Decision and further consultation

FORMAL DECISION ON CITIPOWER'S CURRENT APPROACH TO CHARGE NEW CUSTOMERS CAPITAL CONTRIBUTION FOR UPSTREAM NETWORK AUGMENTATION

AND

FURTHER CONSULTATION ON WHAT SHOULD BE THE FAIR AND REASONABLE CHARGING RATES

17 JULY 2009

AUSTRALIAN ENERGY REGULATOR

Request for submissions

Interested parties are invited to make written submissions to the Australian Energy Regulator (AER) regarding this decision by the close of business on 14 August 2009. In particular, as set out in section 6.2 the AER is seeking submissions on the way in which a 'bring-forward' factor can be applied to CitiPower's estimated costs of augmentation in order to determine the appropriate level of customer contribution.

Submissions can be sent electronically to: aerinquiry@aer.gov.au

Alternatively, submissions can be sent to:

Mr Chris Pattas
General Manager
Network Regulation South
Australian Energy Regulator
GPO Box 520
Melbourne VIC 3001

The AER prefers that all submissions be publicly available to facilitate an informed and transparent consultative process. Submissions will be treated as public documents unless otherwise requested. Parties wishing to submit confidential information are requested to:

- clearly identify the information that is the subject of the confidentiality claim
- provide a non-confidential version of the submission in a form suitable for publication.

All non-confidential submissions will be placed on the AER's website at http://www.aer.gov.au. For further information regarding the AER's use and disclosure of information provided to it, see the *ACCC/AER Information Policy*, October 2008 also available on the AER's website.

Enquiries about this paper, or about lodging submissions, should be directed to the Network Regulation South branch of the AER on (03) 9290 1446.

Summary

All Victorian electricity distribution businesses are required to make an offer to connect new customers to the distribution network. The distribution licence conditions require that such offers, which may include an up-front charge for connection, must include a price and other terms and conditions that are fair and reasonable, and consistent with *Electricity Industry Guideline No. 14 - Provision of Services by Electricity Distributors* (Electricity Guideline No.14).

As part of the transition to national regulation of energy markets, the Australian Energy Regulator (AER) is now responsible for exercising certain powers and functions previously undertaken by the Essential Services Commission of Victoria (ESCV). The new responsibilities are conferred on the AER by the operation of the *National Electricity (Victoria) Act 2005* (NEVA) in accordance with the *Trade Practices Act 1974* and the Australian Energy Market Agreement. The NEVA specifically confers economic regulatory functions, powers and duties on the AER. This includes the ESCV's powers to decide on whether the charges by electricity distribution businesses for new customers seeking connection to their networks are "fair and reasonable" under Electricity Guideline No.14.

Several new customers connecting to or seeking an upgrade to CitiPower's distribution network raised concerns with the ESCV in 2008 about the customer contributions determined by CitiPower pursuant to its distribution licence and Electricity Guideline No.14. The key element of the complaints related to CitiPower charging the new customers for recovering the cost of future augmentation of CitiPower's shared network assets upstream of the customer connection points, regardless of whether such augmentation takes place immediately or some time in the future.

CitiPower charged upstream augmentation on a per MVA capacity basis as part of the customers' capital contribution for connecting to its distribution network. According to CitiPower, the charge rates were based on its long-term average historical unit cost of upstream network augmentation as a proxy for the unit cost of augmentation.

The ESCV undertook a formal review of the fairness and reasonableness of CitiPower's charges for recovering the cost of augmenting shared assets upstream of the point of connection. It released a draft decision—*CitiPower's Contribution Charge for Marginal Cost of Network Reinforcement*—on 17 December 2008.[1]

In the draft decision, the ESCV concluded that CitiPower's approach to calculating customer connection charges for upstream augmentation is not consistent with Electricity Guideline No.14 because it does not:

- have regard to the locational capacity associated with the customer in question

[1] Prior to 1 January 2009, the ESCV has the power under the distribution licence conditions to make decision on whether such charges are fair and reasonable.

- have regard to the present value of costs incurred by the distributor in relation to the customer in question.[2]

The ESCV also sought input from stakeholders, in particular CitiPower, on the way in which CitiPower's upstream augmentation charge cost should be calculated with regard to the anticipated bringing forward cost component of upstream augmentation due to connection of new customers.

Ten submissions, including CitiPower's, were received regarding the ESCV's draft decision. Customers and customer groups expressed their agreement with the draft decision and their dissatisfaction with the lack of clear information provided in CitiPower's connection offers.

However, none of the submissions addressed the question on how to calculate the fair and reasonable rates for CitiPower to charge new customers regarding future upstream augmentation. Hence, the AER undertook a review to estimate the charge rates that could be considered as appropriate for CitiPower to recover the upstream augmentation cost attributable to new customers.

The AER's analysis (Appendix A) shows that, based on a "N-1" planning standard[3] or similar capacity consideration[4]:

- 62 per cent of CitiPower's zone substations and 78 per cent of its high voltage feeders are operating at less than 100 per cent capacity

- 19 per cent of CitiPower's zone substations and 49 per cent of its high voltage feeders are operating at less than 75 per cent capacity.

This shows that not all new customers' energy demand would require immediate upstream network augmentation.

Hence, the AER concludes that CitiPower's methodology in relation to brought forward costs is not fair and reasonable or consistent with Electricity Guideline No.14 in that it does not reflect the incremental capital costs that would otherwise have been incurred at a later date had the customer not connected to the system. Based on this decision, the AER will direct CitiPower to stop charging new customers at its current rates for recovering upstream augmentation cost.

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[2] Electricity Guideline No.14 specifies that the "brought forward upstream cost" is the time value of money arising from bringing forward of upstream augmentation due to the additional energy demand of the new customer. It is the difference between (1) the NPV of the incremental capital costs the distributor will incur in undertaking that augmentation at an earlier date as a result of the customer having connected to the distributor's network; and (2) the NPV of the incremental capital costs the distributor would otherwise incur in undertaking that augmentation at a later date, if the new customer had not connected to the distributor's network.

[3] N-1 planning standard means that no supply interruption would result in the event that one major component of the network is unavailable. It is the acronym for normal minus one.

[4] CitiPower's urban HV feeders are rated at 66 per cent of their thermal capacity to provide operating flexibility.

What should be the fair and reasonable rates?

CitiPower's original upstream augmentation charge rates, on per MVA demand basis, were:

- Zone Substation Bus $257,634
- HV Feeder $273,603
- Distribution Substation $415,632
- LV Street Circuit $676,002.

The AER's calculation suggests that the fair and reasonable rates for recovering the additional cost impact due to new customers to augment the shared upstream network of CitiPower network should be:

- Zone Substation Bus $86,591
- HV Feeder $91,958
- Distribution Substation $139,694
- LV Street Circuit $227,204.

The AER considers that further consultation on the above charging rates is desirable because the AER did not receive sufficient information through the initial consultation process to form a final decision on this matter. Submissions should be provided by 14 August 2009. Details of how to make a submission are set out on page ii of this paper.

Contents

1 Introduction

All Victorian electricity distributors are required to make an offer to connect new customers to the distribution network. The distribution licence conditions require that such offers, which may include an up-front charge for connection, must include a price and other terms and conditions that are:

- fair and reasonable
- consistent with the current Electricity Price Determination and all relevant regulatory guidelines.

In 2004, the Essential Services Commission of Victoria (ESCV) undertook a review of the guidelines for setting such charges. The ESCV's final decision, *Review of Augmentation and Customer Connection Guideline* (2004 Final Decision), together with *Electricity Industry Guideline No. 14 - Provision of Services by Electricity Distributors* (Electricity Guideline No.14), provide guidance on how the distributors should calculate a customer's capital contribution.[5]

In summary, the amount of a customer's capital contribution should not be greater than the difference between (1) the overall cost, in net present value (NPV) terms, in relation to the connection of the customer; and (2) the expected incremental network revenue, also in NPV terms, the distributor will earn as a result of providing the connection.

Electricity Guideline No.14 provides that the relevant incremental cost include:

- the cost of the necessary network augmentation to enable the new connection (direct connection cost)
- the NPV of future operating and maintenance cost due to the additional network asset
- other costs the distributor will incur, including the brought forward component of upstream network augmentation cost due to the additional demand of the new customer—"brought forward upstream cost", also commonly referred to as "deep connection charge").

Electricity Guideline No.14 specifies that the "brought forward upstream cost" is the time value of money arising from bringing forward of upstream augmentation due to the additional energy demand of the new customer. It is the difference between (1) the NPV of the incremental capital costs the distributor will incur in undertaking that augmentation at an earlier date as a result of the customer having connected to the distributor's network; and (2) the NPV of the incremental capital costs the distributor

[5] Section 2.2(h) of the *Victorian Electricity Supply Industry Tariff Order 2005*, published under section 15A of the *Electricity Industry Act 2000* (EIA), requires that " the terms and charges for a Distributor's Excluded Services will be set in accordance with the provisions of Distributors' Distribution licences issued under Division 3 of Part 2 of the EIA and any applicable guidelines published by the ESC [Essential Services Commission of Victoria], and subject to oversight under the ESC Act [Essential Services Commission Act 2001]".
Excluded Services include capital contributions for new works and augmentation.

would otherwise incur in undertaking that augmentation at a later date, if the new customer had not connected to the distributor's network.

Several new customers connecting to or seeking an upgrade to CitiPower's distribution network raised concerns with the ESCV about the customer contributions determined by CitiPower pursuant to its distribution licence and Electricity Guideline No.14.

The ESCV undertook a formal review of the fairness and reasonableness of CitiPower's charges for recovering the cost of augmenting shared assets upstream of the point of connection. It released a draft decision—*CitiPower's Contribution Charge for Marginal Cost of Network Reinforcement*—on 17 December 2008.[6]

In the draft decision, the ESCV concluded that CitiPower's approach to calculating customer connection charges for upstream augmentation is not fair and reasonable because it does not:

- have regard to the locational capacity associated with the customer in question
- have regard to the present value of costs incurred by the distributor in relation to the customer in question.

The ESCV also sought input from stakeholders, in particular CitiPower, on the way in which CitiPower's incremental cost should be calculated with regard to the bringing forward cost component of upstream augmentation due to connection of new customers.

1.1 The role of the Australian Energy Regulator (AER)

As part of the transition to national regulation of energy markets, the AER is now responsible for exercising certain powers and functions previously undertaken by the ESCV. The new responsibilities are conferred on the AER by the operation of the *National Electricity (Victoria) Act 2005* (NEVA) in accordance with the *Trade Practices Act 1974* and the Australian Energy Market Agreement. The NEVA specifically confers economic regulatory functions, powers and duties on the AER. This includes the ESCV's powers and functions under Electricity Guideline No.14.

1.2 Purpose of this paper

This paper presents the AER's decision on CitiPower's current approach to charge new customers for upstream network augmentation (referred to by CitiPower as "marginal cost of network reinforcement"), taking into consideration the ESCV's previous work, stakeholders' submissions and further information provided to the AER.

Insufficient information was received through the initial consultation process to make a decision on what should be considered a fair and reasonable amount to charge new customers for future upstream augmentation. The AER considers that further consultation is required before those amounts are determined.

[6] Prior to 1 January 2009, the ESCV has the power under the distribution licence conditions to make decision on whether such as offer is fair and reasonable.

As noted above, this review focuses on whether the upstream augmentation charges for customer connection established by CitiPower are fair and reasonable. It does not consider similar charges, if any, set by any of the other distributors. However, the approach adopted by this review would form the basis of any assessment of similar charges levied by other distributors.

This review does not cover charges for recovering the cost of installing assets that are unique to individual new customers, that is, the direct costs involved in providing and installing the lines and equipment that are dedicated to a customer. As direct cost varies depending on the specific circumstance of individual customers, they are looked at individually when a dispute occurs.

The AER is making this decision pursuant to the ESCV's Electricity Guideline No. 14.

1.3 Review process

In developing the decision, the AER has considered stakeholders' submissions to the ESCV's draft decision, which are discussed in chapter 5 of this paper.

1.4 Structure of this paper

Chapters 2 to 6 outline:

- the requirements of and principles for calculating capital contributions set out in Electricity Guideline No.14
- CitiPower's methodology for calculating its capital contribution charges
- the ESCV's draft decision on CitiPower's contribution charge for the marginal cost of network reinforcement
- submissions in response to the ESCV's draft decision
- the AER's decision on CitiPower's contribution charge for the marginal cost of network reinforcement.

2 Customer contributions and Electricity Guideline No.14

2.1 Customer contributions and annual charges

The capital costs of augmenting an electricity network can be recovered in one of two broad ways. Firstly, the capital costs can be annualised and recovered through ongoing charges levied on all users of the network. A second approach is simply to recover the capital costs through direct up-front contributions from customers, particularly new customers and those customers looking to significantly increase their use of the network, which in turns requires network augmentation.

Both approaches will ensure that the distributor is able to recover the costs of augmenting its network. However, the two different approaches impose different costs on different customer segments over different time periods. Annualising the capital cost of augmentation spreads the burden over the entire customer base over the medium to long term; seeking up-front contributions places a higher burden of costs on new customers and over the short term.

The electricity distribution price review process needs to ensure that it reflects existing policies regarding the degree to which the cost of augmentations should be recovered through annual charges or customer contributions. This will ensure that distributors do not over or under-recover their costs, particularly in the short term.

In its 2006 Electricity Distribution Price Review (EDPR) the ESCV reflected the approach to determining capital contributions set out in its 2004 Final Decision and Electricity Guideline No. 14. Electricity Guideline No.14 requires that customers contribute towards the capital cost of new customer connections where the incremental cost of the connection is greater than the incremental revenue. Electricity Guideline No. 14 also sets out the manner in which incremental cost and incremental revenue should be calculated, and the way in which any subsequent capital contribution should be determined.

However, a potential problem arises if distributors' forecasts of customer contributions for the regulatory period are materially lower than what distributors actually charge for customer contributions over the period. Under such circumstances distributors might 'double-recover' some of its costs, at least until the end of the regulatory period. This double-recovery might arise if the forecasts of customer connections and demand are materially different from that assumed during the price review process. However it could also occur, for example, if the distributors are not appropriately applying the customer contribution policy in place at the time of the price review.

Based on the regulatory account statements provided to the AER and ESCV by CitiPower, the AER notes that the total amount of customer contribution received by CitiPower for the 2006 calendar year was $7.3m (119 per cent of the original forecast level). The level of customer contribution increased to $13.5m during 2007 (215 per cent of the original forecast) and further increased to $29.3m in 2008 (447 per cent of original forecast).

While different factors could cause this significant level of increase in recovering construction cost from customers (for example, higher than expected growth in new customers or augmentation costs), one factor to consider is whether CitiPower's current charge rates reflect the provisions of Electricity Guideline No. 14 accurately.

2.2 Electricity Guideline No.14

Clause 11.1 of CitiPower's distribution licence requires it to make an offer to connect new customers to the distribution network. Pursuant to clause 11.3, the offer must:

- include a price, and other terms and conditions, which are fair and reasonable
- be consistent with the current Electricity Price Determination or any other applicable price determination made by the ESCV, and any applicable approved statement.

Under clause 11.4 of CitiPower's distribution licence, any question as to the fairness and reasonableness of a term or condition is to be decided by the ESCV (as noted in chapter 1 the ESCV's powers and functions under Electricity Guideline No.14 have been conferred on the AER).

Electricity Guideline No.14, which is a relevant guideline for the purposes of clause 11.3 of CitiPower's distribution licence, includes a requirement for customers to contribute to the capital cost of new works. The capital contribution must be determined on the basis that:

- the customer is not to contribute towards the capital cost of new works and augmentation unless the incremental cost in relation to the connection offer is greater than the incremental revenue
- the amount of any such customer capital contribution is not to be greater than the amount of the excess of the incremental cost in relation to the connection offer over the incremental revenue.

A key purpose of Electricity Guideline No.14 is to articulate and provide for a practical implementation of the incremental cost principles established in the ESCV's 2001 Electricity Distribution Price Review for customer capital contributions, which stated that:

> *a customer should only be required to make a contribution for connecting to the system where it would expect to contribute less than the incremental cost of providing its supply (given projected distribution or network prices).*

The objective of the capital contribution should be to make up any shortfall between projected future payments for network services and the incremental cost of this service.

In developing Electricity Guideline No.14[7], the ESCV stated that the approach to calculating capital contributions should be simple, afford distributors flexibility in

[7] Refer to www.esc.vic.gov.au/public/Energy/Consultations/Review+of+Electricity+Connection+and+Augmentation+Guidelines+draft+decision/Electricity+connection+and+augmentation+guidelines+review.htm

estimating incremental costs and meet the ESCV's pricing principles (efficient cost allocation and least cost network solutions) in a transparent and practicable manner. In particular:

- Capital contributions for new connections should be consistent with providing efficient price signals, in particular, through signalling differences in the long run incremental cost (LRIC) of connecting to different points of the network, and differences in the costs imposed by connecting customers with different load characteristics.
- Distributors should have sufficient flexibility to estimate the incremental cost of servicing a customer, consistent with the principles to be specified in Electricity Guideline No.14.

Clause 3.3 of Electricity Guideline No. 14 provides guidance on how distributors are to calculate capital contributions in a manner that the ESCV considers to be fair and reasonable and which is consistent with these principles.

In particular, in determining the price to include in its connection offer, Electricity Guideline No.14 requires a distributor to calculate the maximum amount of a customer's capital contribution for new works and augmentation, as follows:

$$CC = [IC - IR] + SF$$

where:

CC is the maximum amount of the customer's capital contribution.

IC is the amount of incremental cost in relation to the connection offer.

IR is the amount of incremental revenue in relation to the connection offer.

SF is the amount of any security fee under the connection offer as contemplated by clause 3.5 of Electricity Guideline No.14.

Under Electricity Guideline No.14, incremental cost essentially represents the time value of bringing forward the cost of augmentation. It is the difference between:

- the present value of the incremental capital costs the distributor will incur in undertaking that augmentation at an earlier date as a result of the customer having connected to the distributor's distribution system; and
- the present value of the incremental capital costs the distributor would otherwise incur in undertaking that augmentation at a later date, if the customer had not connected to the distributor's distribution system.

Incremental revenue is the present value of the incremental distribution tariff revenue the distributor will earn in providing services as a result of also providing the connection services offered.

Electricity Guideline No.14 states that the incremental cost and the incremental revenue are to be such amounts as fairly and reasonably estimated by the distributor.

2.3 Practical implementation of the incremental cost and incremental revenue principle

There are a range of inputs into the calculation of the incremental revenue and incremental cost. These include the unit cost of augmentation, the customer's demand characteristics, the expected life of the connection and the expected growth in base level demand.

In order to avoid significant administrative costs, potential delays in connection that would not be warranted in respect of small new connections and potential disputes over charges, the ESCV specified in Electricity Guideline No.14 some parameters and principles to be used by distributors in determining incremental costs and revenues. These include:

- The term over which the connection services offered will be provided is 30 years for domestic customers and, unless the distributor fairly and reasonably determines some other term is more appropriate in any particular case, 15 years for all other customers.
- The distribution tariff earned by the distributor over that term is:
    - for the period over which the prevailing Price Determination applies, the distribution tariff the distributor is entitled to earn under that Price Determination
    - after then, the distribution tariff the distributor would be entitled to earn under that Price Determination if it were to continue to apply, with the applicable X-factor being the same X-factor that applies in the last calendar year in respect of which that Price Determination applies.
- The amount of electricity supplied to the customer is to be fairly and reasonably estimated by the distributor having regard to the customer's load and connection characteristics.
- Incremental costs include a margin of up to 10 per cent for overheads (this must be the same percentage margin as contemplated by clause 2.3.2(b) of Electricity Guideline No.14).

3 ESCV's draft decision

This section outlines the approach and assumptions used by CitiPower in determining its upstream augmentation charges and the ESCV's assessment of CitiPower's approach to such charges, as stated in the draft decision.

3.1 CitiPower's approach to setting charges

CitiPower's approach to setting new connection charges in respect of the recovery of the cost of augmenting shared assets is to include a 'deep-connection' charge element, being an amount equal to the 'marginal cost for reinforcement', as part of its overall cost.

The calculation of the marginal cost of reinforcement is based on an estimation of the new customer's expected demand and uses CitiPower's long term average historical unit cost of upstream network augmentation (indexed for inflation) as a proxy for the unit cost of augmentation. The charge is adjusted to take into account different levels of connection and the load diversity of the connecting customer. This approach results in the following per MVA costs for different connection levels for all of CitiPower's distribution area[8]:

- Zone Substation Bus $257,634
- HV Feeder $273,603
- Distribution Substation $415,632
- LV Street Circuit $676,002.

CitiPower observed that its approach to setting customer contribution charges is underpinned by the assumption that there will be little if any future uptake of left over capacity due to demand side climate change policies being introduced by State and Federal Governments. CitiPower suggested that State and Federal Government action will result in significantly reduced demand on the shared distribution network over the next few decades and notes that:

> *Recent developments indicate that there will be little if any network demand growth in 15/30 years time when existing connecting customers are assumed to cease taking supply…It would therefore not be economically efficient for this cost to be borne by existing customers, but rather new customers should pay the full marginal cost of reinforcement.*

3.2 ESCV's analysis

In its draft decision, which was released on 17 December 2008, the ESCV assessed whether CitiPower's capital contribution charges for new augmentation are fair and reasonable having regard to:

[8] The ESCV reviewed CitiPower's rates by calculating the average book value (adjusted for inflation over time) of CitiPower's network assets and found that CitiPower's charging rate is not inconsistent with the historical cost.

- the incremental cost and incremental revenue principles and calculations articulated in clause 3 of Electricity Guideline No.14
- the 2004 Final Decision, Draft Decision and Issues Paper released for its Review of Augmentation and Customer Connection Guideline.[9]

3.2.1 Incremental revenue

Based on its assumption about there being little or no network demand growth after the end of the 30 year (for domestic customers) or 15 year (for other customers) connection lives, CitiPower's calculation of the incremental revenue associated with the augmentation only includes revenue received from the connecting customer over the notional connection agreement term. It does not include any estimated revenue for the remainder of the asset life once the term of the notional agreement ends.

The ESCV noted in its draft decision that while Electricity Guideline No.14 does not preclude distributors from taking into account revenue earned from customers taking up the capacity at the end of the connection life of the original connecting customer, in designing Electricity Guideline No.14 the ESCV recognised the difficulty and uncertainty associated with projecting incremental revenue over the long term and therefore established the 15/30 year rule for connection lives.[10]

The ESCV therefore considered that CitiPower's methodology for calculating incremental revenue did not appear to be inconsistent with Guidance No.14.

3.2.2 Incremental cost

Location base pricing

In its draft decision, the ESCV noted that CitiPower's approach does not distinguish between the geographic location of connections, or specific locational costs. The same charge applies regardless of the geographic area in which a customer is located.

Electricity Guideline No.14 does not describe a standard approach to estimating the incremental capital cost of an augmentation. However, the ESCV's approach in developing Electricity Guideline No.14 was that:[11]

> *capital contributions for new connections should be consistent with providing efficient price signals, in particular, through signaling differences in the (long run) incremental cost (LRIC) of connecting to different points of the network, and differences in the costs imposed by connecting customers with different load characteristics.*

The ESCV's draft decision re-stated its observation from the 2004 Final Decision that:

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[9] Refer to http://www.esc.vic.gov.au/public/Energy/Consultations/Review+of+Electricity+Connection+and+Augmentation+Guidelines+draft+decision/Electricity+connection+and+augmentation+guidelines+review.htm for a link to the consultation process.

[10] Extensive discussion about the life of the connection is provided in section 3.2.3 of the Issues Paper for *Review of Connection & Augmentation Guidelines: Vol 2 – Customer Contributions.*

[11] *Review of Augmentation and Customer Connection Guideline* – Final Decision, April 2004, p.10.

> *the planning of future augmentations is a key task of distributors in operating their businesses efficiently, and that understanding the incremental cost of serving different types of customers at different locations should be a key input to their long term tariff strategy…*

The 2004 Final Decision envisaged the use of an averaging approach for calculating the incremental cost of augmentation of the lower levels of the distribution network, but not for the sub-transmission and zone substation levels of the network (which are relevant to the cost of augmenting upstream network assets):[12]

> *regional locational signals could, for example, be reflected in estimates of LRIC [long run incremental cost] for sub transmission and zone substation levels of the network, as opposed to lower levels of the network where a more averaged approach may be warranted.*

The ESCV's draft decision was that CitiPower's approach was inconsistent with the 2004 Final Decision because it does not provide any locational signals[13] and that CitiPower had also not provided any information to suggest that the localised costs and capacity constraints are similar across its licence areas.

The ESCV sought stakeholders' comments on options for providing locational signal, for example, CitiPower undertakes a case-by-case estimate of the locational cost of connection to its network for large customers only; whereas other customers are charges on an averaging approach.

The brought-forward capital works

Electricity Guideline No. 14 specifies that the incremental cost should reflect the difference between:

- the present value of the augmentation costs the distributor will incur as a result of the customer being connected; and
- the present value of the costs the distributor would have otherwise incurred in undertaking the augmentation at a later date due to increase in demand by existing customers, assuming no new customers were connected.

The ESCV's draft decision stated that, by charging the new customer the full incremental cost of reinforcement, rather than some estimation of the time value of a brought-forward capital investment, CitiPower implicitly assumes that:

[12] Review of Augmentation and Customer Connection Guideline – Final Decision, April 2004, p.9.

[13] While CitiPower's charges distinguish between the network level of connection (eg HV feeder versus LV Street Circuit), the approach does not distinguish between the geographic location of connections or the specific locational costs. In the 2004 Final Decision and the Electricity Guideline No.14, the ESCV clearly articulated that there should be locational signals provided in customer contribution charges in order to achieve least cost network solutions.

- An augmentation will be required to meet the customer's needs. This assumption may be inconsistent with CitiPower's view that system demand may be stable or falling in future as a result of climate change policies.
- The augmentation needs to be undertaken immediately rather than at some time in the future. This implies that the entire network is currently at full capacity, which is not realistic.

The ESCV noted that there is significant uncertainty associated with projecting the timing of augmentation. Developing this estimate on a customer-by-customer basis would require substantial analysis and decisions on matters that require a subjective view to be taken.

However, the ESCV also observed that it is still not reasonable to assume that in every case the augmentation would not otherwise need to occur and needs to occur immediately. It is likely that in some cases the increased demand on the system which causes supply to reach maximum capacity is a result of not only the new customer connecting to the network, but also many incremental increases in demand by existing customers. In such cases, it would only have been a matter of time before augmentation was needed. Therefore, even where a particular customer has triggered the need for a network capacity upgrade, and a substantial augmentation is required to provide supply, it would be expected that in most cases the incremental cost associated with the customer is the financing cost associated with spending money now rather than in the future. This incremental cost would be far lower than the total capital cost of that augmentation.

On this basis, the ESCV stated in its draft decision that CitiPower's approach does not appear to be consistent with Electricity Guideline No.14, which clearly describes an approach for estimating incremental cost based on the present value of bringing augmentation forward. The ESCV stated that CitiPower's approach does not do so and raises significant equity issues because the connecting customer bears the full costs of augmentation in all cases.

3.3 ESCV'S draft decision

The ESCV's draft decision concluded that CitiPower's approach to calculating customer connection charges is not fair and reasonable because it does not:

- have regard to the network locational capacity and cost issues associated with the customer in question
- have regard to the present value of costs incurred by the distributor in relation to the customer in question.

3.4 The ESCV's proposed approach

3.4.1 Location based pricing

The ESCV's draft decision suggested that it should be feasible for distributors to undertake analysis of locational costs for large customers because the planning of future augmentations is a key task of distributors in operating their businesses

efficiently, and that understanding the incremental cost of serving different types of customers at different locations should be a key input to their long term tariff strategy. For other customers an averaging approach could continue to be used.

The ESCV also suggested that large customers could be distinguished based on whether they have high voltage connections. The ESCV sought feedback from stakeholders on this proposal.

3.4.2 Brought forward capital cost

In its draft decision the ESCV stated that CitiPower's calculation of incremental cost should take into account the bring forward cost of capital. However, given some of the complexities in measuring incremental costs on a case-by-case basis, the ESCV observed that the challenge in doing so is to ensure that the incremental cost principle is applied in a practical manner.

The ESCV proposed that one option is to calculate incremental costs based on an assumption about the bring forward timing and costs for small customers.

As noted, CitiPower's approach assumes that augmentation needs to occur immediately. The ESCV stated that an alternative (and fair and reasonable) assumption could be, for example, that the customer's connection will bring forward a planned augmentation from year 'y' to year 'z'.

The ESCV noted that the application of this approach and determination of a benchmark factor relies on CitiPower having accurate historical information regarding the average time that augmentations are brought forward as a result of new customer connections.

The ESCV also sought feedback on the way in which CitiPower's incremental revenues and costs should be calculated. The ESCV suggested that it preferred proposals that would address the equity issue that arises because new customers bear the full costs of augmentation in all cases.

4 Submissions received

4.1 Third party submission

Apart from CitiPower, the following submissions were made to the ESCV's draft decision:[14]

- Almond Investors Limited (Almond Investors)
- C.B. Holdings (Robinvale potato farmers)
- Department of Innovation, Industry and Regional Development (DIIRD)
- Jemena Electricity Networks (Jemena)
- Stuart Eason (domestic customer)
- Timbercorp
- Utilacor
- Victorian Farmers Federation (VFF)
- Macquarie farm Assets & Resource Management Ltd.

Almond Investors, C.B. Holdings, DIIRD, Timbercorp, the VFF and Utilacor all advised that they support the ESCV's position in the draft decision.

Most submissions suggested that information currently provided by distribution businesses is not clear or understandable. Several submissions also requested that previous charges applied by CitiPower be reviewed for over-charging and that the reimbursement be provided where applicable.

Jemena considered that the ESCV's proposal for large customers to be distinguished based on whether they have high voltage connections is reasonable. However, Jemena did not support a calculation of the customer's contribution for new connection that envisages the use of locational signals for estimating the incremental cost of upstream augmentation, while the estimation of the incremental revenue is based on an average network tariff. Jemena considered that applying a locational signal to the cost component while the revenue component is based on an average network tariff is a flawed approach and does not provide efficient price signals.

Jemena supported CitiPower's use of the long term historical unit cost of upstream network augmentation, noting that this avoids potential complexities and that the customer is only required to pay the full cost of augmentation. Jemena observed that under this approach the distributor will fund the spare capacity created by the

[14] Submissions are published at www.esc.vic.gov.au/NR/exeres/D244491E-82B3-49FC-B186-DFCD321F21E6.htm.

augmentation initiated by the customer, thus avoiding an unfair burden being incurred by any one customer.

4.2 CitiPower's response

In response to the ESCV's draft decision, CitiPower noted that, while it concedes that the cost charged for the shared augmentation component does not provide locational signals:

- It would be extremely unlikely for any locational signal through the capital charge to induce a customer to locate in a lower cost area, and that the complexities and administrative costs involved in providing locational signals are unlikely to outweigh the benefits.

- In any event, CitiPower currently provides locational signals through the 'dedicated asset component', the costs of which vary by the location of the customer.

- The interconnectedness of CitiPower's network makes it difficult to provide locational signals, with particular difficulties in relation to defining the cost of augmentation by location as augmentations generally benefit several adjacent zone substations.

CitiPower's argued that its methodology is not inconsistent with the Guideline with regard to locational signals, particularly given that CitiPower's network has a high level of density and interconnection between adjacent substations.

CitiPower disagreed with the ESCV's conclusion that its approach to the calculation of the incremental costs for the marginal cost of the network reinforcement component is not 'fair and reasonable' and that its approach raises significant equity concerns. CitiPower asserted that:

- Its approach does not assume that augmentation to the shared network (which would not otherwise have occurred) is always required and that, to the contrary, CitiPower's approach requires the customer to contribute to CitiPower's augmentation costs in proportion to the customer's share of total capacity delivered by its augmentation.

- Because its approach results in the connecting customer being charged with reference to the customer's incremental demand, the customer is not in all cases required to bear the full cost of augmentations.

- Its approach achieves an equitable distribution of its augmentation costs between customers because the proportion of total augmentation costs recovered through capital contributions made by new customers is equal to their contribution to the cost of CitiPower's augmentations.

CitiPower also argued that, while not strictly compliant with the requirement to base the incremental cost on the present value of bringing forward the timing of augmentation, its approach complies with the spirit and intent of Electricity Guideline 14. CitiPower observed that:

> *…its approach may be said to assume that the cost of incremental augmentation (as distinct from the cost of an augmentation) needs to be incurred immediately, rather than at some future time. CitiPower further concedes that this is not strictly consistent with clause 3.3.2(a)(2) of Guideline 14 which, literally applied, would require the incremental cost for the MCR [marginal cost of reinforcement] component to be determined based on the present value of bringing forward the timing of augmentation required for a specific new customer connection.*

However, CitiPower noted that as the new customer contributes to augmentation costs in proportion to the capacity required to facilitate their connection as a share of total capacity delivered by augmentations, its methodology can be thought of as an appropriate proxy for taking into account the present value of incremental capital costs to the distributor as required by Electricity Guideline No. 14.

CitiPower also observed that, rather than the ESCV's requirement for CitiPower to strictly and literally apply the bring forward calculation, its approach is consistent with Electricity Guideline No.14's objective of flexible regulation.

5 AER's analysis and decision

5.1 AER's analysis

5.1.1 Location based pricing

The ESCV noted in its draft decision that CitiPower's approach is inconsistent with Electricity Guideline No.14 because it does not provide any locational signals and no information had been provided by CitiPower to suggest that the localised costs and capacity constrains are similar across licence areas.

The AER agrees that there is a need for connection charges to provide efficient price signals, in particular, through signalling differences in the incremental cost of connecting to different parts of the network. However, the AER also notes CitiPower's view in its submission to the ESCV's draft decision that:

> *there will be no efficiency gain from implementing a locational signal in the marginal cost for reinforcement in the circumstances of its network.*

CitiPower explained in its submission a number of network characteristics specific to its network that need to be taken into account, including:

- Given that CitiPower's network is located in a high-density metropolitan area, with site density therefore unlikely to be the prime determinant of location choice, locational signals will be highly unlikely to have an effect on the behaviour of CitiPower's new customers.

- Due to the extent to which CitiPower's network is interconnected, there are substantial practical difficulties in identifying the extent to which all planned augmentations benefit a specific area and so which customers should bear the cost of augmentation. CitiPower noted that:

  > *Many high voltage feeders in CitiPower's network are interconnected with high voltage feeders from other substations. Due to the customer and load density of CitiPower's area, high voltage feeders from one zone substation can be connected to feeders from several adjacent zone substations.*

CitiPower also observed that, because the cost of dedicated assets (i.e. those that are unique to individual new customers) are based on the location of the customer and are reflected in a separate component of CitiPower's capital contribution charge, CitiPower's charge does in fact provide a locational signal.

The AER sees merit in CitiPower's arguments in relation to locational signals. While the AER agrees with the principle of providing efficient price signals including locational cost signals, in considering the information provided by CitiPower

regarding its network, the AER is also mindful of the ESCV's view in developing Electricity Guideline No.14 that[15]:

> *the guideline for assessing capital contributions needs to be simple and afford distributors some flexibility in calculating incremental costs where specific circumstances need to be taken into account.*

With respect to locational signals, the AER's decision is therefore that CitiPower is not in breach of Electricity Guideline No. 14 on the basis that:

- The high density and interconnected nature of CitiPower's network means that the capital costs of connection are likely to be difficult to estimate.
- The dedicated asset component of the connection charge provides an appropriate locational signal.
- The level of difference in cost between geographic locations is unlikely to be significant.

The AER notes that this decision is based on the specific characteristics of the CitiPower network and may not be relevant to other distribution networks.

5.1.2 Brought forward capital cost

In its draft decision, the ESCV observed that CitiPower's calculation of upstream augmentation charge did not take into account the bring-forward cost of capital. The importance of this principle was set out in the 2004 Final Decision where the ESCV explained that a key purpose of Electricity Guideline No. 14 was to ensure that customer contributions reflected:

> *the incremental cost of providing network services to that customer, **including the impact of that customer's connection on the timing of future augmentations to the network.**[16] [emphasis added]*

Electricity Guideline No. 14 reflected this principle in clause 3.3.2 (a)(2)(B).

The ESCV's draft decision then suggested a potential method by which the bring-forward impact of the augmentation could be estimated. In summary, the draft decision suggested that if, for example, the average bring forward time for an augmentation was from 10 to 5 years then this difference could be used to establish an average factor (in this case 0.16) by which the cost of an augmentation could be multiplied to determine the capital contribution.

In response to the draft decision CitiPower raised two material concerns with the ESCV's potential approach.[17] According to CitiPower:

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15 Ibid, p.10.

16 Ibid, p.10.

17 CitiPower, *Submission to the Essential Services Commission on the Draft Decision regarding CitiPower's Capital Contribution Charge for Marginal Cost of Network Reinforcement*, 23 January 2009, p. 14.

- *the proposed 'bring-forward factor' calculation would appear to contain errors in that:*

  - *it purports to use only that part of the brought-forward augmentation cost attributable to the customer connecting, rather than the total brought-forward augmentation cost, in calculating and applying the 'bring-forward factor'; and*

  - *there appears to be an error in the averaging method used in the benchmark bring forward factor in that it does not properly account for the time value of moving augmentations forward in time.*

- *the proposed 'bring-forward factor' calculation is not practicable because:*

  - *the required accurate historical information regarding the average time that augmentations are brought forward as a result of new customer connections is not available and, if it were, would be highly subjective;*

  - *the average time that augmentations are brought forward as a result of new customer connections varies widely with the network level at which the augmentation occurs, so necessitating a discrete bring-forward factor calculation for each network level; and*

  - *the highly interconnected nature of the network.*

The AER considers some aspects of CitiPower's approach—charging upstream augmentation cost on a per unit basis— have merit, because:

- The approach is simple and minimises the administration costs and time involved in calculating capital contribution charges. This is consistent with the key principles outlined by the ESCV's in developing Electricity Guideline No.14.

- By requiring the customer to contribute to CitiPower's augmentation costs in proportion to the customer's share of total capacity delivered by the augmentation, CitiPower's approach avoids the problem where the marginal customer triggers the need for a network capacity upgrade and potentially bears the full costs of augmentation.

However, the AER considers that CitiPower's approach does not take into account the timing of future augmentations, which is a key requirement of Electricity Guideline No.14. While CitiPower believes its methodology is an appropriate proxy for taking into account the time value of money because it requires customers to contribute to augmentation costs in proportion to the customer's share of total capacity, this view appears to be comparing two unrelated concepts, in that:

- Electricity Guideline No. 14 requires that, as augmentation of the upstream shared network will be required some point in the future due to demand growth of existing customers, new customers should be paying for the increase in cost, being the financing cost for bring forward share network augmentation from year 'y' to year 'z'; rather than the full cost.

- CitiPower's approach appears to suggest that, all customers (new and existing) are using its existing network capacity, the new customers should be paying for the capacity taken up by them proportional to the level of usage.

The AER notes that the cost of CitiPower's existing network is being recovered by CitiPower through its network charges to the existing and future customers. The historical cost of its existing network is a 'sunk cost' rather than the 'relevant cost' for future share network augmentation. It is not clear to the AER that considering only the customer's share of capacity (rather than the total cost of any future augmentation) will have an equivalent impact to considering the bring-forward impact of that customer.

Furthermore, CitiPower's approach is to recover costs from not just those new customers that cause an augmentation to be brought forward immediately, but all new customers connecting to the network—including those whose marginal impact do not cause an augmentation to be brought forward in the near future.

The AER's analysis (Appendix A) shows that, based on a "N-1" planning standard[18] or similar capacity consideration[19]:

- 62 per cent of CitiPower's zone substations and 78 per cent of its high voltage feeders are operating at less than 100 per cent capacity

- 19 per cent of CitiPower's zone substations and 49 per cent of its high voltage feeders are operating at less than 75 per cent capacity.

This shows that not all new customers' energy demand would require immediate upstream network augmentation.

The AER considers that CitiPower's methodology in relation to brought forward costs is not fair and reasonable or consistent with Electricity Guideline No.14 in that it does not reflect the incremental capital costs that would otherwise have been incurred at a later date had the customer not connected to the system.

5.2 Decision

Some aspects of CitiPower's approach to charging upstream augmentation cost on a per unit basis have merit because this approach is (1) simple and minimises the administration costs; and (2) avoids the problem where the marginal customer triggers the need for a network capacity upgrade and potentially bears the full costs of augmentation. However, the AER concludes that CitiPower's existing charge rates do not comply with Electricity Guideline No.14 because these rates do not take appropriate account of the timing of future augmentations.

[18] N-1 planning standard means that no supply interruption would result in the event that one major component of the network is unavailable. It is the acronym for normal minus one.

[19] CitiPower's urban HV feeders are rated at 66 per cent of their thermal capacity to provide operating flexibility.

6 Further consultation

6.1 Calculation of the brought forward capital costs

The AER has considered how CitiPower's existing approach might be modified to comply with Electricity Guideline No.14. The AER considers that, if possible, the best approach is to require CitiPower to amend its calculations rather than completely overhaul its approach to customer contributions.

It is the AER's view that any approach to calculating the brought forward capital cost of augmentations needs to be clear, transparent and equitable. The AER considers that in order to achieve a practical implementation of the brought forward capital cost principle it is reasonable to utilise averages of relevant parameters, rather than a calculation based purely on customer-specific information. This is also consistent with the approach to calculating other components of the capital contribution charge.

The ESCV sought feedback in its draft decision regarding CitiPower's method for calculating incremental revenues and costs, including the determination of a benchmark factor for bring forward timing. The ESCV proposed, for example, that it could be assumed that the customer's connection will bring forward a planned augmentation from year 'y' to year 'z'.

No stakeholders responded to the ESCV's request to suggest an appropriate approach to calculating the incremental upstream cost, including the bring forward time for upstream augmentation. However, as noted above, CitiPower raised two concerns with the approach proposed by the ESCV.

In respect to the first of CitiPower's concerns regarding the ESCV's approach, the AER agrees that any equitable approach should consider only the customer's share of a capacity upgrade. The AER also notes that, as identified by CitiPower, any averaging of bring-forward periods should theoretically place greater weight on augmentations that are brought forward to closer to the present time.

However, the AER is not convinced that it is not practical to calculate a historical average time that augmentations are brought forward as a result of new customer connections. Indeed, based on both publicly available data, as well as data provided directly by CitiPower the AER has estimated that:

- On average, CitiPower's network components will need to be augmented in 16.7 years based on the forecast demand growth rate of new and existing customers.

- In the absence of new customers, CitiPower's network components would not need to be augmented, on average, for 63.5 years based on the estimated average consumption growth rate of existing customers.

The difference of 46.8 years is therefore the average period by which augmentations will need to be brought forward due to the existence of new customers. Based on the current rate for weighted average cost of capital of CitiPower (6.4 per cent) set under the EDPR, this equates to a net present value factor of 0.3361—that is, under this

approach the current rates used by CitiPower would be multiplied by 0.3361 to determine the average cost of network reinforcement for each customer.

Based on this adjustment factor, the AER calculated that the fair and reasonable rates for recovering the cost impact due to new customers' on additional augmentation requirements on the shared upstream network of CitiPower's network are:

- Zone Substation Bus $86,591
- HV Feeder $91,958
- Distribution Substation $139,694
- LV Street Circuit $227,204.

Details of the methodology underlying the calculation of this bring-forward factor are provided in Appendix A. The AER acknowledges that its calculation method does not fully address CitiPower's comment regarding the averaging of bring-forward periods. However, the AER's initial view is that that this approach would provide a practical solution to the bring-forward issue.

6.2 AER seeks stakeholders input

Before reaching a final view on the appropriate treatment of the bring-forward matter in CitiPower's customer contribution calculation, the AER seeks comments and inputs from stakeholders, in particular CitiPower, on the manner in which CitiPower's current approach could be modified to be consistent with Electricity Guideline No.14—on the approach that is summarised above and further detailed in Appendix A, as well as any alternative approaches which may satisfactorily address the issue.

The AER seeks submissions on this matter, to be provided by 31 July 2009. Details of how to make a submission are available from page ii of this paper.

Appendix A: estimation of bring forward augmentation time due to new customers

A.1 General approach

As set out in Chapter 5, the AER considers that CitiPower's approach to calculating the up-front charge to a customer for connection is not fair and reasonable in respect of shared network costs. This is because CitiPower's calculations do not take into account the bring-forward aspect associated with a customer's connection to the network.

In respect of the bring-forward calculation, the AER considers there is merit in establishing a broad rule for estimating the bring-forward factor, rather than determining it on a customer-by-customer basis.

One approach to determining a bring-forward factor involves establishing the average time by which augmentations need to be brought forward due to new customers. This can be calculated as the difference between:

- the average time for network augmentation of various network components due to the increase in electricity demand (usage) of new and existing customers; and
- the average time for network augmentation of various network components due to the increase in electricity demand (usage) of existing customers.

A.2 Key considerations and sources of information

In order to calculate the average time periods in accordance with the approach outlined above, the AER has had regard to the following considerations:

- the peak demand growth rate of CitiPower's existing customers
- the peak demand growth rate of CitiPower's new and existing customers in combination
- the existing average network utilisation of CitiPower's various network components including the high voltage network, low voltage network and sub-transmission network
- the level of utilisation, on average, at which a component of CitiPower's network requires augmentation.

In respect of peak demand growth, the AER has based its calculations on the ESCV's *Final Decision, Electricity Distribution Price Review 2006-10* (the EDPR), which sets out growth forecasts for all Victorian distribution businesses. The EDPR is an appropriate reference because it sets out CitiPower's revenue requirements for the current price control period.

The AER has also had regard to CitiPower's latest published Distribution System Planning Report (December 2008)[20] as the reference for CitiPower's asset management policy regarding growth related augmentation. As CitiPower's Planning Report covers only zone substations and sub-transmission feeders of its network, the AER sought information from CitiPower on the high voltage (HV) and lower voltage (LV) feeders' utilisation and peak demand. These two categories of network components are considered relevant because the AER understands they represent 56 and 27 per cent of CitiPower's overall network asset value (undepreciated) respectively.

CitiPower provided its HV feeders' capacity information to the AER. However, it has not provided LV feeders' demand and capacity information.[21]

CitiPower advised that maximum demand level of its LV network is not the only driver for augmentation. Other considerations include (1) voltage regulation, which may lead to augmentation before a circuit reaches its capacity; and (2) protection reach issue, which requires larger circuit capacity to be installed to ensure that the fuse will operate correctly.

A.3 Demand growth and customer numbers

Peak demand growth rates

The EDPR provides the forecast non-coincident zone substation peak demand for the 2006-10 period. The AER considers that non-coincident zone substation peak demand could be used to represent CitiPower's overall growth rate because all customers' consumption are aggregated at the zone substations. While other demand information may be used, a reliable source of such information is not readily available to the AER at this time.

Table 4.3 of the EDPR shows that the CitiPower's benchmark forecast non-coincident zone substation peak demand increased from 1,699 MVA in 2005 to 1,874 MVA in 2010. This represents an average compound growth rate of 1.98 per cent.

Customer number growth

Table 4.1 of the EDPR shows that CitiPower's overall customer numbers (residential and non-residential) were forecast to grow from 283,410 to 304,787 from 2005 to 2010. This represents an average compound growth rate of 1.46 per cent.

Peak demand growth rates due to new and existing customers

[20] Available from www.citipower.com.au/docs/pdf/Electricity%20Networks/CitiPower%20Network/CitiPower%20Distribution%20System%20Planning%20Report%202008.pdf.

[21] CitiPower advised that it do not have comprehensive records of maximum demand levels of LV feeders. The data that CitiPower have on LV feeders are the irregular load readings that are taken when it needs to determine if a new customer is likely to overload the feeder, or if planning studies indicate an issue. Such records are spot readings and do not indicate the maximum demand level.

The AER does not have access to information on the average consumption of new customers. However, it considers that it is not unreasonable to assume that the average consumption of new customers is same as the average consumption of existing customers. The estimated peak demand growth rate of CitiPower's network due to new customers is therefore assumed to be 1.46 per cent.

The peak demand growth rate of CitiPower's network due to existing customers is the difference between the overall growth rate and that of new customers, hence, 0.52 per cent.

A.4 Network utilisation

The level of utilisation for some of CitiPower's network components are discussed below.

A4.1 Zone substations

CitiPower's Distribution System Planning Report provides a list of all of its zone substations and the capacity and maximum demand information of these zone substations.

The report shows that there are 37 zone substations in CitiPower's network.[22] CitiPower stated in the planning report that:

> *In terms of overall planning objectives at the zone substation and sub-transmission system level, CitiPower aims to achieve a network that is capable of satisfactorily withstanding any single contingency event at the 50th percentile demand forecast without interruption to customers. This N-1 standard provides for the planned or unplanned removal from service of any line, transformer, circuit breaker, etc at the time of 50th percentile maximum demand loading on the station/system…*

The AER therefore considers that the utilisation level of a zone substation should be based on the N-1 capacity of the zone substations. Table B1 of Appendix B lists the capacity and utilisation levels of the zone substations. Table 1 below summarises the distribution of the levels of utilisation of the zone substations.

Table 1: Distribution of zone substation utilisation

Zone substation utilisation level	No of substations	Percentage of substations
0 to 25%	0	NA
25 to 50%	1	2.7
50 to 75%	6	16.2
75 to 100%	16	43.2
more than 100%	14	37.8
Total	37[a]	100.0

[a] See footnote 22 below

[22] CitiPower advised that while 38 zone substations are listed in its 2008 Planning Report, one of the zone substations, sub-SM, has been decommissioned. Hence, the AER's analysis will not include this zone substation.

Of the 14 zone substations (38 per cent of the total number) with utilisation level above 100 per cent, five have been identified as requiring major augmentation in the next four years (2009 to 2012). These substations are BSBQ, MP, RD, VM, and WA, with utilisation levels at 140, 105, 118, 127 and 112 per cent respectively.

The AER considers that the requirement for major augmentation at the five zone substations identified is in part due to new customer demand over previous years. The AER estimates that the weighted average level of utilisation of these five zone substations is 115 per cent of N-1 capacity, which the AER considers is the level of utilisation, on average, at which a zone substation will require capacity augmentation (the trigger level).

Table 1 also shows that 62 per cent of CitiPower's zone substations operate at 100 or less per cent in terms of N-1 capacity. These zone substations all have spare capacity for new customer growth and do not need immediate augmentation due to the additional demand of new customers.

The weighted average utilisation level of all zone substations, including those identified for major augmentation, is 96 per cent. The weighted average utilisation level of those zone substations not identified for major augmentation is 92 per cent.

A4.2 Sub-transmission feeders

Except for the feeders with forecast maximum demand above capacity limit, CitiPower's Distribution System Planning Report does not provide specific details about the actual maximum demand and capacity of its sub-transmission feeders. There are 83 sub-transmission feeders in total, of which 31 feeders (or 37.3 per cent of all feeders) are expected to operate at varying levels (between 1.4 and 34.2 per cent above capacity, prior to the implementation of planned response) above their respective designed capacity limits.

Of the 31 feeders operating above capacity limits, 11 feeders (or 13.3 per cent of all feeders) have been identified as requiring major augmentation in the next four years. The AER estimates that the weighted average level capacity utilisation of these feeders is 115 per cent.

Table 2 provides a comparison of the utilisation patterns of CitiPower's zone substations and sub-transmission feeders. The AER notes that the patterns of utilisation of these two categories of CitiPower's network components are almost identical.

Table 2: Comparison of utilisation, zone substation and sub-transmission feeders

	Percentage operating above capacity	Percentage requiring major augmentation	Average utilisation factor of those requiring major augmentation
Zone substations	37.8	13.5	115%
Sub-transmission feeders	37.3	13.3	115%

A4.3 High voltage (HV) feeders

CitiPower reports its HV feeders' maximum demand levels to the AER (previously ESCV) each year. However, the reports do not contain feeder capacity information.

On request from the AER, CitiPower provided a table of its feeders detailing the capacity and the recorded maximum demand levels during 2008 of each feeder. Table B2 of Appendix B lists the details of these feeders.

CitiPower advised that:

- Its urban feeders are rated at 66 per cent of their thermal capacity to provide operating flexibility. Hence, some of the feeders are shown to operate at higher than 125 per cent of capacity.

- The CBD feeders are not de-rated as the operating flexibility is provided through standby feeders.

The weighted average level of utilisation of CitiPower's HV feeders is 72 per cent. The weighted average levels of utilisation of those feeders operating below and above capacity are 61 and 115 per cent respectively. Table 3 provides a summary of the levels of utilisation of the HV feeders.

Table 3: Analysis of capacity utilisation levels CitiPower's HV feeders

Capacity utilisation range	Percentage of all feeders
0 to 25%	11.3
25 to 50%	12.1
50 to 75%	25.2
75 to 100%	29.0
More than 100%	22.3

A4.4 Other network assets

Low voltage (LV) feeders

CitiPower has not provided information to the AER regarding demand and utilisation levels of its LV feeders.[23] The AER understands that monitoring of actual demand levels of LV feeders is not as comprehensive as for HV feeders across the distribution businesses due to the large number of such feeders.

CitiPower advised that the utilisation level of its LV network is not the only driver for augmentation. Other considerations, such as voltage regulation and protection system effectiveness, must also be taken into account for making augmentation decisions.

As there is no information about LV feeder utilisation, the AER, noting CitiPower's other augmentation considerations, has assumed that the level of LV network utilisation is similar to that of CitiPower's HV network. This assumption will introduce some level of error. However, the AER considers that the level of error should not be significant due to the following reasons:

[23] Refer footnote 21.

- With the exception of the operating voltage, the AER understands that both HV and LV networks are of similar style of construction and usage.

- The LV network of CitiPower does not represent a large proportion of its network asset value. The AER also notes that the asset value of CitiPower's LV network represents about 27 per cent of its combined sub-transmission, HV and LV network asset values, based on the regulatory account statements provided by CitiPower.

Distribution transformers

The AER does not have demand and utilisation information of CitiPower's distribution substations.

CitiPower advised that is uses standard size transformers to match customers' requirements. This sometimes results in larger than actual demand level size transformers being used. Hence, the utilisation factor of a distribution transformer is not always the determining factor for future upgrades.

In addition to CitiPower's advice, the AER has not included the analysis of distribution transformers because of the following reasons:

- A high proportion of the distribution substations are considered as connection assets for supplying customers.

- Such assets do not represent a high proportion of CitiPower's network value. Hence, any error resulting from this assumption would not be material.

Allowance for the lack of information on LV feeders and distribution transformers

In its estimation of overall asset utilisation level, the AER will provide allowance for the information gap.

A.5 Estimation of bring forward augmentation due to new customers

Based on the information set out above, the AER has assumed the average 'trigger level' for each asset type is the same as the average utilisation level of those network items identified as requiring major augmentation.

Table 4 below summarises the average network utilisation and the estimated augmentation trigger levels of CitiPower's major network components.

Table 4: Summary of average utilisation levels and trigger levels for augmentation

Network component	Weighted average utilisation level	Weighted average trigger level utilisation factor for augmentation
Zone substations (ZSS)	• 92% (those not requiring augmentation in the next 5 years) • 96% (all ZSS)	115%
Sub-transmission feeders	no information	115%
HV feeders	• 72% (all feeders) • 61% (those with less than 100% utilisation)	115% [a]
LV feeders (assumed to be same as HV feeders)	• 72% (all feeders) • 61% (those with less than 100% utilisation)	115%

[a] based on the weighted average utilisation level of all feeders operating above 100% capacity.

The average augmentation of a network component is determined by the average spare capacity (the gap between average utilisation level and the average augmentation trigger level) and the growth rate.

There are two ways to determine the average utilisation level:

- the average of all network components; or
- the average of all network components not already identified for augmentation in the next four years in CitiPower's planning report.

The AER considers that the latter approach is more appropriate because those network components already identified for augmentation are most likely the result of previously connected customers. Once the identified augmentations are complete, the level of utilisation of these network components will be much reduced. Further augmentation of such network components in the foreseeable future, in the context of estimating the bringing forward time, would be unlikely.

Table 4 shows that the estimated augmentation trigger level of all CitiPower's network components is about 115 per cent utilisation. The average utilisation across

the network components (for those not already identified as requiring augmentation in the next four years), however, varies over a much wider range, between 72[24] and 92 per cent.

The AER understands that, in terms of asset value, the HV and LV networks combined value is much higher than the sub-transmission feeders, which in-turn have a combined value higher than the zone substations. Hence, the AER considers that the network overall average should be closer to that of the HV and LV feeders. Allowing for the lack of information regarding LV network and distribution transformers, and for simplicity in applying a common approach to all network components, the average overall utilisation factor is assumed to be 82 per cent, being the mid-point between 72 and 92 per cent.

The average augmentation trigger level of all network components is assumed to be 115 per cent.

The expected average time to augmentation for a network element, if no new customers were to be connected, can be calculated at (115-82)/0.52 per cent per year, or 63.5 years.

The expected average time to augmentation for a network element, due to the connection of new customers, is (115-82)/1.98 per cent per year, or 16.7 years.

[24] Because no specific information about which individual HV feeder has been identified as requiring augmentation, this level is taken as the overall average of all feeders.

Appendix B: capacity and utilisation levels of CitiPower's zone substations and high voltage feeders, 2008

Table B1: Capacity, maximum demand and utilisation of CitiPower's zone substations

Zone substation ID [a]	N-1 capacity (MVA)	Actual maximum demand (MVA)	Utilisation as percentage of N-1 capacity
AP	61.6	56.2	91%
AR	33.7	41.0	122%
B	29.0	31.6	109%
BC	32.1	30.5	95%
BK	27.4	14.2	52%
C	17.0	12.0	71%
CL	65.8	59.5	90%
CW	32.2	31.7	98%
DA	28.8	35.0	122%
E	24.3	19.2	79%
F	28.0	17.1	61%
FB	63.7	56.8	89%
FR	61.4	62.4	102%
J	38.4	22.8	59%
JA	118.0	112.8	96%
L	32.1	41.4	129%
LQ	131.6	121.0	92%
LS	23.6	24.8	105%
MG	61.7	51.5	83%
NC	28.5	28.5	100%
NR	57.4	53.2	93%
PM	28.0	13.1	47%
PR	27.5	27.0	98%
Q	30.7	35.5	116%
R	31.4	27.8	89%
RP	18.7	13.6	73%
SK	62.6	71.0	113%
SO	63.7	73.7	116%
TK	50.8	40.8	80%
TP	11.6	10.3	89%
WB	26.4	23.5	89%
WG	67.0	40.9	61%
BSBQ [a]	25.8	36.1	140%
MP [a]	116.3	121.8	105%
RD [a]	30.6	36.1	118%
VM [a]	63.2	80.1	127%
WA [a]	67.0	74.8	112%

[a] Zone substation SM, which has been decommissioned, not included in this table

[b] Zone substation identified by CitiPower as requiring augmentation

Table B2: Capacity, maximum demand and utilisation of CitiPower's high voltage feeders

Note: CitiPower's urban feeders are rated at 66 per cent of their thermal capacity to provide operating flexibility.

Feeder ID	Capacity, MVA	Maximum demand (2008 year), MVA	Utilisation as percentage of capacity
AP001	4.02	2.87	0.71
AP003	4.02	4.98	1.24
AP006	4.02	4.15	1.03
AP007	4.02	2.25	0.56
AP008	4.02	5.05	1.26
AP009	8.04	6.86	0.85
AP011	4.02	2.75	0.68
AP012	4.02	1.37	0.34
AP013	4.02	4.32	1.07
AP014	4.02	4.52	1.12
AP015	4.02	4.00	1.00
AP017	8.04	4.34	0.54
AP018	8.04	5.32	0.66
AP019	8.44	4.48	0.53
AR002	4.00	3.86	0.97
AR003	4.00	5.32	1.33
AR004	4.00	2.55	0.64
AR005	4.00	4.05	1.01
AR006	4.00	4.60	1.15
AR007	4.00	2.31	0.58
AR009	4.00	3.62	0.91
AR010	4.00	4.92	1.23
AR011	4.00	4.48	1.12
AR013	4.00	5.05	1.26
B002	4.00	3.31	0.83
B003	4.00	2.10	0.53
B004	4.00	3.68	0.92
B011	4.00	4.18	1.05
B012	5.91	5.65	0.96
B014	4.00	2.70	0.68
B016	4.00	4.00	1.00
B021	4.00	0.54	0.14
B023	4.00	2.42	0.61
BC006	4.00	2.10	0.53
BC011	4.00	2.24	0.56
BC012	4.00	4.39	1.10
BC013	4.00	3.36	0.84
BC015	4.00	3.04	0.76
BC020	4.00	1.64	0.41
BC022	4.00	1.77	0.44
BC023	4.00	5.19	1.30
BK002	2.29	2.38	1.04
BK003	2.29	2.54	1.11
BK004	2.29	1.89	0.83
BK006	2.29	0.45	0.20
BK007	2.29	2.04	0.89
BK009	2.29	1.07	0.47
BK011	2.29	2.80	1.22
BQ001	4.57	1.14	0.25
BQ003	4.95	5.81	1.17
BQ007	4.57	3.98	0.87
BQ008	4.95	2.36	0.48
BQ009	3.43	0.80	0.23
BQ015	4.57	4.97	1.09
BQ020	4.57	0.61	0.13
BQ022	4.57	4.23	0.93
BQ024	4.95	4.69	0.95
BQ028	4.57	3.14	0.69
BQ030	4.10	3.64	0.89
BQ033	3.43	1.28	0.37
C022	2.29	2.43	1.06
C023	2.29	2.38	1.04
C027	2.29	1.47	0.64
C028	2.29	1.92	0.84
C029	2.29	2.25	0.98
CL013	4.18	1.99	0.48

Feeder ID	Capacity, MVA	Maximum demand (2008 year), MVA	Utilisation as percentage of capacity
CL014	4.18	3.51	0.84
CL016	4.18	4.66	1.11
CL021	4.18	4.66	1.11
CL022	4.18	6.19	1.48
CL023	4.18	5.22	1.25
CL026	4.18	3.72	0.89
CL027	4.18	3.05	0.73
CL033	4.18	3.51	0.84
CL034	4.18	5.26	1.26
CL036	4.18	2.63	0.63
CL037	4.18	3.45	0.83
CL038	8.37	7.51	0.90
CW004	4.00	1.54	0.39
CW005	4.00	3.72	0.93
CW006	4.00	1.83	0.46
CW007	4.00	3.34	0.84
CW008	4.00	1.51	0.38
CW009	4.00	4.42	1.11
CW011	4.00	2.52	0.63
CW012	4.00	3.17	0.79
CW014	4.00	2.36	0.59
CW015	4.00	3.59	0.90
DA004	6.86	2.39	0.35
DA006	4.95	1.95	0.39
DA007	4.57	4.08	0.89
DA008	4.57	3.40	0.74
DA009	4.57	5.56	1.22
DA013	4.95	1.36	0.27
DA016	4.57	6.50	1.42
DA020	4.57	2.39	0.52
DA021	4.57	3.56	0.78
DA022	4.57	2.07	0.45
DA026	4.57	4.88	1.07
DA027	4.95	3.15	0.64
DA028	4.57	1.90	0.42
DA029	4.95	3.59	0.73
DA030	5.72	6.62	1.16
E033	2.29	1.57	0.69
E035	2.29	1.38	0.60
F026	2.29	1.38	0.60
F027	2.29	1.62	0.71
F028	2.29	1.73	0.76
F029	2.29	0.79	0.34
F030	2.29	1.03	0.45
F032	2.29	0.86	0.38
F033	2.29	1.82	0.79
F034	2.29	1.93	0.84
F035	2.29	1.23	0.54
FB004	8.00	2.03	0.25
FB005	8.00	1.23	0.15
FB006	11.43	4.29	0.38
FB011	4.00	1.02	0.26
FF084	2.29	2.58	1.13
FF085	2.29	1.13	0.49
FF086	2.29	2.29	1.00
FF092	2.29	1.71	0.75
FF097	2.29	2.68	1.17
FR001	4.82	3.66	0.76
FR003	4.82	1.04	0.22
FR004	4.82	5.14	1.07
FR006	6.63	3.74	0.56
FR007	4.82	5.12	1.06
FR008	5.12	3.01	0.59
FR009	4.82	0.74	0.15
FR013	4.82	1.15	0.24
FR014	5.63	4.02	0.71
FR015	4.82	5.59	1.16
FR016	4.92	3.76	0.76
FR018	4.82	3.92	0.81

Feeder ID	Capacity, MVA	Maximum demand (2008 year), MVA	Utilisation as percentage of capacity
FR019	4.82	4.02	0.83
FR020	4.82	3.62	0.75
FR024	4.82	4.64	0.96
FR026	4.82	2.35	0.49
FR027	4.82	5.51	1.14
FR028	4.82	3.68	0.76
FR029	4.82	4.56	0.95
FR030	4.82	3.44	0.71
FR031	6.13	5.75	0.94
FR032	4.82	4.20	0.87
J047	2.70	1.95	0.72
J052	2.70	3.11	1.15
J053	3.26	2.96	0.91
J055	2.70	1.93	0.71
J057	2.70	2.39	0.89
J059	2.70	2.05	0.76
J062	2.70	2.26	0.84
J063	2.03	1.35	0.67
J067	2.70	0.37	0.14
J068	2.03	1.62	0.80
J070	2.70	3.32	1.23
JA001	9.91	8.00	0.81
JA002	9.91	5.40	0.54
JA005	9.91	8.00	0.81
JA006	4.95	2.30	0.46
JA009	9.15	8.20	0.90
JA010	4.95	4.40	0.89
JA011	5.53	5.90	1.07
JA013	4.60	2.40	0.52
JA014	4.95	0.60	0.12
JA017	4.95	4.50	0.91
JA018	5.53	4.40	0.80
JA019	10.48	4.40	0.42
JA021	4.57	1.90	0.42
JA022	4.57	3.40	0.74
JA025	5.53	4.50	0.81
JA026	4.95	5.50	1.11
JA027	4.95	2.90	0.59
JA029	4.57	3.90	0.85
JA030	4.95	0.50	0.10
JA034	4.57	4.00	0.88
JA035	4.95	3.80	0.77
JA037	4.95	4.20	0.85
JA038	4.95	2.20	0.44
JA042	9.91	9.10	0.92
JA043	4.95	5.30	1.07
JA046	9.91	6.60	0.67
L002	4.00	5.11	1.28
L004	4.00	4.93	1.23
L005	4.00	4.19	1.05
L006	4.00	2.08	0.52
L009	4.00	2.48	0.62
L010	4.00	0.51	0.13
L013	4.00	4.42	1.11
L014	4.00	3.12	0.78
L018	4.00	4.15	1.04
L019	3.50	4.28	1.22
L020	4.00	3.44	0.86
L022	4.00	1.27	0.32
L023	4.00	3.88	0.97
LQ001	4.78	3.88	0.81
LQ002	4.78	3.63	0.76
LQ003	4.78	5.44	1.14
LQ004	4.78	3.45	0.72
LQ007	6.57	2.41	0.37
LQ008	4.78	0.70	0.15
LQ009	4.78	2.73	0.57
LQ010	4.78	1.04	0.22
LQ011	4.78	5.32	1.11

Feeder ID	Capacity, MVA	Maximum demand (2008 year), MVA	Utilisation as percentage of capacity
LQ012	7.77	5.88	0.76
LQ014	4.78	4.10	0.86
LQ015	12.55	3.31	0.26
LQ016	5.18	2.31	0.45
LQ017	12.55	5.16	0.41
LQ021	4.78	3.45	0.72
LQ022	5.18	5.44	1.05
LQ023	4.78	4.58	0.96
LQ024	4.78	2.87	0.60
LQ027	4.78	0.30	0.06
LQ028	4.78	5.70	1.19
LQ029	4.78	4.88	1.02
LQ030	4.78	3.88	0.81
LQ033	4.78	1.85	0.39
LQ034	12.55	4.12	0.33
LQ035	6.57	1.23	0.19
LQ040	5.18	5.58	1.08
LQ041	4.78	3.23	0.68
LQ042	4.78	2.03	0.42
LQ043	4.78	2.17	0.45
LQ046	7.77	6.75	0.87
LQ047	4.78	4.68	0.98
LQ048	4.78	3.82	0.80
LQ049	4.78	4.48	0.94
LQ050	7.77	4.58	0.59
LQ052	4.78	2.89	0.60
LQ054	4.78	3.82	0.80
LQ055	12.55	6.57	0.52
LQ056	4.78	4.70	0.98
LS003	2.70	3.92	1.45
LS004	2.70	1.36	0.50
LS005	2.70	1.13	0.42
LS006	2.70	2.25	0.83
LS007	2.70	0.55	0.20
LS009	2.70	1.50	0.56
LS010	2.70	0.55	0.20
LS012	3.26	2.88	0.88
LS016	2.03	2.25	1.11
LS017	2.70	0.35	0.13
LS020	2.70	1.63	0.60
LS023	3.26	2.51	0.77
LS024	2.00	1.75	0.88
LS025	2.70	2.70	1.00
LS027	2.70	2.70	1.00
MG001	4.00	3.83	0.96
MG004	4.00	4.12	1.03
MG005	6.00	3.57	0.60
MG006	4.00	2.11	0.53
MG009	4.00	3.29	0.82
MG013	8.04	3.83	0.48
MG014	7.62	5.30	0.70
MG015	4.00	4.02	1.01
MG018	4.00	4.31	1.08
MG022	4.00	1.65	0.41
MP001	4.95	4.88	0.99
MP003	4.95	3.37	0.68
MP005	4.95	4.13	0.83
MP008	4.95	4.59	0.93
MP009	4.57	5.11	1.12
MP015	4.57	3.87	0.85
MP016	2.30	1.77	0.77
MP017	4.95	4.88	0.99
MP018	6.29	3.28	0.52
MP020	4.57	3.24	0.71
MP021	4.57	5.73	1.25
MP026	6.48	5.28	0.81
MP029	4.57	3.33	0.73
MP030	4.57	4.74	1.04
MP031	4.57	2.50	0.55

Feeder ID	Capacity, MVA	Maximum demand (2008 year), MVA	Utilisation as percentage of capacity
MP033	4.95	4.25	0.86
MP035	2.30	0.65	0.28
MP036	4.86	2.71	0.56
MP037	6.48	4.80	0.74
MP038	4.57	1.71	0.37
MP040	4.57	4.93	1.08
MP041	4.57	3.60	0.79
MP047	5.53	4.90	0.89
MP049	4.60	4.76	1.03
MP050	5.53	3.43	0.62
MP051	4.57	4.69	1.03
MP053	5.53	5.07	0.92
MP054	6.29	3.73	0.59
MP055	6.29	3.83	0.61
MP058	4.57	4.73	1.04
MP059	6.48	5.05	0.78
MP062	5.53	5.24	0.95
MP064	4.57	3.47	0.76
MP067	5.72	3.64	0.64
NC001	4.00	3.24	0.81
NC002	4.00	4.07	1.02
NC004	4.00	4.06	1.02
NC005	4.00	2.16	0.54
NC006	4.00	2.24	0.56
NC009	4.00	3.08	0.77
NC010	4.00	1.39	0.35
NC013	4.00	2.43	0.61
NC014	4.00	4.36	1.09
NC015	4.00	3.11	0.78
NR002	8.00	5.94	0.74
NR003	8.00	7.52	0.94
NR004	6.57	3.02	0.46
NR006	4.00	4.74	1.19
NR007	4.00	4.18	1.05
NR013	6.57	2.58	0.39
NR015	4.00	3.59	0.90
NR016	4.00	3.36	0.84
NR020	8.00	4.00	0.50
NR021	4.00	4.21	1.05
NR022	4.00	4.42	1.11
NR025	4.00	4.06	1.02
NS010	4.00	0.63	0.16
NS013	4.00	1.09	0.27
PM001	2.29	0.82	0.36
PM002	2.29	2.62	1.14
PM003	2.29	2.82	1.23
PM004	2.29	2.33	1.02
PM005	2.29	1.82	0.79
PM006	2.29	1.30	0.57
PM007	2.29	0.15	0.07
PM008	2.29	1.87	0.82
PM009	2.29	1.25	0.55
PM010	2.29	0.79	0.34
PM011	2.29	0.15	0.07
PM012	2.29	0.48	0.21
PR017	4.00	4.24	1.06
PR018	4.00	2.34	0.59
PR019	4.00	3.57	0.89
PR020	4.00	3.50	0.88
PR021	4.00	2.99	0.75
PR022	4.00	3.57	0.89
PR025	4.00	4.18	1.05
PR026	4.00	4.44	1.11
Q001	4.00	4.44	1.11
Q002	4.00	1.51	0.38
Q004	4.00	2.99	0.75
Q005	4.00	4.73	1.18
Q009	4.00	5.18	1.30
Q010	4.00	5.10	1.28

Feeder ID	Capacity, MVA	Maximum demand (2008 year), MVA	Utilisation as percentage of capacity
Q013	4.00	5.10	1.28
Q014	4.00	4.33	1.08
Q018	4.00	5.10	1.28
R080	4.00	4.12	1.03
R081	4.00	1.23	0.31
R082	4.00	2.25	0.56
R083	4.00	3.41	0.85
R086	4.00	2.07	0.52
R090	4.00	2.51	0.63
R091	4.00	2.95	0.74
R092	4.00	1.90	0.48
R093	4.00	2.74	0.69
R095	4.00	2.18	0.55
R096	4.00	3.14	0.79
RD001	4.00	3.43	0.86
RD002	4.00	5.39	1.35
RD004	4.00	5.22	1.31
RD005	4.00	4.35	1.09
RD006	4.00	4.73	1.18
RD009	4.00	3.43	0.86
RD010	4.00	2.48	0.62
RD013	4.00	4.74	1.19
RD014	4.00	3.94	0.99
RD015	4.00	2.07	0.52
RP001	2.70	1.53	0.57
RP002	2.70	1.19	0.44
RP003	2.70	2.16	0.80
RP007	2.70	0.32	0.12
RP018	2.70	2.27	0.84
RP019	2.70	1.35	0.50
RP022	2.70	0.64	0.24
RP026	2.70	2.98	1.10
RP030	2.70	1.91	0.71
SK001	4.00	3.78	0.95
SK004	6.00	4.76	0.79
SK005	8.00	5.70	0.71
SK006	4.00	5.30	1.33
SK010	6.48	4.39	0.68
SK013	4.00	4.20	1.05
SK014	6.00	4.05	0.68
SK015	4.00	3.67	0.92
SK018	6.48	3.31	0.51
SK019	6.00	3.20	0.53
SK020	6.00	5.80	0.97
SK022	4.00	4.51	1.13
SK023	4.00	3.13	0.78
SK024	6.00	3.39	0.57
SO001	4.00	2.90	0.73
SO002	8.00	7.90	0.99
SO005	8.00	6.13	0.77
SO006	8.00	6.21	0.78
SO009	4.00	6.22	1.56
SO010	8.00	4.79	0.60
SO013	7.62	6.70	0.88
SO014	11.43	2.86	0.25
SO015	4.00	2.40	0.60
SO018	4.00	4.57	1.14
SO019	4.00	5.29	1.32
SO020	4.00	2.29	0.57
SO022	7.62	3.82	0.50
SO023	4.00	5.30	1.33
SO024	4.00	3.50	0.88
TK001	4.18	3.61	0.86
TK002	4.18	1.95	0.47
TK004	4.18	5.14	1.23
TK005	4.18	2.75	0.66
TK006	4.18	3.61	0.86
TK009	4.18	4.16	1.00
TK010	4.18	5.26	1.26

Feeder ID	Capacity, MVA	Maximum demand (2008 year), MVA	Utilisation as percentage of capacity
TK011	4.18	1.85	0.44
TK013	4.18	3.21	0.77
TK014	4.18	3.25	0.78
TK015	4.18	4.54	1.09
TK017	4.18	3.67	0.88
TP002	2.74	2.08	0.76
TP003	2.74	2.14	0.78
TP006	2.74	2.00	0.73
TP008	1.37	0.80	0.58
TP014	2.74	2.74	1.00
TP027	2.74	2.61	0.95
TP031	2.74	0.67	0.24
TP034	1.37	1.01	0.74
VM002	4.57	0.15	0.03
VM003	4.57	1.87	0.41
VM004	4.57	3.20	0.70
VM005	5.53	1.75	0.32
VM006	5.53	4.13	0.75
VM007	5.53	1.75	0.32
VM008	4.57	2.32	0.51
VM009	5.53	3.30	0.60
VM010	5.72	2.50	0.44
VM011	4.57	1.30	0.28
VM014	4.57	2.51	0.55
VM018	4.57	4.73	1.04
VM019	4.57	4.73	1.04
VM020	4.57	1.54	0.34
VM022	4.57	0.46	0.10
VM025	4.57	1.43	0.31
VM026	4.57	1.94	0.42
VM027	4.57	0.82	0.18
VM029	5.53	3.09	0.56
VM030	4.57	3.16	0.69
VM034	3.43	2.51	0.73
VM035	4.57	2.92	0.64
VM037	4.57	2.92	0.64
VM038	5.53	2.32	0.42
VM040	4.57	3.87	0.85
VM041	4.57	4.00	0.88
VM042	4.57	3.68	0.81
VM043	5.53	4.23	0.76
WA002	6.48	3.94	0.61
WA003	4.57	2.38	0.52
WA004	4.57	2.44	0.53
WA005	4.57	2.51	0.55
WA006	4.57	1.18	0.26
WA008	4.57	4.25	0.93
WA009	9.15	7.00	0.77
WA011	4.57	1.24	0.27
WA014	4.57	1.52	0.33
WA015	6.48	5.94	0.92
WA020	9.15	4.10	0.45
WA021	4.57	2.69	0.59
WA022	4.57	4.61	1.01
WA023	3.43	1.31	0.38
WA024	4.57	1.79	0.39
WA027	4.57	1.33	0.29
WA030	4.57	2.13	0.47
WA031	4.57	2.19	0.48
WA032	4.57	1.35	0.30
WA033	4.57	1.26	0.28
WA034	4.57	2.32	0.51
WA035	4.57	2.29	0.50
WB001	2.40	2.33	0.97
WB002	4.80	4.79	1.00
WB004	4.80	2.25	0.47
WB005	2.40	1.81	0.75
WB009	2.40	2.21	0.92
WB010	2.40	1.71	0.71

Feeder ID	Capacity, MVA	Maximum demand (2008 year), MVA	Utilisation as percentage of capacity
WB011	4.80	2.60	0.54
WB013	4.80	3.45	0.72
WB014	2.40	2.37	0.99
WB015	2.40	2.80	1.17
WD002	4.00	3.81	0.95
WD004	4.00	5.03	1.26
WD006	4.00	4.67	1.17
WD007	4.00	5.53	1.38
WD012	4.00	5.28	1.32
WG011	6.29	3.01	0.48
WG012	11.24	1.83	0.16
WG013	6.29	0.91	0.14
WG014	4.00	2.99	0.75
WG016	4.00	2.32	0.58
WG017	12.00	5.62	0.47
WG021	6.29	3.72	0.59
WG022	11.24	1.68	0.15
WG023	12.00	6.27	0.52
WG024	12.00	4.93	0.41
WG026	4.00	0.10	0.03
WG027	4.00	0.11	0.03
WG028	4.00	2.44	0.61
WG032	4.00	2.44	0.61

Source: CitiPower