NETWORK PRICING PRINCIPLES

PREPARED BY
PAWA NETWORKS

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1 INTRODUCTION

This Pricing Principles paper is presented for the information of current and future users of the network[1] facilities of the Power and Water Authority ("PAWA Networks"), as part of the reforms to the electricity industry in the Northern Territory. The paper provides a statement of the principles that PAWA Networks will follow in developing network tariffs in the newly regulated market for network access and services. The paper has been approved by the regulator[2] for use by PAWA Networks.

This paper covers the background to the need for network tariffs, and the network pricing objectives of the regulated market. It then proceeds to explain the nature of costs of owning and maintaining networks as these costs become important in determining an appropriate level and structure of tariffs to recover the required revenue. The discussion then draws out the implications for network pricing.

2 BACKGROUND

The Territory's *Electricity Networks (Third Party Access) Act 2000* ("the Act"), which commenced on 1 April 2000, set up the new framework for access by third parties to electricity networks within the Territory. The Network Access Code ("the Code") is set out in the Schedule to the Act, as subsequently amended.

The Code notes that "The network provider is to be responsible for determining the pricing structure that best gives effect to the [Code's pricing] principles …."[3] and sets out criteria for establishing for price structure and elements.

The Act defines four separate networks subject to regulation in Darwin, Katherine, Alice Springs and Tennant Creek.

Competing generation and retail organisations are able to access PAWA's networks for the delivery of electricity from generation plants to customers.

The Maximum Annual Revenue (the "Revenue Cap") to be earned by PAWA Networks is determined by the regulator in accordance with the requirements of the Code.[4] This revenue is then to be recovered by PAWA Networks through charges to the various Generator / Retailer groups ("networks users") for the use by their customers ("end-users")

It is the translation of the determined Revenue Cap into schedules of tariffs and charges to be paid by each network user that forms the subject of this Pricing Principles paper.

The network user can be expected to pass on these charges to its customers. Whether, and how, these generators / retailers charge their customers for network usage is a matter for those generators / retailers, and not PAWA Networks.

[1] Electricity networks involve the poles and wires that transport electricity between generators and end-use consumers.

[2] The Utilities Commission, established under the *Utilities Commission Act 2000*.

[3] Access Code Clause 75 (1) – as quoted in Appendix 1.

[4] Schedule 6 of the Code sets out the principles.

3 NETWORK PRICING OBJECTIVES

PAWA Network's intention is to ensure that the Revenue Cap is in fact recovered from users in a manner that is understandable, practical, efficient and equitable, and which reflects their usage and benefit from the network.

To this end, PAWA Networks is guided by the network pricing objectives laid down in Clause 74 of the Code. PAWA Networks' interpretation of the Code's pricing objectives is as follows:

- Cost reflective signals — there should be appropriate signalling to network users of their impact on existing and future network capacity and costs.

- Revenue recovery — to ensure that appropriate investment takes place in the longer term, network prices need to recover the appropriate revenue as determined under the Revenue Cap.

- Simplicity — prices should be straightforward in application and readily understood by network users.

- Stability — prices should remain stable over time to permit customers to make informed investment decisions.

- Equity — prices should be equitable for network users. Generally, this means that prices reflect the user's utilisation of the existing network.

- Prices should be subsidy free. From an economic efficiency perspective, this requires that the price for a customer, or group of customers, be no less than the incremental cost of meeting their needs and no more than the stand-alone cost of supply.

When submitting its annual pricing proposals to the regulator, PAWA Networks will provide an assessment of its proposed tariffs against these objectives.

In principle, it is recognised that there may be conflicting objectives in the setting of tariffs to recover regulated revenues which essentially derive from sunk costs[5] in a manner which adequately recovers the regulated amount, while recognising the other objectives in the regulated regime. The overall aim is to produce a tariff schedule that adequately reflects the above objectives while incorporating a reasonable balance between conflicting objectives.

4 COST DRIVERS IN ELECTRICITY SUPPLY NETWORKS

In principle, costs associated with the provision of electricity networks are driven by factors relating to -

- the existence of a customer and connection, largely independent of the capacity required or used, and largely independent of the energy consumed;

[5] Costs incurred in producing specific assets are 'sunk' in that, the sole purpose for the existence of these assets are highly specialised. It is the nature of these assets that their use are non-recoverable in other types of production. Hence, it makes revenue recovery particularly difficult in a regulated environment, as there are considerations to be made for 'sunk investments', which form part of any Network system.

- the peak or maximum capacity required or used by the customer, largely independent of the duration of the load, and hence largely independent of the energy consumed; and

- the energy consumed.

There can often be a mixture of elements driving the costs of individual assets or services.

For example, in the operation of a network, a major zone substation and its connecting higher voltage supply lines become necessary in a location as load or load density increases. Part of this cost will be determined by the magnitude of the load to be serviced, but part of the cost of establishing such a facility is independent of the capacity of the transformers installed, and hence independent of the demand it can service. Similarly, when high and low voltage mains are built or laid to connect to individual customers, part of the cost (eg for the poles themselves, or for the trench and pillars etc) is largely independent of the size and hence capacity of the wires or cables. Part of the cost varies according to the capacity of the transformers or cables so that it is difficult to identify a single cost driver.

The considerations outlined above lead to the situation where costs are fixed, or depend on capacity required or used and the effective average rate, on a cents per kWh basis, decreases as greater utilisation is made of the installed equipment. The higher the utilisation "load factor", the lower the effective average rate.

The extent of the network depends on the location of associated connections for the generators and consumers, while the capacity of the network is determined by the load that is to be transmitted through the equipment concerned. Although load changes according to cycles with daily, weekly, seasonal and annual variations, it is the maximum or peak capacity required or demand taken, which drives much of the cost of overhead and underground mains and cables, together with the size, capacity and cost of substations and associated transformers.

5 STRUCTURED NETWORK TARIFFS

Any pricing regime which aims to be "cost reflective" must contain elements which relate to the capacity required or demand taken and it should also exhibit a declining average cost per unit as both size and utilisation increases.

PAWA Networks considers that a tariff, especially for network services only, and especially for large and sophisticated customers, should explicitly reflect and signal costs of capacity required for supply.

These costs are best reflected into tariffs through:

- a "Customer Connection" charge or "Service Availability" charge, generally on a cents per day or dollars per month basis;

- a charge related to capacity required or used, generally based on contracted or measured maximum kilo-Watts (kW) or, more properly kilo-Volt-Amperes (kVA), generally on a monthly or annual basis; and

- a charge related to energy used, generally based on kilo-Watt-hours.

The Supply Availability Charge recognises the customer connection and metering requirements provided by a network system, and can reflect the cost of supply through the network. The supply availability charge signals allocative efficiency to users by providing the means of recognising common benefits to all customers as a result of a network system's existence, and the associated costs of making this supply "available". By providing the investment in supply availability, a network is telling users there is a cost associated with connecting to a power source.

The Demand Charge signals the cost of supplying a particular level of demand. There are costs associated with meeting peak demands and the differentiation between peak and off-peak encourages load profile improvements. The demand charge reflects the cost of customer capacity utilisation as well as to distinguish differences in demand for various peak periods. Therefore, the demand charge recovers the cost of installing a certain level of system capacity to meet demand whilst also recovering some operational and maintenance component related to the upkeep of this system. Charging with a 'demand' component recognises that different customers impact differently on the system and therefore, large customers whose supply would be at High Voltage (HV) will not contribute to the cost of providing for Low Voltage (LV) customers.

The Energy Charge attempts to reflect system utilisation and usage. To a large extent however, energy does not have a bearing on infrastructure costs of supplying a particular load, because system infrastructure is largely driven by demand. Energy output is the direct "result" of having a particular demand requirement. Hence, the energy charge attempts to recover a part of the cost of supplying capacity as well as the O&M associated with that. The energy charge is a way of approximating demand for lower end consumers where sophisticated metering is not installed. This gives customers equitable pricing signals because they respond to the "user pays" concept intrinsic in such a charge.

These charges should distinguish between usage during peak periods, where load requirements are more likely to drive network augmentation, compared with usage during off-peak periods, where network capacity may be less utilised.

PAWA Networks will exercise its best judgement, based on it own experience and guided by what has occurred in other jurisdictions, in determining the balance between amounts recovered from the Supply Availability Charge, the Demand Charge and the Energy Charge.

As a Revenue Cap is assigned to each of the networks in separate locations, there is likely to be broad geographic differentiation in the tariffs to retain a consistency between tariffs and associated network costs.

6 ALLOCATING COSTS BETWEEN END-USERS

The separate issue is how to distribute costs among the end-users of a network in the most efficient or least distortionary way.

It is the view of PAWA Networks that network charges should reflect only the costs of the network upstream of any end-user so that customers supplied at high voltage into their internal local distribution systems[6] should not have to bear costs related to the low-voltage system.

[6] For example, inside the boundaries of a Defence establishment, dispersed mining operation or Hospital complex.

PAWA Networks' preferred cost allocation principle is to use a Fully Distributed Cost model(FDC). This allocates costs and hence revenue requirements for different customer classes according to their level of connection in the system, and hence, only reflect their use of the upstream network elements involved in the delivery of electricity to their point of connection.

Network system provision is capital intensive, with much of the cost related to prior investment in system capacity, while the cost directly related to energy through-put is relatively small. PAWA Networks recognises that, in order to create a fair and equitable tariff, there must be a method of recovering the costs relating to existing assets by taking into account, customer demand on these assets, bearing in mind equity considerations for all users, and at the same time, signalling the cost associated with future system augmentation.

Therefore, the results deriving directly from the FDC model will be modified:

- where necessary to prevent price shocks between regulatory and pricing periods;
- to achieve some graduation through and between customer size ranges and;
- to reflect customers' desire for a tariff structure reflecting electricity usage rather than a formulation with large fixed charges.

7 STRUCTURING PRICES FOR DIFFERENT CUSTOMER CLASSES

Tariffs which reflect the requirements of customers and their characteristic demand behaviour associated with network utilisation will give the appropriate cost of supply signals to users of the network. This assists PAWA Networks in matching customer requirements and in maximising the use of its infrastructure assets.

Declining scale demand and energy charges will be applied in reflection of the lesser dependence of large users on the low voltage network infrastructure.

It is proposed that the structured network price will be applied to all customers as they progressively become contestable so as to assure equality of treatment for PAWA Generation and Retail *vis á vis* other competing generator / retailer groups. The *contestable customers*, who are generally large and sophisticated organisations, represent a significant proportion of the total electricity market, and the demand and consumption characteristics outlined above are observable through sophisticated metering systems. Network tariffs will be applied directly to the customer's selected Generator / Retailer and may be re-bundled in the tariff actually negotiated between these organisation and the electricity consumers.

The proposed structured tariffs require measurement of customers' time and demand pattern elements. These elements are not measured or recorded in the vast majority of non-contestable customer installations. Because this information is not available for these smaller customers, the network tariffs will reflect the consumption information available, and may require pricing for these customers to be a less directly formulated. The Network tariff for these customers may reflect their demand by use of energy consumption as a surrogate for direct demand measurement.

As **Table 1** below briefly shows, there is a relationship between the characteristics or behaviour of users, which determines the types of service required, the effect it has on infrastructure and cost of supply, and how these are reflected in the pricing components of network tariffs.

Customer characteristics/behaviour	What this implies for infrastructure and cost of supply	Network Response - price signalling mechanism
Customer connection to system - customers connection to Network	Administrative, metering and connection assets (fuses, switchgear etc)	Daily fixed Charge
Demand - customers require a level of capacity for use.	Leads to increase in Capacity - some impact on O&M costs as more assets added to the network.	Monthly Demand Charge & recovered partly through Daily Fixed Charge
Demand Pattern/Profile - each customer has their own specific profile over periods of time reflecting levels of demand.	Impacts on Capacity: - Maximum rate of usage provided for in facilities - Under-utilisation - Partly utilised	Monthly Demand Charge to recover cost of installing sufficient capacity to meet the peak demand.
Power Factor - each customer imposes power factor requirements on Network Systems	Leads to increase/decrease in Capacity provided - depending on how 'good' a customers' power factor is.	Demand charge expressed in $/kVA/month rather than $/kW/month
Energy - customers measurable usage	No direct impact on infrastructure cost - energy charge mainly used to 'soften' fixed capacity charges & recovering some O&M	Energy Charge ¢/kWh - delivered through the meter at customers premises.
Small Customers - domestic & commercial	Connection assets, assets to provide capacity, O&M	For smaller customers - Daily Fixed Charge plus Energy Charge - to replace demand charge where demand is un-metered.

8 PRICE CHANGES MOVING TO THE NEW REGIME

One of the effects of moving to a new pricing regime is that there may initially be some changes from the current individual customer contributions to revenue recovery. There are several principal reasons why this may eventuate.

Firstly, there is likely to be recognition that larger customers have been over-contributing towards costs. There have probably been implicit cross-subsidies, at least in layman's terms, if not in pure economic terms, so that price reductions for these customers will put pressure on others.

Secondly, the identification of separate regulated networks is likely to result in unequal "average" prices between the networks.

Thirdly, any movement of contestable customers from flat-rate general tariffs to contract tariffs, where price signals are more pronounced, will contribute to effective changes in prices during the implementation period. This is because the movement of contestable customers to structured tariffs which are more cost reflective will result in price reductions for many of these customers, and therefore a larger share of the revenue cap will need to be recovered from non-contestable customers.

Fourthly, the cost allocation across utilisation levels will recognise the higher network costs associated with use by small customers of all levels of the network, and is likely to infer a higher network cost for residential customers and small commercial customers than is currently accommodated within the bundled tariff.

Finally PAWA, as a vertically integrated electricity supplier, estimates that the rate of return to invested capital has been less than two per cent in recent years. As from 1 April 2000, however, the network component of total electricity tariffs will be based on the revenue cap which includes a specific rate of return to capital. This implies a higher revenue for network services than has been implied in the past.

It should also be mentioned that prices applying after 1 July 2000, will include the Goods and Services Tax (GST). This will be an effective "pass through" additional to the revenue cap, but will contribute to variation of prices experienced during the initial regulatory period.

When submitting its annual tariff proposals to the regulator for approval, PAWA Networks will provide an assessment of the impact of the proposed tariffs on a series of representative contestable and non-contestable customers [a "customer impact analysis"].

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