residential services appear to be cost reflective and are comparable with those used for residential customers in the Albury and Wagga Wagga studies. The unit rates assumed for business services are similarly within the range used in the other asset valuation studies in Table 3-3. EP concurs with the "average" unit rates adopted for services. However, we note that on a case by case basis actual unit rates may be highly variable due to varying connection distances. The range of uncertainty in these rates is not considered material to the study.

We have focused our unit rate review on the MP, secondary, primary and trunk receiving facilities and the relevant associated services. These assets make up over 95% of AGL(ACT)'s 1998 DORC proposal. With the inherent uncertainty in unit rate value they make up a significant portion of total asset value uncertainty. The unit rates for the other minor asset classes were checked and determined to be reasonable with respect to their quantum. These smaller asset classes are not discussed further in this report.

3.4.3 Conclusion

Based on our review of AGL(ACT)'s asset registers, we have no reason to doubt the asset register accuracy.

Several issues affecting the robustness of the value of RC are:

- overlooking relevant cost components in establishing unit rates for primary and secondary networks, overlooking the effects of easement costs and an inadequate review of restoration costs on unit rates;
- overlooking the effects of capitalising project management; and
- applying a general engineering charge of 10 % to certain assets.

AGL(ACT) developed a set of unit rates for the various asset classes by reviewing the 1996 JP Kenny NSW asset valuation. This process did not determine a statistical average for each asset class from a range of potential unit rates the process selected one rate within a range of rates. This process is unsatisfactory as used by AGL(ACT).

EP considers that AGL(ACT) has not adopted a robust procedure for determining mains unit rates and as a result a potential uncertainty exists in the RC.

Specifically, the MP system has been valued by AGL(ACT) as a single asset class. We have not conducted an analysis of the rates applicable to this asset class for a "New Entrant", although a new methodology for determining unit rates has been proposed by AGL(ACT). While the unit rate used for this asset class is in the general range expected, we can make no comment on the actual average value within the range. Further analysis would be required by AGL(ACT) to determine these rates. This represents considerable uncertainty in the RC.

Secondary mains have been subject to a review of their applicable unit rates. The unit rate proposed for Secondary mains ranges between $93/m and $519/m ($1999) depending on main diameter. The quantum of uncertainty in value in this category is considered insignificant compared to the uncertainty in the MP mains. However, AGL(ACT) have proposed a "New Entrant" value for secondary mains. While we have not reviewed this proposal in detail, their calculations are presented in Appendix G for completeness.

We concur with the unit rates adopted by AGL(ACT) for District Regulators and meters. Slight differences in percentage terms are immaterial to total asset value.

The cost of services adopted by AGL(ACT) agree reasonably with costs documented elsewhere and we concur that these are reasonable within the context of the overall asset valuation.

3.5 Optimised Replacement Cost

3.5.1 Modern Engineering Equivalent Units

The expression “Modern Engineering Equivalent (MEE)” is an important concept for determining the current ORC of assets, as it allows the valuation of an asset to be based upon modern engineering design, materials, installation methods and technologies. By employing an MEE philosophy to the determination of an ORC, all changes in technology, together with their cost efficiencies can be captured for consideration in the asset valuation.

The AGL(ACT) 1999 valuation has some consideration to the application of MEE within the various network asset classes, applying the relevant engineering standards, materials and cost structures to the “Optimisation” process. However, in the JP Kenny study which is the basis for AGL(ACT)’s current “Optimisation” process”, it has been difficult to determine the extent of MEE application due to the lack of detailed discussion.

Secondary Networks

These networks normally operate at pressures up to 1020 kPa (gauge pressure), and are constructed in pressure rated (class) welded steel pipe and service the Industrial and Commercial contract and tariff markets

From our review, it appears that AGL(ACT) hold the view, that the current secondary networks (1020 kPa) are an optimal MEE solution, as defined by their guidelines, industry and engineering standards. While we concur with the use of steel pipework as the MEE we have concerns regarding the effect of the 100mm minimum diameter. The effect of this simplifying assumption are not thought to be material.

MP Networks

The MP networks at 210 kPa are constructed with modern, corrosion resistant HP polyethylene and nylon piping systems. The Industrial, Commercial and Domestic tariff gas markets and a small number of contract customers are serviced by these networks which are connected to HP “feeder mains” at District Regulator stations, where HP 1020 kPa natural gas is reduced to lower distribution pressures of 210 kPa to 300 kPa.

EP has an understanding from AGL(ACT) that they regard these networks as being a MEE “Optimised” design for ORC valuation purposes.

We do not concur with this view completely. In a full consideration of an optimised, new design, other asset classes might be considered to construct the system. These might include:

- PE 100 class pipework;
- class 400 PE pipework(as mentioned by PPK); and
- steel pipework of lower diameter than the 100 mm (minimum) used.

Refer to the discussion of the optimisation process for the impact of this limited MEE selection.

3.5.2 Optimisation Processes

The optimisation process followed by AGL(ACT) is documented in Appendix G. This involved iterative and sequential trials of reducing present pipeline diameters until the terminal conditions required were just achieved. This process of reduction starts at the extreme ends and progresses to the supply nodes.

This process has been followed for both the HP networks and Contract Stand-Alone market. “Optimisation” of the MP networks, which deliver gas to the tariff market, has not been undertaken in this manner.

The failure to consider the MP network was based upon AGL(ACT)’s belief that the system was fully loaded and already “optimal”. Also AGL(ACT) considered that the unit rates for the entire MP network were essentially similar negating the need to consider pipe size reduction to lower DORC asset value.

AGL(ACT), with hindsight have now acknowledged that; their process was deficient in some regards and is being addressed In particular deficiencies exist in:

- assumptions on unit rates ($/m),
- optimal placement of pipes and
- the MEE suite used for the optimisation process; and
- the distribution pressure constraints.

AGL(ACT) Methodology

AGL(ACT) utilised it’s “Cadastral” and “Stoner” software to arrive at a 1999 ORC valuation. Extensive work was undertaken to prepare the data and engineering specifications for the network optimisation.

This work included:

ε Cadastral mains mapping (supplemented by Microstation for Queanbeyan):

ε Mains digitisation:

Details of pipe sizing and mains lengths are digitally recorded into electronic (read only) files for the following activities:

a. Future engineering design;
b. System evaluation and data storage; and
c. Network analysis using the “Stoner” software modelling program.

At present, the digital records of AGL(ACT)’s networks utilise different systems in different locations to record ACT, Queanbeyan and Yarrowlumla mains statistics. EP assume that as the Geographic Information System (GIS) is implemented it will compile and centralise all digital records for AGL(ACT)’s networks. This will further the accuracy and robustness of existing asset registers (refer to Section 3.4.1).

The following networks have been analysed by AGL(ACT) for the ACT, Queanbeyan and Yarrowlumla regions:

– Primary mains (Watson – Phillip looping project)
– Secondary mains
– MP mains

ε AGL(ACT)’s Optimisation

AGL(ACT) has adopted a specific approach for the optimisation process. This has been documented. Appendix G contains the full AGL(ACT) document provided for this review "ACT Asset Valuation – Process and Assumptions".

EP has analysed the optimisation methodology and discussed it with AGL(ACT). To understand their process and its inherent limitations, as with every optimisation process, it is necessary to understand the assumptions and methodologies used.

The following system assumptions and parameters are used for the optimisation of the system pipework:

a. No geographic relocation of network assets, control facilities or gas mains routes to customer locations (ie. no route optimisation)
b. Use of the present system operating pressure constraints at Trunk, Primary and Secondary network interface connections (TRS 1200 kPa, PRS 1010 kPa, DRS 525 kPa)
c. Determine all the system, network, branch and nodal input gas flows and terminal pressures from Customer records, validation reports and SCADA databases
d. Network load demand determined by the addition of the following: (i) contract market flow – (booked capacity), and (ii) MHQ (Tariff market flow) (ie 20% above recorded peak flow)
e. Maintain contracted (minimum) delivery pressures for customers on routes
f. Maintain gas flow below critical velocities to prevent undue regulator and pipework noise (30m/s)
g. Maintain system reliability with the loss of any one DRS
h. Minimum pipe size for the steel system to be 100mm
i. Mains to be no larger than current network pipework
j. Pipe sizes were to be selected from a suite of AGL(ACT) "standards"

k. Contract Market Gas Flow

A spreadsheet is prepared for all contract customers. The individual contract gas flows are identified as "booked" maximum daily quantity (MDQ) and maximum hourly quantity (MHQ) which are programmed into the "Stoner" modelling software for network analysis.

The minimum contract pressure delivery requirements are stored, as well as correlated with measured flows from AGL(ACT)'s SCADA database and validation reports. The highest "peak day" flows are recorded on an annual basis and used with other SCADA data from the networks to allow a determination of load demand.

The Contract market optimisation is based upon current loads only.

l. Tariff Market Gas Flow

On 17 July 1996 AGL(ACT) utilised the data from its SCADA database on peak day flows (for the coldest day of the year minus 7°C) to determine the corresponding peak day flow for the Industrial, Commercial and Domestic Tariff gas markets. The domestic market characteristics used by AGL(ACT) have been documented in the market model projections undertaken in January 1995.

EP has reviewed the assumptions, effects and outcomes on the load demand forecast for the Domestic Tariff market. Our comments on this are included in Section 4.3.1.

AGL(ACT) indicated in their "ACT Asset Valuation - Process and Assumptions" document that no allowance for five years of tariff market growth could be adopted for load modelling and network optimisation. We are unable to comment at this point in time. ACIL is conducting a separate review on market growth predictions. The use of "one in 20" year forecasts was not considered as AGL(ACT) claimed that the secondary network would be incapable of meeting this demand.

It is worth noting that AGL(ACT) considers "diversified load demand" for all tariff customers when they undertake system and local network design. This diversification "averages" the peak and daily flow requirements over the customer base to avoid designing for arbitrarily high peak flows. This is a reasonable assumption.

In Table 3-4 is a summary of key criteria used to establish a design load for network optimisation from previous valuation studies. It is worth noting the differences in Table 3-4, as the common approach elsewhere has been to adopt shorter term views of load growth (eg 3 years), where possible.

Table 3-4 Comparison of Load Demand Criteria for Network Optimisation

Optimised Replacement Cost Study	Current Gas Load		Forecast Growth			1:20 Winter	Diversity Adjust-ment
	Contract	Tariff	3yr	5yr	10yr		
1. STRATUS/IPART Albury Gas Company – Gutteridge Haskins & Davey October 1997	✓	✓	✓				
2. ORG & ACCC Victorian Gas Transmission & Distribution Businesses – Sinclair Knight Merz February 1998	✓	✓	✓			✓	
3. IPART Great Southern Energy – Wagga Wagga – Kinhill August 1998	✓	✓		✓			
4. IPART Albury Gas Company – Kinhill February 1999	✓	✓	✓				
5. IPART AGL(ACT) - as stated by AGL(ACT) in 1999 documentation	✓	✓					✓

In summary, although the assumptions outlined above provide an "optimised" result, the process is constrained by the EAPL city gate minimum pressure delivery of 1200 kPag and would not necessarily represent an optimal network configuration under different terms of reference (refer to Section 3.5.4). In effect, it produces solutions that replicate the existing system.

3.5.3 Evaluation of "Stoner" Software

The Stoner software uses the network information provided to it in spreadsheet formats to construct a set of mathematical equations that form a model of the piping system. The solution of these equations provides predictions of pressures, flows, valve positions, compressor speeds, pipe diameters and other modelling parameters.

The Stoner software utilises the Newton–Raphson technique with Kirchhoff's first law to solve elements of the network (this is known as the nodal approach to solving a network). The network state is described in terms of *balanced, unbalanced or infeasible* and the software will ask the operator to solve the network until all unknown parameters are solved within set tolerances, and until a *balanced* solution is calculated for the network.

The AGL(ACT) optimisation methodology involves a manual iterative process to solve for minimum pipe sizes and pressures for each node in the network.

Pipe sizes are reduced to the extent that the terminal conditions of the system are just satisfied. No pipe sizes are increased if the present pipe size is less than optimal. The optimisation process itself involves an engineer to iteratively reduce the sizes of pipework in series from terminal points to source until the required supply conditions are satisfied. The "minimised" pipe size network is then adopted as an "Optimised" solution.

This optimisation methodology is different to that used elsewhere in the gas and electricity industry. The concepts employed by others can be seen in various references in Appendix A. We are of the view that the AGL(ACT) methodology has shortcomings resulting in constrained "optimised" networks.

3.5.4 Limitations of AGL(ACT) Optimisation

The AGL(ACT) methodology did not consider amongst other things:

- different pipework layouts or geography; and
- different system operating pressures.
- methods of utilising line pack to reduce the peak flow requirement

The extent of optimisation can be appraised in relative terms by comparing the change in asset value, resulting from the effects of the optimisation process (ie RC to ORC), provided the unit rates remain consistent for each asset class.

Table 3-5 shows a comparison of the change in asset values or the "extent" of optimisation undertaken in the 1998 asset valuation (ie RCs compared with ORCs).

Table 3-5 Review of 1998 Asset Valuation Optimisation

Asset Description (Class)	AGL(ACT) Replacement Cost ($1,000s)	AGL(ACT) Optimised Replacement Cost ($1,000s)	Extent of Optimisation (% change)
Primary mains	13,427	13,427	0%
Secondary mains	32,321	32,321	0%
MP/LP mains	193,917	193,917	0%
Total mains	238,745	239,665	0%
Secondary services	657	657	0%
MP/LP services	32,280	32,280	0%
Total services	32,937	32,937	0%
Trunk receiving stations	736	736	0%
District regulator sets	1,961	1,961	0%
Total regulators & valves	2,697	2,697	0%
I & C meters	4,891	4,891	0%
Residential meters	12,854	12,854	0%
Total meters	17,745	17,745	0%
Totals asset costs	293,044	293,044	0%
Engineering costs	27,693	27,693	0%
Totals	$320,933	$320,933	0%

Note: The RC tabled above supersedes the information provided in the 1999 RAAI document. In particular, it should be noted that AGL(ACT) discovered an oversight in calculating the RC documented in part of the 1999 RAAI document.

Table 3-5 shows the corrected RC as being no different from the ORC of AGL(ACT)'s networks (refer Appendix G – ACT Asset Valuation Process and Assumptions).

From Table 3-5 it is apparent that the:

- Secondary mains are not optimised;
- Trunk Receiving Stations and HP control regulators are not optimised;
- MP mains (Tariff Market) are not optimised; and
- Metering and services are assumed not to require optimisation.

While EP concur that metering and services are unlikely to require optimisation, we are unable to confirm the legitimacy of there being no optimisation possible for the remaining AGL(ACT) network asset classes.
Specifically, the optimisation of AGL(ACT)'s networks has the following limitations:

– HP Networks:

AGL(ACT) made assumptions about the operating pressure levels for the primary, secondary and MP system that mirrored their own network. For ORC purposes this is excessively constrained. A “New Entrant” would design the system today without these constraints; it would be simpler and may incorporate HP plastic pipes in place of some of the steel systems and smaller “large” MP systems. The effect of this constraint is unknown at this point in time. Further analysis would be required to estimate precisely the effects on the ORC valuation.

– MEE Range Considered:

A new plastic piping system, PE 100, is now available from overseas and local manufacturers. It has been developed for 700 kPa to 1,000 kPa applications in the gas industry. It has not been considered in the 1998 asset valuation.

The PE 100 HP rated plastic pipe could compliment the suite of pipes used in the system design and “optimisation” processes and replace the use of steel pipework at the lower end of their application and pressure ranges.

– MP Mains:

The AGL(ACT) 1998 valuation adopts a unit rate of $67/m ($1999 – inclusive of 10%) for all pipe sizes in determining the RC of 3,221 km of MP mains. The adoption of this unit rate is not reflective of actual construction costs, and by adopting a fixed unit rate implies high RCs for small pipes and low RCs for large pipes.

EP considers that it is inconsistent to adopt a methodology which develops a “single unit rate” for a group of pipe sizes within a diversified asset class, such as AGL(ACT)’s MP networks, when it is apparent that unit rate changes may have a material impact on total asset value.

This approach is not consistent with unit rates adopted in other studies and is a departure from the standard valuation processes adopted by AGL(ACT) for the steel main network.

The MP network is the largest asset (class) considered by AGL(ACT). It is valued at $194 million. Consequently, a small change in the unit rate for this asset group may have a major effect on both total RC and total ORC for AGL(ACT)’s network assets.

EP considers the valuation methodology of adopting a “single unit rate” to be unreasonable and inconsistent for this asset group.

AGL(ACT) claimed that this asset group is unable to be optimised as all pipe sizes are of the same value in the ground. We do not concur with this view.

This lack of optimisation effects the Industrial, Commercial and Domestic Tariff markets to a greater extent than the Contract market. Further work is required to determine a satisfactory and robust optimisation for this asset class. As this work has not been undertaken, EP is unable to comment on the quantum of the change to RC and ORC that may result.

We are of a view that the MP mains designed by a new entrant might be designed for pressure greater than 210kPa. An example would be Class 400 pipework where low cost regulators could still be used.

– Minimum Size Constraint:

AGL(ACT) have adopted a minimum steel pipe size for "Optimisation" purposes of 100 mm. However, they have and still use small diameters in the physical network (for connections to SDRSs). The expected effect of this constraint has not been investigated in detail. The affected asset is valued in the order of $300,000 and of minor impact on the total valuation.

– Optimal Network Selection:

The "Optimisation" process is capable of producing several alternative solutions on a technical level. AGL(ACT) have advised that they did not select the least cost networks from an array of optimised solutions. We find this inconsistent with a methodology that has as one of its criteria "least cost". The effect of this process constraint is difficult to estimate and requires further investigation.

Also, a "New Entrant" would consider the potential for redesigning the network to meet the load duration profile. A review of Figure 3-2 and Figure 3-3 and the development of a load duration histogram may produce a network design, which incorporates assets that increase network utilisation (with Demand Side Management (DSM) or utilising line pack of specific HP sections to reduce the peak flow requirements).

3.5.5 Conclusion

In undertaking this "review", EP has only considered the AGL(ACT) methodology, its applications and outcomes. We have not been directed to produce a parallel DORC calculation ourselves to compare with AGL's value. At this time of writing this report (June 1999) the review found some areas of uncertainty and deficiency in the AGL(ACT) process. We have not been directed to undertake this work, however we understand that many of the issues are currently being addressed by AGL(ACT)

We have assumed that an optimised asset design is that one which a "New Entrant" would develop in a complete system redesign (refer Section 3.3.4).

We have considered the AGL(ACT) "Optimisation" methodology against this criteria and the effect of possible changes in its underlying assumptions. As discussed, a less constrained optimisation approach may produce an optimised design different to the system now proposed by AGL(ACT).

EP reviewed the documented AGL(ACT) optimisation process. The following points, amongst others, summarise our principal concerns with their process. AGL(ACT):

ε have not optimised MP pipework;
ε incorrectly apply a single unit rate for the MP networks;
ε assumed the HP networks were optimal;
ε optimised the network using overly constrained operating pressure ranges;
ε have not considered PE 100 HP as a MEE for secondary pressure system applications;
ε have not considered the use of linepack in the optimisation process to reduce peak short term flows; and

- have not selected a least cost technical solution from several viable options.

AGL(ACT) have produced an outcome in the optimisation process where the ORC is equivalent to the RC. To our knowledge, no other optimisation study has produced this result. EP considers this outcome to be inconsistent with the objectives of the "optimisation" process, and we have not been convinced that this outcome is robust.

EP has not attempted to quantify a technical uncertainty range due to the optimisation process alone. This would require a significant amount of further work by AGL(ACT).

3.6 Depreciated Optimised Replacement Cost

3.6.1 General

The treatment of depreciation for asset valuation purposes is outlined in s8.32 and s8.33 of the Code. Straight-line depreciation has been employed in valuing AGL(ACT)'s network assets. This is consistent with the depreciation method adopted in other gas network asset valuation exercises within Australia. The Code (in s8.33(b)) requires that *economic lives* be considered for depreciation purposes. AGL(ACT), in complying with the Code, have adopted economic asset lives for the 1999 DORC valuation proposal (refer Appendix D).

The definition of economic asset life used in Victoria is *the normal or average period before it becomes necessary for safety, economic or technical reasons to replace or fully refurbish the asset* (ODRC Methodology – Gas Distribution Network Valuation 1996, Gas and Fuel Corporation, 27 March 1996 – Appendix G). This definition is in accordance with Accounting Standard SAP1 which defines asset life as *the estimated total period from the date of acquisition over which the service potential of the asset is expected to be used up in the business of the entity*. In the case of AGL(ACT)'s network assets, their economic life is equivalent to their technical life.

Appendix D presents a reconciliation of asset lives (and depreciation rates) used by AGL(ACT) and other asset valuation studies.

It is important to note that for the purposes of a DORC based valuation, the lives of existing assets are used even when they have been replaced by their MEE during the optimisation process (ODRC Methodology – Gas Distribution Network Valuation 1996, Gas and Fuel Corporation, 27 March 1996 – Appendix G).

A breakdown of the network asset lives proposed by AGL(ACT) as at 30 June 1998 is given below.

1 July 1998 (from *AGL(ACT) RAAI February 1999*):

	($ million)
Replacement Cost (ORC)	321
less Economic Depreciation	73
DRC (Network Assets)	248

Table 3-6 compares the asset lives assumed by AGL(ACT) with those used in recent asset valuation studies and includes the range of technical lives we consider reasonable for the various asset classes. A comment on each of these categories with respect to current asset condition follows.

Table 3-6 Comparison of Asset Lives

Asset Category	AGL(ACT) RAAI 1999 (Technical Lives)	Great Southern Energy Networks Wagga Wagga (Technical Lives)	Albury Gas Network (Technical Lives) GHD	Victorian Gas Networks (Economic Lives) GHD	Victorian Gas Networks (Technical Lives) SKM	EP Expected Ranges (Technical Lives)
Gas Mains – Cast Iron	50	100	50-120	50-120		50 - 80
- Steel (Protected)	80	80	120	120	120	60 - 120
Polyethylene/nylon	50	50	60	60	50	40 - 60
Gas Services / Inlet Services	50	50	60	60	50	40 - 60
Meters – Domestic	15	25	25	25	15	15 - 25
Meters - I&C	10	25	30	30	15	10 -15
District Regulators	50	40	50	50	50	40 - 50
City Gate	50	50	50	50		40 - 60

3.6.2 Gas Mains

An economic/technical life of 80 years has been proposed for AGL(ACT)'s HP gas mains network. Compared with other asset valuation studies this in the low range of what has been used. However, we consider this to be within the expected range.

AGL(ACT)'s MP network is comprised of polyethylene and nylon piping systems. An economic/technical life of 50 years has been proposed for these asset classes. This is consistent with what has been used in other asset valuation studies. We consider the proposed asset life to be reasonable given that manufacturers now provide life cycle guarantees (warranties) of 60 years for correctly installed nylon and polyethylene (class) materials for gas utility applications.

3.6.3 Gas Services/Inlet Services

AGL(ACT) employs the same materials for its inlet services and gas mains. Customers on steel mains are provided with steel inlet services. Customers on nylon mains are connected with nylon services.

An economic/technical life of 50 years has been proposed for this asset class (ie. the same life as for MP mains). This asset life is consistent with economic/technical lives used in other asset valuation studies. EP considers the proposed asset life to be reasonable and a logical progression of the materials used for such applications.

3.6.4 Meters

AGL(ACT)'s metering assets are categorised into the following market groups: Industrial &. Commercial (I&C) and Domestic. AGL(ACT) have proposed an economic/technical life of 15 years for Domestic meters and 10 years for I&C meters.

Although the proposed life for Domestic meters is in the low range of what has been used in other asset valuation studies, a life of 15 years is considered reasonable by EP as it is the current statutory requirement.

The average Domestic meter in ACT will pass on average, approximately 750 GJ over its 15-year life. These same meters in higher usage locations such as the UK, will reliably measure much larger volumes of gas over the same period. There may be significant scope to increase meter life based upon their capacity to accurately measure much larger quantities of gas than is presently the case in the ACT. We believe a comparison of gas passed by meters in the ACT with the UK would provide substantive evidence to review the current requirement.

The 10-year life proposed for I&C meters is lower than the economic/technical lives used in other valuation studies. While we are unable to specifically comment on the prudence of this assumption, we acknowledge that even a doubling of meter life would not materially affect the network's DORC valuation. Therefore we find the assumption immaterial.

3.6.5 Regulators and Valves

AGL(ACT)'s TRSs, District Regulators and primary valves have a proposed economic/technical life of 50 years. This is within the range used in other asset valuation studies and EP considers this reasonable given the market growth projections outlined in AGL(ACT) RAAI (February 1999).

3.6.6 Summary

Based on comparisons of technical asset lives with other Australian gas distribution networks, we agree with the asset lives and depreciation schedule proposed by AGL(ACT) as listed in Table 3-6 and Appendix D.

Although the assumed asset life of I&C meters is in the lower range of what we would expect, we do not believe that a review of the current assumption would have a material impact on the DORC valuation.

3.7 Treatment of Queanbeyan Assets

The 1997 AU included the Queanbeyan network assets. These network assets are now included in the AGL(ACT) AA and RAAI for ACT, Queanbeyan and Yarrowlumla Network, February 1999 submission to IPARC. As such, they have been removed from AGLGN's February 1999 RAAI for the NSW Network. The changes made to AGL(ACT)'s assets are itemised below:

- Reduction of 265,313 m of MP/LP Mains in the Southern region. At an assumed unit rate of $51/m this results in a reduction of $13.551 million in ORC
- Reduction of 9 secondary services in the Southern region. At an assumed unit rate of $1,592/service this results in a reduction of $0.014 million in ORC
- The amount of $13.545 million is increased by **10%** as an allowance for engineering to resulting in a net reduction of $14.9 million to ORC

We have no reason to doubt that the physical asset quantities indicated above are correct. However, it is important to note that the unit rates applied to the physical assets are now different. Previously AGLGN used the "Country Southern" rates and AGL(ACT) now uses ACT unit rates (which are effectively Newcastle/Sydney rates).

While we understand that this is due to the differing global assumptions adopted for the two asset valuations, we provide no further comment as to the logical nature of these differences as the decisions are largely arbitrary.

3.8 Impending Assets Forecast – DORC Valuation (1 July 1999)

The DORC valuation as at 30 June 1998, is $248 million. AGL(ACT) has provided an element of "impending assets" for the purposes of "rolling forward" the DORC valuation of the network from 1 July 1998 to 30 June 1999. The DORC network asset valuation proposed by AGL(ACT) as at 1 July 1999 is $252 million. This valuation date is intended to coincide with the beginning of the next regulatory period.

A list of the impending asset values proposed by AGL(ACT) are provided in Table 3-7**.**

Table 3-7 Impending Network Assets (1 July 1998 to 30 June 1999)

	$'000s
Replacement Cost	4,448
Depreciated Replacement Cost	4,360
Optimised Replacement Cost	4,448
Depreciated Optimised Replacement Cost	4,360

The values in Table 3-7 have been derived from Capex forecasts (in late 1998) for the financial year ending 30 June 1999. Impending assets are assumed to be optimal and depreciation is estimated by applying a 50-year economic life to the assets. EP believes a robust DORC valuation should only consider actual capital installations rather than the forecast quantities. As such, we recommend that the 1998 assets be updated with <u>actual</u> capital additions for the 1998/99 financial year. In the event that this is not possible, impending assets could be removed to provide an <u>actual</u> asset valuation as at 1 July 1998.

Further, as we understand, installation of the new Phillip PRS and it's associated value would need to be considered over the 1998/99 financial year.

3.9 Summary

3.9.1 General

This asset valuation review identifies several areas in which the robustness of the current AGL(ACT) proposed valuation is questionable. This is not unexpected given the nature of DORC, which relies on a particular valuation "philosophy". The processes and assumptions applied to the "philosophy" will often be based on industry and internal company standards. The number of possible asset valuations is limited only by the number of differing processes and assumptions adopted.

To quote a particular asset value requires careful consideration of the approach adopted (and the reasoning behind that approach) in calculating the value. A DORC value is only valid and can only be considered reasonable within the constraints it was defined. Thus, a review of any asset valuation exercise requires a review of how the assumptions adopted meet the reasonable expectations of users. While we have not undertaken a detailed valuation of AGL(ACT)'s current network assets, we have reviewed the processes and assumptions adopted by AGL(ACT). We have assessed AGL(ACT)'s methodology and assumptions against those that a "New Entrant" would use for the same system.

The full asset valuation is affected by several components, namely:

- unit rates;
- the assets included;
- optimisation methodology; and
- asset lives (depreciation).

Our comments on these areas are summarised below:

3.9.2 Replacement Cost

The RC proposed by AGL(ACT) as at 30 June 1998 is $321 million (network assets).

Based on our review of AGL(ACT)'s asset registers, we have no reason to doubt the asset register accuracy.

Several issues affecting the robustness of the value of RC are:

- overlooking relevant cost components in establishing unit rates for primary and secondary networks, overlooking the inclusion of assets (Mortlake Control Centre), effects of easement costs and an inadequate review of restoration costs on unit rates;
- overlooking the effects of capitalising project management; and
- applying a general engineering charge of 10 % to certain assets.

AGL(ACT) developed a set of unit rates for the various asset classes by reviewing the 1996 JP Kenny NSW asset valuation. This process did not determine a statistical average for each asset class from a range of potential unit rates. This process, as used by AGL(ACT) is unsatisfactory.

EP considers that AGL(ACT) has not adopted a robust procedure for determining mains unit rates and as a result, a potential uncertainty exists in the RC.

Specifically, the MP system has been valued by AGL(ACT) as a single asset class. We have not conducted an analysis of the rates applicable to this asset class for a "New Entrant", although a new methodology for determining unit rates has been proposed by AGL(ACT). Although the unit rate used for this asset class is in the general range expected, we can make no comment on the actual average value within the range. Further analysis would be required by AGL(ACT) to determine these rates. This represents considerable uncertainty in the RC.

Secondary mains have been subject to a review of their applicable unit rates. The unit rate proposed for Secondary mains ranges between $93/m and $519/m ($1999) depending on main diameter. The quantum of uncertainty in value in this category is considered insignificant compared to the uncertainty in the MP mains. However, AGL(ACT) have proposed a "New Entrant" value for secondary mains. While we have not reviewed this proposal in detail, their calculations are presented in Appendix G for completeness.

We concur with the unit rates adopted by AGL(ACT) for District Regulators and meters. Slight differences in percentage terms are immaterial to total asset value.

The cost of services adopted by AGL(ACT) agree reasonably with costs documented elsewhere and we concur that these are reasonable within the context of the overall asset valuation.

3.9.3 Optimised Replacement Cost

The ORC proposed by AGL(ACT) as at 30 June 1998 is $321 million (network assets). We have assumed that an optimised asset design is that one which a "New Entrant" would develop for a complete system. AGL(ACT)'s attempts to optimise the AGL(ACT) gas distribution network have not involved "downsizing of pipe".

We have considered the AGL(ACT) "Optimisation" methodology and the effect of possible changes in its underlying assumptions. As discussed, a less constrained optimisation approach may produce an optimised design different to the system now proposed by AGL(ACT).

The following points, amongst others, summarise our principal concerns with the AGL(ACT) process:

- they incorrectly apply a single unit rate for the MP networks;
- they assumed the HP networks are optimal;
- they constrained operating pressure ranges;
- they have not optimised the MP pipework;
- they have not considered PE 100 HP as a MEE for secondary pressure system applications; and
- they have not selected a least cost technical solution from several viable options.

AGL(ACT) have produced an outcome in the optimisation process where the ORC is equivalent to the RC. To our knowledge, no other optimisation study has produced this result. EP considers this outcome to be inconsistent with the objectives of the "optimisation" process, and we have not been convinced that this outcome is robust.

EP has not attempted to quantify a technical uncertainty range due to the optimisation process alone. This would require a significant amount of further work by AGL(ACT).

3.9.4 Depreciated Optimised Replacement Cost

The DORC proposed by AGL(ACT) as at 30 June 1998 is $248 million (network assets).

Based on comparisons of technical asset lives with other Australian gas distribution networks, we agree with the asset lives and depreciation schedule proposed by AGL(ACT) as listed in Table 3-6 and Appendix D. However, we suggest that the statutory life for domestic meters be reviewed.

Although the assumed asset life of I&C meters is in the lower range of what we would expect, we do not believe that a review of the current assumption would have a material impact on the DORC valuation.

EP recommends that the 1998 valuations above be updated with actual capital additions for the 1998/99 financial year, rather than the impending assets currently proposed.

4. Capital Expenditure Review

4.1 Terms of Reference

The objective of the consultancy was to review the Capex for the AGL(ACT) gas distribution network in the ACT, Queanbeyan and Yarrowlumla, for the previous five years and to comment on the level of prudence of that expenditure. The review was also to focus on the proposed Capex budgets for the next AA period and comment on its prudence. IPARC nominated these terms of reference for this review prior to receiving the submission of the draft AA and AAI from AGL(ACT). However, it was necessary to modify the original terms of reference to take account of the information available and supplied by AGL(ACT) and the form of information required by IPARC for their determination.

In particular this investigation will:

1. Review the available information from AGL(ACT) on their major projects undertaken in the previous five years.

   This will be with a view to the development and assessment of project performance indicators such as:

   - Numbers of customers connected per km of mains installed.
   - Average cost for a customer connection.
   - Unit rates for the installation of mains, services and meters.

2. A view will be formed from this basis of the adequacy of the five year projections of AGL(ACT). Special safety related or major acquisition projects would be assessed from their project descriptions and budget allocations.

3. The data base approach will allow analysis and reporting in the areas of:

   - HP systems by region.
   - MP systems by region.
   - Customer categories for expenditure Key Performance Indicator's.

   where the information is available from AGL(ACT).

4. This review should examine the prudence of the investments in accordance with the Code requirements.

Capex is driven primarily by the connection of additional tariff customers and, to a lesser extent, by increased consumption by existing customers. The expenditure relates either directly to the new connections or indirectly through the need to reinforce upstream networks to supply the additional load.

Upstream reinforcements and the connection of larger customers, or groups of customers such as major new housing developments, are evaluated by the Network Planning group. The evaluation of these types of developments is discussed in Section 4.3.

Smaller projects, such as the connection of individual customers, are evaluated by an automated process based on information provided by retailers. This process is discussed in Section 4.4.

In the past there has been growth in the Contract market. AGL(ACT) believes that this segment of the market has matured and that it will not contribute significantly to Capex in the future.

4.2 National Access Code Requirements

A full extract of the applicable section of the Code is contained in Appendix E. The important requirements are highlighted below.

In determining "allowable revenue" the Code states that an operator may recover the reasonable Capex (new facilities investment) incurred in maintaining the "Reference Services" provided by the gas distribution system. Reasonable Capex refers to prudent (efficient) operation based upon expected growth in consumption, accepted good industry practice and the lowest sustainable cost of delivering services.

4.3 Project Evaluation Methodology

The network planning process used by AGL(ACT) is conventional in that it involves:

- the development of load forecasts;
- the use of network models to assess the adequacy of network performance;
- the development of options to overcome expected network problems; and
- the technical and economic evaluation of those options.

It then leads into the project implementation process, which incorporates authorisation of the Capex.

Our comments on the important aspects of the planning process are outlined in the following sections.

These actual business protocols have no relation to those underlying assumptions used for DORC calculation purposes, and should not be confused. DORC is a hypothetical costing methodology whereas the business planning methodology has different assumptions, constraints and outcomes.

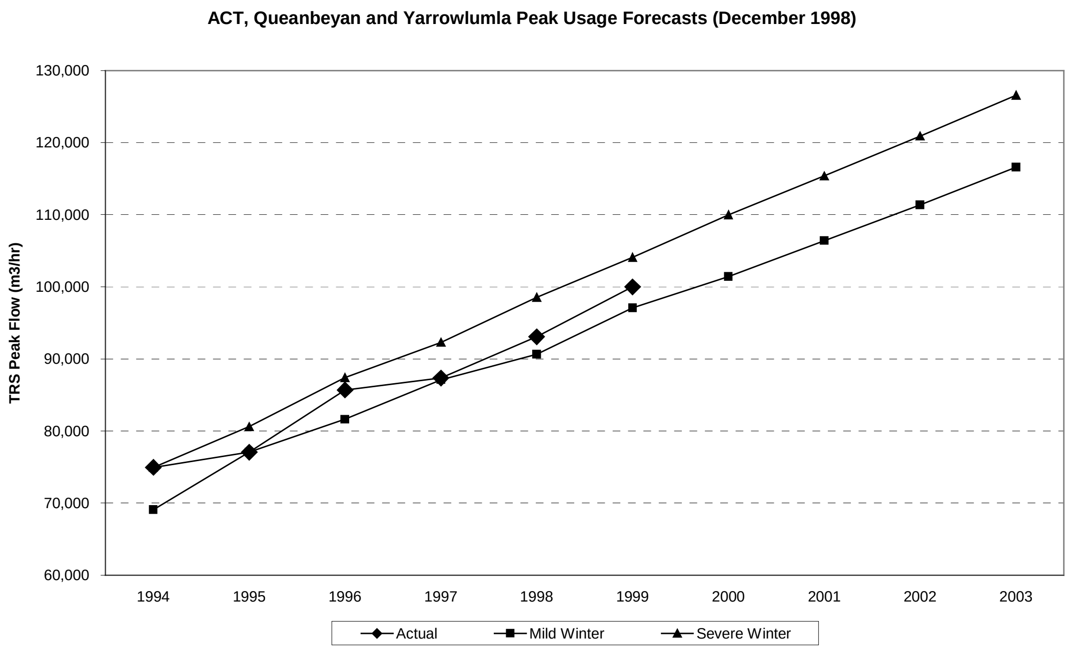
4.3.1 Load Forecasts

In planning the network, AGL(ACT) uses load forecasts which incorporate the expected contract customer loads and estimated "severe winter" year loads for tariff customers.

The expected load profile for contract loads are determined from the contracted Maximum Hourly Quantities (MHQ) and Maximum Daily Quantities (MDQ) and historical diversities. This is a sound approach.

AGL(ACT) estimate "severe winter" and "mild winter" tariff loads from the actual winter 1994 and winter 1995 loads respectively. The December 1998 forecasts are shown in **Error! Not a valid bookmark self-reference.** below.

Figure 4-1 ACT, Queanbeyan and Yarrowlumla Peak Usage Forecasts (December 1998)



We believe there is an unquantified risk that the use of "severe winter" forecast loads may result in the timing of system augmentation projects not being optimal. We recommend that data be collected to develop tariff load models, which could be used to estimate "one in 20", year loads (in a manner similar to that used for NSW, but with greater rigour). The use of "one in 20" year loads for network planning would then align with common international practice.

4.3.2 Network Models

AGL(ACT) uses Stoner software to model its networks. The models are validated annually against measured quantities obtained from the SCADA system and from gauging of pressures at selected locations (usually at network extremities).

A copy of AGL(ACT)'s document titled "Gas Network Design Criteria and Performance Validation for Supply Reliability and Growth", which describes model validation, design criteria and review of network models is included as Appendix I.

We have reviewed the methodologies and subject to other comments in this report are satisfied that the approach is reasonable.

4.3.3 Option Development

From our review of several system augmentation projects (mostly in NSW), it is clear that AGL develops sound engineering solutions.

AGL(ACT) reviews each network annually, and refines plans for larger projects as information becomes available. Authorisation of expenditure is sought, for inclusion in the budget, the year before the project is required. Where expenditure is staged over more than one-year, the total expenditure (and details of the staging) is included in the initial authorisation. Authorisation of expenditure for the second and subsequent stages is obtained from an officer with the appropriate level of authority, the year before it is required.

Also, AGL(ACT)'s practices of:

- regularly reviewing each network to update models and refine plans;
- developing long term forecasts and models to check that proposed projects are consistent with possible longer term developments; and
- staging developments and using sections of main at lower pressures for short periods, to delay Capex;

are sound.

However, we have not been able to determine if the most appropriate options have been adopted, or whether they have been implemented at the most appropriate time.

4.3.4 Planning Criteria

AGL(ACT) assesses the need to augment the network, based on minimum acceptable pressure levels, which are determined from customer requirements. This is a sound practice.

The minimum allowable pressure on the AGL secondary network of 525 kPa, is based on the pressure required on the MP system plus a minimum differential pressure of 200 kPa across the axial flow SRSs. This minimum differential pressure is based on advice from regulator manufacturers.

Historically, axial flow regulators required this large pressure drop to perform properly. However, manufacturers have developed improved models and retrofit kits which will allow these types of valves to operate at lower operating pressures.

For example, at 400 kPa new regulators with inspirator control will provide 90% of their rated capacity with a pressure drop of as low as 55 kPa.

In assessing network augmentations, AGL(ACT) should consider replacement or upgrading of regulators as this may allow the 525 kPa minimum pressure to be reduced, and consequently augmentations to the secondary network deferred. Had replacement or upgrading of regulators been considered (and been found to be feasible) when the Watson to Phillip primary main was being planned, then that main may have been able to be deferred.

4.4 The Capital Expenditure Decision Making Process

4.4.1 Capital Expenditure Procedure

AGL(ACT) uses the guidelines developed by AGL for the evaluation of Capex decisions. As these guidelines are intended to cover all types of Capex within the AGL group, they are broad.

They consider the important factors, including:

- the need to undertake the Capex;
- the timing of the Capex;
- consideration of other options;
- conducting project post audits to improve the evaluation process;
- the term of the evaluation being at least ten years (the analyses we have reviewed cover a 20 year period);
- conducting sensitivity analyses;
- inclusion of residual values;

- taxation;
- the success criteria, namely EBIT/Funds Employed, payback period and NPV;
- use of post tax nominal quantities to calculate NPV and IRR; and
- the discount rate for NPV calculations.

We consider these guidelines to be generally appropriate, subject to the following comments.

4.4.2 Expenditure Approval Authorities

AGL(ACT) uses the AGL hierarchy of authority levels for particular types of expenditure. These levels are reviewed from time to time and have changed over the last five years.

The present levels are shown in Table 4-1 below. Where the Board has approved a major project, higher authority levels for the authorisation of individual components of that project apply.

Table 4-1 AGL(ACT) Capital Expenditure Authority Levels ($'000s)

	Managing Director		Group General Manager	Group Managers and General Managers	Senior Managers	Managers/ Specialists
	Within Budget	Outside Budget				
Board Approved	Note	Note	7,000	5,000	500	50
Other	7,000	5,000	2,500	1,000	100	10

Note: The Managing Director has authority to approve expenditure up to the level approved by the Board.

These authority levels should be adequate to ensure that projects are reviewed at an appropriate level within the organisation prior to expenditure being authorised.

4.4.3 Expenditure Authorisation and Project Construction Management Systems

AGL(ACT) has database systems, referred to as the RUGS and DIGS systems respectively, which manage the project authorisation and project construction process. They are linked to each other and to the company financial databases and systems.

Minor jobs costing less than $5,000, such as the connection of a new domestic customer, are entered directly into DIGS. Other jobs are first processed through RUGS.

The RUGS System

The approval of all minor Capex is undertaken in the RUGS system, which amongst other things, manages requests for gas supply.

The evaluation process built into RUGS considers the incremental costs and benefits of the proposed expenditure over a 15-year period for commercial customers and 20 years for domestic customers. It uses a 15% hurdle rate to allow for approximations and errors in estimating capital costs and loads, and the fact that some costs, such as those of upstream system reinforcements, are not necessarily included.

This compares to a system wide Weighted Average Cost of Capital (WACC) value of about 8%.

RUGS tracks the progress of requests for gas supply including the identity of the people estimating input information and those authorising expenditure. Various reports covering performance indicators, such as the time taken to respond to customer requests, are regularly produced.

RUGS is also used to track other Capex, such as that for motor vehicles, computer equipment, etc.

AGL(ACT)'s policy for cost estimation is to use generic unit costs for minor expenditures of less than $10,000. For larger jobs, more detailed investigations, including site inspections and measurement of lengths of mains and services required, are carried out.

The DIGS System

DIGS is a job or work management system. It tracks job progress and has links to the financial system to enable contract payments to be made and the asset register to be updated on completion of jobs.

4.4.4 Review of Project Approval Documentation

As a check on AGL(ACT)'s compliance with the Capex Procedure, we reviewed the available documents seeking approval for major projects from either the Board or senior management.

The three documents reviewed related to the extension of the primary main from Watson to Phillip and from Watson to Gungahlin. Two were Board reports and the other a supporting document which gave details of the financial analysis of the Watson to Phillip extension. Our comments on these documents are provided in the following sections.

Canberra Primary Extension Financial Analysis

This document was prepared in August 1995 and outlines the extension of the primary main, in two stages, from Watson to Phillip, and the installation of a TRS at Phillip.

The financial analysis showed a post tax nominal IRR of 32.9% (excluding the residual).

Sensitivity studies were carried out and the results of key sensitivities reported. These results are shown in Table 4-2 below.

Table 4-2 Results of Key Sensitivities

Base Case	30% Increase in Distribution Capital Cost	30% Reduction in Load Forecast	10% Decrease in Average Tariff Price	30% Increase in Customer Connection Cost
IRR 32.9%	28.8%	23.1%	28.2%	28.9%

The project appears to be very robust, on the assumptions made at the time.

The average consumption of new homes was taken to be 66 GJ per annum, which is considerably above the present level for existing homes of approximately 52 GJ per annum. Also it was assumed that each year 5% of existing homes would increase their average consumption from 52 GJ per annum to 60 GJ per annum. In light of average new domestic customer usage levels for Canberra overall of approximately 51 GJ per annum in 1994/95 and 48 GJ per annum in 1997/98, this seems to have been optimistic. However it is within the range considered in the sensitivity studies.

A further document titled “Canberra High Pressure System Evaluation” dated April 1994 considered another option of looping the existing secondary system. While it did not specifically mention the “do nothing” option, system modelling showed that an augmentation was necessary to maintain adequate supply pressures. The reports of subsequent annual reviews of the Canberra high-pressure system showed a progressive refinement of the project parameters (such as length of main, cost and timing).

Fyshwick to Phillip Network Reinforcement

This project is part of the Canberra Primary Extension discussed above. The Board report sought approval for expenditure of $2.6 million to extend the primary main from Fyshwick to Phillip. The IRR of the project was reported as being 29.9% (excluding residual values).

The only options mentioned in the report relate to ownership of, rather than alternatives to construction of the pipeline extension.

Gungahlin Supply Infrastructure

This Board report sought approval for the expenditure of $2.3 million to install 10 km of primary main from Watson to Gundaroo. This main would be used initially at secondary pressure, and is the initial stage of a long-term plan for supply to the Gungahlin area.

The project IRR was reportedly 14.77% (excluding residual value). The financial analysis appears to have considered all four stages of the project.

No results of sensitivity analysis are reported. Nor is there any mention of the alternative options, which may have been considered.

Conclusion

We consider that the extension of the primary main from Watson to Phillip and the establishment of a TRS at Phillip was a prudent development. There was insufficient information provided to draw any meaningful conclusion on the prudence of the Gungahlin Supply Infrastructure project.

AGL(ACT)’s Capex approval process presently results in abbreviated reports being prepared for the Board and senior managers. Thus, there is not always a report of sufficient detail to be able to assess the prudence of proposed projects, readily available. In undertaking our NSW review, we were able to locate supporting documents, where they existed, and were satisfied that, for major projects, the planning and project authorisation process is auditable up to project authorisation. We expect that, given sufficient time, more extensive supporting documentation may be provided for the Gungahlin project. However, we have yet to see this documentation and consequently cannot assess whether the associated Capex is prudent under the code.

As discussed in Section 4.5.2, AGL(ACT)'s data were not sufficiently specific or accurate to enable meaningful unit rates for most activities to be calculated. As unit rates form an integral part of both estimating future expenditure and reconciling actual expenditure, the lack of reliable data renders the overall Capex process (from planning to ex-post reconciliation) neither readily auditable or transparent.

We would recommend an improvement in the AGL activity based cost reporting and monitoring system be undertaken. This would improve the transparency of AGL’s accounts with respect to IPARC’s interests under the Code.

4.5 Historical Capital Expenditure 1993-1998

4.5.1 General

The historical Capex from 1993/94 to 1997/98 is shown in Table 4-3.

Table 4-3 Capital Expenditure ('000s)

Description	1993/94	1994/95	1995/96	1996/97	1997/98
Land/Build/Leasehold	0	0	378	26	434
Plant & Equipment	162	248	550	37	43
Office Furniture	9	18	6	0	65
Motor Vehicles	231	270	56	161	61
Computer Services	0	31	0	8	45
Total Other	402	567	990	232	648
Mains	3,729	2,543	4,526	2,976	3,967
Services	1,322	1,342	1,809	1,782	1,978
Meters	872	766	1,240	2,195	834
Fixed Plant and Other	0	0	167	0	0
Reconciliation to Accounts	0	0	0	0	1
Total Market Expansion and System Upgrade	5,923	4,651	7,742	6,953	6,780
TOTAL CAPEX	6,325	5,219	8,732	7,185	7,428

4.5.2 Prudence of Historic Capital Expenditure

We conducted a review to assess the prudence of historical Capex comprising five steps. These were:

- A check of unit rates calculated from the total expenditures and the quantities of assets acquired. This provides a measure of "value for money" of the expenditure.
- A comparison of actual loads with previous forecasts. This provides a measure of the accuracy of previous forecasts.
- A review of post audits carried out by AGL(ACT).
- A generic analysis of Capex over the past five years.
- A review of performance indicators, which can provide a measure of the effectiveness of the expenditure in maintaining or improving service levels.

These are addressed in the following sections.

Check of Unit Rates

We undertook a high level reconciliation of the major expenditures and a selection of smaller expenditures. To the degree possible, more detailed information on the assets acquired was obtained and, where appropriate, unit rates calculated.

In most cases, the categories in which the financial information and the asset information was available, were incompatible. Consequently, reconciliations were usually carried out in aggregate across the three local government regions, and sometimes across asset categories.

Our detailed comments on the reconciliations are set out in the following sections.

System Upgrade and Market Expansion
It was generally not possible to segregate the actual assets by region, or into the categories of market expansion or system upgrade.

- Mains
  Information on the lengths of primary, secondary and MP mains was available, however, cost information was available only for mains in total.

  The unit rates for all mains varied from $19/m in 1994/95 to $116/m in 1996/97. Due to the mixture of types of mains installed, the calculation of an overall unit rate has little meaning. We attempted to derive unit rates for primary, secondary and MP mains, which were consistent with the total Capex and the lengths of mains installed in each of the five years. This was unsuccessful as no consistent rates could be derived and some of those derived were negative.

  We believe that the cost information is questionable.

- Services
  Information on the number of secondary and MP services was available. Secondary services made up less than 1% of those installed each year. Cost information was available only for services in total.

  The unit rates derived vary between $279 in 1993/94 and $436 in 1997/98.

  We have reservations about the data as the calculated unit rates vary considerably and the total number of new services for the ACT and Queanbeyan in 1993/94 to 1995/96 is less than the reported number of new domestic customers in Canberra. It is not clear from the information available, whether some new services may supply more than one customer or whether some new customers are supplied by reactivating existing services.

- Meters
  Information on the number of domestic and “industrial” meters installed was available, however cost information was available only for meter installation in total. No information on new or replacement meters was available.

  The unit rates varied from $124 in 1994/95 to $482 in 1996/97.

  It was not possible to derive or confirm unit rates for domestic and “industrial” meters, which were consistent with the numbers, installed and the total meter installation cost.

- Conclusion
  Overall, we were unable to reconcile the Capex amounts and the assets acquired with the accuracy we would have liked. We believe that this is due to the variable quality of data. AGL(ACT)’s systems may be adequate for their originally intended purpose, but have not been capable of providing data in the format we required for reviewing prudence under the Code. We are unable to confirm the Capex amounts are prudent under the terms of the Code.

We suggest that AGL(ACT)'s activity based costing systems be extended to incorporate the collection of data suitable for assessing prudence of Capex.

Other Capital Expenditure
The Capex in this category was $2.839 million or around 8% of the total Capex over the period 1993/94 to 1997/98.

- Land, Buildings and Leasehold
  The Capex in this category was only $838,000 or around 2.4% of the total Capex over the period 1993/94 to 1997/98. Other than to note that it is small, we offer no comment on this expenditure.

- Plant and Equipment
  Expenditure on plant and equipment totalled $1.4 million, or 2.9% of the total Capex over the period.

  We are satisfied with this expenditure as it is small and within the range expected.

- Office Furniture
  Expenditure on office furniture totalled $98,000, or 0.3% of the total Capex over the period.

  Overall, this expenditure is not material and is within the range expected.

- Motor Vehicles
  Expenditure on motor vehicles totalled $779,000, or 2.2% of the total Capex over the period.

  We are satisfied with this expenditure as it is small and within the range expected.

- Computer Services
  Expenditure on computer services totalled $84,000, or 0.2% of the total Capex over the period. This is a surprisingly small amount.

  Overall, this expenditure is not material.

- Conclusion
  We are satisfied with the expenditure classified as "Other Capital Expenditure" as it is in the expected range and not material to the overall Capex.

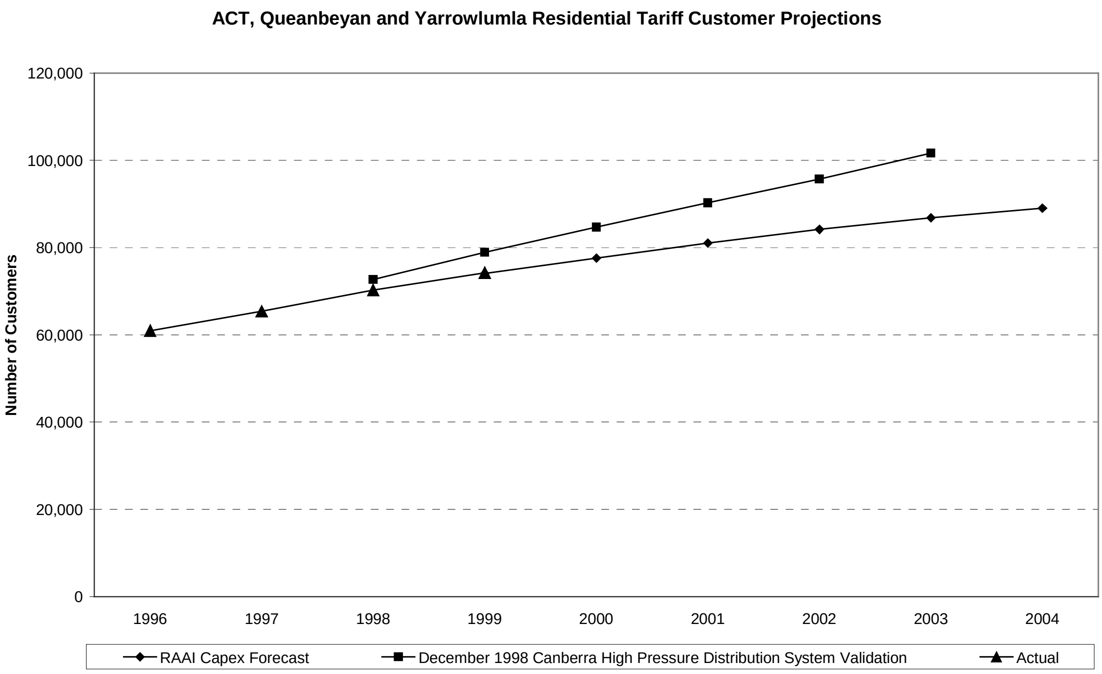
Comparison with Previous Forecasts

No previous Capex forecasts were available to allow a reconciliation with actual expenditure to be carried out.

As a check on load forecasts and, indirectly, capex, we compared projections of customer numbers in the December 1998 Canberra High Pressure Distribution System Validation with those on which the Capex forecast in the RAAI is based.

These projections, which are shown in **Error! Not a valid bookmark self-reference.**, exhibit dissimilar starting points and growth rates. We understand from AGL(ACT) that these forecasts were prepared at different times.

Figure 4-2 ACT, Queanbeyan and Yarrowlumla Residential Tariff Customer Projections



We note that the forecast in the RAAI is consistent with actual historical information. We also understand from AGLACT that the capital expenditure projections have been based on the forecast in the RAAI.

Post Audits

Although the Capex procedures refer to the need to carry out project post audits, this is rarely undertaken by AGL(ACT) as it has been found to be difficult to do with sufficient precision.

No information on post audits that may have been carried out was available.

Generic Analysis of Historical Market Expansion Capital Expenditure

As a generic test of the prudence of past market expansion Capex, AGL(ACT) analysed the average expenditure over the five year period ending 30 June 1998. Their analysis considered:

- average market expansion Capex;
- average load growth;
- average additional customers;
- the 1998 distribution charges (escalated in line with CPI);
- marketing costs of $5 million in total;
- incremental operating costs of $30 per additional customer (escalated with CPI);
- CPI of 2.5% per annum; and
- a 20 year evaluation period.

It showed that the market expansion Capex achieved a post tax nominal IRR of 22%.

The incremental operating cost per customer was derived from 1997/98 data. The actual expenditure recorded against 43 cost codes was determined and an estimate made of the variable proportion of each. While this is not a highly rigorous process, it should give a reasonable indication of the marginal cost. As a check, we examined the sensitivity to changes in this factor.

The marketing costs are those identified for 1997/98 from the activity based costing system.

We made a number of modifications to the analysis, to:

- incorporate the average system upgrade Capex;
- enable the distribution charges to be escalated at “CPI – X”;
- reduce the initial distribution charge to the level it would have been at in 1995/96 (had it existed at that time) using the escalation rate;
- extend the assessment period to 50 years (the AGL(ACT) assessment of the economic lives of the mains and services) to avoid difficulties with determining residual values;
- incorporate real and nominal, pre tax and post tax IRRs; and
- incorporate replacement of meters every 15 years.

Copies of the AGL(ACT) analysis and ours are included in Appendix K.

The revised analysis showed similar results to those of the AGL(ACT) analysis. If the average system upgrade Capex is included, the IRR (post tax nominal) decreases to 12.3%.

We conducted analyses of the sensitivity to incremental operating cost, network charge escalation rate, CPI and marketing expenditure, the results of which are shown in Table 4-4, Table 4-5, Table 4-6 and Table 4-7 below.

Table 4-4 Sensitivity to Incremental Operating Cost per Customer

Incremental Operating Cost ($/customer)	0	30	60	90	180
IRR (post tax nominal)	13.2%	12.3%	11.3%	10.3%	7.0%
IRR (post tax real)	10.5%	9.5%	8.6%	7.6%	4.4%
IRR (pre tax nominal)	14.9%	13.7%	12.6%	11.5%	7.8%
IRR (pre tax real)	12.1%	11.0%	9.9%	8.7%	5.2%

Table 4-5 Sensitivity to Network Charge Escalation Rate

X Factor (%)	0	0.5	1.0	1.5	2.0	2.5
IRR (post tax nominal)	12.3%	11.8%	11.4%	11.0%	10.5%	10.1%
IRR (post tax real)	9.5%	9.1%	8.7%	8.3%	7.8%	7.4%
IRR (pre tax nominal)	13.7%	13.3%	12.9%	12.5%	12.0%	11.6%
IRR (pre tax real)	11.0%	10.6%	10.1%	9.7%	9.3%	8.9%

Table 4-6 Sensitivity to CPI

CPI (%)	1	2	3	4	5
IRR (post tax nominal)	11.3%	11.9%	12.6%	13.3%	14.0%
IRR (post tax real)	10.2%	9.7%	9.3%	8.9%	8.6%
IRR (pre tax nominal)	12.7%	13.4%	14.1%	14.8%	15.5%
IRR (pre tax real)	11.6%	11.2%	10.8%	10.4%	10.0%

Table 4-7 Sensitivity to Marketing Expenditure

Marketing Expenditure ($ million)	2.5	5	7.5	10
IRR (post tax nominal)	14.1%	12.3%	10.8%	9.7%
IRR (post tax real)	11.4%	9.5%	8.1%	7.1%
IRR (pre tax nominal)	16.3%	13.7%	11.9%	10.6%
IRR (pre tax real)	13.5%	11.0%	9.2%	7.9%

Overall, the post tax nominal IRR, when system upgrade Capex is included, is in the range of 10% to 13% for credible ranges of the input factors. On this basis, overall the historic Capex appears to have achieved a prudent IRR. However, we can make no comment about:

- the prudence of individual projects;
- whether the most appropriate works have been undertaken; or
- whether they have been undertaken at the optimum time.

Nor can we comment on the level of marketing expenditure, other than to note that it is large. AGL(ACT) staff indicated that they believed that there would be some growth (of unknown magnitude) if marketing was to cease. However, on the information available to us it is not possible to make an informed comment on the appropriateness of AGL(ACT)'s marketing expenditure.

If improved cost information becomes available, from a source such as an expanded activity based costing system, it should be possible to conduct similar analyses for particular categories of customers. This would enable a more refined assessment of prudence to be made.

Performance Indicators

AGL(ACT) provided a list of performance measures in four broad categories:

- generic performance measures;
- design and record performance measures;
- construction performance measures; and
- operation and maintenance performance measures.

These are shown in Appendix J.

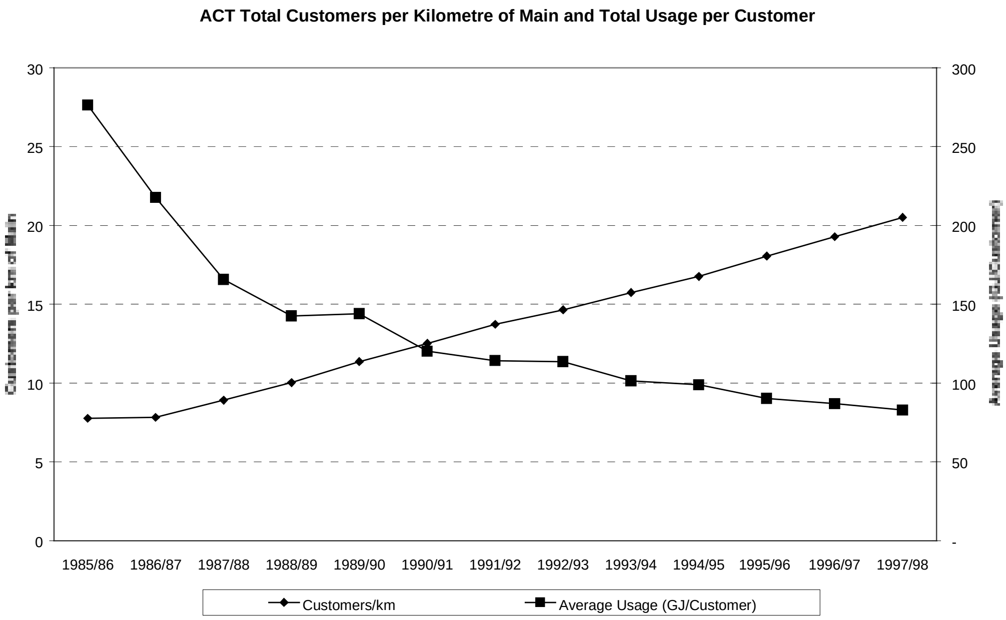
None of these indicators, covering the ACT and Yarrowlumla only, was available.

As indicated in Section 4.5.2, the available data were not sufficiently accurate to enable unit rates for particular activities, such as service installation and meter replacement, to be reliably determined. We did not attempt to carry out external benchmarking of these activities as the results would have little meaning.

As the network activities within AGL have only recently been ring fenced, there is only a limited history. Historical performance measures related to costs, revenues and staff numbers can now be misleading as the basis for determining these quantities has changed.

The only other generic performance measures for which information could be obtained were customers per length of main and usage per customer. These are shown in Figure 4-3, Figure 4-4 and Figure 4-5 below. There was insufficient information on UAG to be able to determine any trend.

Figure 4-3 AGL(ACT) Total System Customers per Kilometre of Main and Total System



Usage per Customer

Figure 4-4 Domestic Customer Usage per Kilometre of Main

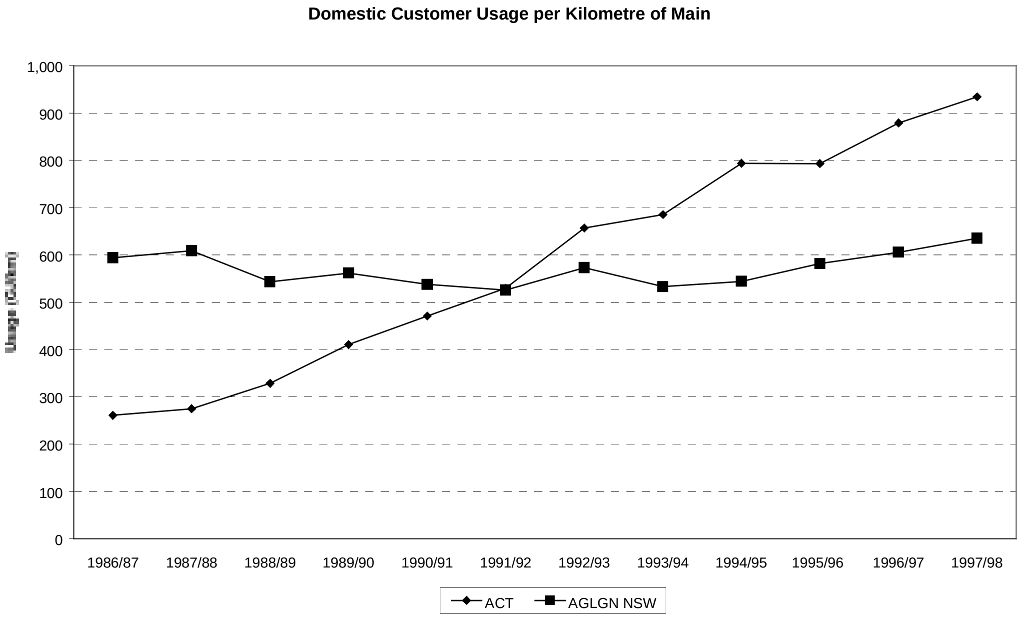
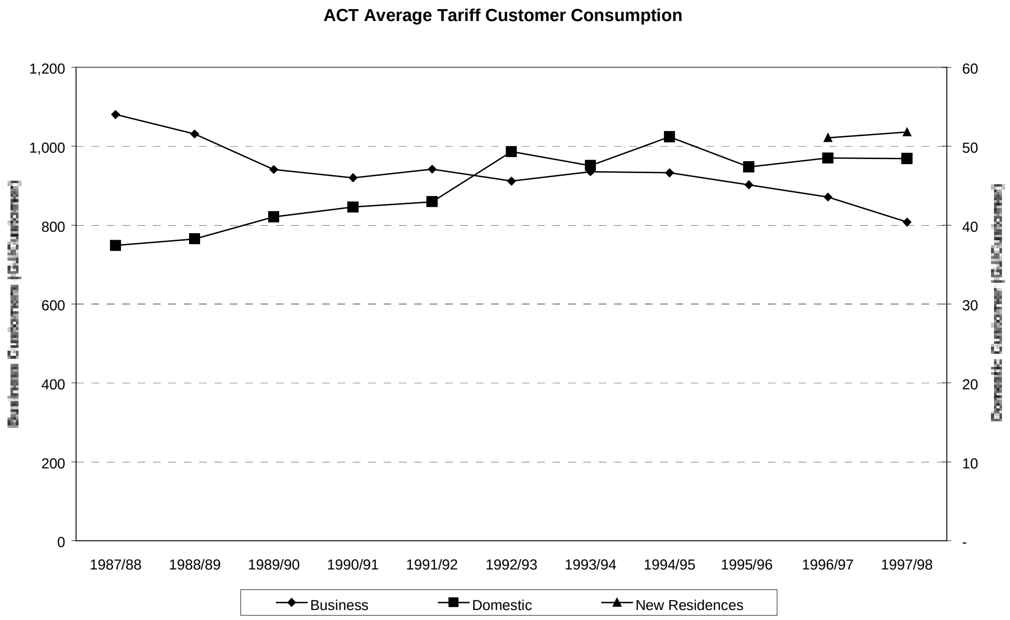


Figure 4-5 ACT Average Tariff Customer Consumption



While the customers per kilometre figures for AGL(ACT) are lower than those for all Australia (45), Victoria (59), New South Wales (35), Albury (49) and Wagga (34), they have exhibited a steady increase over the last ten years. The low number of customers per kilometre and its steady increase reflects AGL(ACT)'s decision to reticulate every street in Canberra and to connect customers as the opportunity arises.

Domestic customer usage per kilometre of main has grown steadily over the last ten years and is now greater than that of AGLGN in NSW.

Average usage per customer has been declining steadily over recent years, reflecting the maturity of the contract market and the emphasis on connecting tariff customers.

While overall usage per customer and that for business tariff customers has declined, that for domestic customers has grown over the last ten years. Domestic customer usage is affected by weather conditions. In the absence of a temperature sensitivity model, it is not possible to comment on the apparent stabilisation of average domestic customer usage over the last three years.

The average consumption of new residences is greater than that of domestic customers overall. The connection of new residences should lead to a continuing increase in domestic customer usage.

Overall, there was insufficient information available to be able to draw any conclusions on the effectiveness of AGL(ACT)'s activities in delivering improved or more cost effective service, although some indicators do show encouraging trends.

We understand that IPARC will address service standards in the near future and expect that a range of performance indicators will be developed at that stage.

The availability of improved cost information, such as that from an expanded activity based costing system, should enable a more comprehensive suit of performance indicators to be developed.

4.6 Forecast Capital Expenditure 1999-2004

4.6.1 General

AGL(ACT)'s forecast Capex is based on a recently developed 20 year forecasting model. The forecast Capex is shown in Table 4-8 below, and is made up of four main components:

- growth related;
- system reinforcement;
- renewal/replacement; and
- contestability.

These are discussed in more detail in the following sections.

Table 4-8 Forecast Capital Expenditure

	1998/ 1999	1999/ 2000	2000/ 2001	2001/ 2002	2002/ 2003	2003/ 2004
Growth Capital Expenditure ($ million)						
Residential						
Meters/Regs/Filters	0.83	0.79	0.78	0.74	0.67	0.57
Services	2.06	1.97	1.94	1.85	1.67	1.43
Business						
Meters/Regs/Filters	0.12	0.12	0.11	0.10	0.10	0.09

Services	0.13	0.13	0.12	0.12	0.11	0.11
Mains						
Residential	0.78	0.82	0.73	0.78	0.77	0.69
Business Tariff	0.42	0.52	0.48	0.46	0.44	0.42
Total Growth Capital Expenditure	4.34	4.34	4.16	4.05	3.75	3.32
System Reinforcement Capex ($ million)	0.00	0.43	1.30	0.00	0.00	0.40
Renewal/Replacement Capex ($ million)						
Meters/Regs/Filters	0.4	0.09	0.83	0.94	1.39	0.55
Non System Assets	1.10	0.58	0.55	0.38	0.55	1.29
Contestability	0.2	0.74				
Total Capital Expenditure	6.04	6.17	6.83	5.37	5.69	5.56

4.6.2 Growth Related

General

The growth related expenditure relates to the MP and LP portion of the network. It is intended to meet expected growth in residential and business consumption and includes the costs for new meters, services and mains.

Growth Forecasts

The forecast expenditure has been estimated, in part, from forecasts of new customer connections. The number of new connections, customer numbers and gas usage assumed by AGL(ACT) are shown in Table 4-9 below.

Table 4-9 Forecast Connections, Customers and Gas Usage

	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
Customer Connections						
Residential						
On line of main	4,941	1,806	1,977	1,850	1,636	1,388
New mains	2,601	2,484	2,209	2,106	1,892	1,616
Business Tariff						
New mains	110	105	98	91	86	82
Total	**4,652**	**4,395**	**4,284**	**4,047**	**3,614**	**3,086**

	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
Average Customers						
Residential	74,071	77,619	81,028	84,174	86,859	88,994
Business	1,943	1,989	2,026	2,055	2,079	2,098
Contract	41	41	41	41	41	41
Total	76,055	79,649	83,095	86,270	88,979	91,133
Gas Usage (TJ)						
Residential	3,503	3,740	3,965	4,180	4,380	4,557
Business	1,326	1,295	1,260	1,233	1,215	1,206
Contract	1,068	1,063	1,057	1,052	1,047	1,042
Total	5,897	6,098	6,282	6,465	6,642	6,805

We understand that ACIL is investigating AGL(ACT)'s growth assumptions as part of a separate consultancy. As such, we make no comment on reasonableness of these growth forecasts. However, we note that the growth in customer numbers and average gas usage per customer varies over the forecast period. Furthermore, the annual change in customer numbers is less than the assumed customer connections for residential tariff and business tariff market segments, as could be expected due to some customers being lost each year.

AGL(ACT) staff also indicated that the forecasts did not allow for the possibility of competitors installing new mains and services.

Adopted Unit Rates

Growth related Capex has been estimated from the number of connections and generic unit costs for each. The generic unit rates are shown in Table 4-10 below. We note that, other than for mains cost, they are identical to those used by AGLGN for NSW.

Table 4-10 Unit Rates for Forecast Capital Expenditure ($ per customer)

	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
Residential						
Meter/Reg/Filter	182	184	185	187	189	191
Services	455	459	464	468	473	478
Business Tariff						
Meter/Reg/Filter	1,087	1,097	1,108	1,120	1,131	1,142
Services	1,224	1,236	1,249	1,261	1,274	1,287
Mains Cost						
Residential	300	330	330	369	405	426
Business Tariff	3,809	4,909	4,958	5,007	5,057	5,108

The cost of a new connection consists of a service line to the customer's premises, a meter, regulator and filter to deliver gas, and may include a mains extension. These unit rates may vary depending on the volume of gas throughput expected and the capacity of the equipment installed. For example, we would expect differences between residential and business tariff customers.

We would expect the replacement unit costs to differ from the "initial" installation costs (the AGL(ACT) forecast Capex unit rates) due to the less costly excavation and restoration required in newly developed regions, where the majority of forecast growth is expected to occur. Therefore, we would expect the initial capital involved in most new customer connections to be less than their replacement cost in subsequent years, due to the greater level of development in these areas in the future. This qualification applies to the comparisons below between the unit rates used to forecast Capex and those used for asset valuation purposes.

RESIDENTIAL
The AGL(ACT) average unit rate for a residential meter/reg/filter package is estimated to be $182 (in 1998/99 dollars). JP Kenny valued the average replacement cost of a GASS meter to be $184 (in 1996 dollars) for NSW. These average costs are understood to include meter purchase and installation. As little or no excavation and restoration is required for meter installations we expect the unit rates assumed for forecast Capex and asset valuation to be comparable.

As discussed in Section 4.5.2, AGL(ACT)'s historical unit costs for the installation of meters of all types varied from $124 in 1994/95 to $482 in 1996/97. We have reservations about the accuracy of the data from which these rates were derived.

The average unit rate to AGL(ACT) for a residential MP service is estimated to be $455 (in 1998/99 dollars). JP Kenny valued the average replacement cost of a MP service to be $594 (in 1996 dollars) for NSW. The majority of residential services would be new MP services installed in new subdivisions. As such, we would expect the unit rate assumed for asset valuation to be greater than the unit rate assumed for forecast Capex.

As discussed in Section 4.5.2, AGL(ACT)'s historical unit costs for the installation of new services of all types was in the range of $399 to $436 in the period from 1995/96 to 1997/98. However, we have reservations about the accuracy of the data from which these rates were derived.

Table 4-11 compares the average unit rates for meters assumed in other asset valuation studies.

Table 4-11 Published Unit Costs for New Meters

Meter Type	Wagga Wagga-GHD	Wagga Wagga-Kinhill	Albury-GHD	Victoria-Kinhill
Domestic	190	108	189	189.17
Industrial small			5,600	
Industrial large	8,000	8,000	8,900	
Commercial small	1,500	1,500	1,100	1,100

Commercial Large	9,900

The residential unit rates for meters/regs/filters is escalated at about 1% per annum (assumed CPI -1.5%). Based on our review, we consider the average unit rates assumed for residential meters to be reasonable. However, we do not offer comment on the assumed escalation of these costs.

Table 4-12 compares the average unit rates for services assumed in other asset valuation studies.

Table 4-12 Published Unit Costs of Services ($ per customer)

Diameter (mm)	Customer Type	Location / Author of Report						
		Wagga Wagga-GHD	Wagga Wagga-Kinhill	Albury - Kinhill	Albury GHD		Victoria-Kinhill	
					Metro	Country	Metro	Country
10	Domestic	550	594	679	625	715	659	727
10	Commercial	1,000	929	901	1,115	866	1,529	1,061
10	Industrial	4,000	4,000	4,000	999	1,030	1,120	702
18	Domestic	550	594	679	625	715	659	727
18	Commercial	1,000	929	901	1,115	866	1,529	1,061
18	Industrial	4,000	4,000	4,000	999	1,030	1,120	702
20	Domestic	550	594	679	1,035	1,035	659	727
20	Commercial	1,000	929	901	1,035	1,035	1,529	1,061
20	Industrial	4,000	4,000	4,000	1,035	1,035	1,120	702
25	Domestic	550	594	679	1,553	1,553		
25	Commercial	1,000	929	901	1,553	1,553		
25	Industrial	4,000	4,000	4,000	1,553	1,553		
32	Domestic	550	594	679	2,070	2,070		
32	Commercial	1,000	929	901	2,070	2,070		
32	Industrial	4,000	4,000	4,000	2,070	2,070		
40	Domestic	550	594	679	2,691	2,691		
40	Commercial	1,000	929	901	2,691	2,691		
40	Industrial	4,000	4,000	4,000	2,691	2,691		
50	Domestic	550	594	679	4,326	4,326		
50	Commercial	1,000	929	901	4,326	4,326		
50	Industrial	4,000	4,000	4,000	4,326	4,326		
100	Domestic	550	594	679	16,767	16,767		
100	Commercial	1,000	929	901	16,767	16,767		
100	Industrial	4,000	4,000	4,000	16,767	16,767		

The residential unit rates for services are escalated at about 1% per annum (assumed CPI – 1.5%). It is also lower than that used in other asset valuations. As this is most probably due to the majority of new services being installed in new subdivisions, we consider that it is reasonable. However, we offer no comment on the assumed escalation rate.

BUSINESS TARIFF

The average unit rate to AGL(ACT) for a business meter/reg/filter package is estimated to be $1,087 (in 1998/99 dollars). The replacement cost of I&C meters varies in the 1996 JP Kenny replacement cost valuation for NSW. As such, no useful comparison can be made.

The average unit rate to AGL(ACT) for a business service is estimated to be $1,224 (in 1998/99 dollars). JP Kenny valued the average replacement cost of a secondary service to be $2,654 (in 1996 dollars) for NSW. Business service connections may require a combination of both MP and secondary service connections. As such, we would expect the assumed forecast Capex unit rate for business services to be within the range defined by MP/LP and secondary services unit rates assumed for asset valuation. That is, that they are within the range of $594 to $2,654 and affected by the proportions of meters and services installed on the various systems.

The business unit rates for both meters/regs/filters and services are also escalated at about 1% per annum (assumed CPI – 1.5%). The unit rates are similar to those used for small commercial meters and medium sized commercial services in other asset valuations and as such, we consider that they are reasonable. Again, we offer no comment on the assumed escalation rate.

MAINS COST

AGL(ACT) has been unable to provide data that would allow us to comment on the prudence of residential and business tariff mains additions. As a “reality check”, we estimated the total length of new mains installed and the length of main per customer. For residential mains, we assumed that the majority of mains would be additions to the MP system in new housing developments, at an average unit rate of about $25/m. This gave estimated installed lengths of around 30 km per annum, which is broadly consistent with the lengths installed over the last couple of years, and between 12 m and 17 m per customer, which is lower than we would expect. A similar analysis for new business customer connections gave total lengths of main and lengths per customer, in the range we would expect.

This is by no means a check of prudence, but provides some comfort that the forecast expenditure in this category is broadly reasonable.

4.6.3 System Reinforcement

AGL(ACT) currently proposes six system reinforcement projects, which are discussed below. We understand that a revised expenditure forecast, reflecting recent changes, is to be provided to IPARC.

Woden

This project involves the installation of 350 metres of secondary main and a DRS to overcome pressure limitations in the medium pressure system. In its analysis, AGL(ACT) considered installation of the DRS at alternative locations.

The estimated cost is $76,000. We understand that AGL(ACT) has recently deferred this expenditure from 1999/2000 to 2000/2001. We note that the expenditure is small and, while no economic analysis was available, we consider this to be a sound project.

Gungahlin

This project involves the installation of 2.5 kilometres of secondary main and a DRS to overcome pressure limitations in the medium pressure system in the Gungahlin area and capacity limitations of the existing DRS at Gungahlin. The estimated cost is $355,000, which AGL(ACT) has recently deferred from 2000/2001 to 2001/2002.

This development is consistent with longer-term plans and extends the secondary network towards the Gungahlin growth areas. While no economic analysis was available, we consider this to be a sound project.

Gungahlin TRS
AGL(ACT) originally proposed that a TRS at Gungahlin be established in 2000/2001. This has been revised to a staged installation, starting in 1999/2000. A TRS at Gungahlin would allow the existing Watson to Gungahlin primary main to be operated at primary pressure, thus providing additional gas storage capacity to meet winter peak loads. To enable it to be completed by winter 2000, the first stage would be a low capacity TRS installation, which is estimated to cost $150,000.

The second stage is estimated to cost $750,000 and involves the installation of additional TRS capacity at Gungahlin. AGL(ACT) currently expects this expenditure to be incurred in 2001/2002.

We concur with the general approach and consider the first stage installation to be a sound development. While we agree that additional TRS capacity at Gungahlin would be required soon after the first stage is completed, insufficient information was available to enable us to be satisfied that the scope and timing of the second stage is appropriate.

Phillip TRS
This project involves the installation of additional capacity at the existing Phillip. The estimated cost is $400,000, which AGLACT currently expects to be incurred in 2001/2002. We understand that this will provide increased security of supply should difficulties be experienced with the Watson TRS or the existing "run" at the Phillip TRS. As yet a risk assessment has not been completed, but AGL(ACT) indicated that one would be done prior to making a commitment to the expenditure. In the absence of a risk assessment, we cannot comment on the prudence of this project.

Connection to the Eastern Gas Pipeline
AGL(ACT) has proposed a connection to the Eastern Gas Pipeline (EGP) which is currently being constructed. Our comments on this proposal are the subject of a separate report.

As part of this project, AGL(ACT) originally proposed that approximately 16.5 kilometres of pipeline be installed by winter 2000 to provide additional storage to meet the winter peak loads, with the balance being installed prior to winter 2001. We note that the present proposal is to install only approximately eight kilometres of new pipeline, prior to winter 2000, as the installation of a TRS at Gungahlin would allow the existing Watson to Gungahlin primary main to be used as storage.

System Monitoring
This project involves the installation of telemetry equipment to monitor supply pressures in the high pressure and medium pressure networks, as well as flows at Watson, Phillip and the proposed EGP connection. The locations of the bulk of the installations are still being finalised. Consequently we cannot comment on the prudence of this project, but we endorse the broad concept of monitoring the performance of the network.

4.6.4 Renewal/Replacement

The renewal/replacement expenditure comprises Meters/Regs/Filters and Non System Assets. We understand that the forecast expenditure has been taken from a recently developed 20 year forecasting model. This model determines the need to replace or renew assets from statutory requirements or the expiry of their nominal economic lives. This is a reasonable approach for estimating longer-term requirements. However for shorter-term estimates, it is necessary to undertake more detailed technical and economic assessments of the condition of the particular assets involved. We understand that these assessments have not yet been undertaken.

As a “reality check” we estimated the cost of replacing meters, based on a unit rate of $150 per meter, and the number of new customers connected 15 years previously. This gave expenditures of between $213,000 and $704,000 per annum over the next five years. The total expenditure was $2.7 million, which compares reasonably well with AGL(ACT)’s estimate of $3.81 million.

While this is by no means a check of prudence, it gives some comfort that this component of the renewal/replacement expenditure is broadly reasonable.

The components of Non System Assets capex are shown in Table 4-10 below.

Table 4-13 Forecast Non System Assets Capex (‘000s)

	1999/00	2000/01	2001/02	2002/03	2003/04
Leasehold Improvements	128	103	27	11	39
Plant and Equipment	20	54	34	98	278
Motor Vehicles	300	63	239	305	622
Computer Services	127	326	78	137	351
Total Non System Capex	575	546	378	550	1,290

The total forecast Non System Capex over the period is $3.339 million or approximately 11% of total forecast Capex or approximately 118% of historical “Other” expenditure over the period 1993/94 to 1997/98.

- Leasehold Improvement
  We make no comment on this expenditure, other to note that the total of $0.308 million, is approximately 37% of the historical expenditure on Land, Buildings and Leasehold over the period 1993/94 to 1997/98.

- Plant and Equipment
  This expenditure totals $0.484 million, which is approximately 35% of the historical 1993/94 to 1997/98 expenditure. We consider this estimated expenditure to be reasonable as it is small and within the range expected.

- Motor Vehicles
  This expenditure totals $1.529 million, which is approximately twice the historical 1993/94 to 1997/98 expenditure.

  We consider this estimated expenditure to be reasonable as it is comparatively small and within the range expected.

- Computer Services
  This expenditure totals $1.109 million, which is significantly more than the historical 1993/94 to 1997/98 expenditure of $0.084 million, although the historical expenditure is surprisingly small.

We consider this estimated expenditure to be reasonable as it is comparatively small and within the range expected.

Overall, the forecast Renewal/Replacement expenditure is around what we would expect. The expenditure for Meters/Regs/Filters satisfies a broad "reality check". Other than for Leasehold Improvements, on which we make no comment, the components of the Non System assets expenditure are comparatively small and within the range expected. Consequently, we consider them to be reasonable.

4.6.5 Contestability Capex

It is expected that the entire tariff market will be fully contestable from 1 July 2000. AGL(ACT) has forecast that the organisation will need to incur $0.74 million in 1999/2000 in Contestability Capex to implement the systems necessary for effective monitoring and control of gas transport in this fully contestable tariff market.

At this stage, no details of this expenditure have been provided.

4.6.6 Generic Analysis of Forecast Capital Expenditure

We conducted a generic analysis of forecast Capex similar to that which was conducted for historical Capex.

The results of our analysis, are shown in Table 4-14, Table 4-15, Table 4-16 and Table 4-17 below.

Table 4-14 Sensitivity to Incremental Operating Cost per Customer

Incremental Operating Cost ($/customer)	0	30	60	90	180
IRR (post tax nominal)	15.4%	14.5%	13.6%	12.6%	9.8%
IRR (post tax real)	12.6%	11.7%	10.8%	9.9%	7.1%
IRR (pre tax nominal)	16.8%	15.8%	14.8%	13.8%	10.6%
IRR (pre tax real)	14.0%	13.0%	12.0%	111.0%	7.9%

Table 4-15 Sensitivity to Network Charge Escalation Rate

X Factor (%)	0	0.5	1.0	1.5	2.0	2.5
IRR (post tax nominal)	14.5%	13.8%	13.0%	12.3%	11.5%	10.8%
IRR (post tax real)	11.7%	11.0%	10.3%	9.5%	8.8%	8.1%
IRR (pre tax nominal)	15.8%	15.1%	14.3%	13.5%	12.8%	12.0%
IRR (pre tax real)	13.0%	12.3%	11.5%	10.8%	10.0%	9.2%

Table 4-16 Sensitivity to CPI

CPI (%)	1	2	3	4	5
IRR (post tax nominal)	12.5%	13.8%	15.1%	16.4%	17.8%

IRR (post tax real)	11.4%	11.6%	11.8%	12.0%	12.1%
IRR (pre tax nominal)	13.8%	15.1%	16.5%	17.9%	19.3%
IRR (pre tax real)	12.6%	12.9%	13.1%	13.4%	13.6%

Table 4-17 Sensitivity to Marketing Expenditure

Marketing Expenditure ($ million)	2.5	5.0	7.5	10.0
IRR (post tax nominal)	18.3%	14.5%	12.1%	10.4%
IRR (post tax real)	15.4%	11.7%	9.3%	7.7%
IRR (pre tax nominal)	20.8%	15.8%	12.9%	11.0%
IRR (pre tax real)	17.9%	13.0%	10.2%	8.3%

Based upon the projected customer demand growth data, this analysis indicates that the IRRs achievable by the future Capex should exceed those of the actual historical expenditure. This reflects expected higher usage per customer and lower system augmentation Capex. On this basis, the forecast Capex appears reasonable and prudent.

However, we cannot comment on:

- individual projects;
- whether the most appropriate works are to be undertaken; or
- whether they are to be undertaken at the optimum time.

4.7 Summary

In this Section we reviewed AGL(ACT)'s:

- project evaluation methodology;
- capital expenditure decision making process;
- actual historical capital expenditure; and
- forecast capital expenditure.

Our findings in these areas are summarised below.

4.7.1 Project Evaluation Methodology

AGL(ACT) develops network models which are regularly reviewed and validated against measured quantities, which is a good practice. The options developed by AGL(ACT) are generally sound engineering solutions. The planning criteria used by AGL(ACT) are generally sound, although there may be an opportunity to revise the minimum pressure on the secondary system.

We have some concerns about the “severe winter” forecasts for tariff customers, and the development of more robust models is warranted. Collection of the necessary data is likely to take several years. In the interim period, continuing to use the existing approach is the only practical course of action.

4.7.2 Capital Expenditure Decision Making Process

AGL(ACT) has published procedures which cover the evaluation of proposed capital expenditure. The authority levels for approving expenditure should be adequate to ensure adequate review prior to expenditure being authorised.

AGL(ACT)'s automated processes for evaluating minor projects consider only the direct costs and benefits and use a hurdle rate of 15%. This seems to result in prudent investments.

The documents seeking approval of capital expenditure, which we reviewed, did not provide sufficient detail to enable an informed comment to be made on the prudence of those particular projects.

4.7.3 Historical Capital Expenditure

Our review of the prudence of AGL(ACT)'s historical capital expenditure included:

- checks of unit rates;
- comparison of actual loads with previous forecasts;
- a review of project post audits;
- a generic analysis; and
- a review of performance indicators.

Due to the lack of information in a suitable form, we had difficulty assessing the prudence of the majority AGL(ACT)'s historical capital expenditure. In particular, we were unable to determine meaningful unit rates.

Our review of the domestic customer load projections for Canberra, showed some discrepancies between the forecasts in the RAAI and the December 1998 Canberra High Pressure System Validation. The forecast in the RAAI is consistent with historical data and we understand that AGL(ACT) has based the projected capital expenditure on this forecast.

AGL(ACT) does not routinely carry out project post audits as it can take many years to obtain sufficient data to make an informed assessment. No information on post audits, which may have been carried out, was available.

The generic analysis indicated that in aggregate, the connection of additional customers and the associated upstream developments were prudent. However, we cannot confirm the prudence or timeliness of individual projects.

While AGL(ACT)'s internal performance indicators, and those we derived, were not sufficiently extensive to give a complete picture, some of the KPI's did show encouraging trends.

For future reviews, the availability of cost data, such as that from an expansion of the existing activity based costing system, will be necessary to enable the prudence of capital expenditure to be assessed.

In particular such information should enable:

- meaningful unit rates to be calculated and trends monitored;
- a suite of performance indicators to be developed; and
- generic analyses of the prudence of connecting particular categories of customers to be developed.

4.7.4 Forecast Capital Expenditure

AGL(ACT)'s forecast capital expenditure has four components:

- growth related;
- system reinforcement;
- renewal/replacement; and
- contestability.

The growth related expenditure is based on forecasts of future customer connections, on which we make no comment as we understand that this is the subject of a separate consultancy. The unit rates for services and meters, which are used in conjunction with the connection forecast, are generally in the ranges we would expect. Insufficient information was available on forecast mains costs to allow us to comment definitively, although the forecast did satisfy a very broad "reality check".

AGL(ACT) currently proposes six major projects, having a total cost of approximately $14 million. The largest of these is the proposed EGP connection, costing approximately $12 million, on which we comment in a separate report. The other five projects appear to be sound engineering solutions, although insufficient information was available to assess whether they are prudent.

Overall, the forecast Renewal/Replacement expenditure is around what we would expect. The expenditure for Meters/Regs/Filters satisfies a broad "reality check". Other than for Leasehold Improvements, on which we make no comment, the components of the Non System assets expenditure are comparatively small and within the range expected. Consequently, we consider them to be reasonable.
A generic analysis, similar to that undertaken for the historical Capex, indicated that, based on AGL(ACT)'s forecasts, the IRR achievable by the forecast Capex should exceed that achieved by the historical expenditure.

5. Contract Stand-Alone System Review

5.1 Terms of Reference

AGL(ACT) have a concept for regulatory tariff setting purposes of a hypothetical gas distribution system to supply only the contract customers. This system would comprise the secondary network and some of the medium pressure pipework and the associated valving, regulators, etc. It would not contain any of the tariff customers. The organisational structure, overheads and costs would be characteristically different from those of the entire AGL(ACT) business. It is AGL(ACT)'s belief that this system as a stand-alone business could be attributed a DORC value, Capex and O&M budget. IPARC require EP to review these calculations and provide comment on their accuracy.

While we can review the DORC values for the system we make no comment on the use of the results or the concept validity in calculating stand-alone system revenues.

Other parties have expressed concern about the levels of cross subsidy and shared economies of scale for this concept that are difficult to quantify.

In undertaking this review, we considered the design of the networks and the AGL(ACT) valuation process.

In particular, our terms of reference included:

1. A review of the AGL(ACT) DORC valuation for the Contract Stand-Alone system. This was undertaken as a subordinate review to the whole asset DORC review as the concepts used by AGL(ACT) were similar in both exercises;

2. A review of the proposed hypothetical system O&M; and

3. A review of any system Capex proposed.

5.2 National Access Code Requirements

There is no specific reference in the Code requiring an analysis of the "Contract Stand-Alone" methodology. However, its relevance is on the allocation of "Total Revenue" amongst services. A full extract of the applicable sections of the Code is included in Appendix E. The important requirements are highlighted below.

In considering O&M (non-capital costs), the Code allows inclusion of "prudent" O&M costs in the tariff calculations. Such costs should ensure safe, reliable and sustainable operation of the distribution system and "achieve the lowest sustainable cost of delivering the Reference Service".

Capital costs, O&M costs and asset value for "revenue allocation" purposes should "to the maximum extent that is commercially and technically reasonable" recover that portion of "Total Revenue" serviced by these expenditure items. For the Contract Stand-Alone approach adopted by AGL(ACT), we assessed the proposed asset value, Capex and O&M costs for the provision of services to the contract market only.

5.3 Unit Rates

The unit rates discussion in Section 3.4 applies to the entire network (including the Contract Stand-Alone networks).

5.4 Asset Base

AGL(ACT) have provided a set of spreadsheets and a print out of the Stoner network model developed for the Contract Stand-Alone market. These documents propose an ORC valuation of $14.694 million as at 30 June 1998 and 30 June 1999 (network assets).

While we have not reviewed the full detail of the Contract Stand-Alone system we have no reason to doubt the accuracy of AGL(ACT)'s information.

The asset includes the same components as the full system generically, and they have been specifically optimised for the smaller Contract Stand-Alone market demand. This includes:

- Secondary mains;
- Some MP mains;
- Services and regulators for the customers; and
- Non network assets required for the system.

5.5 Optimised Replacement Costs – AGL(ACT) Approach

AGL(ACT) has developed a "Contract Stand-Alone" approach to network design as a basis for determining an open access transportation price for each contract customer. The transportation price should be proportional to the contract customer's share of network utilisation.

In adopting their Contract Stand-Alone approach, AGL(ACT) conceptually redesign the gas network systems for the contract markets.

Gas mains, which do not service contract customers, are considered "redundant" and are removed from the hypothetical gas system (that is mains solely serving the Tariff market).

5.5.1 Optimisation

The relevant network is optimised in accordance with AGL(ACT)'s Technical Policies.

The optimisation criteria adopted by AGL(ACT) is the same as that described in Section 3.5, with the exception that no consideration is given to future contract load demand on the network. The design loads are determined from the customer contract MDQ capacity reservations and an engineering factor used to convert the MDQ's to a diversified peak hourly flow.

AGL(ACT) developed a complete Contract Stand-Alone customer model for this evaluation. After the Stand-Alone "Stoner" modelling was completed, flows through individual customer pipes were recorded to determine the customer's share of network assets. These network assets were then costed to determine the ORC of the system, using the same MEEs, as the whole network. As each pipe has an associated cost, AGL(ACT) can calculate the customer's share of mains asset costs based upon the customers utilisation of the network and it's AA formulae.

The Contract Stand-Alone model developed follows the AGL(ACT) optimisation methodology described earlier, and as such the same generic limitations apply.

We will not discuss these limitations further at this point.

5.5.2 Optimisation Conclusions

The potential exists to lower the ORC valuation by using less constraints on the optimisation process than at present with the AGL(ACT) methodology, as outlined in previous sections.

We also consider the suite of MEEs used in the process to be incomplete.

We can only conclude that the DORC process as applied to the Contract Stand-Alone system and as described to EP is unsatisfactory. We believe that its use, as documented would not be appropriate.

5.6 Depreciated Optimised Replacement Cost – Asset Lives

It is EP's understanding that the asset lives adopted for the entire network have also been applied to Contract Stand-Alone assets. As such, the comments made in Section 3.6 are equally valid for Contract Stand-Alone assets. The accumulated depreciation applicable to the Contract Stand-Alone system is $3.2 million, resulting in a Contract Stand-Alone DORC of $11.5 million. This is a reasonable accumulated depreciation provision. No further comment is made in this regard.

5.7 Forecast Operating and Maintenance Expenditure

AGL(ACT) developed an estimate of the cost of operating the contract market system as a stand alone system, based on historical data from an activity based costing system. This estimate is shown in Table 5-1 below.

Table 5-1 Contract Stand-Alone System Operating Cost Estimate

Act. ID	Description	Cost for Total System ($1,000)	Cost for Stand Alone System ($1,000)	Category
B10	Perform cathodic protection	88	39	a
B11	Perform pipeline surveillance	152	69	a
B12	Perform regular maintenance of Trunk System (Trunk ALB Valves)	0	0	n/a
B13	Perform regular maintenance of Primary System (TRS & Primary Valves)	54	50	b
B14	Perform regular maintenance of Secondary System (PRS, POTS & Secondary Valves)	0	0	n/a
B15	Perform pressure survey and maintenance of customer meter sets HP (Customer related)	143	100	d
C16	Perform SCADA monitoring (including gas quality and balancing monitoring)	26	20	b
D17	Perform unplanned repairs & maintenance – HP	1	10	d
E18	Perform system design and monitor and model network performance HP	103	50	d
F20	Perform Line valve inspection & maintenance MP/LP (pipe related)	2	0	n/a

Act. ID	Description	Cost for Total System ($1,000)	Cost for Stand Alone System ($1,000)	Category
F21	Perform pressure survey and maintenance of customer meter sets MP/LP (Customer related)	77	0	n/a
F22	Perform regular maintenance of MP/LP System (SDRS & governor)	5	0	n/a
G23	Perform unplanned repairs & maintenance – MP/LP	585	0	n/a
H24	Perform system design, monitor and model network performance MP/LP	246	0	n/a
I26	Perform urgent response work	281	200	d
J27	Audit quality for regulatory compliance - (after the meter)	249	10	e
J28	Audit quality of R&M work including Life Guard (before the meter)	127	10	e
J29	Audit quality of Capital work including Life Guard (before the meter)	66	10	e
K30	Support service requests for access	97	10	e
K31	Collect meter readings (Excl. collect meter reading from SCADA)	247	0	n/a
K32	Operate and maintain daily metering devices (including collect meter reading from SCADA)	12	12	b
K33	Process enquires & complaints	182	10	e
K34	Perform connection & disconnection (excl. turn-on and turn-off)	24	10	e
K35	Maintain customer accounts	10	5	e
L40	Market Network Utilisation - Residential Existing Customer (Increase gas load)	406	0	n/a
L41	Market Network Utilisation - Residential New Home	530	0	n/a
L42	Market Network Utilisation - Residential Line of Main	3,387	0	n/a
L43	Market Network Utilisation - Business Sales Tariff	662	0	n/a
L44	Market Network Utilisation - Contract Customer	14	14	f
L45	Market Network Utilisation - New Area Expansion	29	20	f
L46	Market Network Utilisation - NGV	104	104	f

Act. ID	Description	Cost for Total System ($1,000)	Cost for Stand Alone System ($1,000)	Category
M50 *	Exercise management control & set strategic direction (including general management)	579	200	c
M51 *	Perform Financial accounting	227	50	e
M52 *	Perform Management accounting	100	50	e
M53 *	Maintain Regulatory relationship	135	100	c
M55 *	Perform research, improvement projects & technical development (including setting technical standards/policies)	630	100	e
M56 *	Manage corporate services	227	100	c
M54 *	Manage personnel & human resources	205	100	c
N61 *	Government Levies	1,060	100	d
N62 *	Corp. Overhead	1,671	200	c
M57 *	Coach and lead colleagues	127	10	e
N63	Insurance Expense	150	68	a
	TOTAL	13,020	1,831	
	Rounded		1,800	

** These costs apply to the DORC hypothetical asset. Overheads of $4.961 million were allocated to the ACT&Q gas networks and the breakdown by these activities were reconstructed based on the breakdown of the total network (including ACT networks), except Government Levies, which were based on actuals.*

We have not reviewed AGL(ACT)'s O&M forecasts and can make no comment on the appropriateness of the amounts forecast. We have confined our comments to those relating to the estimation of the stand alone O&M costs based on the 1997/98 data for the total system shown in Table 5-1.

The activities M50 to M57 and N62 are essentially corporate activities and are difficult to allocate to particular regions, assets or customers. The total cost is allocated between NSW and the ACT on what must be an arbitrary basis. AGL(ACT) has distributed the ACT and Queanbeyan allocation between activities N62 and M50 to M57 in proportion to the amounts recorded against these activities.

We note that the cost allocated to the Contract Stand-Alone system for activity D17 is greater than that for the whole system. However, as the amount is small and would not have changed the rounded total for the Contract Stand-Alone system, we do not consider it material.

The costs for some activities were easy to estimate, for example pipeline surveillance could be readily determined from the length of steel mains in the contract system as a proportion of the total length. Some other activities, such as maintenance of primary system valves, would not change or only change slightly. However, for the majority of activities, the costs for the stand-alone system were "educated estimates". AGL(ACT)'s estimates reflect the inherent inability to be precise and are generally "round numbers".

For each activity, AGL(ACT) indicated the rationale for the estimate as being one of seven. These seven categories and their associated contribution to total stand alone O&M is shown in Table 5-2.

Table 5-2 Contract Stand Alone System O&M Categories

Category	Description	Cost ($1,000)	Proportion
(a)	Cost is proportional to the length of mains. 45% to the contact market as the stand-alone contract market design is 45% of the HP system in length.	176	10%
(b)	Around the same cost is required for the stand-alone contract market design	82	4%
(c)	Best estimate to service around 39 contract customers and management at the current level	700	38%
(d)	Best estimate to operate / maintain the stand-alone contract market design	460	25%
(e)	Consider as the minimum cost to service the market as a stand-alone operation	275	15%
(f)	Best estimate to market / expand the contract market	138	8%
	Total	1,831	

The costs in categories (a) and (b) are relatively defensible. The balance, which make up the bulk of the total, are estimates.

As the Contract Stand-Alone system is artificial and there are no similar systems with which it could be compared, we saw little value in calculating standard industry benchmarks (eg. $ per customer, $ per kilometre of main and $ per GJ of gas transported) for comparison with other networks. Consequently, this has not been done.

We cannot comment other than to note that:

- We consider the DORC conceptual asset to be flawed;
- the estimation of the stand alone system O&M is essentially arbitrary;
- based on the information available to us, any assessment of the appropriateness of a particular estimate is arguable; and
- AGL(ACT) appears to have made reasonably defensible estimates of approximately 14% of the total cost, namely the costs in categories (a) and (b).

Cost allocation can arguably be based upon any of the following criteria:

- gas volumes consumed;
- numbers of customers;
- length of steel mains used versus plastic for tariff customers; and
- DORC values for Stand-Alone systems (Contract and Tariff).

The selection of any one particular basis is largely arbitrary. The Contract Stand-Alone concept should only be used with caution until its relevance has been agreed.

AGL(ACT) staff have advised that AGL(ACT) has retained INDEC Consulting to review the stand alone contract system O&M. The final report of this review is presently expected in June 1999.

5.8 Forecast Capital Expenditure

AGL(ACT) believes that the contract market is mature and that, other than for possible cogeneration schemes, there is little prospect of growth in this sector. In fact, AGL(ACT) has forecast no change in the number of contract customers and a slight decrease in gas usage over the next five years.

We offer no comment on AGL(ACT)'s forecast as we understand that it is the subject of a separate consultancy.

AGL(ACT) staff indicated that should additional contract customers request connections, those requests would be treated on their economic merits. Given that the size, timing and location of new contract loads can be difficult to predict, and the contract market does appear to be mature, we consider this approach to be sound.

There is no forecast Capex for the Contract Stand-Alone market. This appears a reasonable assumption based upon our analysis with the exception of the contestability capital expenditure.

AGL(ACT)'s queuing policy allocates network capacity on a “first come, first served” basis. This, together with considering the impact of new contract loads on longer-term network developments during the appraisal of their economic merit, should be adequate to allocate network capacity.

As indicated in Section 4.6.5, it may be more appropriate to include the Contestability Capex expenditure as Contract Stand-Alone System Capex.

5.9 Summary

5.9.1 Depreciated Optimised Replacement Cost

AGL(ACT) have produced a system design for the Contract Stand-Alone market. This system has been optimised using the same AGL(ACT) methodology that was described in Section 3 of this report.

The RC of the Contract Stand-Alone system is subject to the same uncertainty as discussed earlier for the steel system and medium pressure system.

The optimisation of this hypothetical system has produced a value that could be higher or lower than that achieved using a less constrained methodology. Further work is required by AGL(ACT) to determine the valuation range or precise value.

AGL(ACT) have provided an estimate of the accumulated depreciation of the Contract Stand-Alone system. As with the whole system depreciation, we would concur that the asset lives are within the range expected. This concept was discussed in Section 3.7 and given the outcome, we concur with the Contract Stand-Alone depreciation used by AGL(ACT).

We have some reservations about the use of a Contract Stand-Alone system DORC value and cost allocations. However, the use of this data is outside our terms of reference so we make no formal comment in this regard.

5.9.2 O&M Budgets

AGL(ACT) have proposed an allocation of the O&M budget for the Contract Stand-Alone system. While we have not reviewed the whole system budget we have considered the portion of the budget allocated to the Contract Stand-Alone system.

The O&M allocation is based upon an unsubstantiated conceptual DORC asset. Consequently, we believe that the proportioning of expenses for the Contract Stand-Alone system is inappropriate at this stage.

AGL(ACT) have proposed a largely arbitrary cost allocation. What is proposed is not unreasonable but could equally have been presented with greater or lesser costs attributed to the system.

These costs could have been allocated by such parameters as:

- ratio of gas consumed;
- length of steel and plastic main used;
- customer numbers; and
- DORC values (with Tariff Stand-Alone considered).

5.9.3 Contract Stand-Alone Capex

There is no Capex proposed for the Contract Stand-Alone system by AGL(ACT).