



**Eskom's Tariff Design
Methodology
2008/9**

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Introduction to Eskom's tariff design methodology

This document sets out Eskom's tariff design methodology for the 2008/9 Retail tariff restructuring plan. This document needs to read in conjunction with Eskom's strategic pricing direction. The strategic pricing direction gives the overall philosophy, principles and goals used to guide tariff development. This document gives the methodology used to determine the tariffs, aligned to the strategic pricing direction and the given strategic pricing objectives viz.

- Economic efficiency and sustainability: tariffs will contain cost reflective signals that promote economic efficiency and sustainability.
- Revenue recovery: tariff structures will not expose Eskom to unacceptable revenue risk and provide the means for adequate revenue recovery to ensure reliability of supply.
- Fairness and equity: tariffs will be designed to be as non-discriminatory as possible by taking into account the needs of all customers on a fair and equitable basis.

This document sets out the methodologies used in determining the tariffs in the proposed 2008/9 retail tariffs restructuring plan. The methodologies discussed in this document will therefore only be applicable to the standard tariffs if the proposed 2008/9 retail tariffs restructuring plan is approved by NERSA. Please refer to www.eskom.co.za/tariffs for definitions used in this document.

1 Overview of the tariff design methodology

The design of Eskom's tariff involves 7 primary steps:

1.1 The approved revenue requirement and volumes

The approved revenue requirement including the return for each Eskom division (Generation, Transmission and Distribution) is used as the total cost of the business to be recovered through the tariffs, based on submitted volumes.

The above costs are allocated in four main areas, energy, transmission network, distribution network and retail

1.2 Allocate energy cost

Energy costs are allocated to customers based on the Generation costs, consumption profiles and approved kWh volumes.

1.3 Allocate Transmission costs

Transmission costs are allocated based on the capacity in each transmission zone of each customer based on the Transmission tariff.

1.4 Allocate Distribution costs

Distribution costs are split between network and retail (customer service and administration) costs. The network costs are allocated based on capacity, the voltage of the supply and whether a supply is on a rural or urban network. The retail costs are allocated on the size of the supply.

1.5 Convert costs into retail tariffs

The costs that have been allocated are then converted into the tariff structure required, at cost reflective rates. The tariff structure used will depend on the customer type.

1.6 Rate impact analysis and scaling to include subsidies

The cost reflective rates are evaluated against the current tariff and adjusted where required to include allowable subsidies.

1.7 Test against revenue neutrality

The sum of all the rates and volumes calculated are tested against the approved revenue requirement to ensure revenue neutrality.

Each step is shown in the following diagram and detailed in the next Section.

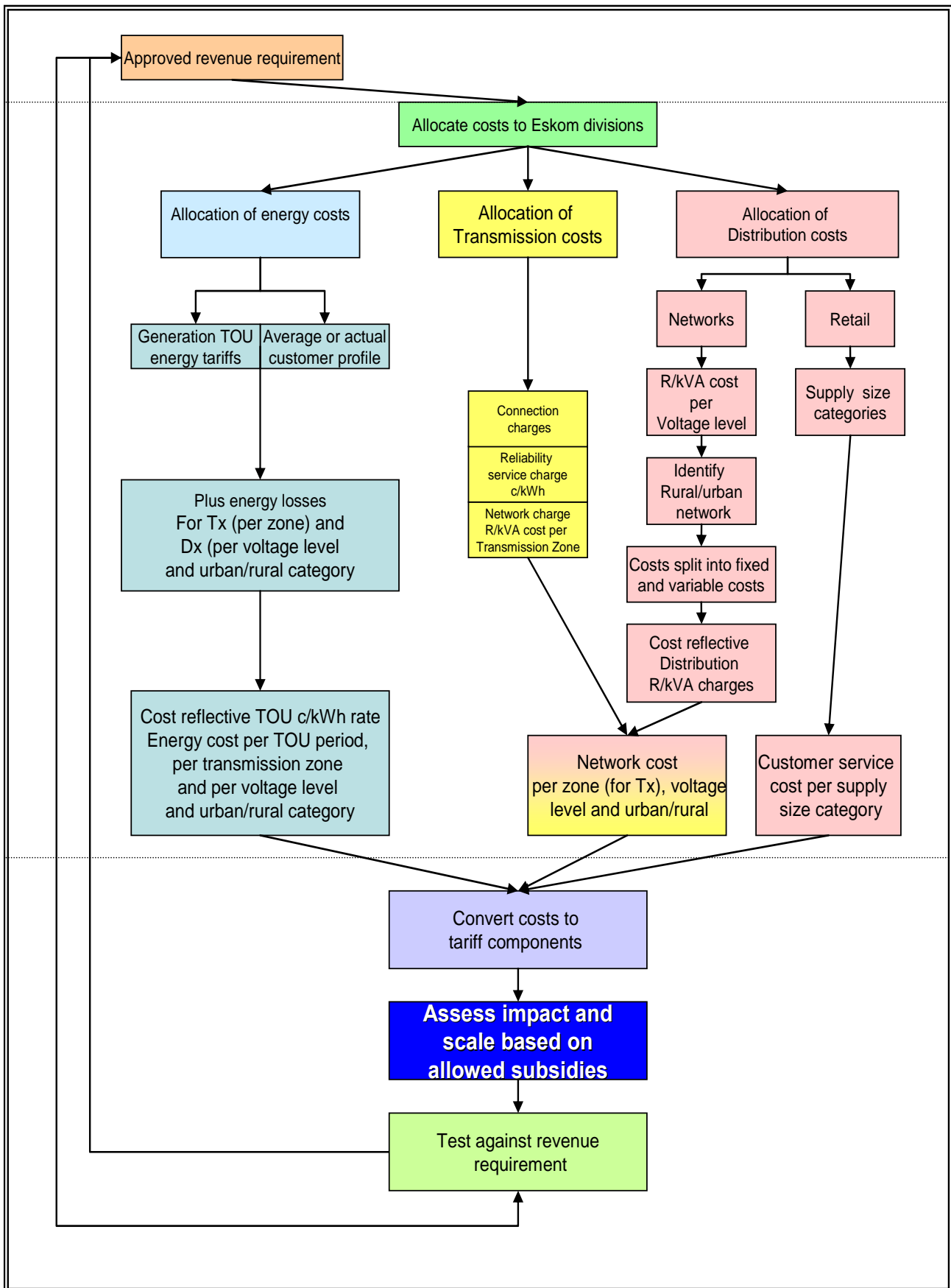


Figure 1 - Tariff design process

2 Design of Eskom's tariffs

2.1 Revenue requirement

The NERSA approved revenue requirement including the return for each Eskom division (Generation, Transmission and Distribution) is used as the total cost of the business to be recovered through the tariffs.

The approval of the revenue requirement by NERSA is separate from the tariff design process. The approval of the revenue requirement determines the allowed revenues (cost plus return) for Eskom and from this the average price increase. Each division in Eskom is financially ringfenced and regulated separately.

The tariffs are designed on the current financial year's revenue requirement and volumes. The sum of all the tariff rates multiplied by their units must balance back to the revenue requirement. This is what is referred to as "revenue neutral".

2.2 Allocation of costs across the Eskom divisions

The costs are allocated in four main areas, energy, transmission network, distribution network and retail

- Costs are allocated for each division to defined cost pools.
- Customer categories determined by capacity, voltage, geography, profile and current tariff and costs are pooled within these categories.
- Costs allocated are ultimately expressed in appropriate units based on the nature of costs and volumes- fixed or variable costs and R/kVA, c/kWh and R/customer.
- Energy and transmission costs allocated directly to the customers as a pass-through i.e. cost based on the Generation and Transmission tariffs.

2.2.1 Cost segmentation

Costs are allocated to identified pools or categories. These pools are based on underlying cost segments and do not discriminate on the economic sector of customer being served, but on significant differences in cost between each pool. Costs are broadly categorized as demonstrated in the following diagram:

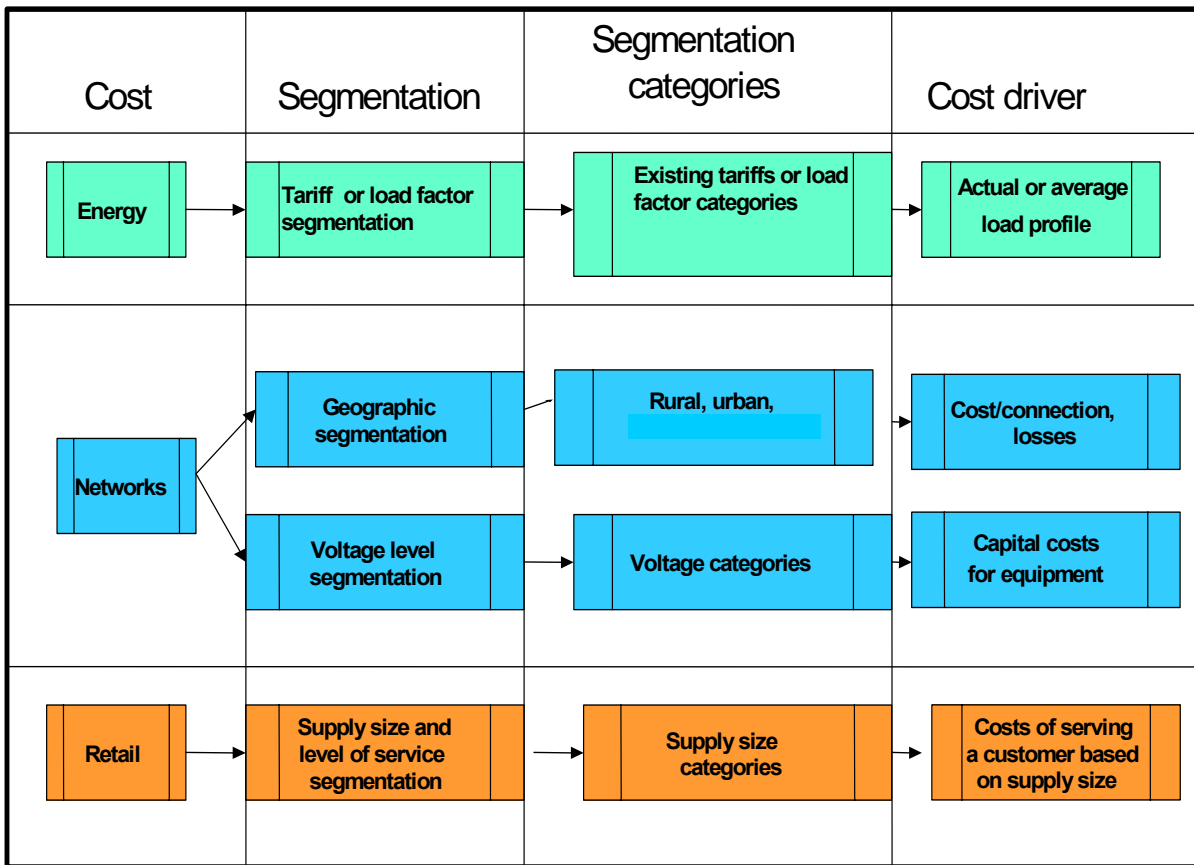


Figure 2 – Customer categories

- **Tariff or load factor segmentation (energy costs)**

Customers are segmented or categorized according to their existing tariff type. This is to ensure appropriate allocation and to allow for comparison to existing tariffs.

- **Geographic segmentation (network costs)**

The density of customers has an impact on Distribution’s cost per connection – the greater the density the lower the cost per connection. For this reason Eskom differentiates costs into rural and urban networks. This is to ensure that costs are allocated correctly to avoid or identify cross-subsidies between rural and urban supplies.

For Transmission the network costs are primarily impacted by the location of generators. For this reason transmission network costs are differentiated by zonal charges which represent these differences in cost.

- **Distance from source and losses**

The geographic position of a supply point has an impact on electrical losses: the further the point of supply is from the source of the supply, the higher the losses. As losses are a cost to the business, they are allocated to customer categories based on the amount of losses

determined. Losses over urban and rural networks are different and therefore different loss factors are associated with the different geographic positions. Voltage also has an impact on losses and this is discussed in the next section.

- **Voltage level segmentation**

Network costs and losses differ depending on the voltage level of the supply. The lower the voltage of the supply, the more electrical losses there are and the more network assets are needed to supply customers. Supplies at higher voltage levels therefore cost less to supply than supplies at lower voltage levels in absolute terms. Eskom's current voltage categories are applicable. Loss factors are represented at geographic and voltage levels.

- **Supply size and level of service segmentation**

Customers are segmented according to supply size and level of service delivered. This segmentation is related to retail or customer service related costs.

The next sections explain the allocation of the costs in for each division in detail.

2.3 Allocate energy costs

The energy purchase cost used is the Eskom Generation tariff which is TOU with differing rates in time periods and seasons. Distribution contracts with Eskom Generation for a forecast volume of energy, per season and time period and is required to pay for these volumes at the purchase tariff. This is a pass-through cost for Eskom Distribution. This energy cost is included in the Distribution revenue requirement as a cost based on the forecasted consumption.

The share of the total energy purchase cost attributable to each customer category is then allocated as a function of the time differentiated consumption of every customer segment at each voltage level and the loss differentiated purchase rates.

The result of this allocation is a TOU c/kWh value for each customer segment at each voltage level representing the energy purchase cost.

2.4 Allocate transmission costs

For transmission costs, Distribution is required notify the capacity required from the transmission system for the coming year and contracts with Eskom Transmission for this capacity. This capacity is the diversified demand of the Distribution's customers at the MTS level. This will be paid by Distribution to Transmission through a fixed annual network charge to Transmission based on reserved network capacity (refer to Transmission Network Grid code). Distribution is exposed to volume risk if the reserve capacities are incorrect or are changed.

The Transmission tariff (TUoS) to Distribution comprises:

- Network charges differentiation per transmission zone.
- A reliability service charge.
- Connection charges.

2.4.1 Allocate Transmission network costs

The embedded Transmission charges are calculated by dividing the (regulated) pass through network charges that Distribution will pay to the Transmission Division at the MTS level capacity, by the sum of the diversified demands of the downstream customers, adjusted for losses to reflect the demand at MTS level. This gives a lower rate for the embedded transmission network charge than the charge applied to Distribution by Transmission.

- The Transmission network charge is applied to the diversified demand at the MTS.
- The Transmission network charges are adjusted by Distribution Division to take into account the diversified demand of all the embedded customers of Distribution.
- If this network charge at the MTS level is applied to the undiversified demands of all customers, the result would be that Distribution receives more revenue for transmission costs than the actual cost to Distribution for this service.
- The effect of system losses also increases the customer's utilised capacity as seen at MTS level, where Distribution will purchase the transmission services on behalf of its customer. The customer's utilised capacity must therefore be increased by the Distribution loss factor for the appropriate transaction voltage.

The embedded Transmission network charges are geographically differentiated aimed at recovering the cost of the transmission system, i.e. >132 kV in different areas in South Africa. In the allocation of costs, the geographic differentiation is applied in accordance with the differentiation as set out in the approved Transmission tariff structure.

The Transmission network costs are allocated to each customer segment in each Transmission zone on a R/kVA basis. The table below gives the zonal charges applied.

Table 1 – Geographic differentiation of Transmission charges

Distance from Johannesburg	Zone	% Price Differential
0 to 300 km	0	0%
301 to 600 km	1	1%
601 to 900 km	2	2%
> 900 km	3	3%

The transmission network costs are calculated as follows:

Transmission network cost = UC (kVA) x distribution loss factor_{VU/R} x transmission network charge (R/kVA_{ZP})

Where

Z_P = applicable zone price

VU/R = at the relevant voltage level and urban/rural differentiation

Where Transmission network costs are shown as separate retail tariff charges, they will be shown per zone, per distribution network category (voltage, rural/urban).

Transmission determines the different loss factors for the different transmission zones to recover energy losses that occur in the delivery of energy.

2.4.2 Allocate reliability costs

Transmission provides reliability services to ensure the short-term reliability of supply to customers. The Transmission System Operator buys ancillary services (mostly from Eskom Generation) to achieve this. Ancillary services are the services, functions and activities that are essential for the stable and efficient operation of the power system. They include regulation, voltage support, reserves and black-start capability.

Distribution purchases reliability services for all embedded-Distribution-connected customers but excluding international customers from Transmission at MTS level, based on the energy flow at that level. To recover this cost from embedded customers, the measured energy at the customer's point of delivery is increased by the loss percentage for the applicable transaction voltage.

The cost of reliability services is recovered on a volumetric basis (c/kWh) and is allocated on this basis.

The cost of reliability services will be equal to the reliability services rate in the purchase tariff multiplied by the energy and increased for losses calculated as follows:

Reliability service (RS) cost = delivered energy x distribution loss factor VU/R x RS rate

Where

VU/R = at the relevant voltage level and urban/rural differentiation

2.4.3 Summary of Transmission cost allocation

The transmission costs are allocated to the Distribution customers as follows:

Table 2 – Allocation of Transmission charges

Transmission cost	Voltage differentiation	Urban/Rural differentiation	Transmission zone surcharge	How is it allocated
Transmission network charge	Yes - on Dx loss factor	Yes – on Dx loss factor	Yes	$R/kVA = UC \times \text{distribution loss factor}_{VU/R} \times \text{transmission network charge } Z_P$. Where: $Z_P = \text{applicable zone price}$
Reliability services charge.	Yes - on Dx loss factor	Yes - on Dx loss factor	No	$c/kwh = \text{Delivered energy} \times \text{distribution loss factor} \times \text{RS rate}$

2.5 Allocate Distribution network and retail costs

The Distribution costs, excluding generation and transmission purchase costs, are made up of the regulated revenue requirement for the Distribution business associated with capital (interest and depreciation) including refurbishment costs, operations and maintenance, retail and return costs for all standard supplies for the costs of all 132 kV and lower networks.

2.5.1 Distribution network costs

In order to design tariffs that are reflective of each customer (or customer pool) costs on the distribution system, costs are allocated according to their principal cost drivers. The principle cost drivers for the network business are the voltage at which customers receive supply, the location of the customer and the capacity of the supply.

Distribution network costs are therefore allocated according to Distribution’s current voltage level and geographic categories on a R/kVA basis. The geographic (locational and density signal) is provided through a rural and urban differentiation.

The voltage differentiation is based on the following categories:

Table 3 – Voltage level categories for cost allocation

VOLTAGE Urban	VOLTAGE Rural
< 500 V	< 500 V
≥ 500 V and < 66 kV	≥ 500 V and < 66 kV
≥ 66 kV and ≤ 132 kV	
> 132 kV	

Network costs are allocated at each voltage level using the average and excess statistical method. This method takes into account the impact of a customer’s capacity on average to the network, plus any peak impact. Diversity is therefore considered when allocating the costs.

The cost of supply methodology values all network assets at replacement cost, but the overall value is scaled to Eskom revenue requirements for capital provision. The above method considers the accounting lifetime of the assets. The revenue requirements for capital provision will be lower for older assets.

The Distribution network costs are made up of the following:

- Capital - the annualised replacement cost of the networks scaled to the capital provision in the revenue requirement (depreciation and interest charges).
- Overheads and operations and maintenance (O&M) – as included in the revenue requirement.
- Regulated return on assets – as allowed in the revenue requirement.

2.5.2 Distribution energy losses

Distribution “purchases” losses for all embedded network-service and its own retail customers and therefore must recover the cost of losses. Losses occur in both the Transmission and Distribution networks. The cost of electrical losses is unbundled and recovered as a function of (a) the appropriate loss factors for the relevant voltage level, whether urban or rural and Transmission zone and (b) Distribution cost of energy purchases cost on a time-of-use basis.

Since the purchase rates are currently differentiated according to the time-of-use, the measurements and calculations of losses will follow the same time-of-use periods. In calculating

the cost of these losses for customers, both transmission and distribution loss factors are considered in allocating the costs, as follows.

Cost for total losses

$$= \sum \{ \text{Delivered energy}_t \times (\text{distribution loss factor}_{\text{VU/R}} \times \text{transmission loss factor}_{z-1}) \times P_t \}$$

Where:

VU/R = at the relevant voltage level and urban/rural differentiation and

Z = transmission zone and

t = the appropriate peak, standard or off peak time period and

P_t = Purchase energy price for each PSO time period.

Transmission loss factors are geographically differentiated whereas the Distribution loss factors are based on estimated average losses per voltage category – voltage level and rural and urban networks differentiation as indicated in Table 4 below.

Table 4 – Distribution loss factors per voltage category

	Urban	Rural
Voltage	Loss Factor	Loss Factor
<500V	1.0912	1.1189
≥500V - <66kV	1.0560	1.0900
≥66 – ≤132 kV	1.0174	NA
> 132 kV	0.0000	NA

The Transmission loss factors are differentiated by zone. The Table 5 below sets out the current Transmission loss factors.

Table 5 – Transmission loss factors

Distance from Johannesburg	Zone	Loss factor
0 to 300 km	0	1.0112
301 to 600 km	1	1.0213
601 to 900 km	2	1.0316
> 900 km	3	1.0419

2.5.3 Retail costs

The customer service function includes the costs associated with marketing, meter reading, billing, and direct customer services and corporate overheads. These above mentioned costs are allocated per customer as the total cost divided by the number or weighted average number of the customer category imposing that cost component

These costs are allocated based on the capacity of the customer split between administration and service related costs into the following categories as shown in Table 6 below.

Table 6 – Retail cost categories

Small	≤ 100 kVA
Medium	>100 kVA and ≤ 500 kVA
Large	>500 kVA and ≤ 1 MVA
Very Large	> 1 MVA
Key Customers	As per qualification criteria

2.6 Convert costs into tariffs

The ideal electricity tariff would mirror the cost components in rate and nature (fixed, variable, time-of-use etc.) perfectly, for example where a cost is time dependent and variable, the charge reflects the exact cost of a time differentiated variable charge, or where a cost is fixed it is applied as a fixed charge.

The type of price components put together in a tariff package is the tariff structure. The ideal tariff structure would therefore follow the cost structure. A cost reflective tariff structure has all cost components reflected separately and charged according to the appropriate cost driver per appropriate rate unit. The philosophy used in designing the tariffs is contained in more detail in Eskom's strategic pricing direction, but is summarised as follows.

How customers are charged in a tariff is often dependent on simple practicalities, such as:

- Sophistication of customer needs
- Metering costs
- Affordability
- Impact of changing from the existing tariffs.
- Revenue risk (departing from the cost driver) and fairness

While there is metering that could measure just about any electricity related unit, it might not be practical or cost effective to install such metering due to the cost and/or the high volume of customers. Other considerations are as follows:

- Is it possible for the billing system to be programmed to be able to handle the tariff structure developed?
- What are the customer's overall needs?
- Do customers need a complicated tariff they could respond to, or do they just want to know what they owe each month?

Revenue risk and fairness are also important considerations. 75% of Distribution's own costs are fixed by the NERSA. A variable charge where costs are fixed may under recover costs if volume is

not realised (or vice versa) or will result in large energy users subsidising small energy users. When designing tariffs, this revenue risk and fairness issue needs to be appropriately handled.

2.6.1 Cost drivers and rate units

The allocated costs are expressed in understandable and measurable units, such as R/kVA or c/kWh. In order to determine what the unit should be, the most appropriate cost driver for a particular cost needs to be established. The following are the most common cost drivers:

Table 7 – Common cost drivers

- **R/customer/month or R/customer/day charge - typically for fixed customer service and administration costs.**
- **R/kVA - typically for fixed network costs.**
- **c/kWh - typically for active energy costs, return and costs that are more variable in nature.**
- **c/kVarh – for reactive energy costs.**

The cost driver is based on the nature of the cost, i.e. what influences the cost. This cost driver becomes the appropriate unit to be used to determine the cost per unit and ultimately the tariff structure to be used.

The following potential rate units may be used in the various tariff structures to recover the allocated cost

Table 8 – Matrix of potential rate units used to recover cost

	R/customer	c/kWh	c/kvarh	R/kVA	% of energy
Energy					
- Purchases	X	X	X	X	
Transmission					
- Network	X	X		X	
- Reliability		X		X	X
- Losses					X
Distribution					
- Capital	X	X	X	X	
- O & M	X	X		X	
- Overheads	X	X		X	
- Losses	X	X			X
- Return	X	X		X	
Retail					
- Service & admin.	X				

2.6.2 Cost reflective tariff structures

A tariff that is cost reflective in structure will look as follows:

Table 9 – Cost reflective tariff structure (Megaflex)

Energy charges <u>c/kWh</u>	Peak, standard and off-peak TOU <u>c/kWh</u> rates Seasonally and hourly differentiated. Differentiated per Transmission zone and per Distribution voltage category (at the Distribution and Transmission loss factors).
Transmission network charge <u>R/kVA</u>	<u>R/kVA</u> - based on highest annual capacity in all periods. Differentiated per Transmission zone and per Distribution voltage.
Transmission reliability services charge <u>c/kWh</u>	Separate <u>c/kWh</u> charge. Differentiated per voltage category (at the Distribution loss factors).
Distribution Network access charge <u>R/kVA</u>	<u>R/kVA</u> - charged on annual maximum demand. Differentiated per voltage category
Distribution Network demand charge <u>R/kVA</u>	<u>R/kVA</u> - based on actual demand in peak and standard periods. Differentiated per voltage category
Administration charges	<u>R/point of delivery/day</u> based on capacity
Service charges	<u>R/account/day</u> based on capacity

This will be the future structure of the Megaflex tariff. Tariffs that do not have this structure have bundled costs that may be recovered through different rates.

The recovery of costs and the rate units used for each of Eskom's tariffs is discussed further.

2.6.3 Appropriate tariff structures

2.6.4 Recovery of energy costs

- Energy costs including losses are mostly recovered through c/kWh charges either TOU, seasonal or single energy rates.
- For TOU tariffs they are recovered in the same structure (periods and seasons) as the generation purchase tariff, except for the proposed Homeflex tariff which will combine the off-peak and standard time periods i.e. have a peak and off-peak rates.
- For larger tariffs, the energy charges will be differentiated not only on a TOU basis, but also on voltage and transmission zone to take into account the different cost of losses.
- For smaller tariffs the energy costs are averaged across the tariff pool based on profile and seasonal usage into a single energy charge. The energy charge reflects the LV level and is also averaged on a national basis for transmission losses i.e. there is no zonal differentiation.
- Where consumption is very low or very consistent, energy charges may be recovered through fixed charges. This is not common and used where the cost of metering and meter reading is not warranted, such as public lighting tariffs and Landrate Dx.

- For the Nightsave tariffs, peak energy costs are recovered through a R/kVA charge based on a chargeable demand.

2.6.5 Energy losses

Electrical (technical) losses vary according to the voltage of the supply and the distance of the supply from the source. These technical losses on the transmission system as well as the distribution system must be recovered through the tariff. The cost of losses is recovered by applying the pre-determined average loss factors as a percentage of usage on all active energy related costs (c/kWh or R/kW) at different voltage levels and at different geographic positions.

- For the larger customer tariffs, loss factors will be applied to the relevant charges.
- For smaller customer tariffs, in order to minimise complexity, losses are bundled into the energy rates at the low voltage level.

Energy costs are recovered in each tariff as follows:

Table 10 – Recovery of energy costs

Energy costs	TOU c/kWh	Seasonal c/kWh	Single c/kWh	R/kVA	Differentiate by loss factors	R/day
Megaflex	X				X	
Miniflex and Ruraflex	X				X	
Nightsave Urban (Large and Small)		X		X	X	
Nightsave Rural		X		X	X	
Landrate 1,2,3,4/ Businessrate 1,2,3/ Homepower			X			
Homeflex* (piloted residential TOU tariff)	X					
Homelight/ Businessrate 4			X			
Public lighting tariffs						X
Landrate Dx						X

* This tariff is still in pilot mode, but the design has been included in this document.

2.6.6 Recovery of transmission reliability services cost

This cost is recovered as a c/kWh charge in all tariffs.

- It is bundled into the energy charge
- For the larger tariffs will include a differentiation based on the distribution loss factors.

The energy charge including the reliability services charge will be made up as follows:

(Energy purchase charge + distribution losses_{VU/R} + transmission losses_z) + (reliability services charge + distribution losses_{VU/R})

Where

Z_P = applicable zone price

VU/R = at the relevant voltage level and urban/rural differentiation

- For the smaller customer tariffs, the reliability services cost is averaged.

Reliability costs are recovered in each tariff as follows:

Table 11 – Recovery of reliability services cost

Energy costs	Fixed adder to the energy rate	Differentiate by loss factors
Megaflex	X	X
Miniflex and Ruraflex	X	X
Nightsave Urban (Large and Small)	X	X
Nightsave Rural	X	X
Landrate 1,2,3,4/ Businessrate 1,2,3/ Homepower	X	
Homeflex	X	
Homelight/ Businessrate 4	X	
Public lighting tariffs	X (converted to the fixed charge)	
Landrate Dx	X (converted to the fixed charge)	

2.6.7 Recovery of transmission network costs

The Transmission network charges, where unbundled, are passed on to the customer on a R/kVA basis, determined by allocating the applicable transmission charges to all Distribution's customers, based on their required annual maximum demand. The applicable rate at the Distribution level and after taking the effect of diversity into account, is determined in the cost allocation process.

The effect of system losses increases the customer's utilised capacity as seen at MTS level, where Distribution will purchase the transmission services on behalf of its customer. The customer's utilised capacity must therefore be increased by the Distribution loss factor for the appropriate transaction voltage.

This unbundled charge is based on the pass-through allocated cost as follows:

$$\text{Transmission network charge} = UC \text{ (kVA)} \times \text{distribution loss factor}_{VU/R} \times \text{transmission network charge (R/kVA}_{ZP})$$

Where

Z_P = applicable zone price

VU/R = at the relevant voltage level and urban/rural differentiation

The effect of system losses increases the customer's utilised capacity as seen at MTS level, where Distribution will purchase the transmission services on behalf of its customer. The customer's utilised capacity must therefore be increased by the Distribution loss factor for the appropriate transaction voltage. Transmission network costs are recovered in each tariff as follows:

Table 12 – Recovery of transmission network costs

Transmission network costs	Unbundled R/kVA network charges	Bundled in the R/kVA network access charge	Bundled in R/day network charge	Bundled in the energy rate	Differentiate by loss factors
Megaflex	X				X
Miniflex and Ruraflex		X			X
Nightsave Urban (Large and Small)	X				X
Nightsave Rural		X			X
Landrate 1,2,3,4/ Businessrate 1,2,3/ Homepower			X		
Homeflex			X		
Homelight/ Businessrate 4				X	
Public lighting tariffs			X		
Landrate Dx			X		

2.6.8 Recovery of distribution network costs

Network charges are derived from the network costs allocated to each customer category and recover distribution network costs and if bundled, also the transmission network costs (refer to the previous section). Network charges recover the total regulated allowed revenue excluding connection charges. The following describes how network charges are calculated.

Table 13 – Calculation of network charges

Distribution network costs	Capital (annualised cost of finance charges and depreciation for approved investment), operations and maintenance, overheads and return.
Total₁	The sum of all costs equals the revenue requirement for Distribution
- Connection charges	Sum of all connection charges
Total₂	Costs less connection charge
Network charges	<i>Total₂ divided by the relevant demand/consumption = the network charge</i>

R/kVA network charges reflect the maximum demand in the voltage categories and are differentiated at each voltage category.

The network charge is a function of the allocated cost divided by the demand. In order to mitigate any volume risk (if demand changes), the ideal would be to charge a customer a fixed network charge each month, but as discussed in the Strategic Pricing Direction, this approach has consequences and the following is taken into account:

- In the long run, not all of Distribution's costs are fixed and therefore making all the charges fixed gives an erroneous economic signal that consumption does not impact Distribution network costs.
- A large fixed charge, however cost-reflective it may be considered, is punitive to a customer with a poor load factor and is unpopular with customers.
- A large fixed charge creates a weaker marginal price signal – impacting DSM and real-time management of demand even though a fixed charge based on demand gives a continuous load management signal.
- A large variable charge completely exposes Distribution to a volumetric risk and creates a cross-subsidy from high consumption supplies to low consumption supplies.

In order to address these issues as fairly as possible, for most tariffs, the network charge is split into a fixed (network access) charge and a variable (network demand) charge.

The Distribution network access charge is based on:

50% of the network costs / Σ annual maximum demand

The network demand charge is based on:

50% of the network cost / Σ monthly chargeable demands.

For larger customers R/kVA charges are more commonly used to recover network related costs as a network charge and for smaller customers it is R/supply size/day or c/kWh.

The fixed charge is called a network access charge (NAC) as it provides a signal associated with providing a customer access at any time to the demand reserved through a notified maximum demand. This charge is levied in all time periods to ensure that customers who use significant demand in off-peak periods end up making the correct contribution to the shared cost of the network providing their NMD.

The NAC may or may not include the Transmission costs depending on whether the network NAC is unbundled or not.

The network demand charge (NDC) has a DSM signal as it not charged in the off-peak periods. The NDC is voltage-differentiated, but does not have loss factors applied to the charge as the Transmission cost to which the loss factor is applicable is allocated to the fixed network charge.

- This network charge may unbundled into three charges; a fixed transmission network charge, a fixed distribution (network access) charge and a variable distribution (network demand) charge.
- The Distribution only R/kVA NAC excludes the transmission network charge and is determined as follows:

Distribution NAC

[50% of total allocated distribution network cost] $V_{U/R} \div \Sigma$ Annual maximum demand in all time periods $V_{U/R} = R/kVA$ network access charge $V_{U/R}$

Where

$V_{U/R}$ = at the relevant voltage level and urban/rural differentiation

- The Transmission and Distribution bundled R/kVA NAC is determined as follows:

Bundled NAC

$$([50\% \text{ of total allocated distribution network cost } v_{U/R}] + [\text{Transmission network charge } (R/kVA_{ZP} \times (\text{distribution loss factor } v_{U/R}))] \div \Sigma \text{ Annual maximum demand in all time periods}$$

$$v_{U/R} = R/kVA \text{ network access charge } v_{U/R} (ZP)$$

Where

VU/R = at the relevant voltage level and urban/rural differentiation

ZP = applicable zone price

- For smaller customers the NAC is recovered as a R/supply size/ day charge as follows:

$$\% \text{ of total Distribution network costs } \div \Sigma \text{ demands determined for the customer segment } \times \text{ ADMD or notified demand per customer category.}$$

- A R/kVA NDC (which does not include transmission costs and therefore no loss factor applied) is determined as follows:

NDC

$$50\% \text{ of total allocated distribution network cost } v_{U/R} \div \Sigma \text{ Monthly maximum demands in all time periods } /12$$

$$v_{U/R} = R/kVA \text{ network demand charge } v_{U/R}$$

Where

VU/R = at the relevant voltage level and urban/rural differentiation

ZP = applicable zone price

- For the Miniflex, Ruraflex, Homepower, Homeflex, Landrate, Nightsave Rural the NDC is an energy charge i.e. the above costs are divided by the consumption allocated to the customer category.

The following table sets out the different rate units applicable to network charges:

Table 14 – Recovery of Distribution network costs

Distribution network costs	Unbundled distribution network charges	Bundled in the energy rate	Bundled in a R/day network charge	Subject to Transmission loss factor	Subject to voltage differential
Megaflex	X				X
Miniflex and Ruraflex	X	X			X
Nightsave Urban (Large and Small)	X				X
Nightsave Rural	X	X			X
Landrate 1,2,3,4/ Businessrate 1,2,3/ Homepower		X	X		
Homeflex		X	X		
Homelight/ Businessrate 4		X			
Public lighting tariffs			X		
Landrate Dx			X		

2.6.9 The Distribution network levy

Due to the historical current voltage differentials – both in the voltage categories and percentage differences between categories – Eskom’s retail tariffs contain cross subsidies from higher voltage customers to lower voltage customers.

To ensure that the same or similar level of cross-subsidies remains when customers are supplied on an unbundled tariff, the NERSA Board approved the implementation of a Distribution network levy (DNL) in order to make the inherent and fair contribution to the subsidies of lower voltage customers by customers connected at voltages above 132 kV, more explicit and to preserve the previous contribution of these customers to the subsidisation, previously made in the retail tariffs. The DNL is also aimed at preventing uneconomic bypass of the Distribution networks.

These customers have contributed historically to the network cost-pool of the distribution business and it is important to retain this contribution to subsidise lower voltage customers.

In terms of the tariff design for the 2008/9 retail tariffs restructuring plan no NAC costs were allocated to the > 132 kV Distribution customers. This means that > 132 kV connected supplies will no longer have a NAC. The Distribution NDC is, however, allocated and therefore still applicable.

2.6.10 Recovery of service and administration costs

Customer service and administration costs are costs associated with billing, the meter cost, meter reading and customer service. These costs are allocated to customers mainly based on their size category as this is the cost driver (the bigger the customer, the more expensive the meter, the service etc.).

- Customer service and administration costs are separately charged for in the larger customer tariffs. The customer service costs are based on the number of accounts and the administration costs based on the number of points of delivery.
- For the smaller customer tariffs, these costs are recovered through a combined charge per account.
- These costs are usually recovered as R/supply size/day charges - based on supply size or NMD except in the single energy rate tariffs and are determined as follows:

The allocated costs are divided amongst the accounts or points of delivery for that size category that receives this level of service to calculate this charge.

The following table sets out the different rate units applicable to service charges:

Table 15 – Recovery of service and administration costs

	R/day account	per	R/day point delivery	per of	Bundled in the energy rate
Megaflex	X		X		
Miniflex and Ruraflex	X		X		
Nightsave Urban (Large and Small) and Nightsave Rural	X		X		
Landrate 1,2,3,4/ Businessrate 1,2,3/ Homepower	X				
Homeflex	X				
Homelight/ Businessrate 4/					X
Public lighting tariffs					X
Landrate Dx	X				

2.6.11 Reactive energy charge

It is very difficult to quantify the costs associated with providing reactive energy. In most cases only a signal can be provided to ensure that customers manage their power factor correctly, such as reactive energy charges or charging for demand costs on a R/kVA basis and not R/kW. In order

to preserve the reactive energy signal a manufactured reactive energy charge is determined and the calculated revenue from this charge is offset against the revenue recovered in the energy rate.

2.7 Assess impact and scale to allowed subsidies

The above exercise determines a set of rates that are cost-reflective. In order to minimise the impact on customers due to affordability or not to cause a large change between their current tariffs and the cost reflective rates, the rates are scaled.

Tariffs receive subsidies have their rates reduced and tariffs that make a contribution to subsidies have the subsidies added as part of their tariff.

The following table shows which tariff receives subsidies and which tariffs contribute to subsidies and whether these subsidies are expressed explicitly as a c/kWh charge called the rate rebalancing levy or inherent in the energy rates.

Table 16 – Contribution to subsidies

	Contribute through the rate rebalancing levy	Contribute in the energy rates	Receive
Megaflex	X		
Miniflex	X		
Nightsave Urban (Large and Small)	X		
Ruraflex, Nightsave Rural			X
Landrate			X
Businessrate 1,2,3, Homepower, Homeflex		X	
Homelight/ Businessrate 4			X
Public lighting tariffs			

2.7.1 Rate rebalancing levy

The rate rebalancing levy is determined as the difference between the cost reflective tariff and the final tariff expressed as a c/kWh value ie it is the contribution to socio-economic subsidies in other tariffs.

The rate rebalancing levy is however, not equal in all tariffs due to historical reasons – in particular between Nightsave Urban and Megaflex. The only way to get these two tariffs aligned would be to increase Megaflex and reduce Nightsave. However, as the majority of larger customer and municipalities are on Megaflex any marked increase in this tariff would not be supported. Eskom proposes to slowly align the tariffs through a slight increase in the Megaflex and Miniflex tariffs and an equal reduction on the Nightsave tariff Urban (Large and Small).

2.8 Test against revenue neutrality

Once the rates are adjusted for subsidies, they are then tested for revenue neutrality ie, the sum of all rates multiplied by the approved volumes (kVA, kWh, Customer numbers) must be equal to the approved revenue requirement.

This exercise is conducted for all customers using data at the most available level of granularity. The rates are scaled to ensure that the revenue requirement is maintained.

2.9 Summary of the tariff structures used

The following tables show the tariff structures per tariff based on the latest tariff design.

Table 17 – Tariff structures for TOU tariffs

	Megaflex	Miniflex/Ruraflex
Retail charges	Based on capacity	Based on capacity
• Administration charges	R/point of delivery/day	R/point of delivery/day
• Service charges	R/account/day	R/account/day
Energy charges	Includes: <ul style="list-style-type: none"> • TOU based energy costs • Reliability service charge • Customer service overheads, abnormal 	Includes: <ul style="list-style-type: none"> • TOU based energy costs • Variable network costs (see network demand charge) • Reliability service charge • Customer service overheads,
	TOU c/kWh: <ul style="list-style-type: none"> • Rates peak, standard and off-peak rates, seasonally and hourly differentiated. • Transmission and distribution loss factors applied to rates 	TOU c/kWh: <ul style="list-style-type: none"> • Rates peak, standard and off-peak rates, seasonally and hourly differentiated. • Transmission and distribution loss factors applied to rates.
Reactive energy charges	Pricing signal to recover reactive energy costs	Pricing signal to recover reactive energy costs
	c/kvarh: <ul style="list-style-type: none"> • Applicable in High demand season only 	c/kvarh: <ul style="list-style-type: none"> • Applicable in High demand season only
Transmission network charges	Recovers Transmission related network charges	Recovers Transmission related network charges
• Transmission network charge	R/kVA charged on utilised capacity: <ul style="list-style-type: none"> • Differentiated per transmission zone 	R/kVA charged on utilised capacity: <ul style="list-style-type: none"> • Differentiated per transmission zone • Included in the Distribution NAC
• Transmission reliability services charge	c/kWh: <ul style="list-style-type: none"> • Recovered in energy charge • Differentiated by Distribution loss factor 	c/kWh: <ul style="list-style-type: none"> • Recovered in energy charge • Differentiated by Distribution loss factor
Distribution network charges	Recovers Distribution network costs	Recovers Distribution network costs and Transmission NAC
• Network access charge	R/kVA charged on utilised capacity: <ul style="list-style-type: none"> • Recovers fixed costs • Differentiated by voltage. 	R/kVA charged on utilised capacity: <ul style="list-style-type: none"> • Recovers fixed Distribution costs plus Transmission NAC • Distribution costs differentiated by voltage. • Transmission network costs differentiated by Transmission zone
• Network demand charge	R/kVA charge based on maximum demand in peak and standard periods: <ul style="list-style-type: none"> • Recovers variable costs • Differentiated by voltage 	c/kWh included in energy rates: <ul style="list-style-type: none"> • Recovers variable costs • Differentiated by voltage
Levies	Separate c/kWh charge	Separate c/kWh charge

Table 18 – Tariff structures for non-TOU demand-based tariffs

	Nightsave Urban (Small and Large)	Nightsave Rural
Retail charges	Based on capacity	Based on capacity
• Administration charges	R/point of delivery/day	R/point of delivery/day
• Service charges	R/account/day	R/account/day
Energy charges	Includes: <ul style="list-style-type: none"> • TOU based energy costs excluding peak costs • Reliability service charge • Customer service overheads 	Includes: <ul style="list-style-type: none"> • TOU based energy costs excluding peak costs • Reliability service charge • Customer service overheads, abnormal
	c/kWh <ul style="list-style-type: none"> • Seasonally differentiated. • Transmission and distribution loss factors applies to rates 	c/kWh <ul style="list-style-type: none"> • Seasonally differentiated. • Transmission and distribution loss factors applies to rates
Energy demand charge	<ul style="list-style-type: none"> • Peak energy costs / chargeable demand • Allocated network demand costs 	<ul style="list-style-type: none"> • Peak energy costs / chargeable demand • Allocated network demand costs
	R/kVA charge based on maximum demand in peak and standard periods: <ul style="list-style-type: none"> • Seasonally differentiated • Transmission and distribution loss factors applied to above rates. 	R/kVA charge based on maximum demand in peak and standard periods: <ul style="list-style-type: none"> • Seasonally differentiated • Transmission and distribution loss factors applied to above rates. • Network costs voltage differentiated
Transmission network charges	Recovers Transmission related network charges	Recovers Transmission related network charges
• Transmission network charge	R/kVA charged on utilised capacity: <ul style="list-style-type: none"> • Differentiated per transmission zone 	R/kVA charged on utilised capacity: <ul style="list-style-type: none"> • Differentiated per transmission zone • Included in the Distribution NAC
• Transmission reliability services charge	c/kWh: <ul style="list-style-type: none"> • Recovered in energy charge • Differentiated by Distribution loss factor 	c/kWh <ul style="list-style-type: none"> • Recovered in energy charge • Differentiated by Distribution loss factor
Distribution network charges	Recovers Distribution network costs	Recovers Distribution network costs and Transmission NAC
• Network access charge	R/kVA charged on utilised capacity: <ul style="list-style-type: none"> • Recovers fixed costs • Differentiated by voltage. 	R/kVA charged on utilised capacity: <ul style="list-style-type: none"> • Recovers fixed Distribution costs plus Transmission NAC. • Distribution costs differentiated by voltage. • Transmission network costs differentiated by Transmission zone.
• Network demand charge	R/kVA charge based on maximum demand in peak and standard periods: <ul style="list-style-type: none"> • Recovers variable costs • Differentiated by voltage 	R/kVA charge based on maximum demand in peak and standard periods <ul style="list-style-type: none"> • Included in the energy demand charge • Differentiated by voltage
Levies	Separate c/kWh charge	Separate c/kWh charge

Table 19 – Tariff structures for residential

	Homelight	Homepower	Homeflex (Future Tariff)
Retail charges	Not size-differentiated	Not size-differentiated	Not size-differentiated
• Administration charges	c/kWh – included in energy rate	Included in service charge	Included in service charge
• Service charges	c/kWh – included in energy rate	R/point of delivery/day	R/point of delivery/day
Energy charges	Includes all costs	Includes: <ul style="list-style-type: none"> • Average energy cost based on a representative profile • Distribution variable network costs (see network demand charge) • Reliability services charge • Customer service overheads, abnormal, return plus tax 	Includes: <ul style="list-style-type: none"> • TOU based energy costs • Distribution variable network costs (see network demand charge) • Reliability service charge • Customer service overheads, abnormal, return plus tax
	<ul style="list-style-type: none"> • Charges differentiated based on the supply size (Amp) • Tariff more expensive for higher supply sizes • Rates receive a subsidy 	c/kWh <ul style="list-style-type: none"> • One single rate expressed at the low voltage level • Make a contribution to subsidies 	TOU c/kWh: <ul style="list-style-type: none"> • Rates peak, standard and off-peak rates, seasonally and hourly differentiated. • Expressed at the low voltage level
Reactive energy charges	N/A	N/A	N/A
Transmission network charges	Recovers Transmission related network charges	Recovers Transmission related network charges	Recovers Transmission related network charges
Transmission network charge	Included in energy rate	Included in network access charge	Included in network access charge
Transmission reliability services charge	Included in energy rate	Included in energy rate	Included in energy rate
Distribution network charges	Recovers Distribution network costs	Recovers Distribution network costs and Transmission NAC	Recovers Distribution network costs and Transmission NAC
Network access charge	Included in energy rate	R/customer/day – based on NMD (kVA)	R/customer/day – based on NMD (kVA p)
Network demand charge	Included in energy rate	Included in energy rate	Included in energy rate
Levies	NA	Included in energy rate	Included in energy rate
Subsidies	Included in energy rate	NA	NA

Note: No voltage or loss differentiation as charges are averaged at the low voltage level and rates include these costs.

Table 20 – Tariff structures for non-TOU small (non-residential) supplies

	Landrate	Businessrate
Retail charges	Not size-differentiated	Not size-differentiated
Administration charges	Included in service charge	Included in service charge
Service charges	R/point of delivery/day	R/point of delivery/day
Energy charges	Includes energy [customer service overheads] and variable distribution network costs (network demand charge)	Includes energy [customer service overheads, abnormal] and transmission network costs
	c/kWh - One single rate	c/kWh -One single rate
Reactive energy charges	N/A	N/A
Transmission network charges	Recovers Transmission related network charges	Recovers Transmission related network charges
Transmission network charge	Included in network charge	Included in network charge
Transmission reliability services charge	Included in energy rate	Included in energy rate
Distribution network charges	Recovers Distribution network costs and Transmission NAC	Recovers Distribution network costs and Transmission NAC
Network access charge	R/customer/day – based on NMD (kVA)	R/customer/day – based on NMD (kVA)
Network demand charge	Included in energy rate	Included in the network access charge

Note: No voltage or loss differentiation as charges are averaged at the low voltage level and rates include these costs.

Table 21 – Non-metered supplies

	Landrate Dx	Public Lighting
Retail charges	Based on Landrate 4	Not size-differentiated
Administration charges	Included in service charge	Included in energy charge
Service charges	R/point of delivery/day	Included in energy charge
Energy charges	Includes energy, transmission and distribution network costs (network demand charge)	Includes energy, transmission and distribution network costs (network demand charge)
	Charged a fixed value per month based on 200 kW per month	<ul style="list-style-type: none"> Charged a fixed value Expressed at the low voltage level x fixed level of consumption Rate dependant on tariff option (24 hours or All Night)
Reactive energy charges	N/A	N/A
Transmission network charges	Recovers Transmission related network charges	Recovers Transmission related network charges
Transmission network charge	Included in network access charge	Included in energy rate
Transmission reliability services charge	Included in energy rate	Included in energy rate
Distribution network charges	Recovers Distribution network costs and Transmission NAC	Recovers Distribution network costs and Transmission NAC
Network access charge	R/customer/day – based on supply size (kVA or Amp)	<ul style="list-style-type: none"> Included in energy rate Note excludes all costs associated with lighting infrastructure
Network demand charge	Included in energy rate	Included in energy rate

2.10 Abbreviations

c/kvarh	Cents per kilovolt-ampere reactive hour
c/kWh	Cents per kilowatt-hour
DSM	Demand side management
DUoS	Distribution use of system charges
HV	High voltage or high-voltage
kVA	Kilovolt-ampere
kWh	Kilowatt-hour
LV	Low voltage or low-voltage
NAC	Network access charge
NDC	Network demand charge
MFMA	Municipal finance management Act
MVA	Megavolt-ampere
NERSA	National Energy Regulator of South Africa
NMD	Notified maximum demand
RRL	Rate-rebalancing levy
R/kVA	Rand per Kilovolt-ampere
TOU	Time of use or time-of-use
TUoS	Transmission use of system charges