Connecting Growth:
Contribution Charges for Connection to Electricity Distribution Networks

Examining Implications for Equity and Efficiency

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A report to the Property Council of Australia, Business SA and South Australian Council of Social Services.

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Preface

This report has been prepared for the Property Council of Australia, Business SA and the South Australian Council of Social Services. It has been funded with the assistance of the NECA Advocacy Panel.

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Executive summary

Capital contributions are the requirement that customers contribute towards the cost of new connections to the electricity network.

Capital contributions in the context of electricity networks refer to the requirement that connecting customers are required to pay for, or contribute towards the cost of, new connections to the electricity distribution network. Their application, in theory, reflect the principles of user pays and allocative efficiency.

There is not a uniform approach to the application of capital contribution charges across all NEM jurisdictions…

While capital contribution policies are active in all National Electricity Market jurisdictions there is not a uniform approach across the various jurisdictions. Major areas of divergence include:

- the assignment and calculation of the costs involved in the connection;
- rebates and reimbursements available to offset costs assigned to connecting customers;
- treatment of developers; and
- contestability for connection services.

…different approaches mean that customers pay different amounts in different jurisdiction.

These differences mean that customers are required to contribute vastly different amounts depending on the jurisdiction. For example, when connecting to the network a large load customer in New South Wales may be required to contribute up to 200 per cent of the actual cost of the connection assets compared to only 100 per cent in the Australian Capital Territory and Queensland. This implies that in jurisdictions other than Queensland and the ACT, customers are effectively paying twice for connecting to the electricity network; first by way of upfront capital contributions and second via distribution use of system (DUoS) charges.

Capital contribution policies in South Australia

Arrangements in South Australia are complex. and lack transparency predictability and consistency…

In South Australia, like other jurisdictions, the calculation of capital contribution charges is highly complex and lacks transparency. They also appear to lack consistency and predictability. In particular,

- there appears to be little or no direct relationship between the total charge and the required electrical load or the magnitude of the development; and

and so stifle the development of new connections.

- the component costs (i.e. the cost for shared and dedicated works and the calculated rebate) of the total charge appear to have little direct relationship with the electrical load required or the magnitude of the development.

Accordingly, the current approach to funding new connections to the electricity distribution network in South Australia has little stakeholder support from connecting customers and property developers. South Australia will adopt a new approach from July 2005, but the proposed method does little to address concerns that connecting customers are being considerably overcharged.

Assessing alternative mechanisms for funding new network connections

There exists a number of alternative funding mechanisms for funding new network connections.

As with other forms of network infrastructure there are a number of alternative financing options for funding new connections to the electricity distribution network. Alternative options include:

- the use of capital contributions (the current approach) —this approach requires the customer to make a once-off upfront payment for the cost of the new connection;
- user charges, such as Distribution Use of System (DUoS) charges — these cover the cost of using the distributor's network from the bulk supply point to the customer's point of connection; and
- taxes — this option entails the state and/or local government financing the upfront cost of new connections and recouping this cost over the life of the asset.

Capital contributions are not efficient or fair and lack transparency.

An assessment of these current approaches reveals that by and large:

- requiring the upfront payment of new network connections is a relatively poor means of funding such works. Current approaches, like other forms of developer charges, are not efficient or fair and lack transparency, and
- there are a number of alternative funding approaches available which are relatively more efficient and equitable. These including the use of user charges and a mix of state and municipal taxes..

They also result in an opportunity cost for the economy as whole in terms of output, employment, consumption and investment.

Modelling undertaken further suggests that financing additional connections to the electricity network via capital contributions result in an opportunity cost for the economy as a whole. Financing new network connections via capital contributions in South Australia results in lower annual employment and lower economic output for the State as a whole over the period 2005 to 2019 relative to using either state/municipal taxes or user charges. In fact, the economy wide costs from the use of capital contributions (that require an upfront payment) nearly wipe out the entire benefits derived from the new customer connections they fund.

By contrast the use of DUoS charges results in an expansion of economic output, employment and investment.

By contrast, the use of user charges to finance network augmentations and extensions results in a relative increase in both annual employment and gross state product (GSP) for South Australia. This is largely because user charges involve a closer matching of costs to the community to benefits from use.

A preferred alternative

The objective of the Code are relevant to developing a best practice model for funding new network connections.

The objectives of the National Electricity Code (the Code) and associated market reforms are highly relevant to developing principles to be applied to the issue of capital contributions. Relevant objectives include:

- cost-reflective prices;
- contestability of connection services;
- beneficiary pays charging; and
- ownership of contributed assets.

Current approaches form weak price signals…

Although the extent to which these objectives are being met by the various jurisdictional approaches varies, it can be said that capital contribution charges are an ineffectual mechanism to establish price signals over connection locations and specifications. Planning laws and associated processes are the dominant factor influencing urban development

and are inconsistent with beneficiary pay principals

In many jurisdictions, current arrangements result in the violation of the beneficiary pays principals enunciated in the Code. This is because current arrangements allow network operators and existing customers to benefit at the expense of connecting customers. This is because new connections allow for increased DUoS revenues and lowers the average fixed costs of the network.

Capital contributions should only be required when the additional costs outweigh the benefits over the life of the connection asset.

Contribution charges should be calculated by assessing the impact on network costs and revenues from the connection over the entire life of the connection asset. Contributions should only be required when the additional costs are greater than the increase in revenues. Such an approach is not expected to have a significant impact on electricity tariffs given that the cost of additional connections (which would be borne by the electricity distributor) would be offset by increased DUoS revenues over the life of the connection assets.

The AER provides an opportunity for streamlining the various jurisdictional approaches.

There is strong merit in streamlining, to the greatest extent practicable, the current contribution policies of the various jurisdictions. The establishment of the Australia Economic Regulator (AER) presents an ideal opportunity to achieve this objective.

Conclusion

A number of current approaches are overly complex, lack transparency and are inconsistent…

A number of jurisdictional approaches to financing new connections to the network (in particular, South Australia's) are deficient. In calculating fair capital contributions some degree of complexity is inevitable. Yet many approaches are overly complex and lack transparency. They also produce inconsistent or unpredictable charges that are often not fair to connecting customers.

…they also violate a number of economic principals enunciated in the Code…

Current arrangements are also inconsistent with a number of economic principles enunciated in the National Electricity Code (the Code). Capital contribution charges form a weak price signal and benefit existing customers and network operators at the expense of connecting customers. Capital contributions are also inefficient and equitable relative to alternative financing arrangements.

they also result in an opportunity cost for the economy.

In several; jurisdictions current arrangements lead to an opportunity cost for the economy in terms of economic output, consumption, employment and investment. This is because in several jurisdictions, capital contribution policies require a substantial upfront payment for long lived assets. This approach does not allow for benefits and costs to be matched over time.

Chapter 1

Introduction

This study evaluates existing and alternative funding mechanisms used to finance extensions, connections and augmentation of electricity distribution networks in the National Electricity Market (NEM). Key objectives of the study include:

- review existing and alternative funding mechanisms for financing extensions, connections and augmentations of the electricity network;
- highlight the impacts arising from current funding arrangements on key stakeholders, such as end users and property developers;
- illustrate the effects that different funding choices have upon wider economic outcomes; and
- propose a best practice model for funding future extensions, connections and augmentations of electricity distribution networks.

In order to meet these objectives this study combines the application of an economic model with qualitative and quantitative inputs sourced from a range of relevant sources. These include various state and territory regulators, electricity distributors, the Property Council of Australia and a number of previous studies and documents relating to the funding mechanisms used to finance the augmentation of electricity supply distribution networks in the NEM.

The remainder of this report is set out in following structure:

- As a background to the rest of the report, chapter 2 provides a current state of play discussion of existing funding mechanisms for network augmentations and extensions in each of the NEM jurisdictions. In particular, it highlights the extent to which existing arrangements differ across States.
- Chapter 3 illustrates the impact of South Australia's current capital contribution policies on connecting customers. Drawing upon connection cost data from several recent developments, it highlights the lack of transparency, consistency and predictability of the current approach
- Chapter 4 provides a qualitative and quantitative assessment of a number of selected financing options and demonstrates the clear superiority of some mechanisms in delivering higher employment and economic growth. The MONASH Multi-Regional Forecasting (MMRF) model was used as a framework for the main quantitative part of the analysis. The MMRF model is a well documented, transparent model of the Australian economy taking into account inter-dependencies between the many sub-components that make up the economy. Appendix A contains further details about the MMRF model and the assumptions that underpin it.
- Chapter 5 identifies a number of broad fundamental principles embodied in the National Electricity Code (the Code) that should be considered in establishing a best practice model for funding future extensions, connections and augmentations of the electricity network.

- Finally, chapter 6 draws the report together and makes a series of recommendations based on the results of the previous analysis. It also discusses the likely implications of the report's findings for both the NEM and the regulatory processes that apply to the NEM.

Chapter 2

Capital contribution policies in the National Electricity Market

In this chapter, approaches to determining capital contributions in different National Electricity Market (NEM) jurisdictions are outlined and compared. It will seek to answer each of the following questions:

- *Are capital contributions applied in each of the NEM jurisdictions? If so how are they applied to different customers (e.g. developers, industry, farmers etc)?*
- *How does the application of capital contributions differ across different jurisdictions of the NEM?*

Capital contributions in the context of electricity networks refer to the requirement that connecting customers are required to pay for, or at least contribute to new connections to the electricity distribution network. New connections include network augmentations and extensions.

2.1 Application of capital contributions

Capital contribution policies are active in all NEM jurisdictions. In all jurisdictions except Queensland, the relevant regulator has recently modernised their contribution policies, with a series of new guidelines published since 2001 (see table 2.1).[1]

Queensland is currently in this process, with a new contributions policy to be implemented during 2005. Under present arrangements, contribution policy is developed by distributors as part of their Pricing Principle Statements, and requires the approval of the Queensland Competition Authority (QCA). Few details of these arrangements are in the public domain. Given the imminent redundancy of this policy, analysis of it has been kept at a high level.

While there is not a uniform approach to the application of capital contribution charges across all NEM jurisdictions, their application reflects the concerns of jurisdictional regulators that an uneconomic load should not be connected to the network at the cost of existing customers. That is, capital contribution charges reflect principles of user pays and allocative efficiency.

[1] The South Australian policy discussed in chapter is the approach to be adopted from July 2005.

Table 2.1

OVERVIEW OF JURISDICTIONAL APPROACHES TO CAPITAL CONTRIBUTIONS

Jurisdiction	Regulator	Relevant policy documents	Broad principles of approach
ACT	Independent Competition and Regulatory Commission (ICRC)	*Electricity Network Capital Contributions Code* (2001)	Contribution only required when the connection cost exceeds that of the 'basic standard' infrastructure
NSW	Independent Pricing and Regulatory Tribunal (IPART)	*Capital Contributions and Repayments for Connections to Electricity Distribution Networks in NSW* (2002)	All customers contribute to cost of 'dedicated' works; large and rural customers only contribute to 'shared' works'.
Qld	Queensland Competition Authority (QCA)	No published policy by regulator. Contribution policies are included in the pricing principle statements of electricity distributors.	No uniform approach —— varies according to customer type
South Australia	Essential Services Commission of South Australia (ESCOSA)	*Electricity Distribution Code Chapters 3: Connections Requiring Network Extension and/or Augmentation – Final Determination* (2003); *Supplementary Determination* (2004)	Cost allocation similar to NSW, but rebate applied.
Victoria	Essential Services Commission (ESC)	*Electricity Industry Guideline No. 14: Provision of Services by Electricity Distributors – Issue 1* (2004)	Only contribute where incremental cost to network exceeds incremental network revenues

Despite obvious differences (see table 2.1) capital contribution policies across the different NEM jurisdictions share a number of broad similarities. These include:

- *ownership of contributed assets* — ownership of the contributed assets tends to revert to the distributor, although some jurisdictions allow the contributor to retain ownership where stringent conditions are met;[2]
- *distributors not earning a return on contributed assets* – in accordance with the Code, distributors do not earn a return on capital contributions. This is achieved differently across jurisdictions. Most regulators exclude contributions from a distributor's regulatory asset base.[3] All jurisdictions incorporate costs from the refurbishment and maintenance of 'gifted' assets into their regulatory operating expenditure;

[2] These typically relate to insurance, safety and technical requirements.

[3] In Queensland, contributions are included but distributor revenues are reduced by a once-off amount equal to the net present value of all future network charges for contributed assets.

- *capital contributions are mostly required of large-load and rural customers* — these type of customers typically need 'unusual' or more costly connection works. 'Regular' connections usually incur either no or a smaller contribution obligation; and
- *differentiation between shared and dedicated works* — in assigning and calculating costs to connecting customers and to all electricity users (through DUoS charges), several policies rely on a distinction between required services. In the terminology of IPART, this distinction is between 'shared' and 'dedicated' works.
  - *Shared* works are those that benefit electricity customers in general, but which are required to accommodate the demands of a new customer. These include works and assets that enlarge the capability of the distributor's existing network to distribute electricity. Some regulators refer to these works as network *augmentations*.
  - *Dedicated* works predominantly benefit the customer seeking the connection. These include works and assets required to connect the customer's supply address to the distributor's existing distribution network. Dedicated works may also incorporate 'excluded' services – services performed by the distributor whose costs are not recoverable through DUoS charges. Some regulators refer to these works as network *extensions*.

Despite these broad similarities, there exists considerable differences in the capital contribution policies of NEM jurisdictions. These differences impact both the type of customer required to contribute and the contribution required. Major areas of divergence involve:

- the assignment and calculation of the costs involved in the connection;
- rebates and reimbursements available to offset costs assigned to connecting customers;
- treatment of developers; and
- contestability for connection services.

Each of these differences and how they impact on the amount connecting customers are required to contribute is discussed in the following sections.

2.2 Assignment and calculation of costs

The assignment and calculation of the costs allocated to the connecting customer differ significantly across each of the NEM jurisdictions. For example, in Victoria all connecting customers are liable for the cost of both shared and dedicated works, while in South Australia and New South Wales only large load and rural customers are required to contribute towards shared works.

These various approaches are summarised in table 2.2.

Table 2.2

ASSIGNEMENT AND CALCULATION OF COSTS: NEM JURISDICTIONS COMPARED

NSW	Queensland	South Australia	Victoria	Australian Capital Territory
All connecting customers are liable for the cost of dedicated works. Only large-load and rural customers (those that impose significant augmentation costs on the network) must contribute towards shared works. The Contribution's Policy does not specify how the cost of shared works is to be apportioned between the large-load/rural customers and the distributor. A case-by-case approach is applied.	Queensland's policy is unique in accordance with its policy of uniform distribution tariffs for customer classes. For ICC customers (>50 GWh/yr), connection charges reflect the share of network assets used by the individual customer. For CAC customers (>4MWh/yr), contribution charges are based on the overall cost of connection. ICC and CAC customer contributions are amortised over the life of connection assets and incorporated into network charges. For SAC customers (>200 MWh/yr), contributions are required where the overall cost of the connection for that particular customer exceeds the average cost for that customer class in the relevant location. The smallest customers are liable for the shared and dedicated cost of connection assets.	All connecting customers are liable for the cost of dedicated works. Only large-load and rural customers (those that impose significant augmentation costs on the network) must contribute towards shared works. The cost of shared works is calculated as the present value of the incremental capital costs of bringing forward 'planned' augmentation. In most cases this is calculated using a system-wide growth factor, based on metropolitan growth. Where a connection is unusual or expensive, individual assessments are undertaken.	All customers are liable for the cost of both shared works and dedicated works. The cost of shared works is calculated as the present value of the incremental capital costs of bringing forward 'planned' augmentation. In most cases this is calculated using a point or area-specific estimate. Where a connection is unusual or expensive, individual assessments are undertaken.	Connections of the 'basic standard infrastructure' do not require a contribution. Connections of a higher standard incur a capital charge up to the additional costs incurred as a result of the enhanced infrastructure. Distributors determine the relevant assets and services constituting the 'basic' level for each connection. Rural and 'uneconomic' connections are prescribed as non-standard. Contributions for rural connection are the extra cost of the connection relative to a standard urban connection. Contributions for 'uneconomic' connections may be an amount up to the full cost of the additional works.

Source: See documents referred to in table 2.1.

2.3 Rebates and reimbursements

Each of the NEM jurisdictions offer various reimbursements and rebates to offset the connection costs allocated to the connecting customer.

Reimbursements

Reimbursements apply where a subsequent connecting customer benefits from extension assets funded by an original contributor. This usually occurs some time after the original contribution has been made. Reimbursements may therefore be paid to the original contributor well after the upfront cost has been incurred.

As detailed in table 2.3, reimbursement schemes are common across NEM jurisdictions. Only the ACT does not allow for such a policy — perhaps because of its largely metropolitan customer base (the schemes are most relevant for rural areas where extension assets may be especially costly). The schemes are broadly similar — the most notable difference is in the length of time over which reimbursements are available.

Table 2.3

REIMBURSEMENTS: NEM JURISDICTIONS COMPARED

NSW	Queensland	South Australia	Victoria	ACT
Reimbursements are available for a period of seven years after the contribution. Only those customers that have contributed towards network augmentations (rural and large load customers) are eligible for reimbursement.	Reimbursements are available for a period of five years after the contribution.	Reimbursements are available for a period of seven years after the contribution.	Distributors to allocate costs among connectors at their discretion but in a manner that is 'fair and reasonable'. AGL and Powercor allow reimbursements for ten and a half years after the contribution.	No provision is made for reimbursements in the ACT's contributions policy

Source: published contributions guidelines; AGL 2004, *AGL Electricity Customer Connection Policy*, June, p. 6, Powercor 2002, *Customer Guidelines for making an Electricity Supply Available to your Property,* p15.

The reimbursement scheme operated by AGL and Powercor in Victoria are the most generous among the NEM jurisdictions. This is followed by New South Wales and South Australia where reimbursements are available for up to a period of seven years. Queensland appears to be less generous again.

Rebates

Rebates are calculated at the time of connection and usually relate to future DUoS revenues arising from the connection. Rebates are credited against network connection costs so that the upfront amount required of the customer is the excess of the costs allocated to the customer over the rebate.

While there is general uniformity in reimbursement schemes, rebate arrangements are markedly different. These differences have a significant impact on the amounts required to be paid by connecting customers in each of the jurisdictions. Table 2.4 provides an overview of the various rebate schemes in operation.

Table 2.4

REBATES: NEM JURISDICTIONS COMPARED

NSW	Queensland	South Australia	Victoria	Australian Capital Territory
No rebate is credited against connection costs.	Because ICC and CAC customers effectively pay their connection costs through network prices, there is no rebate for them. The rebate for mid-sized customers is the 'average cost' of connections for that customer class in that location. The smallest customers receive a rebate equivalent to 4.44 times annual DUoS payments (about five years worth, depending on the discount rate).	Rebates differ according to the type of customer and connection. They are currently set at: • $3000 for residential customers; • $1200 plus three years worth of estimated DUoS payments for non-residential customers; and • three years worth of estimated DUoS payments for redevelopments.	Rebates are based on the present value of DUoS revenues facilitated by the connection ('incremental revenue') over a period of: • 30 years for residential customers; and • 15 years for non-residential connections. Distributors may require 'risky' customers to make a security deposit at the time of connection. This is refunded when forecast revenues are expected to materialise.	The 'implicit' rebate for all customers is the cost of the basic standard infrastructure. Rural customers only contribute the extra cost of their connection relative to this standard. Large load customers receive a rebate equal to the DUoS revenue arising from their connection over the life of the connection assets. This is because such customers are only deemed 'uneconomic' (thus required to make a contribution) where DUoS revenues over the life of the connection compared to the network costs make the connection 'unprofitable'.

Source: See documents referred to in table 2.1.

2.4 Impact on developers

In most jurisdictions, analogous arrangements tend to apply to developers as for other segments of the community, as prescribed in the various contributions policies.

In NSW, developers are subject to the general requirement to pay for assets and services specific to their site, and shared assets if they exceed the 'large load' threshold.

In Victoria developers rather than distributors, are responsible for installing electricity infrastructure within urban residential subdivisions. However, the generic funding principal still applies. The amount developers are ultimately required to contribute is based on the incremental network costs and revenues over the specified life of the connection asset.

South Australia similarly brings developers under its general policy, but the nature of the policy discriminates against certain developers. Developers who apply for connection are treated as if they were individual customers and hence are entitled to receive the fixed portion of the rebate ($1 200) only once. This creates the anomalous situation where a developer receives the one off fixed rebate only once ($1 200 in aggregate) despite the fact that the development may be made up of several 'serviced' lots. By contrast an individual customer wishing to connect one 'serviceable' lot would attract the same rebate upon connection.[4]

The rebates scheme described above have a significant impact on the contributions of developers. For example, in South Australia developers of residential lots are entitled to a total rebate of $1 200 plus three years of DUoS payments. By contrast in Victoria rebates in relation to residential developments are based on the net present value (NPV) of DUoS revenues facilitated by the connection over a period of 30 years.

2.5 Contestability for connection services

In relation to the contestability of connection services, jurisdictions tend to rely on individual assessments of whether the costs and benefits of contestability warrant its application. The level of contestability for performing services therefore varies across jurisdictions, in accordance with those assessments.

- In South Australia, dedicated works are contestable while augmentations are non-contestable. The distributor is afforded sole provision of augmentation services because of the potential impact of faulty works on its existing customers, and the technical and safety issues involved.
- In Victoria, most dedicated works are contestable while augmentations are only contestable at the discretion of the distributors.
- In NSW the general approach is that all works funded by capital contributions are contestable. These include dedicated works and some augmentation works.

[4] Serviced lots are those where the developer applied for connection; serviceable lots are those where property purchasers apply for connection, often discretely.

- In the ACT, works funded by customers are contestable provided the customer contribution exceeds a threshold value and the works are able to be safely isolated and not unduly interrupt other customers.[5]

In these jurisdictions, prices for non-contestable services are usually subject to regulatory oversight. For example, charges for these augmentation services in South Australia are calculated using a prescribed formula, while prices for ‘monopoly services’ in NSW (including design and inspection functions) are set by the regulator.

Queensland is an exception to other states, as the Government does not mandate contestability for services; instead, it has been left for industry to implement.

2.6 Summary of contribution policies

As the preceding discussion indicates, there are quite different approaches to the application and derivation of capital contributions across the NEM. The vagaries and nuances of each particular arrangement means that the actual capital contributions required in each jurisdiction will vary.

However, the general nature of the rebates, reimbursements and factors included in connection cost evaluations suggest contribution policies can be broadly ranked across jurisdictions. Clearly, the NSW regime — with no rebate — is the most demanding in terms of contributions, particularly for large load customers.

At the other end of the scale, the ACT regime is the most generous. Residential customers requiring only the basic standard of infrastructure are not required to pay a capital contribution. For those customers requiring a higher standard of connection (i.e. ‘large load’ customers), the rebate is considerable, and includes the present value revenues over the life of connection assets. Furthermore, relative to the other jurisdictions the ACT’s capital contribution policy appears to be both simple and transparent.

The South Australian policy favours residential connections over large load connections, because the thresholds applied mean that only large load and rural customers contribute towards shared works. Customer rebates differ according to the connection type – either being fixed, calculated on three years of DUoS charges, or a combination of both. The policy applied in South Australia effectively discriminates against certain types of developers given that the rebate is paid per customer as opposed to the number of ‘serviced’ lots.

In Victoria all customers are liable for both shared and dedicated works. The contribution amount is calculated in a transparent and consistent manner. The calculation takes into account the expected revenues that are likely to accrue from the asset over a period of 30 years for residential connections and 15 years for non-residential connections. Hence, in Victoria connecting customers pay contributions if the cost to the network of connecting the customer exceeds the forecast additional network revenues.

[5] ICRC 2004, *Final report: Review of contestable electricity infrastructure works*, pp. 15-19.

As detailed in this chapter the different jurisdictional approaches mean that customers are required to contribute vastly different amounts depending on the jurisdiction. According to Exigency Management[6], in NSW the amount a large-load connecting customer pays (in contributions and future DUoS revenues) may be up to 200 per cent of the actual cost of the connection assets. This compares to only 100 per cent in the ACT (see table 2.5).

Table 2.5

POTENTIAL CUSTOMER CONTRIBUTIONS: NEM JURISDICTIONS COMPARED

Jurisdiction	Potential customer contribution (per cent)	Comments
NSW	200	No DUoS off-set for contestable works
Queensland	100	Costs recovered over the economic life of the asset
South Australia	165 - 180	A 3 year DUoS reimbursement plus a standard rebate per customer.
Victoria	135	DUoS offset based on a 15 year asset life for large load customers and a 30 year asset life for residential customers.
ACT	100	Discount period based on life of the asset

Note: Potential customer contributions are calculated as contributions plus discounted DUoS charges expressed as a percentage of the connection asset costs.
Source: Exigency Management 2004, *Whose line is it anyway,* p.5.

The following chapter provides colour to the above analysis by providing actual examples of how South Australia's contribution policies impact on connecting customers in that jurisdiction.

[6] Exigency Management 2004, *Whose Line is it Anyway? A review of the connection arrangements for large customers throughout the National Electricity Market*, p. 5.

Chapter 3

Capital contributions in South Australia

This chapter illustrates the impact of current capital contribution policies on connecting customers in South Australia. It highlights a number of shortcomings associated with the current approach, namely that it lacks transparency, consistency and predictability.

As discussed in chapter 2 there are marked differences in the capital contribution policies of each of the NEM jurisdictions. Furthermore, in several states the calculation of capital contributions are complex and lack transparency. This is particularly the case in South Australia..

3.1 Calculating capital contribution charges in South Australia

Table 3.1 details the calculation of the required capital contribution charge for a number of recent property developments in South Australia. These include residential, commercial and industrial developments located in different areas across the state. The table details the value of the development, its location, and a breakdown of the various capital contribution components.

As discussed in the previous chapter and reflected in table 3.1 the calculation of capital contribution charges in South Australia is complex and requires the calculation of the following:

- the calculation of shared works The cost of shared works reflect the cost associated with bringing forward planned works to the existing electricity distribution network such as the cost of upgrading a electrical substation;
- the cost of dedicated works. This includes the actual cost of network assets that are specific to the new connection such as transformers, cabling (i.e. powerlines) and meters; and
- the value of rebates. In South Australia rebates vary according to customer type and usually involve a lump sum payment as well as an estimate of future DUoS revenues over a three year period.

3.2 Analysis of the actual charges

Analysis of the data in table 3.1 reveals that both the total cost and the component costs and rebates have little direct relationship with the required electrical load or the magnitude of the development. In particular:

- there is little or no relationship between the cost of dedicated works and the total electrical load or physical size of the development; and
- there is little or no relationship between the cost of shared works and the required electrical load.

Table 3.1

ETSA UTILTY COSTS — SELECTED SA DEVELOPMENTS

Project	Type	Location	Load (KVA)	ETSA Charges				Size of Development	Value of Development ($ Million)
				Augmentation ($ 000)	Connection ($ 000)	Rebate ($ 000)	Total ($ 000)		
Barossa Valley Aged Care Facility	Residential subdivision (Aged care residence)	Nurioopta	500	61.5	70.5	32.0	99.9	70 units	11.2
Bent Street Apartments	Residential apartments	CBD	500	40.7	244.3	103.3	181.7	100 apartments	17.5
Frome/Flinders Street Development	Commercial office	CBD	1 000	120.2	220.9	149.7	191.4	6 600 m2	9.0
Elizabeth City Centre	Shopping centre	Elizabeth	7 500	960.4	160.4	100.3	1020.5	29 500 m2	78.0
UniSA City West Campus Building 2 & 3B	Education	CBD	1 155	160.0	228.3	91.5	296.8	12 566 m2	29.0
Lyell McEwan Hospital	Hospital	Salisbury	6 250	708.5	592.6	241.2	1059.9	34 000 m2	85.0
Exacto Plastics	Industrial	Edinburgh	1 500	115.9	113.2	154.8	74.3	8 000 m2	6.0

Source: BESTEC Pty Ltd

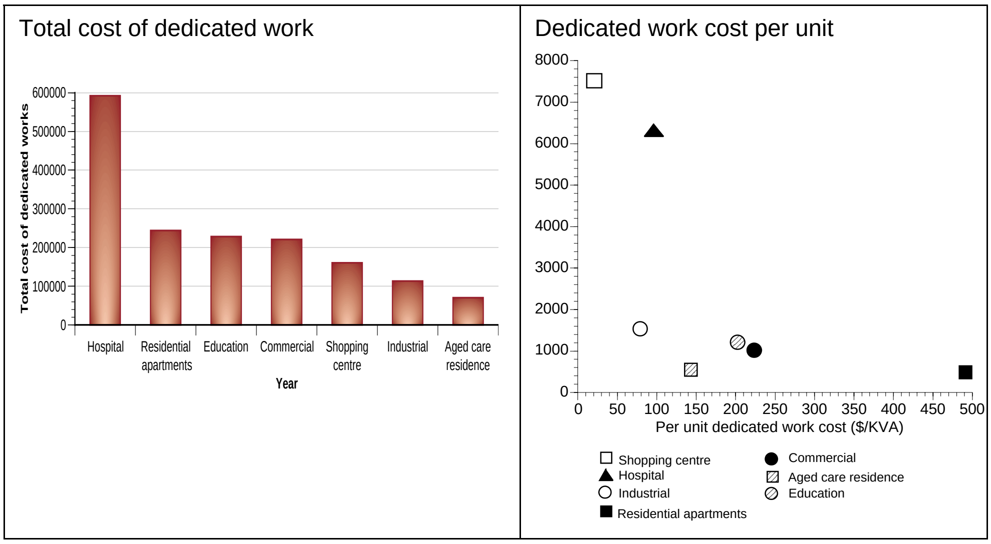
Taken together these factors mean that the calculation of capital charges in South Australia is highly complex and lack transparency, predictability and consistency. Accordingly, they have little stakeholder support from connecting customers and property developers.

There is little or no relationship between the cost of dedicated works and the total electrical load or physical size of the development.

There appears to be little or no relationship between either the total cost, or the per unit cost, of dedicated works and the required electrical load. It is also interesting to note that the cost of dedicated works has little to do with the number of individual connections that the development will require. This is most notable from the comparing the two residential developments included in figure 3.1.

Figure 3.1

ETSA DEDICATED WORK COSTS — SELECTED PROJECTS



Source: BESTEC Pty Ltd

The total cost of dedicated works incurred by the Barossa Valley development was $70 442. This development required an electrical load of 500 KVA and the connection of 70 individual units. Hence, the average cost of the dedicated works per unit were approximately $1 007. By comparison, the connection cost incurred by a development of 100 apartments in the Central Business District (CBD) of Adelaide was $244 310 or an average cost of $24 431 per apartment. This development also required an electrical load of 500 KVA.

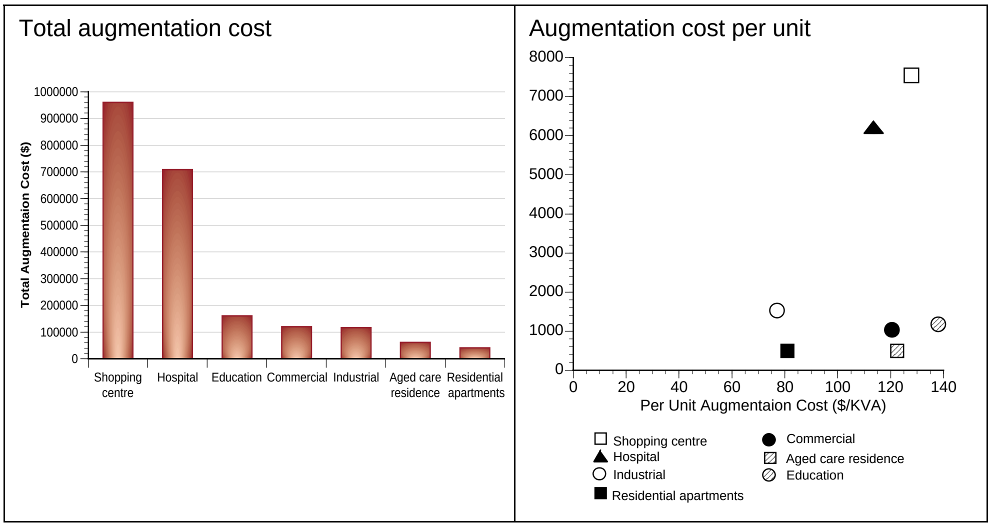
While it is noted there is likely to be some variation in the per unit cost of dedicated works across developments, especially where one development may require the installation of underground cabling as opposed to overhead cables, the above variations seem large given that both developments require the same electrical load and the scale of the developments are not markedly different. It is our understanding that ETSA Utilities has given the connecting customers little justification for this difference in the cost of the dedicated works between the two specific projects.

There is little or no relationship between the cost of shared works and the required electrical load.

While the total amount of shared works appear to increase with the total electrical load (KVA) required, the per unit cost does not – see figure 3.2. For example comparing the two residential developments, (which both require the same electrical load) reveals that the per unit cost network augmentation differs by a factor of approximately 1.56 between the CBD and Barossa Valley. This difference can be solely justified by the fact that in comparison to the CBD development, the Barossa Valley development requires planned work on the electricity distribution network to be brought forward.

Figure 3.2

ETSA AUGMENTAION COSTS — SELECTED SA PROJECTS



Source: BESTEC Pty Ltd

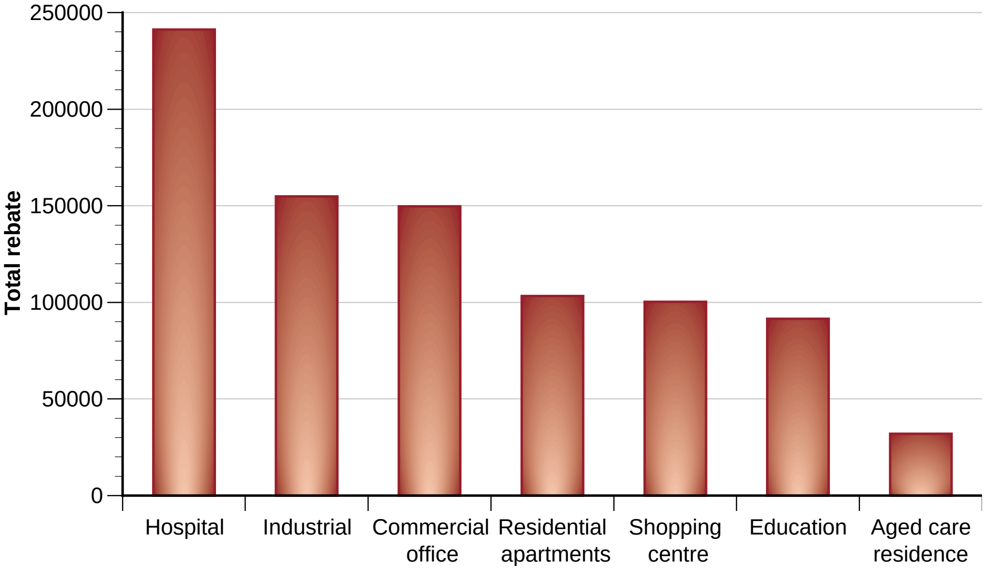
The calculation of rebates lack transparency, predictability and consistency

The calculated rebate for non-residential customers is based on the expected DUoS revenues over the first three years of the connection asset. Hence, consumption patterns determine the rebate.

Given different types of customers (i.e. residential, industrial or commercial) have different consumption patterns, the type of development is likely to impact on the consumption of electricity and also the expected DUoS revenues likely to be realised over the first three years of the connection asset. Therefore, it is reasonable to assume that similar types of developments would attract similar rebates (subject to size of the development). It is not clear, however, this is occurring at present. Accordingly, developers note that the current arrangements in relation to calculation of rebates lack transparency predictability, and consistency.

Figure 3.3

TOTAL ETSA REBATE — SELECTED SOUTH AUSTRALIAN DEVELOPMENTS



Source: BESTEC Pty Ltd

Taken together the above factors mean the total capital contributions currently payable by connecting customers lack transparency, consistency and predictability. Lack of transparency means connecting customers, and in particular developers, have little understanding of how the costs of connecting to the electricity distribution network are calculated.

Similarly, lack of predictability and consistency means that connecting customers are unable to fully, assess with any certainty, the cost connecting to the network. Normally this would have a negative impact of investment decisions by connecting customers, however this not the case given that:

- the cost of connecting to the electricity distribution network is only a small proportion of the overall cost of a development;
- investment decisions regarding property developments are determined mainly by local planning laws as opposed to the price signals created by various developer charges such as capital contributions; and
- demand for connecting to the electricity network is highly inelastic (given that supply of electricity is an essential service).

As noted, South Australia will adopt a new policy from July 2005. While the move away from the flawed approach currently in place is welcome, the new policy has major shortcomings and inconsistencies.

Chapter 4

Evaluation of funding alternatives

This chapter will seek to identify a number of alternatives for funding dedicated works other than capital contributions. It will evaluate each of these alternatives according to a rigorous framework including both qualitative and quantitative indicators.

4.1 Funding alternatives

There are several funding options available for financing large-scale utility infrastructure such as electricity distribution networks including:

- Capital contributions similar to the current arrangements in each of the National Electricity Market (NEM) jurisdictions. These are effectively a form of developer charges.
- Distribution Use of System (DUoS) charges which cover the cost of using the distributor's network from the bulk supply point to the customer's point of connection. These are a form of user charges and are incorporated into the total end user charge for electricity.
- State taxes/municipal rates which entail the state and/or local government financing the upfront cost of the infrastructure works and recouping this cost over the life of the asset. Given the extent to which electricity distribution networks in Australia have been privatised and/or corporatised this funding mechanism is likely to be politically unpalatable, however its inclusion in this analysis is useful for the purposes of comparison.

4.2 Qualitative assessment

The first step in conducting a transparent qualitative assessment of the identified funding mechanisms is to be clear about the criteria on which they are to be assessed. Seven criteria on which to assess the relative performance of the various funding mechanisms include:

- *Effectiveness* — refers to the extent to which sufficient funds are mobilised to allow for the investment to be undertaken, and whether it can be done in a timely manner.
- *Efficiency* — this criterion considers the impact of a funding approach upon wellbeing in general. It asks the question does the measure make people, the community at large or the environment better or worse off? Typically, the key issue is whether or not the required approach allows prices to reflect true economic costs. The larger the gap between prices and costs the less likely that resources will be allocated efficiently.
- *Equity* — this is concerned with the relative fairness of a funding instrument. Its importance arises from social justice concerns about sharing the burden of revenue raising fairly between individuals who have differing abilities to pay.

- *Stability/reliability* — this criterion assesses the degree of consistency and predictability associated with a funding instrument. A consistent and predictable source of revenue is preferred to a source that is subject to shifting and unforeseeable influences.
- *Administration costs* — typically low administrative costs are a result of simplicity.
- *Transparency* —transparency is a key means of reducing uncertainty as it facilitates an understanding of the process and issues that need to be dealt with, by relevant parties.
- *Stakeholder support* —stakeholders' reaction to funding options is typically taken into consideration by policy makers and regulators.

Capital contributions (the current approach)

Capital contributions and effectiveness

Capital contributions have been an effective means of funding new connections to the electricity network for sometime. They have allowed regulated electricity distributors to overcome the difficulties of funding ongoing and often unforeseen connections to the network without the need to expend capital and operational expenditure allowed by the regulator.

Capital contributions and efficiency

Capital contributions can influence the allocation of resources in the development of electricity networks and urban developments in general. Key factors generally identified as advantages include the following:

- charges increase the investment that developers make when providing lots into the market. The response has been to increase the scale of developments. They also encourage developers not to hold on to land (i.e. speculate);
- developers install electricity distribution services in advance of building which costs less than subsequent installation; and
- charges discourage development in locations where service provision would be expensive by making the developers responsible for those costs. Developers have a strong incentive to focus upon lower cost areas.

While most of these economic advantages relate to developer charges in general, it is unclear that they offer significant benefits in the context of new connections to the existing electricity network. In fact there is a degree of evidence which suggests that capital contributions serve to distort economic efficiency as they provide a disincentive for network operators to upgrade network facilities in those areas which may be subject to a network augmentation in the short to medium term. For example, in areas where there is likely to be large scale urban development, the network owner may chose to delay or even forgo the upgrading of network facilities on the basis that they anticipate a request by a developer to connect a residential or commercial development.

Furthermore, as noted in chapter 4 of this report, the effectiveness of capital contributions and developer charges to provide price signals is undermined by the current planning laws and associated processes. They are also undermined in the sense that the cost of connecting to the electricity network is but one of many cost considerations for a developer. Hence, capital contributions do not provide developers with strong incentives to undertake activities in areas where connecting to the electricity network would be less costly.

A further concern is the incentives faced by developers to provide facilities that may be 'less than optimally durable' in order to meet immediate requirements at the lowest cost. This may potentially result in increased whole-of-life network costs. This, however, is somewhat mitigated by the regulations restricting the contestability of network connections particularly the restrictions imposed on network design and the undertaking of work for 'large load' connections.

Capital contributions and equity

Capital contributions have equity effects that are generally regressive. Capital contributions are generally passed on to customers (see box 4.1). This implies that the incidence of the charge is passed on to new home buyers or tenants of commercial developments. When the price of new houses rise, so does the price of its close substitute, existing housing. Thus existing home owners are made wealthier while renters and prospective home buyers face increased prices for new homes.

There are many additional dimensions to indicate that capital contributions in relation to electricity networks raise equity issues. Increased house prices resulting from the use of capital contribution charges raise the hurdle for first home owners and renters in general to buy homes. Increased house prices in general raise rents paid by tenants. Moreover, capital contributions tend to be regressive, as the impact fees are typically the same whether a new commercial or residential property is priced at $15 000 or $150 000. The fee therefore implies a larger percentage increase in the sale price of lower-priced property than of higher-priced property.

Critics of capital contributions note that additional connections to the network generates incremental revenue for the network owners. This revenue only arises as a result of increased demand derived from adding new customers to the network. Given that the costs of electricity networks are largely fixed in the short term, any additional revenue accruing from new connections is effectively a windfall gain for the electricity distributor in the short term.

Taken together, the above evidence suggests that capital contributions are an inequitable form of financing new connections to the electricity distribution network.

Box 4.1

WHO ULTIMATELY PAYS FOR CAPITAL CONTRIBUTION CHARGES?

Capital contributions are essentially a form of user pays charging, involving the upfront payment for infrastructure. Much commentary has focused on the negative impact that developer charges in general have on the affordability of housing. Implicit in these arguments is a presumption that the economic incidence of developer charges (such as capital contributions) is ultimately borne by the final home purchaser.

The majority of the literature on this subject supports this proposition, and it is further argued that this general assumption holds more strongly over the longer-term. In the short-term, market dynamics heavily influence the incidence of such levies or charges.

The legal incidence of a tax or levy will diverge from its economic incidence to varying degrees, in response to supply and demand characteristics across the production chain, and the absence of arbitrary price constraints. In relation to taxes and levies on property, while the developer faces the legal incidence of a given charge, the developer is usually able to incorporate this charge in the final price of their land and home package. In this sense, the economic incidence of the developer contribution charge is ‚passed forward to the new home owner.

The theory underlying such an outcome rests upon the differential between the elasticity (or price responsiveness) of demand in the market for raw land purchased by the developer, and the market for home and land packages into which the developer is selling their product. In this regard, Neutze refers to tax incidence theory which implies that a ‚developer contribution charge will be passed backward if the supply of raw land is less elastic, and forward if the demand for serviced land is less elastic. Neutze makes the relevant point that demand for serviced land may be less elastic (or price responsive) due to the fact that servicing costs are only part of the cost of land, with land itself only one element of the cost of a total dwelling, and indeed the demand for completed dwellings itself being quite inelastic.

In the long-run this outcome allows the developer charge to be passed forward. However, on occasion, supply and demand characteristics in each market will alter the extent to which the economic incidence is able to be fully passed forward. If the prevailing market for home and land packages is not strong, and a developer’s cost of finance is such that withholding lots from sale for a period of time is not feasible, then the developer may choose to absorb some of the developer charge in its profit margin. That said, this outcome can only ever be a limited short-term phenomenon, or else the sustained lower returns on capital for the developers would imply a shakeout in the market further down the supply chain.

Returning to the theory for a moment, we can also consider the unlikely but theoretically possible situation where developers might seek to pass the cost and economic incidence of a, developer contribution charge backwards to the owners of the raw land. For this outcome to hold, the developer either needs to be a monopsonist (i.e. the sole potential purchaser of the raw land), or alternatively have a unique information set (relative to other developers) regarding the development potential of a plot of raw unimproved land. In addition, the alternate uses and returns to which that land might be put (e.g. agriculture or forestry purposes) must be so relatively unattractive as to make the owners of the raw land willing to accept a price for the land which has been depressed to the extent of the contribution charge that the developer was required to pay to the council.

Given the unlikely set of factors that would enable a developer to pass the contribution charge backwards, and noting that developers would only be prepared to absorb an element of this charge in their profit margin in limited circumstances in the short-term, it seems reasonable to assume that the economic incidence of developer contributions is passed forward to consumers in most circumstances.

The application of infrastructure charges to new developments will also flow through to the price of existing dwellings. In deciding whether to purchase a new or existing home, home buyers take into account relative prices. To the extent infrastructure charges increase the price of new houses, this will enhance the relative attractiveness of existing homes. Prices will adjust until the discrepancy caused by the infrastructure charge is dissipated.

Source: Access Economics 2003, *Financing Infrastructure for Residential Development,* A report for the Housing Industry Association Limited, Australia, pp. 35-36;
The Allen Consulting Group 2003, Funding Urban Public Infrastructure: Approaches compared, a report for the Property Council of Australia, Sydney, p. 65; and
Neutze 1997, Funding Urban Services: Options for physical infrastructure, Allen & Unwin.

Stability/reliability of the funding base

A convenient aspect of capital contributions is that they can be applied when the infrastructure is needed (i.e. when development is afoot). As such they represent a source of finance that is generally likely to move in concert with the demand for additional connections to the network. However, they are less available when the property and construction cycles are in a downturn phase.

Administration costs involved with capital contributions

Generally, developer charges are often seen as being a lower cost means of raising revenue than consumer charges. Rather than deal with large numbers of consumers, or collecting small fees from a large number of users, the infrastructure provider merely have to deal with a handful of businesses.

In the case of capital contributions, and as illustrated in the previous chapters, this is not necessarily the case. First, the calculation of capital charges is difficult. For example, in South Australia the calculation of the required contribution requires estimation of likely DUoS charges projected 3 years into the future, the calculation of the allowable rebate and an estimation of the metropolitan load growth factor. Hence, the calculation of the required contribution charge is complex which no doubt adds to the administrative burden of both the electricity distributor and the connecting customer (particularly in the case of large load customers). Second, capital contributions normally involve negotiations with developers and land owners regarding the quantum of the charge. This is both resource-intensive and time consuming.

Transparency

Capital contributions lack transparency and there is considerable scope for arbitrary, ad hoc administrative decision making on behalf of the electricity distributors. As noted by the Property Council of Australia there is limited information available to the connecting customer regarding connections, contributions and associated works. Information is either not published or is published but incomplete and consequently is of limited use for customer budget planning and decision making processes.[7]

This adds significantly to uncertain outcomes, commercial risk and ultimately raises the cost of capital for connecting customers.

Stakeholder support regarding capital contributions

Developers in general are not supportive of the current arrangements for capital contributions. In general, capital contribution arrangements, particularly in South Australia and NSW are poorly understood and in some instances place an unwarranted financial burden on the connecting customer.

Reflecting the low level of stakeholder support for capital contributions is the fact that there are high rates of informal negotiations between property developers and network distributors regarding the magnitude and calculation of capital contributions.

User charges

General user charges or pricing to cover capital and operating expenses is used by numerous network and infrastructure service providers throughout Australia. The accumulated funds derived from these charges or prices are used to finance the cost

[7] Property Council of Australia.

of maintaining and upgrading the existing network as well as additions to it. In such industries per unit charges are set at a level necessary to recover the long rum incremental cost of providing the particular service. This includes the incremental cost associated with the service itself as well as network infrastructure.

User charges and effectiveness

Where an economic activity is profitable user charges are an effective way to raise sufficient funds to cover the cost of an investment. The problem arises where the economic activity in question is considered to be uneconomic. This may be applicable for network extensions to regional and remote areas (i.e. to remote properties).

As shown by the Victorian arrangements, in most cases electricity network augmentations are economically viable. That is DUoS charges (i.e. user charges) will provide a sufficient risk adjusted rate of return to compensate the electricity distributor for the additional investment required to connect the additional customer. Similarly, in the ACT user charges are sufficient to cover the cost of network connections of a basic standard (see chapter 2).

User charges and efficiency

The main theoretical advantage of user charges is that they encourage the use of the infrastructure service up to the level where the cost of supplying an additional unit would be greater than its value to consumers. Economic theory holds that because of this characteristic the use of user charges are most likely to result in the best allocation of resources between network industries and other sectors of the economy.[8]

It is often argued that in the context of network industries characterised by high fixed costs assets it is difficult to assign user charges in a manner that achieves perfectly efficient pricing. Problems arise in relation to falling average costs, sunk costs, congestion and capacity constraints. While this is true of all network industries the substantial degree to which there exists price regulations such as retail price controls suggests that calculating per unit prices to reflect the total cost of service is not an insurmountable task. Furthermore, given that access to electricity is an essential service, it is unlikely user charges will dampen the demand for electricity (including access to the network) to below optimal levels.

Accordingly, in the context of electricity networks, user charges appear to be an efficient way of raising the necessary funds for network connections. That said however, there are no doubt cases where the incremental costs of connecting an additional customer will outweigh the expected revenue from user charges and are therefore uneconomic in nature. This is most likely to be the case for remote and regional customers such as farmers. In such cases user charges may be an inefficient means of recovering the cost of additional connections.

User charges and equity

User pays approaches are viewed as being equitable where the user is the main beneficiary. The problem in relation to new connections to the electricity network is that not all users of the network will benefit directly from the new connection. They may however benefit indirectly, and over time, from lower per unit costs reflecting the fact that increased demand from additional connections allow for fixed network costs to be spread over a larger total demand.

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[8] See Nuetze 1997, *Funding Urban Infrastructure: Options for physical infrastructure*, Allen and Unwin, Sydney, p.113.

Stability/reliability of the funding base

The revenue from user charges is related to use. Use may not be constant and where a premises is vacant there may be no use at all. If the network distributor is dependent upon this source of revenue to recoup a capital cost it is then taking a commercial risk.

Administration costs

User charges need to be collected.

Recovering the cost of new connections as part of DUoS charges would be unlikely to add a significant administrative or financial burden upon the network distributors. In fact, given that the network distributors currently have extensive customer databases and associated systems it could be argued that recouping customer connections via DUoS charges would place less of an administrative burden on the network distributor than the current arrangements.

Transparency and user charges

User charges are prices and hence tend to be very transparent.

Stakeholder support

Most consumers of network services see the link between a service and the price. Consumers tend to be more accepting of charges for new infrastructure services. They are less accepting of new or increased charges for 'old' or pre-existing infrastructure.

4.3 Taxes

Many large infrastructure projects are financed through the power of government to apply taxes. This includes a wide range of taxes at the state level (e.g. payroll taxes and stamp duties) and municipal rates (e.g. to commercial and residential property) at the local government level.

Taxes and effectiveness

Contrary to widespread complaints by state governments about the inadequacy of their tax base, significant funds are in fact raised this way and can be raised this way in future.

The situation for local government taxation (via rates) is less clear. Rates do raise a significant quantum of revenue for infrastructure provision. However, in some states, such as NSW, the ability of local councils to substantially increase rates for the purposes of funding additional infrastructure — in either the short or long term — is constrained by rate pegging restrictions.[9]

Taxes and efficiency

State taxes have little impact upon encouraging efficient levels of use of infrastructure services. Furthermore state taxes can distort economic outcomes. They do not merely redistribute money and resources they can shrink the economy, leaving us all poorer. They involve an 'excess burden' or 'deadweight loss'.

[9] The *NSW Local Government Act 1993* provides for the Minster to specify the amount by which councils annually increase their ordinary general rates income. For 2003, this increase was set at 3.6 per cent of the preceding year. The Act provides for councils to seek variations above the generally allowed increase.

Local government rates appear to rank well in efficiency terms in an absolute sense and relative to other state taxes. Productivity Commission research, for example, notes that broad-based property taxes have long been regarded as a relatively efficient form of taxing.[10] That research also found the marginal excess burden of taxation (a measure of the efficiency cost of raising an additional dollar of revenue) for such taxes is negligible — confirming the view that that they are highly efficient.

One implication of using taxation to finance long lived network infrastructure is that costs are allocated to current taxpayers, whereas the benefits of many infrastructure projects accrue over the life of the infrastructure asset. This involves a reduction in allocative efficiency over time, or in dynamic efficiency.

Taxes and equity

Using current taxation to finance long lived network assets raises concerns about intergenerational equity. This is because paying for such assets with current taxes attributes the total cost of the infrastructure to current generations only. By contrast, the benefits accrue over the life of the asset which in many cases will span several generations.

Stability/reliability of the funding base

The goods and services tax (GST) provides the states with a stable and reliable tax base that is expected to grow over time.

Municipal rates represent a relatively stable source of revenue. Although they are subject to variations in the property market, this has been mitigated in many states by using average values over a number of years.[11] Crucially however, rates fare poorly in the context of providing a growing source of revenue to match growing community demands for services. This characteristic severely compromises local government's ability to both fund existing infrastructure services and provide additional investment.

Administration costs

State taxes also involve relatively modest administration and compliance costs. However, that said, they are viewed as having efficiency drawbacks and can distort economic outcomes.[12]

Municipal rates require the valuation of land. Once this has been completed the marginal cost of raising additional revenue through rates is low.

Transparency and taxes

It is likely that most of the existing state tax arrangements are well understood and do not pose a disproportionate burden upon taxpayers.

Municipal rates exhibit a high degree of transparency.

Stakeholder support

No one likes paying taxes. Treasurers face considerable resistance to taxation. Naturally, the largest state taxes attract considerable criticism.

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10 Gabbitas and Eldridge 1998, *Directions for state tax reform, Productivity Commission staff research paper*, AusInfo, Canberra, p. 155.

11 Gabbitas and Eldridge 1998, *Directions for state tax reform, Productivity Commission staff research paper*, AusInfo, Canberra, p. 170.

12 The Allen Consulting Group 2003, *Funding Urban Public Infrastructure: Approaches compared*, a report for the Property Council of Australia, Sydney, p. 54.

Municipal rates generally have a better degree of stakeholder acceptance as the facilities and services they fund are provided within the council's jurisdiction, and thus where the ratepayer is likely to receive some benefit from them

Drawing the threads together

Table 4.1 summarises the qualitative assessment of the consultant. A black circle (●) in the table represent a judgement that a funding approach results in generally favourable outcomes against a criterion. In almost every case there are pros and cons and a tick reflects a view that the balance is positive. A white circle (○) reflect the opposite view. A semicircle (◒) indicates that there is some uncertainty or ambiguity about the performance of the approach against a criterion.

Table 4.1

NETWORK FUNDING APPROACHES: SUMMARY ANALYSIS

	Capital contribution	User charges (DUoS)	Taxes
Effectiveness	●	●	●
Efficiency	○	●	◒
Fairness./equity	○	●	●
Reliability	●	●	●
Administration costs	●	○	●
Transparency	○	●	●
Stakeholder support	○	●	◒
Overall score	3	6	6

Source: The Allen Consulting Group

Based on the qualitative assessment outlined in table 5.1, there are no approaches that are perfect; every approach has at least some drawbacks.

What is clear, however, is that capital contributions are a less effective means for funding new connections to the electricity network relative to user charges and a mix of state/municipal taxes. In particular, capital contributions, like other forms of developer charges, are not efficient or fair and relative to user charges and taxes they lack transparency.

4.4 Quantitative analysis

Assessing the same three funding approaches within an economic model, to take into account time and interactions within the economy at large, provides more compelling grounds for discriminating between the various approaches available. This analysis has been conducted using the Monash Multi-Regional Forecasting (MMRF) model, a dynamic multi-regional, multi-sectoral applied general equilibrium model of the Australian economy. The MMRF model is used by policy advisors throughout Australia, including state government Treasury officials.

We examine three alternative scenarios. In each scenario the South Australian economy experiences a once-off $40 million increase in its annual electricity infrastructure budget. This quantum is broadly consistent with the actual value of works funded via capital contributions (includes value of transferred assets) in South Australia for the 2000-01 financial year.[13] It is assumed this infrastructure generates ongoing benefits to the residents of South Australia. We model these benefits via an improvement in South Australian total factor productivity sufficient to generate a return of 12.5 per cent on each $40 million of additional infrastructure.

The program of additional infrastructure investment must be financed by the South Australian economy. The three scenarios are distinguished from one another by the choice of financing instrument. Specifically, we evaluate the effects on the South Australian economy arising from funding electricity network infrastructure via the following financing instruments:

- developer charges — the imposition of developer charges in the form of a tax on new house construction in South Australia sufficient to raise $40 million per year;
- electricity prices — an increase in South Australian electricity prices sufficient to generate a real return of 8.26 per cent on each tranche of infrastructure spending. This is consistent with the real pre-tax cost of capital that the government used to set the current price controls that apply to electricity distribution networks in South Australia[14]; and
- residential rates — an increase in rates on residential properties in South Australia designed to raise $40 million each year. As noted previously this option is included primarily for the purposes of comparison.

For each of the financing methods analysed, figure 4.1 shows results for South Australia generated by the MMRF model. The results are the dollar value deviation from a basecase forecast, except for the change in capital stock which is measured by the percentage deviation from the basecase forecast.

[13] ESCOSA (November 2002), 3rd *Annual Performance Report: Performance of Regulated Electricity Businesses in South Australia 2001-02*, page 54 (www.escosa.sa.gov.au)

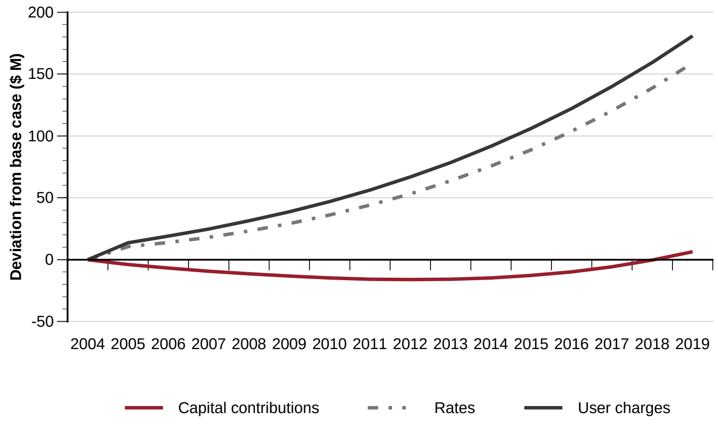
[14] ESCOSA 2004, Draft 2005 — 2010 Electricity Distribution Price Determination, Part A Statement of Reasons, South Australia, p 197.

Figure 4.1

SOUTH AUSTRALIAN RESULTS (2004 TO 2019)

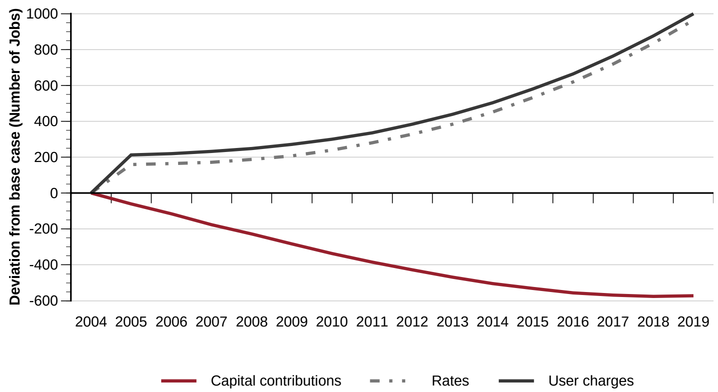
4.1 (A) — REAL OUTPUT

Network connections financed by DUoS charges have the effect of raising output (measured in terms of changes in Gross State Product (GSP) in the short, medium and longer term This is also the case with new connections financed via State and Municipal taxes, however to a lesser extent. By comparison, new connections financed via capital contributions result in a decline in the State's economic output in the short to medium term and a modest increase in the longer term.



4.1 (B) — EMPLOYMENT

The program of additional electricity network expenditure as modelled, financed by either DUoS charges or by State and municipal taxes will result in a increase in South Australia's employment over the period 2005 to 2019.The use of capital contributions, however, results in a decline in aggregate employment in every year from 2005 to 2019.

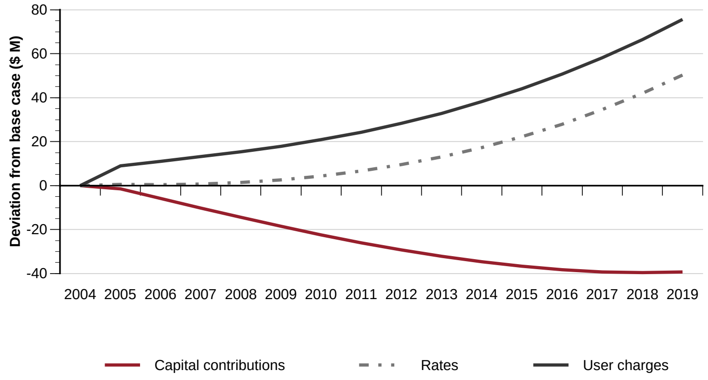


4.1 (C) —AGGREGATE CONSUMPTION

Output is generally regarded to be unreliable indicator of wellbeing. A better indicator is changes in consumption potential. All else being equal (and in the absence of externalities) the capacity to increase consumption is generally viewed as being beneficial to consumers and the community as a whole. It is often noted by economists that the point of economic activity is consumption.

Of the three funding approaches considered only the use of DUoS charges results in an increase in aggregate consumption in the short term as well as in the medium to longer-term. The use of State and municipal taxes raise aggregate consumption in the medium to longer term, however in the short term they result in no significant increase in aggregate consumption.

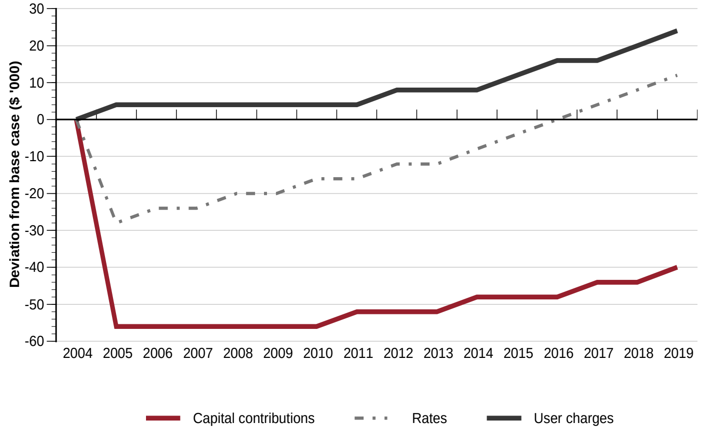
Capital contributions involve a reduction in aggregate consumption in each year of the simulation period (i.e. 2005 to 2019). Hence, the use of capital contributions to fund new connections to the electricity network reduce economic wellbeing for consumers in aggregate.



4.1 (D) — REAL INVESTMENT

The use of DUoS charges to fund new connections to the electricity network has a small but positive impact on aggregate investment in South Australia both in the short and longer term. By comparison, the use of State and Municipal taxes results in an initial decline in aggregate investment in the short term, but in the longer tern, however, the use of this financing option results in a increased levels of investment relative to the base case forecast.

The use of capital contributions results in a sharp decline in aggregate investment in the short term. However, while investment levels increase over the medium to long term, they remain well below the basecase level for the entire simulation period.



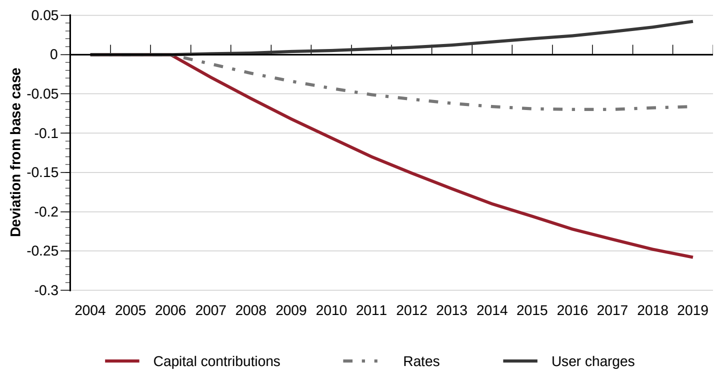
4.1 (E) — CAPITAL STOCK

Changes in the capital stock arise where a financing option changes the competitiveness of the South Australian economy and capital moves into (or out of) the State.

As detailed in the graph different funding approaches may raise or lower the capital stock in South Australia by between plus 0.05 and minus 0.26 percentage points over time.

Using capital contributions and taxes to fund additional connections to the electricity network does not produce sufficient competitive gains for the South Australian economy to offset lower returns that some businesses will consequently experience. Hence, these financing options will result in capital remaining outside the state throughout the forecast period.

By comparison the use of DUoS charges results in an increase in South Australia's capital stock in the medium to longer term. This suggests that this financing option allows the South Australian economy to become more competitive relative to other Australian States as reflected by an increase in capital flows into the State.



The simulation results reported in figure 4.1 stand at odds with the current approach to financing new connections to the electricity network in many of the NEM jurisdictions. The results suggest that a shift towards alternative financing mechanisms would result in material benefits for economic output, employment and wellbeing.

To illustrate the impact of the alternative approaches considered it is helpful to compare the difference in the net present value (NPV) of the additional output (i.e. GSP) under each compared with the gain obtained using the benchmark approach (taxes). The gains from each approach (and differences from the benchmark) in terms of the NPV of changes in GSP over the forecast period are as follows:

- *user charges* — $1.2 billion;
- *capital contributions* — minus $145 million; and
- *taxes* — $971 million.

What is striking is the economy wide costs from the use of capital contributions more than offset the benefits derived from the infrastructure it funds — leading to a negative outcome in NPV terms over the forecast period.

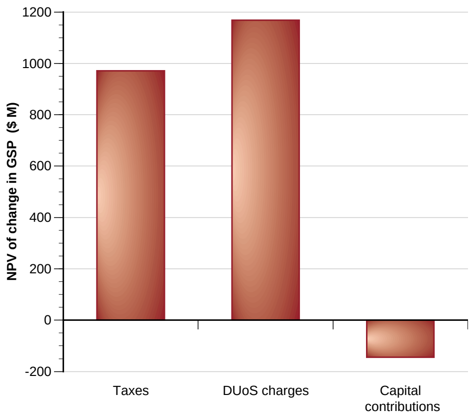
The difference between the funding approaches is also reflected in the employment impacts as the economy adjusts to the new infrastructure and the mechanisms imposed to pay for it.

The indicative net impacts on real gross state product, employment, real consumption and aggregate investment of each of the funding mechanisms considered are illustrated in figure 4.2.

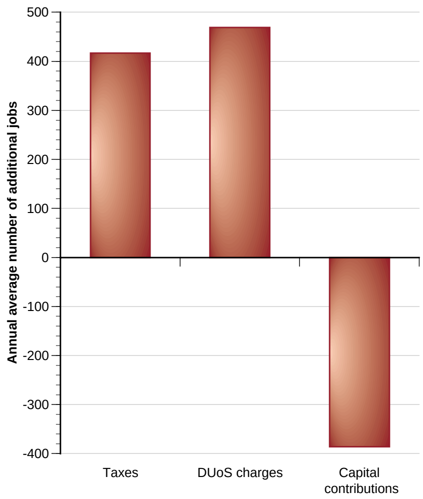
Figure 4.2

FUNDING A FORTY MILLION DOLLAR INCREASE IN NETWORK CONNECTION EXPENDITURE

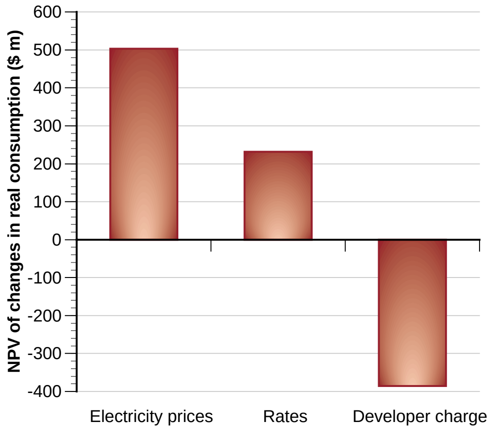
GROSS STATE PRODUCT OUTCOMES (NPV)



EMPLOYMENT OUTCOMES (AVERAGE ANNUAL EMPLOYMENT)



AGGREATE CONSUMPTION OUTCOMES (NPV)



AGGREGATE INVESTMENT OUTCOMES (NPV)

The analysis in this chapter presents a clear message that the objective of efficiency is best served where jurisdictions adapt policies that shift the burden of funding new connections away from thee customers and onto all network users.

The remainder of this report focuses on developing a best practice model for funding new connections to the electricity network. In doing so it seeks guidance from the Network Electricity Code (the Code).

Chapter 5

Key principles for capital contributions

This chapter identifies a number of broad fundamental principles embodied in the 'National Electricity Code' (the Code) that should be considered in establishing a best practice model for funding future extensions, connections, and augmentations of the electricity network.

In developing principles to be applied to the issue of capital contributions, the objectives of the Code and associated market reforms are highly relevant. These enunciate broad objectives within the sector and provide high-level guidance to the process. Objectives relevant to the specific issue of capital contributions, include:

- cost-reflective prices;
- contestability of connection services;
- beneficiary pays charging; and
- ownership of contributed assets.

The following section explores the merit of each of these objectives and the extent to which they are being met by the current arrangements.

5.1 Cost reflective prices

Consistent with the primary objective of the Code, which is to achieve a competitive market, each of the NEM jurisdictions stipulate that capital contributions should be cost reflective.

Cost reflective prices are desirable because under certain circumstances they provide consumers with an effective price signal which facilities efficient consumption decisions thereby improving overall allocative efficiency.

Applied to electricity connections, cost-reflective prices may influence consumer decisions over a given connection relative to:

- Connecting in a substitute location;
- Connecting to a substitute source of energy (eg. gas); and/or
- Connecting suing a substitute configuration (eg. non-network).

Consumers then selecting the most cost-effective connection in their own self-interest would reduce overall network costs.

However, conditions requisite to prices being an effective signal include:

- *Prices must be open and transparent* — Consumers need to be aware of factors influencing price as well as the prices of alternative products. This informs decisions between particular goods and their substitutes.

- *Prices must be known early in the decision process* — Consumers cannot respond to the signal provided by prices if they are not known prior to the consumption decision. Therefore, prices will only elicit efficient consumption in situations where they are made known at an appropriate time.
- *Prices must comprise a significant portion of the overall cost of a decision.* Where a consumer is purchasing a bundle of goods, the power of the signal provided by the price of any single good diminishes with its relative cost in the bundle. For example, the price of a tyre will have little influence on a consumer's decision to buy a new car.

These circumstances are often lacking in relation to the imposition of capital contributions for electricity network augmentations. This is for several reasons:

- Planning laws and arrangements, rather than capital contributions, remain the primary driver for steering development, particularly in urban areas.
- Building on a new property requires a myriad of goods and services. Connection costs comprise only a small proportion of these, and are therefore unlikely to be influential in the overall decision regarding property location and building specification.
- The quantum of capital contributions is not commonly known until critical consumption decisions and commitments have already been made. Connection charges tend to be revealed in the final stages of the planning cycle, especially after property has already been purchased. Many consumers facing capital contributions are effectively 'locked in' to paying them.
- The methods of calculating capital contributions, and differences between localities, are often unclear to consumers. This reduces their ability to make an efficient decision between substitute locations and electricity specifications.

Taken together these factors mask, or obscure, the signals provided by capital contributions and significantly undermine their influence over decisions concerning new connections. Hence , 'price signalling' objectives form a weak foundation on which to base a capital contributions policy.

The primary means of alleviating these problems is to ensure that prices are as transparent as possible, by:

- Making them known at the earliest possible stage; and
- Using a simple method to calculating them.

Yet these solutions may interfere with the accuracy with which prices reflect costs. For example, augmentation costs should be lower for customers in areas with lower existing capacity utilisation – but calculating an area-specific changes may be timely and more complex. Chapter 6 explores such trade-off in greater detail.

This does not mean, however, that regulators should eschew cost-reflective pricing. Rather, the limited power of capital contributions to drive efficient consumer behaviour needs to be recognised by regulators and policy makers.

5.2 Contestability of connection services

If customers are required to make a capital contribution towards required works, as a matter of principle they should not be exposed to monopoly prices for these services. Pricing discipline can be achieved through either competition or through regulatory measures that seek to provide a surrogate for competitive forces.

This simple yet important issue is complicated by the nature of electricity networks and the potential for new works to have negative consequences for the network as a whole (and users of the network) if the new works are of a sub-standard quality. In other words, there is scope for negative externalities to arise from the connection of new customers. Accordingly, there are legitimate grounds for the network owners to restrict or limit the ability of others to connect to the network unless certain standards of service and quality of work are adhered to. Furthermore, there is strong merit to have a consistent strategic framework for network design.

As detailed in chapter 2 of this report, current approaches to network augmentations across the NEM recognise that, while there is a need to maintain quality of services, network security and safety standards, there is still scope for the provision of new services to be made competitive. Accordingly, in all of the NEM jurisdictions except the ACT, the provision of network connection services are contestable.[15] By contrast, network augmentations are only contestable in Victoria and NSW on the grounds that network augmentation requires more extensive network engineering and therefore there is greater risk to the existing network (see table 5.1).

Table 5.1

CONTESTABILITY OF NETWORK CONNECTIONS

Jurisdiction	Extensions	Augmentation
NSW	Contestable	Contestable — subject to safety
Queensland	Contestable	Non-contestable
South Australia	Contestable	Non-contestable
Victoria	Contestable	Contestable
ACT	Non-contestable	Non-contestable

Source: Exigency Management Pty Ltd 2004, *Whose line is it anyway,* p.18.

5.3 Beneficiary pays

In efficient markets, the beneficiary of a product must bear its cost, and will agree to do so provided the benefit exceeds the cost. This principle is desirable not only because of the economic efficiencies it engenders, but because it is also equitable; the beneficiary bears the associated cost.

Although the principle of matching benefits and costs is theoretically straight–forward, its application to new network connections is complex because there are significant complexities and ambiguities in relation to which party benefits from a new connection and to what extent.

15 Within the ACT, no framework exists for contestability of connection services. This in part reflects the ACT's policy of recouping connection costs (for connections of a basic standard) from DUoS charges.

In the context of electricity networks the benefit accruing to a new customer connecting to the network is both obvious and immediate. The connecting customer is provided access to electricity. However, equally relevant, but less obvious, are the benefits accruing to the electricity distributor and to all users of the distribution network.

The electricity distributor may benefit from a new connection given that an additional connection means an additional user of electricity from which the distributor will earn DUoS revenue. Moreover, given that most of the short-run costs of a distribution network are fixed in relation to electricity demand, the increase in revenue typically translates to higher profits for the distributor.

Existing users of the network are also likely to benefit from additional connections. This is a result of the regulatory regimes that apply to electricity networks in the NEM. In particular, current regulations stipulate that prices should reflect costs. Hence, an increase in load growth from new connections will mean network costs (which are essentially fixed over the short term) can be spread more thinly over a greater number of users thereby lowering average prices.

A number of the jurisdictional approaches to capital contributions recognise the additional benefits that accrue to existing customers and the network distributors from new connections. However, despite this, some jurisdictional approaches effectively truncate these benefits by only considering a portion of the additional DUoS charges likely to flow from a new connection. In this regard current arrangements for capital contributions are inefficient as they burden the connecting customer with a disproportionate share of the costs largely to the benefit of the network distributor.

Subsequent users of network extension assets that were initially funded by an original connecting customer should be required to reimburse that customer some proportion of their expense. This provides for a dynamic alignment of beneficiaries and contribution responsibilities. Most jurisdictions that require contributions recognise the fairness of this principle.

5.4 Ownership of contributed assets

Customers should have the right to assume ownership of assets they fund, provided that they meet all legal requirements for owning, maintaining and operating the contributed assets. Such requirements relate to insurance, safety and technical standards, and typically impose significant costs. In most cases, customers are unable to meet these requirements and ownership should be vested with the relevant distributor.

Even where legal requirements are met, ownership should be further restricted to assets that ‘stand alone’ on the customer’s premises. Isolation of privately owned assets avoids potential interference to the supply of other customers connected to the local network. This principal is universally recognised in jurisdictional policies for capital contributions.

Distributors should not receive a return on contributed assets. This principle is largely self-evident and is incorporated in Clause 6.51.2(a) of the Code. However, it is equally reasonable that expenditures by a distributor for the maintenance and renewal of contributed assets are recognised in the derivation of allowable network revenues. This second principle is also duly recognised in both the pricing regulations that apply to the electricity network distributors and in the capital contributions policies of the various jurisdictions.

5.5 Conclusion

This discussion yields a number of important themes that should underpin a framework for calculating capital contributions. In particular:

- Capital contribution policy should not be framed primarily to establish price signals over connection locations and specifications. A number of factors make such signals inconsequential. Planning objectives are more appropriately pursued under planning laws and associated processes. Cost-reflective pricing should be a product of accurately assigned connection costs and benefits, not used as a means to explicitly influence urban development.
- Given that many developers work across jurisdictions as well as recent moves for greater consistency in the regulation of electricity services, NEM jurisdictions should align their capital contribution policies to ensure similar consistency as exists in the methodology for determining DUoS charges.
- Payments for connection services should be split between the connecting customer and the distributor/all users in accordance with the benefits accruing to each. In particular, contributions policies should recognise that future DUoS revenues enabled by the connection benefit all users. Connecting customers should only contribute the excess of connection costs above the present value of these revenues.
- Services required for connections should be open to competition where possible. If this is deemed inappropriate, service terms and conditions offered by the distributor should be subject to regulatory oversight. If connecting customers are required to purchase such services they should not be forced to pay monopoly prices for them (i.e. they should be cost reflective).
- Subsequent users of connection assets that may have been originally ‘dedicated’ and funded by an initial connecting customer should be required to reimburse the contributor. This facilitates the dynamic application of the ‘beneficiary pays’ principle.

Chapter 6

How much should connecting customers pay?

This chapter outlines a contributions policy template for NEM jurisdictions and how it can be implemented.

As established in chapter 5, contributions policies should recognise that future DUoS revenues, enabled by the additional connection, benefit all users. Accordingly, connecting customers should only contribute the excess of connection costs above the present value of these network revenues. Furthermore, as revealed by the quantitative analysis undertaken in chapter 4 there are economy-wide benefits resulting from financing the cost of additional connections via user charges. Such an approach matches the additional costs to the benefits obtained over the life of the asset (i.e. the connection).

However, estimations of revenues and costs in this context are potentially complex and timely, demanding excessive administrative effort. The desired approach must be implemented in a manner cognisant of the costs associated with an overly demanding set of forecasts and calculations. It must also be transparent, to strengthen the price signal, as discussed in chapter 5.

Practical considerations, transparency and administrative costs are therefore important. This remainder of this chapter describes how the proposed approach might be implemented in a manner reflecting these concerns. Trade-offs between administrative simplicity and theoretical purity are a recurring theme.

6.1 Calculation of additional network revenues

This section discusses in depth how additional network revenues from the connection, which benefit all network users, might be calculated. These should estimate the net present value of expected network revenues, calculated over an appropriate time period.

Accordingly, four inputs are required:

- an estimate of the distribution tariffs applied to the connection;
- forecasts of the load or demand associated with the connection. This, together with the estimate of the network tariff, allows future annual network revenues to be estimated;
- a time period over which to calculate the additional revenues (and costs); and
- a discount rate to convert future revenues to present values.

There are issues associated with each of these inputs so that none are straightforward to establish. Simplifying assumptions and/or averaging are commonly appropriate.

Distribution tariffs

Estimating *distribution tariffs* beyond the existing regulatory period would require information on future regulatory rulings, which in turns relies on forecasts of a whole series of inputs to the regulatory process. A more timely and cost-efficient method of calculation is to assume a continuation of the existing price regulation (in particular, the X-factor) over the period for which the tariffs must be estimated. This X-factor should be assumed as equivalent to that applied in the final year of the current regulatory period.

Future load/ demand

Forecasting the *future load* of the connection could involve use of either an average for that class of customer or an individual assessment. For residential and small business connections, an average load should suffice, as deviations from the average only have a minor impact on the assessment (because overall demand is small). Individual assessments are more appropriate for large customers where accurate load forecasts have greater significance. In this instance, the additional cost of a specific assessment may not be great because required information may already be collected for other purposes (e.g. the design of connection assets or the decision on the tariff rate to assign the customer).

In light of these considerations, the Essential Services Commission of Victoria (ESC) proposed the individual assessments apply for connections whose demand tariff is expected to exceed 50 kW per year. Otherwise, average usage of the class of customer would be used.[16] This level seems reasonable, although the particular characteristics of each jurisdiction's distribution network may mean a uniform threshold is inappropriate.

Time period

The *time period* over which revenues (and costs) are calculated should include the entire life over which the connection generates network revenues. However, while the life of connection assets are generally well-known, ongoing occupancy of the site is less certain.

There is a risk that the distribution revenues assumed in the calculations and factored into a customer's contribution amount do not materialise – most significantly where a site is vacated prematurely. If the time period fully reflects the life of the connection assets, other network users would bear this risk. It should instead reside with the connecting customer. Accordingly this risk should be transferred to the customer by discounting the horizon over which network revenues are expected relative to the life of the connection assets. The discount should depend on the general nature of the connection, due to risk differentials. For example, there is lower risk of a residential premises being vacant (over the medium to long term) than a specialised business establishment.

The average life of connection assets is about 45 years. Residential contributions should be calculated using a time period close to or marginally below this amount – noting that the difference from using time periods of say, 30 and 45 years, is quite small due to the impact of discounting. Business connections should be assessed using a time period of 15 to 20 years, due to their increased risk of vacancy. This is consistent with the arrangements in Victoria.

[16] ESC 2002, *Review of Connection and Augmentation Guidelines: Volume 2 – Customer Contributions for Connections and Augmentations*, Issues Paper, October, p. 11.

Where there is a material possibility that the premises may become unoccupied even before this time (15 to 20 years), a further measure to protect network users would be to require a security deposit from the customer. As the network revenues envisaged in contributions calculation are received, the deposit could be repaid with appropriate interest. The security deposit should not exceed the forecast network revenues.

Discount rate

For consistency, the *discount rate* applied to revenues (and costs) should be the same as that applied to expected customer contributions in the price review process. In Victoria, for example, this approach results in the pre-tax weighted average coat of capital (WACC) being used. Other jurisdictions may discount differently in accordance with their methodology.

6.2 Calculation of additional network costs

The costs caused by a connection should be estimated by summing the costs of the relevant components. The major areas in which costs arise are in:

- the provision of connection services dedicated to the customer ('dedicated' works), including future maintenance; and
- the bringing forward of augmentation works ('shared' works) – noting that this may not impose an immediate cost, only the advancement of a future cost.

Cost calculations should also include an allowance for distributor overhead costs associated with calculating contribution amounts. Contributions policies may consume administrative resources of distributors, which they should be entitled to recover.

Dedicated works

Calculating the cost of *dedicated works* requires estimates of the present value of the capital costs of the extension, and any ongoing operating and maintenance costs imposed on the distributor by the extension assets.

Only those dedicated works whose cost is recovered by the distributor through DUoS charges should be included in the assessment (i.e. 'excluded' services should not be incorporated, and instead be paid directly by the connecting customer). This is because the calculation should only consider the cost imposed on all network users (the cost of excluded services would be otherwise borne by the distributor).

Shared works

Determining the cost of bringing forward *network augmentations* requires a comparison of the present costs of future distribution network augmentation expenditures with and without the connection.[17] Alternatively, historical estimates of augmentation expenditures and the associated increase in capacity might be used.

Box 6.1 outlines approaches to estimating the cost of shared works, as published by ESCOSA and the ESC. Their differences reflect certain trade-offs in the derivation of unit costs for augmentations.

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[17] This might be estimated by projecting the time profile of augmentation requirements for a point or area under two demand scenarios; a base level, and then with a small but significant increase

It is perhaps inappropriate to prescribe how this trade-off should be resolved in jurisdictions due to differences in administration costs, especially in data availability and technical features. For example, the ESC noted in relation to the process outlined in box 6.1 that:

> Following recent changes to the Electricity Distribution Code, distributors are required to publish a Distribution System Planning Report that describes how they intend to meet predicted demand supplied at the sub-transmission, zone substation and high voltage levels. The production of these planning reports should require the distributors to undertake much of the technical assessments required for estimating the incremental cost of augmentation to a reasonable degree of regional specificity.[18]

Accordingly, the additional cost of deriving area-specific unit costs was expected to be relatively small in Victoria. Such data may not be as readily accessible in other jurisdictions. Standard unit costs or location-specific costs may therefore be used depending on the administration costs involved.

Box 6.1

CALCULATING THE COST OF NETWORK AUGMENTATIONS FOR CONNECTIONS

The approach, recently documented by ESCOSA will be for the distributor to calculate a 'standard unit augmentation cost' ($/kVA) based on the average cost of augmentations in the metropolitan area. This will be applied to all connecting customers who are liable for augmentation costs, apart from those who require individual evaluations.

The components of the distribution network to be considered include:

- sub-transmission lines;
- substation;
- high voltage feeder exit; and
- high voltage feeder.

The distributor will use recent data on the cost of augmentations in the metropolitan area; and the corresponding capacity increases provided to determine a unit cost in $/kVA for each component. The separate unit cost components will then be added to give an aggregate average unit cost for all augmentation in the metropolitan area.

'Standard unit augmentation costs' are derived by discounting this value for the average period before future augmentation expenditures will be required.

Individual assessments (required where the connection will have a particularly large impact on planned augmentation) will use a similar approach but be based on the specific local network circumstances (rather than a metropolitan average).

The ESC outlined a more comprehensive approach in 2002. This essentially involves comparing, for a particular point or area:

- The present cost of augmentation requirements under the base (planned) level of electricity; and
- The present cost of augmentation requirements with a small but significant increase in demand above the base level.

The difference – the additional present cost – is then divided by the assumed increase in demand above the base level to derive a 'per unit incremental cost' in $/kW.

The approach proposes that distributors estimate the per unit incremental cost for several different levels of the distribution network – sub-transmission and zone substation, high voltage feeders, distribution substation and low voltage feeders – although in some instances it is recognised that this may not be a feasible exercise.

This is a key difference in methodologies. The ESC, unlike Essential Services Commission of South Australia (ESCOSA), allows for area-specific assessment of the $/kW cost (rather than a simple metropolitan average).

Source: published contributions policies

[18] ESC (2002), *Review of Connection and Augmentation Guidelines: Volume 2 – Customer Contributions for Connections and Augmentations*, Issues Paper, October, p. 17.

6.3 Reimbursement schemes

There is a risk to the connecting customer that the cost and revenue formula used to calculate their contribution underestimates the distribution network revenue facilitated by the connection. This is most likely where a subsequent connection not factored into the original estimation makes use of the extension assets funded by the initial contributor. It is particularly relevant for rural customers.

Connecting customers should be protected against this risk through a reimbursement scheme, as is already the case in most NEM jurisdictions.

Ideally the scheme should operate by allowing a retrospective reallocation of contribution obligations between the customers. Contribution amounts required of the original and subsequent customers should be recalculated by considering the joint revenues and costs relevant to the connection, discounted over an appropriate period for each (i.e. when they connect). This will usually result in the initial customer obtaining a refund of some portion of their original contribution.

For example, where connection assets are evenly shared and the connections occur simultaneously, it would be appropriate for revenues and costs to be considered in aggregate and any net costs allocated equally.

Given the likely cost of administering such a scheme, and the fact that potential reimbursements decrease over time (due to discounting), it makes sense to cap the length of time for which a reimbursement can be obtained. Subject to these concerns, choosing a cap is somewhat arbitrary. The fact that Powercor and AGL in Victoria allow reimbursements for a period of ten and a half years after the contribution is made suggests that distributors can accommodate this sort of timeframe without incurring undue costs. Such a period therefore seems reasonable

6.4 Implementing a national approach

In December 2003, the Ministerial Council on Energy (MCE) agreed the regulation of electricity distribution be consolidated in a national regulatory body — the Australian Economic Regulator (AER) — by 2006. One objective of this reform is to develop common regulatory instruments that are capable of applying across Australia.

This process presents a unique opportunity to harmonise contributions policy and in particular, to eliminate the inconsistencies that result in similar customers paying very different connection charges across the NEM.

Work is currently progressing to develop a national framework ahead of the transfer of distribution regulatory responsibilities to the AER. A relevant issue is the degree to which uniformity can be achieved in the various electricity codes, rules and guidelines applied across jurisdictions – including contributions policies. Uniformity may not be appropriate where:

- jurisdictional differences are justifiable – perhaps due to the particular technical characteristics of the network in the jurisdiction; and
- the cost associated with harmonising regulatory measures outweighs the benefits from doing so.[19]

[19] MCE Standing Committee of Officials (2004), *National Framework for Electricity and Gas Distribution and Regulation – Foreword and Issues Paper*, August, p. 62.

These qualifications are not generally applicable to contributions policies. Where jurisdictional anomalies exist (e.g. administrative costs of estimating augmentation costs from a connection, as discussed in this chapter) they can be overcome through minor modifications of the calculation procedure. The overarching framework should not change, and should be applied across all jurisdictions.

6.5 Summary

Contribution obligations should be calculated by assessing the impact on network costs and revenues from the connection. Contributions should only be required when the additional costs are greater than the increase in revenues. Such an approach is consistent with those principles detailed in chapter 4 of this report. The approach is also consistent with quantitative and qualitative findings of chapter 5.

The increase in revenues should be calculated using expected DUoS charges and loads for the connection. This calculation should incorporate a time period closely reflecting the life span of the connection assets (about 45 years) less a deduction relating to the risk that the premises becomes unoccupied. Appropriate time periods would be:

- 30 to 45 years for residential connections; and
- 15 to 20 years for business connections.

A refundable security deposit might be used for premises of particularly high risk.

The cost of network extensions and augmentations should be considered in the assessment of network costs. Augmentation costs should be based on an assessment of the present cost of bringing forward planned augmentations. The costliness of estimating this amount (in dollars per unit of demand) will differ across jurisdictions, depending on data availability and technical feasibility. Accordingly, techniques might vary from using statewide unit costs to area-specific unit costs.

All jurisdictions should operate schemes allowing original customers to be reimbursed by subsequent users of their extension assets for around ten years.

The consolidation of regulatory responsibilities for distribution in the AER presents an opportunity to harmonise contributions policies across the NEM. There are few material barriers to a uniform framework, which should be based on the approach detailed in this chapter.

Appendix A

Abbreviations

ACT	Australian Capital Territory
AER	Australian Economic Regulator
CAC	Connection Asset Customers (Queensland)
CBD	Central Business District
DUoS charge	Distribution Use of System charge
ESC	Essential Services Commission of Victoria
ESCOSA	Essential Services Commission of South Australia
GSP	Gross State Product
GST	Goods and Services Tax
ICC	Individually Calculated Customers (Queensland)
ICRC	Independent Competition and Regulatory Commission
IPART	Independent Pricing and Regulatory Tribunal of NSW
MCE	Ministerial Council on Energy
MMRF	Monash Multi-Regional Forecasting Model
NEM	National Electricity Market
NPV	Net Present Value
NSW	New South Wales
QCA	Queensland Competition Authority
QLD	Queensland
SAC	Standard Asset Customers (Queensland)
WACC	Weighted Average Cost of Capital

Appendix B

The MMRF Model

The Monash Multi-Regional Forecasting Model (MMRF) was used in this study. This is a regional version of the MONASH Computable General Equilibrium (CGE) model. This in turn has its roots in the ORANI model which was developed by leading staff from the Centre of Policy Studies (CoPS) at Monash University. Originating in the late 1970s, ORANI has made a significant contribution to economic methodology, policy analysis and economic outcomes. ORANI has achieved considerable recognition in Australia and abroad.[20]

The MMRF is a dynamic multi-regional, multi-sectoral Computable General Equilibrium (CGE) model of the Australian economy.[21] It distinguishes eight Australian regions (six States and two Territories) and, depending on the application, up to 50 commodities/industries. The model recognises:

- domestic producers classified by industry and domestic region;
- investors similarly classified;
- eight region-specific household sectors;
- imports from and exports to the rest of the world;
- eight state and territory governments; and
- the Commonwealth government.

The model contains explicit representations of intra-regional, inter-regional and international trade flows based on regional input-output data developed at CoPS, and includes detailed data on state and Federal governments' budgets.

As each region is modelled as a mini-economy, MMRF is ideally suited to determining the impact of region-specific economic shocks or changes (such as a policy change). Second round effects are captured via the model's input-output linkages and account for economy-wide and international constraints. Outputs from the model include projections of:

- changes in output (i.e. GDP and GSP);
- employment (national and within regions);
- sectoral output, value-added and employment by region;
- export earnings, import expenditure and the balance of trade;
- the flow of goods and services, labour and capital between regions within Australia;
- State and Territory revenues and expenditures; and
- the spending and taxing activities of the Commonwealth Government and changes in the budget balance.

[20] See Dixon et al, 1982.

[21] Full technical documentation of MMRF is given in Naqvi and Peter (1995).

The original version of MMRF was a comparative static model. It showed, for a single year, the differences produced in the regional economies by changes in taxes, technology, tariffs and other exogenous variables. Because the model is now dynamic, it is able to track changes over time as series of annual solutions connected by dynamic relationships (similar to the parent MONASH model).

Both the MONASH and MMRF models have a high level of microeconomic detail, and unlike ORANI have strong forecasting capabilities. This is due to:

- a more detailed specification of inter-temporal (i.e. dynamic) relationships;
- greater use of up to date data; and
- enhancements that allow the model to take on information from specialist forecasting organisations and from recent historic trends.

The key to generating realistic forecasts is to use detailed information available from expert groups specialising in the analysis of different aspects of the economy. MONASH and MMRF forecasts incorporate a wide variety of information including:

- macro forecasts from the Treasury and Access Economics;
- export forecasts from Australian Bureau of Agricultural Resource Economics (ABARE) and the Tourism Forecasting Council;
- forecasts of changes in technology and consumer tastes derived from trends calculated at CoPS; and
- detailed information about the application of taxes and other fiscal measures based upon ongoing projects.[22]

B.1 Structure of MMRF

MMRF has a core set of equations which determine supplies and demands of commodities based on assumptions of optimising behaviour of agents at the microeconomic level within the context of competitive market structures. Further, MMRF specifies demands and supplies of factors of production. The factors of production can cross regional borders so that each region's endowment of productive resources need not be fixed. The supply, demand and market clearing equations comprise the CGE core of the model.

In addition to the core equations are blocks of equations describing:

- regional and Federal government finances;
- accumulation relations between capital and investment, population and population growth, foreign debt and the foreign balance of trade; and
- regional labour market settings.

The various equation blocks provide linkages between variables within a region and between regions. The description of MMRF begins with the CGE core followed by brief comments on the additional four blocks of equations.

[22] See for example, Dixon, P.B. and Rimmer, M.T, (1999).

The CGE core

The CGE core equations of MMRF are based on the equation system of the ORANI model of the national Australian economy. The ORANI equations system describes the economy of a ‘single–region’, where Australia is the region. The transformation of the ORANI system into the MMRF system, in principle, means adding a regional dimension to all equations and adding interregional trade flow and market clearing equations. The basic theoretical assumption made in the CGE core module are as follows.

The nature of markets

Markets are assumed to be perfectly competitive. Competition guarantees that a level of output is produced in each industry at a point where the producer’s price equals marginal costs and where zero pure profits are earned. Demand is assumed to equal supply in all markets except in the market for labour where oversupply is allowed. The government intervenes in a market by imposing sales taxes on commodities. This puts a wedge between the price paid by the purchaser and price received by the producer. The model also recognises nine margin commodities (wholesale trade, retail trade, road transport, rail transport, water transport, air transport, transport services, insurance and restaurants) which are required for each transaction involving a commodity or service. The costs of the margins are included in the price paid by the purchaser.

Input demand for industry production

Two broad categories of inputs to the production process are recognised, intermediate inputs and primary factors (labour of various occupations, capital, agricultural land and working capital). Intermediate inputs are distinguished by commodity type and by source (domestically-produced and imported). Firms in each industry are assumed to choose a mix of inputs that minimises the costs of production for given input and output prices and for a given level of output. They are constrained in their choice of inputs by a production technology that combines intermediate and primary inputs to produce output.

Households demands

The household determines the composition of consumption by choosing commodities (distinguished by source) to maximise a utility function subject to an expenditure constraint. A consumption function determines the overall household expenditure as a function of household disposable income.

In MMRF, household preferences are described by a utility function leading to demand functions of the form:

$X_i = f\,(T_i,P_i,C_i)$

where:

X_i is consumption of good I per household;

P_i is a vector of commodity prices;

C_i is total consumption expenditure per household; and

T_i is a taste change variable.

Input demand for investment

Given a level of investment expenditure, an industry chooses inputs (distinguished by type and by source) to minimise the costs of capital creation. The input-demand functions to capital creation are analogous to the input-demand functions for current production, with the exception that there are no primary factor inputs to capital creation.

Government demands for current production

There is no explicit theory determining governments' consumption expenditures. These can be determined in one of three ways:

- endogenously, by a rule such as moving government expenditures with household consumption expenditure or with overall domestic absorption;
- endogenously, as a policy instrument which varies in order to accommodate an exogenously determined policy target such as a required outcome for the government's budget deficit; or
- exogenously.

Foreign demand (international exports)

MMRF cannot explicitly model all of the determinants of foreign demand for Australian products. It handles export demand by imposing for each exported commodity a foreign demand schedule. These schedules, which relate to the volume of exports to the foreign currency price of Australian products, are downward sloping. Hence, export volumes and foreign-currency prices can respond to changes in Australian supply conditions.

Government finances

MMRF includes a system of equations determining various sources of income and expenditures of the eight regional governments and the Federal government. The major sources of government income are tax revenues, interest payments on government–owned assets and (for the regional governments) commonwealth grants from the Federal government. The major government expenditures are current expenditure, investment, and personal benefits to households. The specification of government finances allows the imposition of government budget constraints and the explicit modelling of regional government and Federal government budget and tax policy.

Calculated within the government finance accounts are unemployment benefits, other personal benefits (e.g. pensions and sickness benefits), PAYE taxes and taxes on non–wage primary–factor income of the households. This facilitates the calculation of net benefits accruing to the households.

Capital stocks, investment and rates of return

MMRF allows for two broad treatments of capital and investment. The first, involving explicit assumptions about movements in rates of return and investment/capital ratios, is suitable for comparative-static simulations. In such simulations, we are concerned with the effects of a policy or other shock after considerable time, say seven years. In these circumstances, MMRF allows the user to assume that the shock under examination does not affect rates of return. Thus, industries favoured by the shock attract capital until their rates of return are driven down to their initial levels and that industries for which the shock is unfavourable lose capital until their rates of return increase to their initial levels. Having, in this way, tied down the long-run effect of the shock on capital stocks, the effect on investment by industry can then be determined by assuming no change in investment/capital ratios.

The treatment of capital and investment in MMRF (the treatment involved in this report) involves explicit capital supply functions, and is used in year-to-year simulations, i.e., simulations tracing out the paths of variables for years t, t+1, t+2, etc. While the assumption of no change in rates of return may be suitable for long–run analysis, it is unrealistic to assume that movements in an industry’s rate of return are eliminated by year-to-year movements in the industry’s capital stock. In each year of year-to-year simulations, industries’ capital growth rates (and thus investment) are determined according to functions which specify that investors are willing to supply increased funds to industry j in response to increases in j’s expected rate of return. However, investors are assumed to be cautious. In any year, the capital supply functions in MMRF limit the growth in industry j’s capital stock so that disturbances in j’s rate of return are eliminated only gradually.

Regional labour markets

This block of equations is designed to allow flexibility in the modelling of regional labour markets. The labour market setting is determined by the modeller’s choice of the value of labour–market parameters and exogenous/endogenous variables in a series of identities relating: regional population to population of working age; regional population of working age to the labour supply; and the regional unemployment rate to the demand and supply of labour.

There are three main possible settings for regional labour markets:

- regional labour supply and unemployment rates are exogenous and regional wage differentials are endogenous;
- regional wage differentials and unemployment rates are exogenous and regional labour supply is endogenous; or
- regional labour supply and wage differentials are exogenous and regional unemployment rates are endogenous.

Equations for facilitating dynamic policy simulations

There are a number of mechanisms in MMRF introduced to facilitate dynamic policy simulations. Probably the most important mechanisms relate to wage and employment adjustment in the labour market. In comparative static analysis, one of the following two assumptions is made about the operations of the labour market:

- real wages adjust so that any policy shock has no effect on employment; or
- real wages are unaffected by the shock and employment adjusts.

MMRF, however, allows an intermediate position for year-to-year policy simulations. In MMRF, real wages can be sticky in the short-run but flexible in the long-run and employment can be flexible in the short-run but sticky in the long-run. More specifically, for year-to-year policy simulations it is assumed that the deviation in the real wage increases in proportion to the deviation in employment from its base case forecast level. The coefficient of adjustment is chosen so that the employment effects of a shock are largely eliminated after eight to ten years. This labour market is consistent with macroeconomic modelling in which the non-accelerating inflation rate of unemployment is exogenous.

B.2 Data requirements

MMRF requires data for each of the blocks of equations described above. The CGE core requires a multi–regional input–output database and behavioural parameters describing various elasticities of substitution. The government finance block requires data on regional and Federal governments' budgets. The accumulation relations require base–year values of various stock and flow variables and depreciation and interest rates. The regional labour market block requires various demographic and labour market data.

Regional data for all blocks but the CGE core are published in various sources by the Australian Bureau of Statistics.[23] Unfortunately in Australia, an official multi–regional IO table is not compiled by the ABS. IO data for MMRF was synthetically created by disaggregating the national IO table used to calibrate the national CGE model MONASH.

The regional disaggregation of the national IO table involves two basic procedures:

- split the columns of the IO table to identify the location of the purchasing agent; and
- split the rows to identify the supply source by commodity of the purchasing agent's consumption bundle.[24]

23 See Peter Dixon (1994) for a description of the ABS data sources used in the MMRF database.

24 A version of this method is described in Han (1992) and Han and Peter (1994).

Appendix C

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