



**AMEU Convention
25 – 27 August 2003
Network Services for Active
Load Control Customers**

Network Services for Active Load Control (ALC) customers.

1. Background

- 1.1 Customers with active load control capability are known as **Active Load Control (ALC) customers**. These customers are able to apply any number of real time technologies (individually or jointly) to manage their loads on the Distribution (Dx) system. These technologies include, but are not limited to, self-dispatching of own generation, self-dispatching of alternative energy sources that do not flow through the Eskom Distribution networks, geyser ripple control etc.
- 1.2 Customers practicing active load control often have network capacity and generation reserve requirements that are different from other customers. Furthermore, some ALC customers (typically customers with alternative energy sources) may contract for the sale of electricity to another customer or may want to supply his own facilities located elsewhere. Such an ALC customer will be charged for network services rendered by Eskom.
- 1.3 Until now the pricing of network services and generation standby charges was contained in Eskom's non-scheduled tariffs in accordance with approved Eskom directives. Eskom has now promulgated the pricing of energy sales, network and generation standby charges for ALC customers for 2003 and this will be implemented for all customers in this category once approved by the National Electricity Regulator (NER).

2. Scope

- 2.1 Network services for ALC customers will be applicable to Eskom customers with active load control schemes and who may consequently have non-standard requirements for network capacity and generation reserves.

3. Definitions and abbreviations (Refer to Figure 1 on page 4)

- 3.1 **Additional Energy** is energy consumed over and above the customer's notified normal load (NNL). This is expected to happen when the customer's load control scheme is out of order and the customer elects not to reduce load to NNL.
- 3.2 **Additional Capacity** is network capacity specifically contracted for by the customer to ensure that outages of his load control schemes can be met with back-up capacity from Eskom Distribution.
 - 3.2.1 **Long-term Capacity** refers to network or generation capacity reserved for the customer to supply his regular load (i.e. NNL) as well as any capacity specifically contracted to be available in the event of the customers' ALC systems being inoperative. (Also see Reserved Capacity).
 - 3.2.2 **Short-term Capacity** is network or generation capacity that the customer may from time to time need over and above his long-term capacity in order to meet short-term increased capacity requirements that result from the in-operability of the customer's ALC equipment.
- 3.3 **Firm network service** in this instance does not refer to N-1 planning standard or premium supplies as defined in Eskom Distribution's Recovery of Capital Costs Policy, but implies that a required amount of network capacity is reserved on Eskom's network. Firm network service may only be interrupted for system emergencies. For firm transactions, network service charges shall cover the full-embedded cost of Eskom.

- 3.4 Long-term network service transactions** take place over a period of one year to several years. The duration could allow for the building of new infrastructure.
- 3.5 Network charge** is a fixed charge payable every month, whether electricity is consumed or not, and is a contribution towards Eskom's fixed network capital costs. Where applicable, this charge is based on the utilised capacity, which is the greater of the customer's reserved capacity or actual maximum demand registered during the previous 12 months, but excluding usage of un-firm network services.
- 3.6 Non-Eskom Generator (NEG)** is a customer connected to the networks of the Distribution Group who has his own on site generation or who has access to generation from a party other than Eskom, e.g. an Independent Power Producer (IPP). Customers who operate embedded generation (including IPPs connected to the customer's networks) must comply with the latest version of Eskom Directive ESKAGAAG2: "MINIMUM REQUIREMENTS FOR THE CONNECTION OF NON-ESKOM GENERATING PLANT TO THE ESKOM ELECTRICAL NETWORKS".
- 3.7 Non-Firm network service**, having less priority than a firm network service, will be interruptible based on system conditions and Eskom's ability to meet the load requirements of its full service customers. Non-Firm network services would typically require the expansion/strengthening of networks to convert to a firm network service. This means that no guarantee can be given that the load will be supplied, even under healthy network conditions.
- 3.8 Normal Load** see Notified Normal Load (NNL)
- 3.9 Notified Maximum Demand (NMD)** is the peak demand that could possibly be imposed on the Distribution system when the ALC customer's load control scheme is inoperative and without the customer taking any other measures (such as load shedding) to attempt keeping the load to within NNL.
- 3.10 Notified Normal Load (NNL)** is the maximum load that the customer expects to purchase from Eskom after allowance for the customer's normal ALC operation. This load can be specified either as a half-hourly load profile, for Real Time Pricing (RTP) customers, or as a notified annual demand for other customers.
- 3.11 Real Time Energy Price** is the price determined daily from the pool price and is applicable to Real Time Pricing (RTP) customers.
- 3.12 Reserved Capacity**
- 3.12.1 Reserved Generation Capacity** is long-term generation capacity that Distribution specifically reserves on Eskom's generation system, in addition to NNL, to be available to the customer under system healthy conditions.
- 3.12.2 Reserved Network Capacity** is the sum of NNL and long-term network capacity and is reserved on the Distribution and Transmission (Tx) systems for the exclusive use of the customer under system healthy conditions.
- 3.13 Short-term network service transactions** may be as short as a few hours to as long as one year. These transactions are not associated with the creation of additional infrastructure.
- 3.14 Standard charges** are a set of charges used throughout Eskom with the aim of recovering the cost of standard operational work done.
- 3.15 Transaction voltage** is the lowest voltage at which Eskom's networks interface either with the ALC customer or the energy source (i.e. the lowest voltage of either the take-off point or injection point).

3.16 Wholesale Electricity Pricing System (WEPS) This is a pricing system that unbundles most of the cost components of electricity supply, in particular the cost of energy generation (by Eskom's Generation Division) and transmission network services (by Eskom's Transmission division).

3.17 Wheeling is the term used for the transportation of energy from one party to another over the networks of a third party. The owner of the networks is entitled to compensation for the use of his assets. The **Wheelee** is defined as the owner of the energy transported and the **Wheelor** is defined as the party over whose network the wheeling transaction will take place.

4. Load contract for ALC customers

When negotiating the supply of electricity to an ALC customer, the following parameters shall be contracted for (over and above the normal contract conditions), as illustrated below:

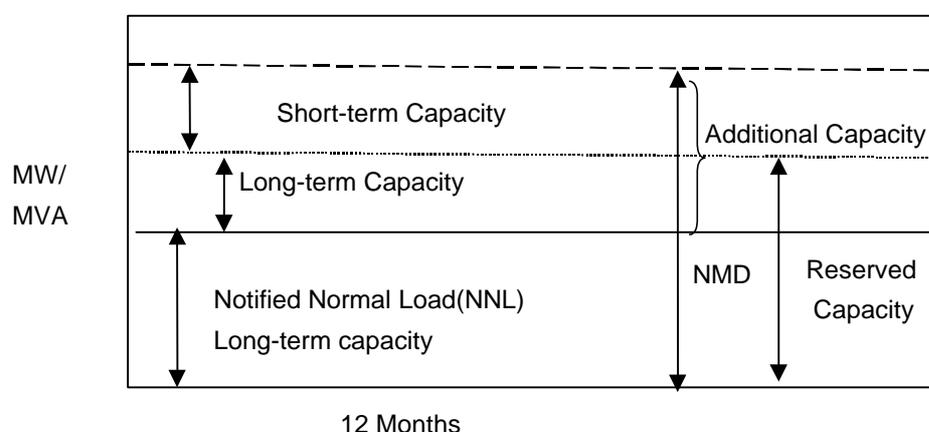


Figure 1

- 4.1 The customer's **notified normal load (NNL)**, based on normal active load control system being in operation, e.g. normal self-generation output, ripple control in use etc.
- 4.2 The customer's **additional capacity requirements**. (The increased load expected when the customer's generation or ALC system fails or is taken out of service for planned maintenance should be included in the additional requirements). Customers may choose to specify long-term capacity of zero, in which case the customer must take steps to limit his load to the NNL during ALC system outages.
- 4.3 The customer's **notified maximum demand (NMD)** which is the greater of the sum of:
- **NNL plus**
 - long-term capacity **plus**
 - short-term capacity **or**
 - peak generation injected into the Eskom system.

The NNL plus long-term capacity (i.e. reserved network capacity) will determine the ultimate sizing of the network and can only be increased by further capital investment with the associated project lead times to be considered.

- 4.4 The NNL may be changed on an annual basis, subject to project lead times where network strengthening may be required. An increase in NNL may require the re-calculation of capital payments. The recovery of such capital expenditure will be in accordance with Eskom Distribution's Recovery of Capital Costs Policy.

- 4.5 Only customers who are on a 2-part Real Time Pricing (RTP) tariff may be allowed to specify their normal load and standby requirements in the form of an hourly load profile. The load profile shall be contracted for a period equal to the profile required in terms of the customer's RTP contract, which is normally one calendar year.

5. Pricing of energy sales, network and generation standby charges for ALC customers

5.1 Standard charges

- 5.1.1 ALC customers are required to pay the connection charges that would normally be applicable for any other customer in terms of Eskom Distribution's Recovery of Capital Costs Policy.
- 5.1.2 The cost of upgrading existing meters shall be for the customer's account on a cash up-front basis.

5.2 Energy charges

- 5.2.1 One of Eskom's promulgated retail tariffs will be applicable for the NNL of the customer, unless a Special Pricing Agreement (SPA) has been negotiated and approved. Energy supplied with respect to NNL will be charged for at the applicable tariff rates, which implies that:
- 5.2.1.1 For RTP customers this is all energy supplied up to the hourly load profile (called the customer baseline load or CBL for these customers).
 - 5.2.1.2 For non-RTP customers this is all energy supplied up to the NNL, which is a straight-line profile for the year.
 - 5.2.1.3 For bundled tariffs, all the normal tariff components will be applicable up to the NNL.
 - 5.2.1.4 For tariffs unbundled into network and energy charges, the network charges will be applicable up to the NNL capacity.
- 5.2.2 Energy sales to an ALC customer, over and above NNL, will be priced to reflect the cost of energy only. This **additional energy** supplied in excess of the CBL for 2-part RTP customers or the NNL for other customers shall be charged for in one of the following two ways:
- 5.2.2.1 The Real Time Energy Price for 2-part RTP customers.
 - 5.2.2.2 Eskom's Distribution's bulk energy purchase price from Generation, adjusted for system losses, plus a retail mark-up.
- 5.2.3 Customers with plant capable of controlling power factor (e.g. generation or capacitor banks) shall ensure that the power factor shall under no circumstances be leading. Reactive energy shall be charged for in terms of Distribution's standard tariffs. Reactive energy consumed as part of additional energy shall be charged at the rate applicable to Megaflex.

5.3 Charges associated with Distribution (Dx) network services:

- 5.3.1 The cost of network capacity to supply NNL is recovered through the normal Eskom retail tariff rates. This includes the cost of transmission network capacity that Distribution has to reserve on behalf of the customer.

5.3.2 The network cost associated with additional capacity requirements (in excess of the NNL) is separated into **short-term** and **long-term network capacity** requirements.

5.3.2.1 The cost of **short-term network capacity** is derived from the short run marginal cost of this capacity, which is deemed to be equal to zero. Distribution shall not be under any obligation to make this capacity available or to include this capacity requirement into the long-term network planning. Short-term network capacity, at zero cost, will therefore only be made available if and when that happens to be available on the system. Customers who wish to include their short-term capacity requirements into the network planning base, can do so by contracting for it as part of reserved network capacity.

5.3.2.2 **Long-term network capacity** will be charged to customers at full-embedded cost. The charge for long-term network capacity will depend on the customer's normal tariff structure:

- i. Where the tariff is unbundled into a cost-reflective network and energy charge, the long-term network capacity charges will be equal to the regular network charges in accordance with Eskom's Schedule of Standard Prices.
- ii. Where the tariffs are still bundled, or the network charge introduced is being phased in, the reserved network capacity has to be differentiated into capacity to meet NNL and long-term network capacity.
 - The charge for network capacity up to NNL is recovered through the regular bundled tariff.
 - The cost for long-term network capacity is recovered through a Dx network services charge which is a voltage differentiated capacity based charge (R/kVA), based on the ALC customer's reserved network capacity. The Dx network services charge will include the cost of refurbishment, operations and maintenance. The customer will therefore not be required to make additional capital contributions in the event of the networks being refurbished.

5.3.2.3 Should any new Distribution network investment be required to support the non-standard requirements for network capacity, the cost of that investment will be recovered in terms of Eskom Distribution's Recovery of Capital Costs Policy. Any capital charges levied by Transmission with regard to their networks will be passed to the ALC customer.

5.4 Charges associated with Transmission (Tx) network services:

5.4.1 Eskom Distribution reserves a certain capacity at each Main Transmission Station (MTS) and pays for this reserved network capacity as a Transmission network services charge. The Transmission network services charge is differentiated into two components:

5.4.1.1 A Tx network charge (TxNC), which is a geographically differentiated charge aimed at recovering the cost of the transmission system, 220 kV and higher. The geographic differentiation will follow the geographic differentiation during the phasing in of WEPS (Wholesale Electricity Pricing System).

- 5.4.1.2 A Tx connection charge (TxCC), which is a voltage-differentiated charge aimed at recovering the cost of the substation equipment where the customer is connected (i.e. line and transformer bays and transformers).
- 5.4.2 The cost incurred by Eskom Distribution to reserve capacity on the transmission system will be recovered from the ALC customers. The Transmission network services charges are currently still bundled and will be recovered from the ALC customers on a R/kVA basis through the Tx network charge.
- 5.4.2.1 The cost of reserved Tx network capacity up to the level of the customer's NNL is recovered through the normal Eskom retail tariff rates.
- 5.4.2.2 The cost of reserved Tx network capacity to cover the customer's long-term capacity requirements (in addition to NNL) is recovered through a separate Tx network charge.
- 5.4.2.3 Short-term network capacity requirements of the customer will be made available at zero cost, following the same principles as for distribution network services
- 5.4.3 The effect of system losses increases the customer's reserved network capacity as seen at MTS level, where Distribution will purchase the Transmission services on behalf of the ALC customer. The customer's reserved network capacity must therefore be increased by the Distribution loss factor for the appropriate transaction voltage.
- 5.4.4 The Transmission network cost applicable to the customer will therefore be:

$$Tx\ Network\ Cost = LTC\ (kVA) \times Dx\ Loss\ Factor \times TxNC\ (R/kVA)$$

$$Tx\ Connection\ Cost = RC\ (kVA) \times Dx\ Loss\ Factor \times TxCC\ (R/kVA)$$

where:

LTC = Customer's long term reserved capacity (in addition to NNL)

RC = Customer's reserved capacity which is the greater of NMD or actual recorded demand in the previous 12 months.

TxNC = Transmission network charge

TxCC = Transmission connection charge determined at the voltage level of the MTS from where the ALC customer is supplied and not the POD voltage.

5.5 Standby charges for generation reserve

- 5.5.1 The cost incurred by Eskom Distribution to reserve generation capacity will be recovered from the ALC customers.
- 5.5.1.1 The cost of long-term generation reserves to meet NNL is recovered through the normal Eskom retail tariffs.
- 5.5.1.2 The cost of reserved Generation capacity to meet the customer's long-term generation capacity requirement is recovered through the Generation standby charge that is passed to the customer from Generation through Distribution.

5.5.1.3 Short-term generation reserves to meet the customer's short-term capacity requirements, will initially be made available at zero cost. This cost will ultimately be reflected through the market for ancillary services/reliability services, where customers with own generation could in fact be a supplier of short-term reserves.

5.5.2 Customers can specify short-term and long-term capacity requirements for networks and generation reserves independently of each other. Therefore, a customer can specify a certain quantity of long-term network capacity and at the same time specify zero long-term generation capacity. It all depends on how the customer views the risks associated with the possible unavailability of the different services. It stands to reason, therefore, that short-term generation reserve capacity will be fully interruptible if there is a short-term generation capacity shortage, even if long-term network capacity has been reserved and paid for.

6. Cost of losses

6.1 Cost of losses in the Distribution system

6.1.1 Distribution will recover the cost of the losses resulting from the supply of additional energy.

6.1.2 Distribution will effectively purchase from Generation the energy lost in its networks while transporting this energy to the ALC customer. This cost will be recovered by determining the amount of energy losses, multiplied by the WEPS energy purchasing rates of Distribution.

6.1.3 The energy losses in the Distribution system will be determined by measuring the energy imported by the customer (i.e. delivered energy). This energy, multiplied by the Distribution loss factor for the appropriate transaction voltage, will be the calculated energy losses in the Distribution system.

i.e. $Losses = Delivered\ energy \times (Loss\ factor - 1)$

Since the WEPS rates are time-of-use differentiated, it stands to reason that these measurements and calculations have to follow the same time-of-use periods. The cost of these losses will be charged at the regular WEPS energy rates.

$$Cost\ of\ Losses = \dot{a}\ cost\ of\ losses_t = \dot{a}\ Losses_t \times P_t$$

$$\setminus Cost\ of\ Losses = \dot{a}\{Delivered\ Energy_t \times (Loss\ factor - 1)\} \times P_t$$

where

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

P_t = WEPS energy price for peak, standard or off peak time periods

6.1.4 If the ALC customer both imports and exports energy (for example some seasonal non-Eskom generators), it should be determined which of these energy flows contribute to losses.

6.1.4.1 If only imports contribute to losses, exports should be ignored for the purpose of calculating the cost of losses (i.e. losses resulting from exports will be zero).

- 6.1.4.2 If only exports contribute to losses, imports should be ignored for the purpose of calculating the cost of losses (i.e. losses resulting from imports will be zero).
- 6.1.4.3 If both imports and exports contribute to losses, the absolute value of imports and exports should be added for the calculation of the cost of losses. (I.e. imports may not be subtracted from exports (or vice versa) to obtain a net value.)

6.2 Cost of losses in the Transmission system and Reliability Services

- 6.2.1 The cost of losses in the Transmission system will be recovered on exactly the same basis as for Distribution losses, except that the appropriate Transmission loss factors will be used, as per the WEPS directive.

I.e.: $Total\ Losses = Delivered\ Energy \times (Dx\ Loss\ Factor \times Tx\ Loss\ Factor - 1)$

The same time-of use differentiated formula used for Distribution would be used to calculate the cost of transmission losses.

- 6.2.2 Distribution purchase reliability services (RS) from Transmission at MTS level, based on the energy flow at that level. To recover this cost from embedded ALC customers, the measured additional energy at the customer's POD will be increased by the loss percentage for the applicable transaction voltage. The cost of reliability services will be equal to the reliability services rate (in WEPS) multiplied by the energy and increased for losses.

$$RS\ Cost = Delivered\ Additional\ Energy \times Dx\ Loss\ Factor \times RS\ Rate$$

For the purpose of this charge, only the additional energy delivered to the customer will be considered (i.e. exports to Eskom will be ignored).

7. Levies

7.1 Electrification Levy

- 7.1.1 ALC customers purchasing additional energy at WEPS rates need to continue their fair contribution to the cross-subsidisation of electrification customers. These customers will therefore be subject to a volumetric c/kWh levy to cover this cost. The levy will be determined by Eskom Distribution Group Finance.
- 7.1.2 Unless and until otherwise directed by the NER, energy wheeled from a non-Eskom generator (i.e. energy exported into the Eskom system) will not be subject to this levy.

7.2 Rural Network Cross-Subsidisation

- 7.2.1 ALC customers purchasing additional energy at WEPS rates need to continue their fair contribution to the cross-subsidisation of rural customers. These customers will therefore be subject to a volumetric (c/kWh) rural network cross-subsidisation levy at the same average rate applied to Eskom Distribution's regular customers.
- 7.2.2 Unless and until otherwise directed by the NER, energy wheeled from a non-Eskom generator (i.e. energy exported into the Eskom system) will not be subject to this levy.

8. Billing

Customers' bills shall, in addition to the usual billing components for NNL, have the following additional components.

- 8.1 Dx network services charge for long-term firm network capacity (as per 5.3) and based on RC minus NNL.
- 8.2 Tx network charge for long-term firm network capacity (as per 5.4) and based on RC minus NNL.
- 8.3 Generation standby charge for long term firm generation reserve capacity (as per 5.5)
- 8.4 Charge for short-term generation reserve (only when the ancillary and reliability services market is introduced)
- 8.5 Active energy charge for energy sold in excess of NNL (as per 5.2), at WEPS rates, plus retail mark-up.
- 8.6 Cost of losses on Transmission and Distribution systems (as per 6.1 and 6.2)
- 8.7 Electrification and Rural levy on additional energy (as per 7.1 and 7.2)
- 8.8 Reliability services charge as per 6.2.2
- 8.9 Reactive energy charge billed as follows:
 - 8.9.1 Where the customer's normal load is supplied on Megaflex, the reactive energy payment shall be calculated on total reactive energy supply, exactly as for any other Megaflex customer.
 - 8.9.2 Where the customer's normal load is supplied on RTP, the reactive energy payment shall be calculated exactly as for Megaflex.
 - 8.9.3 Where the customer's normal load is supplied on Nightsave, billing for reactive energy is more complex and shall be done as follows:
 - i. No reactive energy charge is applicable to those half-hours where the actual demand was less than NNL or during off-peak periods.
 - ii. Determine the active and reactive energy for every half-hour where the actual load exceeded the NNL.
 - iii. Apportion the reactive energy to (a) normal load and (b) energy in excess of NNL in the same ratio as active energy.
 - iv. The reactive energy in excess of 30% of active energy of the excess energy component is accumulated for every half-hour to derive the monthly total.

9. Proposed charges for 2003

All prices quoted in this notice are in 2003 Rand value and exclusive of VAT.

9.1 Network services charges

The following network services charges (in the Rand value as indicated) will be applicable during 2003. These rates will escalate annually at Eskom's average annual price increase, until the rates are superseded by new rates, calculated on a later version of the cost of supply study.

9.1.1 Table 1 - Dx Network Services Charges

Voltage	< 500 V	= 500 V - < 66 kV	= 66 kV – = 132 kV	> 132 kV
Urban (R/kVA)	7.17	6.72	6.57	6.11
Rural (R/kVA)	16.83	15.79	N/A	N/A

9.1.2 Table 2 - Dx Loss Factors

Voltage	Loss Factor (Urban)	Loss Factor (Rural)
< 500 V	1.0912	1.1189
= 500 V - < 66 kV	1.056	1.090
= 66 kV – = 132 kV	1.0174	NA
> 132 kV	1.0000	NA

9.1.3 Table 3 - Transmission Network Charges (TxNC) and Loss Factors

Distance from Johannesburg	Zone	TxNC (R/kVA)	Loss Factor	RS (c/kWh)
0 to 300 km	1	2.11	1.0107	0.1379c/kWh
301 to 600 km	2	2.13	1.0207	0.1379c/kWh
601 to 900 km	3	2.15	1.0307	0.1379c/kWh
> 900 km	4	2.18	1.0407	0.1379c/kWh

9.1.4 Table 4 - Transmission Connection Charges (TxCC)**

Tx Supply Voltage	Transmission Connection Charge
≥ 400 kV	R 0.00
220 kV to 275 kV	R 0.00
88 kV to 132 kV	R 0.00
< 88 kV	R 0.00

** Charges are still bundled with the Network Charges.

9.2 Other Charges and Values

Charge Type	Rate
Electrification levy	1.16c/kWh
Rural Network Levy	0.54c/kWh
Service Charge	R1 455.07
Administration Charge	R1 099.96
Retail Mark-up	0.569 c/kWh

9.3 Dx energy purchase price for 2003 (WEPS rates)

Season	Peak (c/kWh)	Standard (c/kWh)	Off-peak (c/kWh)
High (June - August)	49,274	12,345	6,304
Low (September - May)	13,307	7,910	5,344

9.4 Standby charges for generation reserve

This charge is currently set at **R2.50 per kW per month**, but may be revised by the NER as the multi-market competitive energy market unfolds.