PAWA
ELECTRICITY NETWORK
PRICING (PUBLIC) SUBMISSION

FOR

DARWIN
KATHERINE
ALICE SPRINGS
TENNANT CREEK
NETWORKS

3 YEAR PERIOD – FROM JULY 2000

RATES APPLICABLE TO FIRST ANNUAL PERIOD

August 2000

EXECUTIVE SUMMARY

Following determination by the Utilities Commissioner of the Maximum Allowable Revenue (MAR) for the PAWA Networks applicable to the period from 1 July 2000 to 30 June 2001, the Power and Water Authority proposes to recover the allowable period revenues[1] as shown in the schedules in this executive summary.

The network prices have been developed in accordance with the pricing principles submitted by PAWA Networks to the Utilities Commission. The level of the prices is largely determined by the MARs set by the Commission whilst the structure and application of the charges is based on the Fully Distributed Cost (FDC) principles and methodology expressed in PAWA's pricing principles.

The prices for contestable customers have a standing charge, demand related charges and energy related charges. The charges for both demand and energy exhibit a declining block structure so that with greater demand and consequently energy, the customer realises the economy of scale which is inherent in network costs. This scale effect is achieved in the network tariff rates in Southern states which utilise several tariffs based on the voltage at which supply is taken.

The prices for franchise (non-contestable) customers will consist of a standing charge and an energy charge which includes a part to reflect a demand component. The simple kWh metering for most franchise customers does not provide the peak demand data available from the sophisticated metering used for contestable customers.

1.1. COMMON PRICING FOR DARWIN AND KATHERINE NETWORKS

It was considered appropriate to combine the MARs from Darwin and Katherine, combine the demands, establish a single set of network tariffs and call the combined system the Northern Grid. It is anticipated that the Utilities Commission will formally approve this approach. On balance, PAWA considers the decision to combine the pricing for the networks is rational and will not be unwelcome to customers. One additional benefit is that the costs of the transmission line which links Darwin and Katherine can be uniformly accommodated in the resultant network prices.

1.2. THE DARWIN-KATHERINE TRANSMISSION LINE

PAWA Networks has included costs related to the Darwin-Katherine transmission line (DKTL) in the proposed network prices in anticipation that recovery of this cost will be formally approved by the Utilities Commission in light of the (indicated) approval of the amount and the recovery method.

[1] The determined revenue does not include amounts for GST, Market Management or for the facilities available in the Darwin – Katherine Transmission Line. These will represent extra charges to network users as appropriate and the DKTL costs have been included in the rates proposed in this submission.

The DKTL costs to PAWA are to be regarded as a common service and recovered at a uniform cent per kWh postage stamp rate from all customers connected to the Northern Grid.

1.3. DESIGN OF THE PROPOSED STRUCTURED TARIFFS

The structured tariff is designed to achieve the following:

- Offering customers price signals regarding the cost of peak and off-peak capacity.
- Charging for demand as measured maximum kVA. This offers power factor signals and should encourage customers towards better utilisation of the system and their own mains and equipment.
- Charging for measured demand on a monthly basis so that occasional peaks do not result in continuing charges.
- Declining block demand charges which recognise that for larger customers, the marginal cost of supply is likely to reduce.
- Recovering some charges based on energy to moderate the impact of charges based solely on demand.
- Reflecting lower rates at off-peak times, and declining block structure into the charges based on energy in recognition of likely decreasing marginal cost.
- Reflecting rates for smaller contestable customers which appropriately relate to the franchise tariffs to minimise price changes as contestability is progressively extended.
- Reflecting the different costs in the different networks.
- Recovery of the appropriate revenue over the regulated financial year period from the contestable customers irrespective of their chosen generator / retail supplier.

1.4. DESIGN OF FRANCHISE TARIFFS

The tariff to be applied to franchise customers is designed to achieve the following:

- Presenting a two block energy tariff, with a simple structure and common energy rates for both commercial and domestic customers in each network, featuring a marginally lower energy rate for greater use which reflects the small economies of scale available at this level of consumption.
- Reflecting an element of fixed costs through the System Availability Charge which differentiates slightly between domestic and commercial franchise customers.
- Reflecting elements of demand cost through the proxy of energy usage.
- Recovering the appropriate revenue over the regulated financial year.

1.5. SYSTEM CONTROL CHARGES

System Control charges are to be recovered as a "postage stamped amount" applied to all energy use in the interconnected Networks.

Any revenue from this charge is outside the network Revenue Cap. It will be the subject of a separate determination by the Utilities Commission although for convenience, Networks may add it to the Network charges and take the appropriate accounting actions.

1.6. ENTRY, EXIT AND METERING

The Network service rates proposed are inclusive of entry, exit and metering costs for existing Network loads, customers and connections unless augmentation is required for increased capacity. The rates include the provision of profiling meters to the first three tranches of customers which will become contestable within the first regulatory year.

1.7. CONNECTION CONTRIBUTIONS

PAWA intends to negotiate in good faith with prospective users to determine an appropriate and equitable connection contribution. Revenue from such charges is not included in the MAR as it cannot be determined in advance and is not related to the value of existing assets upon which MAR is based.

1.8. EXCESS CAPACITY FACTOR

PAWA proposes a factor of 1.25 as excess network usage factor as envisaged in various clauses of the Code.

It is further proposed that such a charge will not be imposed within the first financial year period unless there is evidence that "gaming" is occurring in that nominated Contract Maximum Demand (CMD) figures do not reflect a good faith indication of the required capacity. Hence for the first financial year the effective Excess Capacity Factor will be taken as 1.00.

1.9. EXISTING NETWORK TARIFFS DARWIN, KATHERINE.

The following interim tariffs for Darwin and Katherine will persist until the proposed tariffs are implemented.

	Darwin	Katherine
Transmission and Distribution of Electricity through PAWA Networks for Network Customers with consumption in the first tranche of Contestability (ie > 4 GWh per year).	4.20 cents per kWh consumed through customer's metering for customers supplied and metered at high voltage. 4.40 cents per kWh for customers supplied and metered at low voltage.	4.85 cents per kWh consumed through customer's metering for customers supplied and metered at high voltage.
Transmission and Distribution of Electricity through PAWA Networks for Network Customers with consumption below the first tranche of contestability (ie <4 GWh per year).	5.70 cents per kWh consumed through customer's metering or as estimated for un-metered consumption.	6.60 cents per kWh consumed through customer's metering or as estimated for un-metered consumption.

1.10. COMMENCEMENT DATE FOR THESE PROPOSED CHARGES

In the calculations of revenue etc, it has been assumed that these new tariffs will be considered by the Regulator, and will be approved, as submitted, or with any required alterations, so as to be publicly notifiable by 1 September, and hence to take effect for network service after 1 October 2000.

1.11. SCHEDULES OF RATES

The following Schedules indicate the proposed rates in the separate networks, and include GST.

PAWA Network Charges - Northern Grid INCLUDING GST

A - For Customers # as they become contestable

Service provided: Transmission and Distribution of Electricity consumed through customer's metering for customers supplied and metered at any voltage in the Darwin and Katherine areas.

	System Availability Charge	$/kVA peak[1]	$/kVA off peak	c/kWh peak	c/kWh off-peak
System Availability Charge					
Dollars per month	$440.00				
Plus charges related to monthly demand					
First 50 kVA per month		$8.250	$1.925		
Next 100 kVA per month		$7.150	$1.705		
Next 300 kVA per month		$5.940	$1.485		
Next 500 kVA per month		$4.510	$1.265		
Next 1,000 kVA per month		$3.410	$1.045		
Next 1,000 kVA per month		$3.080	$0.935		
Any further kVA per month		$3.080	$0.935		
Plus charges related to energy metered					
First 10,000 kWh per month				4.371	4.041
Next 20,000 kWh per month				3.931	3.601
Next 50,000 kWh per month				3.381	3.051
Next 100,000 kWh per month				2.941	2.611
Next 200,000 kWh per month				2.501	2.061
Next 200,000 kWh per month				2.281	1.951
Any further energy per month				2.171	1.841

B - For Franchise customers # and other customers which have not yet become contestable

Service provided: Transmission and Distribution of Electricity for Customers supplied at low voltage[2].

	System Availability Charge	c/kWh off-peak	c/kWh anytime
System Availability Charge			
Commercial: cents per day	35.2		
Domestic: cents per day	22.0		
Plus charges related to energy metered			
First 1,000 kWh per month (pro-rated per billing period)			6.846
Energy used above 1,000 kWh per month (pro-rated per billing period)			5.746
Street lighting		3.821	

[1] Peak and off-peak periods for demand and energy related charging rates will be as determined from time to time. The initial peak period rates apply to usage between 6.00 am and 6.00 pm on any day. Off-peak period rates apply at other times.

♦ These energy rates include an amount approved by the Utilities Commission to recover the costs of the Darwin-Katherine transmission line

These charges are normally paid by retailers on behalf of the customer.

[2] Note: If a non-contestable customer is supplied at high voltage, a discount of 5% will apply to Energy rate charges but not to the SAC.

PAWA Network Charges - Alice Springs INCLUDING GST

A - For Customers # as they become contestable

Service provided: Transmission and Distribution of Electricity consumed through customer's metering for customers supplied and metered at any voltage.

	System Availability Charge	$/kVA peak[3]	$/kVA off peak	c/kWh peak	c/kWh off-peak
System Availability Charge					
Dollars per month	$440.00				
Plus charges related to monthly demand					
First 50 kVA per month		$7.480	$1.595		
Next 100 kVA per month		$6.490	$1.375		
Next 300 kVA per month		$5.280	$1.210		
Next 500 kVA per month		$4.180	$1.100		
Next 1,000 kVA per month		$3.080	$0.880		
Next 1,000 kVA per month		$2.860	$0.825		
Any further kVA per month		$2.860	$0.825		
Plus charges related to energy metered					
First 10,000 kWh per month				3.520	3.190
Next 20,000 kWh per month				3.080	2.750
Next 50,000 kWh per month				2.530	2.200
Next 100,000 kWh per month				2.090	1.760
Next 200,000 kWh per month				1.870	1.430
Next 200,000 kWh per month				1.650	1.320
Any further energy per month				1.650	1.320

B - For Franchise customers # and other customers which have not yet become contestable

Service provided: Transmission and Distribution of Electricity for Customers supplied at low voltage[4].

	System Availability Charge	c/kWh off-peak	c/kWh anytime
System Availability Charge			
Commercial: cents per day	35.2		
Domestic: cents per day	22.0		
Plus charges related to energy metered			
First 1,000 kWh per month (pro-rated per billing period)			5.775
Energy used above 1,000 kWh per month (pro-rated per billing period)			4.675
Street lighting		3.520	

[3] Peak and off-peak periods for demand and energy related charging rates will be as determined from time to time. The initial peak period rates apply to usage between 6.00 am and 6.00 pm on any day. Off-peak period rates apply at other times.

[#] These charges are normally paid by retailers on behalf of the customer.

[4] Note: If a non-contestable customer is supplied at high voltage, a discount of 5% will apply to Energy rate charges but not to the SAC.

PAWA Network Charges - Tennant Creek INCLUDING GST

A - For Customers # as they become contestable

Service provided: Transmission and Distribution of Electricity consumed through customer's metering for customers supplied and metered at any voltage.

	System Availability Charge	$/kVA peak[5]	$/kVA off peak	c/kWh peak	c/kWh off-peak
System Availability Charge					
Dollars per month	$440.00				
Plus charges related to monthly demand					
First 50 kVA per month		$11.550	$2.420		
Next 100 kVA per month		$9.900	$2.145		
Next 300 kVA per month		$8.030	$1.870		
Next 500 kVA per month		$6.490	$1.595		
Next 1,000 kVA per month		$5.390	$1.375		
Next 1,000 kVA per month		$4.950	$1.155		
Any further kVA per month		$4.950	$1.155		
Plus charges related to energy metered					
First 10,000 kWh per month				5.610	5.280
Next 20,000 kWh per month				5.170	4.840
Next 50,000 kWh per month				4.400	4.070
Next 100,000 kWh per month				3.740	3.410
Next 200,000 kWh per month				2.970	2.530
Next 200,000 kWh per month				2.640	2.310
Any further energy per month				2.530	2.200

B - For Franchise customers # and other customers which have not yet become contestable

Service provided: Transmission and Distribution of Electricity for Customers supplied at low voltage[6].

	System Availability Charge	c/kWh off-peak	c/kWh anytime
System Availability Charge			
Commercial: cents per day	35.2		
Domestic: cents per day	22.0		
Plus charges related to energy metered			
First 1,000 kWh per month (pro-rated per billing period)			14.850
Energy used above 1,000 kWh per month (pro-rated per billing period)			13.750
Street lighting		11.000	

[5] Peak and off-peak periods for demand and energy related charging rates will be as determined from time to time. The initial peak period rates apply to usage between 6.00 am and 6.00 pm on any day. Off-peak period rates apply at other times.

#These charges are normally paid by retailers on behalf of the customer.

[6] Note: If a non-contestable customer is supplied at high voltage, a discount of 5% will apply to Energy rate charges but not to the SAC.

2. DETERMINATION OF NETWORK TARIFFS

2.1. BACKGROUND

Following examination and consideration of the Power and Water Authority submission "Quantifying the Revenue Cap", the Utilities Commissioner has made a determination of the revenue caps[1] to apply to PAWA Networks during 2000-01, and the X factors to be used to calculate the revenue caps to apply during 2001-02 and 2002-03.

2.2. DETERMINATION

In summary, the network revenue caps for 2000-01 are as follows:

Table 1 – Revenue Caps as Determined

REVENUE CAPS, 2000-01	
	$M
Darwin	**$46.299**
Katherine	**$7.491**
Alice Springs	**$9.713**
Tennant Creek	**$3.028**

As noted in the Commissioner's Annexure:

** Exclusions are the Darwin-Katherine Transmission Line and items shown in the Excluded Services Determination for 1 April to 30 June 2000.*

As explained later, the prices proposed in this submission will be based on combining the Darwin and Katherine MARs into a single amount for the "Northern Grid" and recovering the costs associated with the Darwin Katherine transmission line, in both cases subject to the Regulator's approval.

It is noted further that System Control (Market Management) Costs are not included, and will be recovered outside the Revenue Cap.

[1] The revenue caps are also referred to as being the Maximum Allowable Revenue (MAR), and these terms are used interchangeably.

2.3. CONTESTABLE CUSTOMER TRANCHES

The Government has determined that the electricity market in the Northern Territory will be progressively opened to competition according to customer's annual consumption as follows:

Table 2 – Contestability Tranches

Annual Consumption Range	Approximate Number* of Customers of this size	Date of Contestability
Above 4 GWh	34	1 April 2000
3 GWh to 4 GWh	13	1 October 2000
2 GWh to 3 GWh	22	1 April 2001
750 MWh to 2 GWh	120 (est)	1 April 2002

*Customer numbers current at July 2000, not all connected to regulated networks

The extension of contestability below this size is not determined, and will likely wait upon developments and experience in this and other electricity markets.

From these dates, contestable customers can seek electricity supply arrangements which differ from the previously applicable "franchise" tariffs, through negotiation with PAWA Generation / Retail, or with other generators and / or retailers. These generator / retailer suppliers will seek "access and use" of PAWA network systems to deliver electricity to their customers under the provisions of the relevant legislation.

PAWA Generation / Retail will retain the obligation to supply non-contestable customers under "franchise customer" conditions with tariffs determined by Ministerial Order.

PAWA networks will operate as a "ring-fenced" network service provider, recovering the determined revenue cap through charges for use of its system by the suppliers of contestable and franchise customers.

Network charges will be directly recovered in the same fashion from the generator / retailer associated with all customers. For the contestable size customers part will be recovered from PAWA Generation / Retail for those customers remaining with this supplier and part from any other generator / retailer for those customers which have chosen another supplier. Network charges for customers on franchise tariffs will be recovered from the franchise supplier, PAWA Generation / Retail. It is a matter for the retailer whether the generation, network and retail charges are bundled into the final sale price to customers.

It is apparent that network tariffs must be established in format and rates to be applicable to both the contestable and franchise markets. PAWA Networks intends structured tariffs for the contestable market which will provide appropriate cost reflective signals, while a simple charge and rate formulation will be used for the franchise market.

2.4. PERIOD OF APPLICATION OF TARIFFS

The period of applicability of the different tariffs as follows has been recognised in assessing the likely revenue to be expected by PAWA networks from the regulated market regime.

Tranche 1 Customers – Contestable since 1 April 2000
July to September (3 months) at continued interim contestable rates
October to June (9 months) at new contestable tariffs

Tranche 2 Customers – Contestable from 1 October 2000
July to September (3 months) at continued interim non-contestable rates
October to June (9 months) at new contestable tariffs

Tranche 3 Customers – Contestable from 1 April 2001
July to September (3 months) at continued interim non-contestable rates
October to March (6 months) at new franchise rates
April to June (3 months) at new contestable tariffs

Tranche 4 Customers and other franchise customers
July to September (3 months) at continued interim non-contestable rates
October to June (9 months) at new franchise rates

The progressive opening of the market to competition from the dates above, coupled with the likely date of application for these tariffs, will result in customers which are contestable within the first year experiencing different periods on different network tariffs.

These timing effects have been incorporated in the development of the appropriate tariffs to deliver the Regulated Revenue Cap.

Tariffs for later years will be devolved each year as the actual MAR's become available through the application of the X factors and adjustment for actual energy transport growth and for any over / under recovery. The tariff formats would remain stable, but the rates would be adjusted as necessary.

3. COST DRIVERS

It is apparent that consideration of tariffs generally, and network tariffs in this proposal, should recognise the factors which drive the cost of providing the supply or service and that tariffs should reflect these drivers into the cost messages sent to users.

This discussion does not specifically distinguish between the traditionally "bundled" charges where cost of generation, transmission, distribution and retail services are recovered in a single tariff formulation, and those which relate more particularly to "network services" for the delivery of electricity, separated from the generation and retail functions. In so far as it refers to signalling costs through tariffs, this discussion relates more specifically to those large and sophisticated customers - early tranche "contestable customers" - where the provision of "smart metering" is justified. These customers will perceive various cost signals which will provide an incentive for appropriate response in terms of their consumption characteristics.

In principle, costs associated with the provision of electricity are driven by factors which relate to

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

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

For example, in a network business, 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 etc installed, and hence independent of the demand it can service.

Similarly, when 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. In many cases, much of the infrastructure has been developed over time, so that an average cost may differ from an incremental cost.

Most of the network costs are independent of the energy through-put and remain whether the lines are used for a few days or hours a year, or for varying degrees over the daily, weekly, monthly and yearly cycle. (At one extreme might be a "holiday cottage" situation, or an industry which has highly seasonal operations and at the other extreme, a location where the load varies little throughout each day and continues like that for every day for the whole year.)

Where costs are fixed, or depend on capacity required or used, the effective average 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.

Translating these costs into tariffs, and into tariff levels and formats which are acceptable to the various stakeholders can be a mixture of art and science.

These costs are often reflected into tariffs through:

- A "Customer Connection" charge or "System 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,
- a charge related to energy used, generally based on kilo-Watt-hours.

Some of the characteristics and results of various formulations are discussed in the following.

3.1. STANDING CHARGES

Much of the network cost derives from its investment in system equipment, and, as discussed above, much of that cost is independent of the capacity actually installed. To recover costs which do not vary with required capacity or duration of usage, a significant fixed or “System Availability” charge might be seen as appropriate.

In the cost allocations which form the starting point for this submission, the high level of System Availability Charges might be regarded as a target, rather than as an amount to be immediately recovered in this fixed charge manner.

It is generally accepted that many customers, especially customers with low consumption, see the inclusion of any significant System Availability Charge as "paying for something they do not use". This situation leads to the conclusion that there is an effective acceptable limit to the recovery of what may be really fixed costs through sunk investments in this manner. Customers notionally "spread this charge" over their consumption and may regard the result as "too high", especially where another customer with the same standing charge and higher usage, can "spread" the charge more thinly over the greater consumption.

Except in the case of the New South Wales TUOS charges, a significant "Fixed - Standing charge" component has not been common. This fixed charge element applied to the Distribution Utilities and formed a small fraction of the combined network charges. It was generally not reflected to the consumer as a fixed amount.

This proposal moderates what might be an appropriate target level for System Availability Charges by regarding higher charges as a longer term target.

3.2. MINIMUM CHARGES & BLOCK TARIFFS

One strategy in pricing for smaller customers is to allow certain consumption within the "standing charge", so that it becomes effectively a "minimum charge" for which certain consumption is included. The effective rate for consumption within this block decreases, but there is a feeling "that you are not just paying for nothing". This formulation has not been common in the PAWA tariffs and is not proposed now.

Another strategy is to price in "blocks" so that first or early consumption in a period is charged at a higher per unit rate to recover some of the fixed costs in the early consumption, but to allow the latter blocks to be available at a rate which may be closer to an incremental cost.

A further reason for a declining block structure is be to reflect a genuine decrease in marginal costs through various "efficiencies of scale" as well as the likelihood that larger consumers will be connected so as to require less of the low-voltage mains system than the multitude of smaller customers.

PAWA Networks proposes to use declining block tariff formulations in its tariffs for larger and contestable customers.

There is argument also, that “middle size” commercial customers also require less low-voltage mains equipment, and this will be similarly reflected in the PAWA proposed declining block rates for franchise customers.

3.3. ACTIVE & REACTIVE POWER AND DEMAND CHARGING

Customers use electricity for many functions, and generally look at the "useful output" from various devices as delivering benefit. Thus it is the output light from a lamp, heat from an element or the turning effect of a motor that is valued and normally paid for through a kilo-watt hour charge. It is measured as "active power" in kilo-watts (kW) and consumed over time in kilo-watt-hours (kWh).

However, many devices depend on the generation of electric or magnetic fields for their operation, and these fields also require electricity for their production. Thus a motor or transformer can only operate by generation and interaction of magnetic fields (from the motor driving a central air-conditioning plant to those in the video or other electronic appliances, from transformers supplying induction furnaces to those in the chargers for cordless phones.) These devices require what is called "reactive power" measured in kilo-Volt-Amperes-reactive (kVAr) and consumed over time in kilo-Volt-Ampere - reactive hours (kVArh), which can be delivered through the mains, or can be "generated" locally by the installation of complementary "power factor correction equipment".

When active and reactive power are both required, the overall effect can be termed "apparent power", and is quoted in kilo-Volt-Amperes (kVA) and consumed in kilo-Volt-Ampere hours (kVAh).

The "active" and "reactive" power can be regarded as "perpendicular vectors" like the sides of a right-angled triangle, with "apparent power" as the hypotenuse. Thus they are related through the "sum of squares" rules and

$$(\text{kVA})^2 = (\text{kW})^2 + (\text{kVAr})^2.$$

The ratio of "active power" to "apparent power" is termed the "power factor". It is the cosine of the angle between these vectors, but is often expressed as a percentage. A "unity" power factor, or power factor of 100% signifies that all the "apparent power" is being seen as "active power". Lower power factors reflect the presence of transformers, motors, discharge lighting etc which require "reactive power".

It is the magnitude of the overall "apparent power" in kVA or Amperes which determines the capacity of transmission and transformation equipment, and hence impinges on the cost of the necessary system and equipment.

It is appropriate, therefore, to measure and charge for capacity required or demanded through kVA rather than kW. This is consistent with the practice in many places, especially at the distribution level, as in the New South Wales access regime, and in the format of the current PAWA Standard Demand Tariff.

PAWA Networks intends to apply charges related to measured demand for larger and contestable customers and to apply this charge based on apparent power in kVA - rather than on active power in kW.

In its recovery of costs from smaller customers, where demand is not commonly measured individually, PAWA Networks proposes that charges based on energy be taken as a proxy or surrogate for demand, with the implicit assumption that higher energy consumption implies higher capacity demand. This implies use of an implied averaged load factor and power factor for those customers where sophisticated metering is not available.

3.4. TARIFFS FOR DIFFERENT SIZED CUSTOMERS

It is common in other jurisdictions to separately determine tariffs for supply at various connection levels in the system, or for supply at various voltages.

Elsewhere, tariffs are discriminated directly according to voltage of supply. For example, under EnergyAustralia network tariffs, the capacity element of the network demand tariff charges $8.00 per kVA per month for supply at low voltage (with a reduction to $7.20 if there has been capital contribution towards the distribution substation), $6.30 per kVA per month for supply from the HV system, $4.30 per kVA per month for supply from a Zone substation, and $3.50 per kVA per month for supply at sub-transmission voltage.[2] Similarly, Integral Energy Network tariffs include demand elements ranging from $6.00 per kVA per month at low voltage, through $4.42 for high voltage to $3.14 for sub-transmission voltage supply.[3]

While minimum chargeable demands for these classifications have been removed over time, experience would suggest that capacity up to about 250 kVA might be available from the general low voltage network, capacity from about 250 kVA to say 1500 kVA might be available at low voltage from a relatively dedicated distribution substation, while capacity above about 2000 kVA would commonly be supplied at high voltage. Larger loads, up to 10,000 kVA might be supplied relatively directly from a Zone substation, while loads above 10 MW (about 11,000 kVA) are often subject to contracts, presumably with individual (cost reflective) pricing.

In Victoria, the network charges retain minimum chargeable demand levels, with various “break points", including 60 kW, 120 kW, 250 kW, 1000 kW and 10,000 kW for AGL, 120 kW, 150 kVA, 1000 kW, 1,150 kVA, 10,000 kW and 11,100 kVA for United energy. Powercor has minimum charges at 250 kW, 1,000 kW, 10,000 kW and 20,000 kW for its various tariffs.

Discrimination into voltage based tariffs has not been the case in the Northern Territory, where the previous tariff regime charged the general commercial customer class at a single c/kWh energy rate (with relatively small fixed charge) irrespective of their size, voltage of supply, location, load profile or power factor.

[2] The associated charges based on energy show less variation according to connection point, reducing from 1.76 cents per kWh at peak times for low voltage supply to 1.65 cents per kWh at peak times for subtransmission voltage supply.
[3] The associated charges based on energy show slight change, from 1.94 cents per kWh at peak time for supply at low voltage to 1.90 cents per kWh at subtransmission voltage

PAWA recognises the likely correlation between demand and mode of connection and its reflection into the depth of system associated with the supply arrangements. In 1999, PAWA introduced its "Standard Demand Tariff" (to the bundled tariff market) with demand steps effectively resulting in varying and decreasing rates at higher levels of demand.

This bundled tariff was clearly intended to be cost reflective showing the likely economies of scale and likely higher voltage of connection in making supply available to higher levels of demand and consumption.

PAWA Networks proposes to utilise a similar structure into its Network tariff for contestable customers.

In particular, it is not proposed to differentiate between say "Hotel A", supplied at high voltage and another "Hotel B" supplied at low voltage merely on this account. It is proposed to reflect decreasing costs for larger and contestable customers, and the reducing averaged effect on c/kWh through demand charges which applies to customers with good load factor and power factor.

> It may be noted in passing, that if a demand of say 150 kVA ought attract the EnergyAustralia demand rate of $8.00, then a step from say $9.00 to say $7.00 around 100 kVA might achieve the same result. A further step at say 1000 kVA to say $5.50 might match the $6.30 level for HV system supply. A further step at say 2500 kVA might allow matching the $4.30 rate for supply from a Zone substation.[4]
>
> PAWA's stepped single tariff offers much the same result, but without formal differentiation according to voltage of supply.
>
> Under PAWA's declining block tariff as proposed for the Northern network, for example, a customer of 150 kVA (likely to be supplied at low voltage) sees an averaged peak demand rate around $6.85 per kVA with a marginal rate of $5.40 per kVA. A 1000 kVA customer, (likely to be supplied directly from a distribution transformer) averages around $4.95 per kVA with a marginal rate of $3.10 per kVA. A 3000 kVA customer (likely to be supplied at high voltage) averages around $3.60 per kVA with a marginal rate of $2.80.
>
> These rates would apply, appropriately in PAWA's judgement, to customers with these demands irrespective of whether they were literally supplied from high or low voltage.

There is a lower cost per kVA in supplying larger customers which are unlikely to require the use of all tiers of the network. The resulting lower supply cost is partially accounted for through the allocation of costs to the system voltage tiers, but there can be a graduation of dependence on system assets and this needs to be reflected in the tariff. Further, it may be noted that certain "customer specific" assets exhibit economies of scale. For example, the cost of extra capacity of transformers in building chamber substations increases less than proportionally with demand and hence the cost per kVA is lower for large customers than it is for smaller customers. This could be achieved through direct tariff for specific methods of

[4] A single stepped demand tariff, as is demonstrated shortly, could relatively well reflect the EnergyAustralia rates for several levels of capacity.

supply or through declining blocks. PAWA prefers using the declining blocks approach because -

- it results in a smoother graduation in average tariffs;
- the existing PAWA (Retail) bundled demand tariff utilises declining blocks. Large Contestable customers are familiar with this tariff, and hence there is merit in replicating its structure in the network tariff schedule. Retailers operating in the contestable market should be able to interpret the tariff formulation in their negotiations with potential customers; and
- future tariff adjustments can be more iterative as it is easier to fine tune the tariff schedule without widespread impact on consumers. Any of the rates, or block sizes can be adjusted to influence revenue results, and change the weighting of the customer signals.

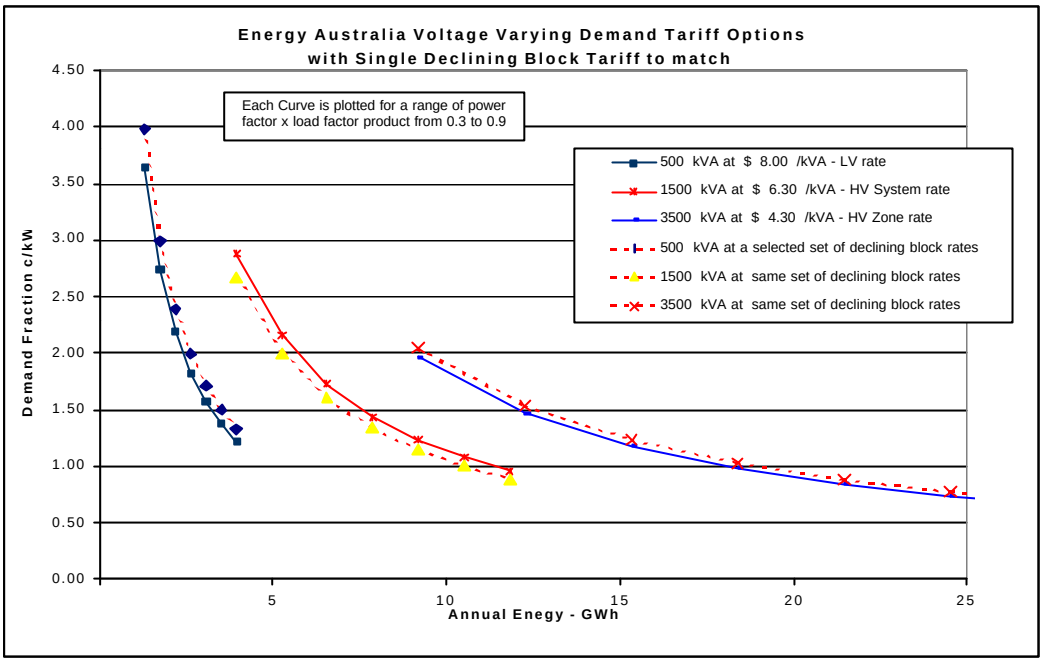
The declining block tariff can be compatible with the direct voltage-based allocation method in that that such a tariff can be made to closely replicate the effect of specific voltage reflective tariffs. This is reflected in the figure below which shows that the averaged effect in cents per kWh of a demand charge under a single declining block tariff can be made so as not to differ substantially from the effective cents per kWh demand fraction for tariffs with specific voltage reference.

The figure below is based on EnergyAustralia's tariff structure with differing kVA rates for supply at low voltage, from the HV system, or directly from a Zone Substation busbar. (The respective rates are $8.00 per kVA at low voltage, $6.30 per kVA at high voltage, and $4.30 for direct supply.) Recognising that typical customers on these rates might exhibit demands of 500 kVA, 1500 kVA and 5000 kVA respectively, a single declining block tariff can be determined to closely reflect the same demand fraction over a range of plausible power factor x load factor product.

Block rates are determined such that sample calculations are consistent with larger users' "typical" lesser reliance on certain system assets, as they are upstream of low voltage connections. If it is accepted that a customer with 500 kVA demand would likely be supplied at low voltage, while a 1500 kVA demand would be connected at high voltage, steps in a single tariff can be made to reflect rates applicable to separate voltage denominated tariffs elsewhere.

The result is three curves which show the average cost of demand, in cents/kWh, over a range of Load Factor and Power Factor combination for Energy Australia customers. A single declining block Tariff applied to each of these customers can give almost exactly the same outcome for the customers. The selection of the rates and the block sizes are critical elements in achieving this outcome.

FIGURE 1: ENERGY AUSTRALIA VOLTAGE VARYING DEMAND TARIFF OPTIONS WITH SINGLE DEMAND TARIFF OPTION TO MATCH[5]



3.5. INTERIM TARIFF FORMAT

In response to the Regulator's wish for a "simple" tariff to be applicable to customers, including contestable customers, in the initial market opening period from 1 April 2000, PAWA calculated tariffs on an "energy only" basis for this period. It was recognised by the parties that such a tariff achieved few of the objectives required for a pricing regime which was cost reflective and passed few of the appropriate costs signals to users.

The interim Tariff Schedule was as follows:

Usage	Darwin	Katherine
>4 GWh per year, supplied and metered at high voltage	4.20 cents per kWh	4.85 cents per kWh
>4 GWh per year, supplied and metered at low voltage(a)	4.40 cents per kWh	not applicable
<4 GWh per year	5.70 cents per kWh	6.60 cents per kWh

(a) relates to customers connected at the normal utilisation voltage of 415/240 volts

In its submission to the Regulator at that time, PAWA noted as follows:

PAWA recognises the need for tariff formats to reflect the various cost drivers within the electricity supply business, and particularly within the network business.

[5] Each curve is plotted for a plausible range of power factor x load factor product from 0.3 to 0.9

PAWA proposes that network tariffs applicable from 1 July 2000 will include elements as follows:

Charge relating to Peak time Demand	*Recovered through measured kVA demand in peak time periods determined over a 15 minute integrating period, and charged on a monthly reset basis*
Charge relating to Off-peak time Demand	*Recovered through measured kVA demand in off-peak time periods determined over a 15 minute integrating period, and charged on a monthly reset basis*
Charge relating to energy taken during peak time periods	*Recovered through measured kWh in peak periods over a monthly billing period*
Charge relating to energy taken during off-peak time periods	*Recovered through measured kWh in off-peak periods over a monthly billing period*
Charge relating to System Availability	*Recovered as a fixed daily charge.*

3.6. TARIFF FORMAT OPTIONS

Recognising that the network Revenue Cap is essentially an annual revenue amount determined by consideration of the owning and operating costs of the existing asset stock, there are a range of possibilities to consider in determining appropriate tariff elements to recover this amount.

Recovery method for network revenues	**Comment**
Fixed annual amount determined for various customer classes or characteristics	Reflects “fixed” nature of certain significant network cost elements
Charges based on energy	As little of the network cost bears a direct relation to energy throughput, this is applicable mainly as a surrogate for demand, where sophisticated metering is not available. If used in association with fixed and demand charging, could be regarded as “softening” the effect of direct demand related pricing
Averaged rate on all energy supplied	Applicable to customers with “simple” metering but does not offer good signals for real utilisation of asset capacity
Differentiated rates on energy at various periods	May offer some customer message re peak and off-peak period costs
Averaged rate on reserved capacity or used capacity	Reflects one of the drivers of network capacity costs
Use of measured demand rather than reserved or contracted demand	Applicable to “existing” system, but less relevant for new connections – Needs sophisticated metering
Use of monthly measured demand rather than annual demand	Less reflective of costs related to annual demand, but better accepted by customers as reflective of their usage
Use of demand charged on kVA rather than kW	Includes price signals reflecting utilisation of the system capacity
Differentiated Rates on capacity at various periods	Offers customer messages re peak and off-peak period costs

PAWA Networks proposes that contestable customers are charged under a tariff with System Availability Charge and charges relating to measured monthly kVA demand and measured energy. The demand and energy rates will be differentiated between peak and off-peak time periods, and will exhibit charging blocks with declining rates.

Franchise customers, and other customers not yet contestable will be charged on the basis of a System Availability Charge which will differentiate between domestic and commercial customers, and a charge based on energy largely as a proxy for demand. Part of the energy charge will relate to "postage stamp" recovery of common costs, part to cover demand. The energy charge will consist of two rates, the second and lower rate will commence after the first 1000 kWh has been delivered each month. This feature will continue the concept of economy of scale down to even the smallest customers.

4. THE NORTHERN GRID

4.1. COMBINING COSTS AND DEMANDS OF THE DARWIN AND KATHERINE SYSTEMS

As the pricing for the Darwin and Katherine networks proceeded, it became evident that the outcome prices would not be substantially different. However, this outcome was dependent on the influence of significant mining activity around the Pine Creek area, compared to the relatively small demand from the rest of the Katherine network. This single customer influence, currently working in Katherine's favour could become significantly greater or less as mining activities decrease or increase. The outlook for Katherine network prices would be that they would fluctuate wildly from year to year. This would probably incur the imposition of side constraints so that network prices did not move significantly from year to year.

It was considered appropriate to combine the MARs from Darwin and Katherine, establish a single set of network tariffs and call the combined system the Northern grid. There is the possibility of some cross subsidisation between the two networks, however the direction of this might vary as mining activity ebbs and flows. On balance, PAWA considers the decision to combine the pricing for the networks is rational and will not be unwelcome to customers. One additional benefit is that the costs of the transmission line which links Darwin and Katherine can be easily accommodated in the resultant network prices.

4.2. THE DARWIN KATHERINE TRANSMISSION LINE

The Darwin – Katherine 132 kV Transmission Line (DKTL) is owned and operated privately, with the whole costs of financing, operating and maintenance, and a margin for profit being recovered by that organisation from PAWA through the differential between rates it pays to PAWA for energy entering the line and rates it charges PAWA for energy leaving the line. For this differential amount, PAWA effectively uses the DKTL to transmit energy from the entry points to the delivery points and is currently the only party paying for this service.

The transmission line provides benefit to all customers and generators in the Northern grid. The benefit may in fact vary between customers and between generators. None the less, the line does allow the sharing of reserve generation plant and the selection by generators, PAWA in particular, to achieve the lowest overall cost. In achieving the lowest overall cost (of generation) all customers potentially benefit in terms of a lesser cost burden in electricity prices generally.

The Utilities Commission has not agreed with PAWA's contention that the cost of the DKTL should be shared by generators. PAWA acknowledges that such a regime could give the appearance of discrimination in certain situations. In this pricing proposal the Utilities Commission's views have prevailed.

In the absence of ownership of the line by PAWA it is proposed that the identified costs to PAWA of the current arrangements will be treated as a common service to all customers connected to the Northern Grid to be recovered as a uniform postage stamp cent per kWh rate from customers in the Darwin and Katherine networks, including the end use energy at the Mt Todd Gold Mine. The mine is connected to the DKTL via a private network and has a generator on site. Although virtually self sufficient, the mine does gain benefit from being attached to the DKTL, just as do many other customers. The benefit occurs from the frequency stabilisation the DKTL provides as well as the back-up when the local generating unit is unavailable due to maintenance requirements.

The DKTL costs to PAWA will be recovered in the proposed network prices without discrimination from all Northern network users.

5. METERING

5.1. METERING CYCLES & UNBILLED CONSUMPTION

The vast majority of existing customers are supplied and charged at present through simple kWh meters which indicate progressive energy consumption since the meter was installed. The difference between successive readings is charged as the consumption for the interval between meter readings. Larger customers are read and billed on a monthly cycle, while smaller and especially domestic customers are read at approximately three-monthly intervals.

There are fluctuations in actual daily consumption according to usage patterns, including, for example a difference between week-days and week-ends, between wet and dry seasons so that the "average consumption per day" between meter readings can vary considerably.

To allow production of monthly energy sales data for various statistical and budgetary purposes, the PAWA Customer Information System (CIS) is programmed to prepare an estimate each month of "unbilled consumption[6]". This takes account of the days elapsed

[6] This should not be confused with supply to certain installations, such as street- and traffic-light installations, telephone cabinets etc where the consumption is calculated from the known installation and duty cycle and often recovered as part of an overall charge for the service.

since the last meter reading and recognises the varying seasonal usage patterns. Each month the actual read and billed consumption is input and calculations performed to reflect the actual consumption during that month.

PAWA reads its larger customers monthly, and arranges that the largest customers on a meter route are read towards the end of the month so as to minimise the estimation required.

The end of year amount is included in the Audited Annual Report as a " Current Receivable" amount which *"represents the estimated consumption of electricity and water services provided to customers but unbilled as at balance date."* The amount in the June 1999 Annual Report[7] was some $22.466 Million in operational revenue of some $319 Million.

5.2. METERING FOR NON-CONTESTABLE CUSTOMERS

Non-contestable customer's individual metering is read cyclically, and bundled accounts raised on that basis by the Retailer. Charges for non metered supplies are raised on the agreed basis, generally derived from consumption calculated from knowledge of installed equipment and its duty cycle.

The network charges for non-contestable customers will be based on metered (customer) consumption, adjusted to accommodate the cyclical nature of billing processes. This will require PAWA Retail to notify Networks of the CIS sales data for franchise customers each month so that a bill can be raised by Networks on Retail. It will be necessary for Retail to provide information in such a way as to enable the proposed stepped charges to be calculated and for the accounting to be verified for billing purposes.

System Availability Charges will be based on customer number records from the PAWA Customer Information System (CIS).

5.3. SOPHISTICATED METERING FOR LARGER CUSTOMERS

It is common for larger customers to be supplied through more sophisticated metering equipment which can record and store consumption at shorter intervals, and hence can allow determination of load profiles and consumption pattern, as well as the maximum rate of consumption representing the customer's maximum demand on the system. These meters can be arranged to measure "active" (kWh) and "reactive" (kVAr) power consumption allowing the calculation of the "apparent" (kVA) power and consumption which best reflects the determinants of system capacity requirements. The meters can store information at selected intervals of say 15 minutes, and can store enough data to cover a normal monthly reading cycle for a large consumer. Easy "down-loading facilities" can transfer the whole month's data to a portable data device at a reading visit to the installation.

Further, these meters can be arranged for remote interrogation by phone or other medium, and can thus be accessed whenever is convenient, and as frequently as might be required.

The Service might include patrol of lighting systems, lamp replacement etc as well as charges for the provision and maintenance of the installation itself.

[7] Note 1 (f) at page 65 refers, and the value is given at page 70.

(For a customer supplied by a generator / retailer other than PAWA, these meters would allow information about a customer's load profile characteristics necessary to allow matching generation to loads[8].)

Needless to say, this type of installation is more expensive, and is generally relevant for large customers, and especially for customers as they become contestable.

PAWA Networks proposes that such metering will be available as customers become contestable to facilitate their choice of generator / retailer, and so as to allow accurate and timely information for the application of network tariffs to such customers.

It is intended that calculations derived directly from such metering at individual contestable customers will be used for network charging purposes. Meter data will also be available for the generator / retailer to calculate relevant overall charges to the customers.

5.4. HV / LV DIFFERENTIAL

As indicated in the Interim tariff submission, some of the customers in the first several tranches are supplied and metered at low voltage, despite their size. Conversely, certain of the later tranche customers are supplied at high voltage for convenience rather than for size[9].

For equity between customers with this different supply arrangement, the appropriate network rates for these HV customers who are not yet contestable should be lower to reflect the boundary between the metered customer location and the PAWA Network system. There are relatively few such customers and it is proposed that energy based charge rates for supply to customers supplied under the franchise tariffs should be decreased by 5.0 % below those being supplied at lower voltage rates.

This is a common differential, and reflects that implemented during the Interim tariff period.

As far as contestable customers are concerned the format and setting of the declining block demand and energy tariffs is selected to appropriately differentiate system usage and hence supply costs to the customer's demand and consumption, and so no specific differential for high or low voltage is relevant to these customers.

6. OTHER MATTERS

6.1. RING FENCING OF NETWORKS

The Regulator's proposed Guidelines for Ring-fencing the various operations carried out by PAWA allow or require the business units to operate according to certain financial and informational separations.

[8] PAWA Networks has arranged remote reading access to contestable customers for the information of their selected generator / retailer.
[9] For example, the Parks & Wildlife Reserve at Katherine Gorge is supplied at high voltage despite its consumption being towards the lower end of the fourth tranche.

It is noted that PAWA's Network Operations should be independent of PAWA Generation and Retail in their accounting, decision making, assessment of costs and hence in the formulation of tariffs.

Strictly interpreted, PAWA networks has no concern for any impact which a particular network tariff formulation might have on the customers of PAWA Generation / Retail (or of any other grouping) and hence would have no concern for the existing bundled tariff formulation and rates.

Such an attitude has been tempered somewhat in these proposals in the identification of "target" tariff structures and values, which may differ from the proposals for immediate implementation so as to take some account of what has occurred before the regulated regime. Some effort has been made to identify the effect network tariffs may have on customers although many of them may not be aware of the level of network charges hidden in their current bundled tariff.

Some account has also been taken of likely effects on customers which may have made investment or operational decisions based on previous tariff formulations.

6.2. EXCESS NETWORK USAGE CHARGE

The Code includes requirements for users to properly determine contracted maximum demand and to not exceed that contracted capacity.

These Sections of the Code might relate most directly to a situation where part or all of the network charges relate directly to the Contracted Maximum Demand (CMD).

At the present time, PAWA proposes to use monthly measured demand as the capacity charging element, rather than contracted demand, but notes that charging according to a contracted demand can be better representative of capacity provision, especially in the case of a new connection, where capacity augmentation might be required. Use of contracted capacity charges, with higher rates for excess demand, imposes an appropriate discipline on the proponent of a new connection and returns revenue related to the asset required.

In certain jurisdictions, demand charges are normally based on a contracted demand, and this contracted demand is deemed to have been increased whenever a new demand exceeds the previously contracted value. Charges on such a regime are generally based on any new level of demand being chargeable for the following 12 month period. PAWA Networks has not opted for this arrangement at this stage, especially as it envisages that most network access agreements will relate to existing system and connections.

The contract maximum demand and declared sent out capacity values are however also used in the determination of Energy Loss Factors in accordance with Schedule 13 of the Code and have been used in this context for existing access agreements. In addition, the design of the electricity market in the NT is such that a generator must be able to demonstrate adequate stand-by arrangements for its customers. The CMD is therefore used by the System Controller when determining the adequacy of standby arrangements.

Network entry and exit losses are calculated with a loss factor determined by reference to the contracted maximum demand or declared sent out capacity.

It is a possibility that a user could manipulate the loss factors by contracting for a capacity which does not well match the actual requirements[10].

While one solution might be to re-phrase the Code so that the demand to be used for losses is the higher of the contracted or observed demands, this might require frequent recalculating of loss factors as loads tend to increase over time.

The better solution is to accept the concept of Excess Network Usage as embodied in the Code, and to apply charges in the manner set out in the Code so as to encourage appropriate nomination of contracted capacities and load and generation management within agreed capacities, charging for excess beyond nomination at a marginally higher rate.

PAWA proposes that the Excess Network Usage Factor for the financial year relevant to this determination be set at 1.25.

It is further proposed that such a charge will not be imposed within the first financial year period unless there is evidence that "gaming" is occurring in that nominated Contract Maximum Demand (CMD) figures do not reflect a good faith indication of the required capacity.

Hence for the first financial year the effective Excess Capacity Factor will be taken as 1.00.

Any additional revenue which results from the application of this factor to excess usage is not included in the MAR and because of its nature, no forecast has been made.

6.3. SYSTEM CONTROL – MARKET MANAGEMENT

System Control charges are to be recovered as a "postage stamped amount" applied to all energy use in the interconnected Networks.

Any revenue from this charge is outside the network Revenue Cap. It will be the subject of a separate determination by the Utilities Commission although for convenience, Networks may add it to the Network charges and take the appropriate accounting actions.

6.4. TRANSITIONAL TARIFF ARRANGEMENTS

The application of the proposed structured tariffs for contestable customers results in different effective cent rates according to the customer's load factor and power factor, as well as their overall demand and consumption.

[10] If the same contracted demand is used as a basis for Standby Generation arrangements, there may be similar opportunities for inappropriate results.

As might be expected, those large customers with good system utilisation are likely to receive effective averaged cent per kWh network rates below those implicit in the previous bundled tariff, and in the interim simple network tariff. These customers, and especially their contracted retailers, seem ready to accept the average cent rate reductions which are implicit in prices which reflect a lower share of supply system costs.

Other customers, with lower utilisation, may see lesser reductions, and some customers may seen increases above the interim simple tariff if the proposed structured tariff is directly applied. There may be a feeling that such customers should be protected from any price shock resulting from an increase. Some of these customers have been previously paying less in total for provision of similar system capacity but lower energy delivery through lower load factors and power factors than the amount recovered from other customers of similar capacity requirements but with better utilisation. Some would argue they have been in receipt of inter-class cross subsidies from other consumers with better utilisation, but moves to rectify this may be seen to be penalising.

On the other hand, PAWA recognises that some of the customers possibly seeing increases have developed load profiles and utilisation practices in response to previous (bundled) tariff formulations. For example, a processing works may operate predominantly at high load overnight to benefit from previous differentials in peak and off-peak rates for an energy-only tariff. When the works continued occasional operation into on through peak periods, the previous incremental cost on an energy only tariff was relatively small.

With low network charges related to off-peak demand and energy, the rates will remain low for operation outside peak periods. However, the effect on charges for regular or occasional use into the defined peak periods will be more significant.

> It may be noted that certain of these daytime operations appear from profiles to derive from a wish to operated between 7 pm and 7 am, rather than PAWA's off-peak period of 6 pm to 6 am. This seems to reflect a convenience based choice rather than a requirement for longer processing times periods.
>
> On other occasions, it seems that increased production is required, and the process can continue for extended periods, both peak and off-peak.
>
> PAWA Networks (and the customer's generator) must, of course stand ready to satisfy these choices and may well incur capacity costs related to the need for peak time operation.

As indicated elsewhere, PAWA recognises that some negotiation may be appropriate in such cases, and may be prepared to consider arrangements somewhat as follows.

> Customers whose significant off-peak operating patterns were clearly[11] influenced by previous tariff formulations may be considered as follows:
>
> - Such a customer may pre-elect the starting time of the 12 hour "peak period" within the range of hours between 5 am and 8 am. The "off-peak" period and rates would be

[11] The proponent in such negotiation would be required to submit profiles and other evidence that the consumption patterns were in fact a result of attractions offered by the tariffs previously actually applicable to the customer.

available outside these hours. The periods would each be of 12 hours duration on a daily basis.

- Such an election of time zone periods would persist for 12 months before another election could be made.
- Where such a customer requires only occasional significant peak time consumption, the customer's overall peak time demand charges would be calculated on a daily demand basis, at a rate equivalent to 5% daily of the normal monthly kVA rate[12].
- This arrangement would also incur a System Availability Charge of double the reference, reflecting the more individual attention required to metering and billing.

Other negotiated arrangements may be possible, and offer a better compromise.

No specific adjustment has been made to the proposed rates to accommodate the revenue reductions associated with such negotiated concessions.

7. REVENUE TARGET.

The proposed rates are, in principle, designed to recover the regulated Maximum Allowable Revenue if applied over a whole year period.

Recognition has been made of several Factors which may impact on the planned revenue.

- It is recognised that occasions will arise where network tariffs will be negotiated below the reference tariffs, for example in cases of possible network by-pass through the use of local generation rather than mains supply.
- Further, the effect of inclusion of kVA demand charges in the network tariffs will offer incentive to customers or retailers to improve installations where the power factor is low. In such a case, the customer's investment is recovered through reduced charges based on the lower kVA requirements for the same kWh consumption. This improves network utilisation and performance, but reduces the income from the tariffs.
- There are certain existing customers with installations and modes of working which were tailored to previous bundled tariffs. For example a time-of-use energy only tariff was available and encouraged some customers to arrange their operations to avoid most of the daytime period. Under a tariff based on energy only, the increase in electricity cost for occasionally or briefly using electricity into the peak periods was slight, and could be regarded as a part of the cost of operation. Under the proposed demand based time-of-use tariff for network service to contestable customers, any demand recorded within the peak period hours carries the associated demand charges. Where it is clear that a customer has responded to previous tariff messages, it may not be reasonable to impose the full effect of the demand tariff.

In each circumstance (and there are probably others which will arise) it is intended to consider the merits of the individual case, and negotiate accordingly.

[12] Thus peak demands on less than 20 days would result in lower costs, while high peak usage more extensively would result in charges higher than on the reference rate. The risk / reward ratio is thus proposed only for genuine customers responding to previous tariffs with only occasional large peak time demands.

In each case, however, any retreat from the effect of the reference tariff levels results in reduction of network revenue.

It is proposed, therefore, to target the reference tariffs a little above the actually set MAR to allow for such revenue reductions.

A contra-effect will occur with the progressive entry to contestability of various tranches, with various parts of the year being supplied under various tariffs. It is apparent that the averaged rates for contestable customers will be more specifically reflective of the large size, and use only of higher system elements, so that transition from the overall franchise tariff to the contestable tariff will result in an average rate reduction and a reduction in network revenue. This will conversely result in the franchise customer average rate needing to increase marginally in the future as more larger customers receive the benefit of lower network tariffs.

The Utilities Commission has indicated that a system of overs-and-unders will apply to balance allowed and actual revenue between years so that the cumulative effect of any misjudgment in these regards will not result in any injustice to either the customer or the network operator.

7.1. NETWORK TARIFF DERIVATION

The formulation of the proposed tariffs has involved a mixture of calculation and judgement as well as experimentation and extrapolation to find a workable solution to satisfy various criteria.

Of necessity, the modelling associated with cost allocation and tariff formulation draws on customer consumption and profile data, both individually and in various groupings. The full detailed modelling spreadsheets containing this confidential data have been included in the submission to the Utilities Commission, but are not available for public release.

In interpreting the period Revenue Cap into tariffs for the first financial year period, PAWA has had regard mainly to separating those customers with annual energy consumption above the level which are or will become contestable within this period from other customers which will remain on their existing overall bundled tariffs. That is, specific segregation was made between customers in the first three tranches, and the remainder.

PAWA has applied a Fully Distributed Cost (FDC) allocation as proposed in PAWA's submission on Pricing Principles, but has tempered the results in the development process, regarding the FDC result as a guide rather than as a strict methodology.

The Darwin Katherine transmission line charge element has been added as a postage stamp cent per kWh element applied to all energy based rates.

In moving towards segregated tariffs for larger and smaller customers, the required revenue, and by implication, the underlying costs, were allocated between high voltage customers and low voltage customers according to the asset value associated with each connection level. The Return and Depreciation fractions were allocated according to the current investment

valuation (ie the DORC – Depreciated, Optimised, replacement Value) while the Operating & Maintenance amount was allocated according to the Replacement Cost.

This attempts to recognise that the financial building blocks are related to the current value of the assets, taking account of a Valuation which recognises efficient replacement costs, as well as useful lives of assets, and the remaining life of the various asset classes. The needs for continuing operation and maintenance are deemed more related to the extent of the facility provided, with the presumption that all parts of the system require such attention (say for vegetation control, access for working and for other regular preventative maintenance) to an extent less dependant of the age of the system. Moreover, contributed system elements, which may not form part of the financial bases, also require ongoing attention for good service.

Line items were allocated according to the cost driver fraction according to Demand, Customer related fraction and Energy fraction.

As indicated later, these allocations resulted in high System Availability Charge amounts, which must be regarded as "target" formulations, and which have been tempered in this proposal.

These voltage level pool costs were then allocated between the customers in the first tranches and the remainder according to the energy consumed at any time. It is recognised that there are several other methodologies for such an allocation, including those which are derived from coincident demand at a single system peak occurrence time (or a few peak occurrences), those which are derived from the individual customer or class demands irrespective of their time of occurrence, and those which derive from a fuller analysis of system and customer (or class) profiles over an extended period. The data needs increase according to the increasing sophistication of the methodology, but PAWA demand and profile data is relatively limited to the large customers which were candidates for the previous Standard Demand Tariff, or where limited surveys were made for load factor or power factor data.

Load profile data and hence the time and magnitude of peak loads for customers or customer classes was only available for the larger customers, generally in the first three tranches, but not generally in the fourth tranche. The duration of recording varied depending if the customer had required demand or time-of-use metering on previous tariffs, and if survey recordings had been taken for load research purposes. No reliable data to allow segregation of the non contestable customers except possibly by subtraction was available, so the charge elements were allocated to the load at the highest level according to any-time energy.

It is anticipated that the extent and quality of profile data will improve as profile recording metering is installed on all customers as they are to become contestable. Future allocations and the resulting tariffs may thus be based on much more detailed information.

7.2. TRANSLATING AVERAGE RATES TO TARIFFS

Over all, a total revenue balance was monitored to compare the revenue to be raised by the various tariffs and consummation patterns against the allowable MAR's . The target revenue

was set a little above the summated MAR to allow for revenue shortfalls because of improved utilisation by contestable customers responding to the price signals, to guard against further customer closures, and the trend to lower than projected growth in electricity sales over the last year.

The rates for the Northern Network were considered first, as this network was by far the largest, and had the most contestable customers, with some variety in their profile characteristics.

The tariff iterations were performed on the Alice Springs and Tennant Creek customer base to derive tariffs for these networks.

The structured tariff block format was taken to match the existing standard demand tariff, and cost parameters were determined to suit the criteria as follows:

- A System Availability Charge for large customers should be around 50 times that for franchise customers to reflect the greater cost and complexity of servicing, metering, interrogations, processing etc[13].
- Increasing Tariff blocks should generally show decreasing price rates.
- Peak and off-peak period rates for demand should reflect the mainly peak-time cost driver but recognise the relevance of charging (at a lower rate) for demand at other times.
- Peak rates for charges related to energy should similarly be higher than those for off-peak periods, though the differentials should not be as great.
- The averaged cent rate for large tabulated customers should target the average rates shown above.
- The ratio of Demand related revenue to total should be around 40% to moderate the effect of demand related charges.
- Tariffs similar in principle and format should be applicable in the various networks, while recognising the difference in average revenue to be recovered.

The results of this process form the recommended contestable tariffs outlined in the Executive Summary earlier.

7.3. FRANCHISE NETWORK TARIFFS

Complementary to the target average revenues for large contestable customers the cost allocation indicated a target for customers with smaller consumption, generally connected to the low voltage network.

In structuring the tariffs it was recognised that allocated customer related charges represented a significantly higher value than customers were used to, so the Supply

[13] With small customer System availability Charge rates averaging a little under $100 per year, a value of $4,800 per year was chosen for monthly divisibility.

Availability Charge was reduced to values a little below the similar element in bundled tariffs within which the network tariff was to be accommodated by the retailer.

It was recognised that commercial customers carried higher SAC amounts reflecting partly their more frequent metering and billing cycles, and the frequent existence of 3-phase supply with more expensive service droppers and metering. Rates of 32 cents per day for commercial customers and 20 cents per day for domestic customers were selected as appropriate.

The similarity between marginal capacity for delivery to commercial and domestic customers, together with the economies of scale for larger customers, and their general use of less of the low voltage mains system, suggested adopting a stepped energy based tariff with the same rate levels for both classes of customer in each location.

Various step levels were considered, and a step at 1000 kWh per month was adopted. It was observed from consumption analysis (albeit a few years previously) that around 75% of domestic energy into more than 90% of premises fell below this consumption level so that only relatively little domestic energy, and relatively few domestic customers would penetrate the consumption level.

On the other hand, only around 5% of commercial energy, consumed in some 45% of commercial premises would be at the higher primary rate.

This suggested a formulation with relatively little variation between the blocks, one which treated small domestic and commercial premises equally as far as energy rates were concerned, but which recovered higher availability charges from commercial premises.

The decreasing average rate allowed gradation towards the contestable rate for highest consummations to reduce any price shock when a customer became contestable.

Again the Northern network was considered dominant, while Alice and Tennant networks were adjusted for appropriate relativity with Northern in terms of a consistent cent rate difference between values for the energy blocks.

A **streetlighting** rate was set recognising general off-peak use by this load of mains largely installed for other purposes. (Note that the streetlighting charge is for conduct of electricity to the connection to the streetlight mains, not through the dedicated streetlighting circuits which do not form part of the regulated network asset.)

The Target from the allocation to franchise customers, tempered as outlined above results in the recommended franchise tariffs outlined in the Executive Summary earlier.

The Darwin Katherine transmission line postage stamp cent per kWh rate has been applied to Northern Network energy based rates after the individual allocation and is included in the rates proposed.

8. ASSESSMENT OF THE RESULTING TARIFFS

8.1. THE STRUCTURED TARIFF

This structured tariff is designed to achieve the following:

- Offering customer signals that demand carries responsibility for system capacity and hence cost.
- Recovery of demand charges over both peak and off-peak hours demand so that customers have incentive to manage their demand on the system. Off-peak customers would not ride free on system capacity, but the reduced charges recognise that it is primarily demand during peak time that drives overall system capacity costs. Some local capacity costs are driven by demand whenever it occurs, and charges are included for off-peak demand.
- Charging for demand as measured maximum kVA so as to signal that overall load, not just "active power" (ie kW) load is the cost driver. This also encourages customers to share the cost of providing reactive power by installation of local capacitors to improve power factor. This results in better utilisation of the system and their own customers' mains and equipment.
- Charging for demand on a monthly basis so that seasonably variable customers or the customer who "gets a large order" which requires greater demand on the system, rather than increased usage of the existing capacity over longer working hours bears the charge only during the month of higher usage.
- Recognising through "declining block" demand charges that larger customers are more likely to be supplied at higher voltages, or more directly from a transformer, and in any case to use proportionately less of the lower voltage system. It recognises that for larger customers the marginal cost of supply is likely to reduce.
- Recovering some charges based on energy designed to moderate the impact of charges based solely on demand. While there may be argument that network costs may bear little direct relationship to energy delivered, it is recognised that application of charges purely by demand may signal "too strongly" the cost effects. A compromise is customary in the implementation of network tariffs and is included here.
- Reflecting lower rates at off-peak times, and declining block structure into the charges based in energy in recognition of likely decreasing marginal cost.
- Preserving the System Availability daily charge and the general formulation from the Standard Demand Tariff.
- Reflecting rates for smaller customers which appropriately relate to the franchise tariffs to minimise price changes as contestability is progressively extended.
- Recovery of the appropriate revenue over the regulated financial year period from the contestable customers irrespective of their chosen generator / retail supplier.

8.2. THE FRANCHISE TARIFF

This tariff is designed to achieve the following:

- Presenting a simple tariff formulation applicable to the general bulk of customers supplied at low voltage, featuring lower energy rates for greater use which reflects the small economies of scale available at this level of consumption.
- Reflecting an element of fixed costs through the System Availability Charge which differentiates slightly between domestic and commercial franchise customers.
- Reflecting elements of demand cost through the proxy of energy usage.
- Recovering the appropriate revenue over the regulated financial year.

8.3. IMPACT ON CUSTOMERS

In determining and setting of Network Tariffs, PAWA Network has tried as much as possible to minimise price shocks on customers. Part of the analysis done by PAWA Networks has been to establish the possible impact of the proposed tariffs on different types of customers.

9. REGULATOR'S CRITERIA

The following Sections outline the proposed tariffs against the Criteria required by the Utilities Commission.

9.1. COST ALLOCATION MODEL

Prices should be based on an acceptable cost of supply model

The Cost Allocation model is a Fully Distributed Cost allocation model outlined earlier in this Document. It forms a basis for the cost allocation and hence revenue recovery, but is modified according to judgements of its data and results as discussed earlier.

9.2. FUTURE INVESTMENT REQUIREMENTS

Regional variations and prices and the structure of network charges should consider future network investment requirements.

Full detailed consideration of this criterion has not been carried out at this stage and may not be as simple as the principles appear.

9.3. INCREMENTAL & STAND ALONE LEVELS

Network Charges to customer classes or individual customers are to be cross-subsidy free; ie prices should be greater than incremental costs but less than stand-alone costs of supply.

Again, extensive analysis has not yet been carried out in this area.

9.4. BALANCE OF ELEMENTS

The structure of prices (ie the balance of fixed, demand and energy components) is to be consistent with economic pricing principles.

As discussed in the earlier sections, it is unlikely that System Availability Charges as proposed cover the allocated costs that are driven by the existence or number of customers, rather than by their capacity required or used, or by their energy consumed.

Energy charges per se are relatively low for network services, but are used for franchise customers with simple metering as a proxy for demand, and to provide a similar proxy in dilution of the signals implicit in allocations according to demand.

For franchise customers, the energy charge is regarded partly as a proxy for demand, partly to recover postage stamped common costs, and partly to recover the amounts reduced from the allocated target System Availability Charge.

In PAWA Network's judgement, the balance is appropriate, though it differs from the target cost allocation in recovering less through System Availability and Demand related charges than the allocation suggests. Both these changes result in lessened variability for customers.

9.5. STABILITY OF PRICES

Annual changes in network charges faced by customers, including the effect of unbundling existing tariffs and the establishment of initial network tariffs, should not be excessive.

It is anticipated that Network Revenue Caps will remain substantially stable, with growth is system assets being offset by growth in customers or customer energy delivered.

PAWA Networks is unable to properly comment on the network charges which may have been implicit in previous bundled tariffs, save to suggest that commercial customers on higher overall tariffs were likely to represent a source of relative over-recovery compared with the recovery from domestic customers on a lower tariff. It is noted that smaller, and domestic customers make use of the whole length of the supply chain including the extensive low voltage network.