

# **AURORA ENERGY LTD**

## **Loss Factors**

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1 October 2003

## 1 INTRODUCTION

Aurora is obliged to calculate and publish loss factors under industry agreements. This document describes the methodology used to calculate the loss factors and sets out the loss factors applicable from 1 October 2003.

## 2 LOSSES

### 2.1 General

Distribution losses represent the electricity entering the network that is consumed during the delivery to consumers' installations. The quantity of electricity metered at consumer installations is thus after losses and in order to determine each retailer's purchase responsibilities the electricity measured at the consumer's meter has to be multiplied by a "loss factor". There are two main technical components to the loss:

- (a) A fixed component due to the standing losses of the zone substation and distribution transformers.
- (b) Variable components arising from the heating effects of the resistance in the delivery conductors. The resistive losses are proportional to the square of the load current and occur in the 33kV, 11kV and 6.6kV and LV network conductors and in the zone substations and distribution transformers.

Other components of loss arise from time to time including metering errors, theft and sales reporting errors and these errors are also included in the overall calculated loss determined from the sales reports received from retailers.

### 2.2 HV and LV Metered Installations

Most consumer installations are metered at LV. However a few consumers' installations are metered at HV and thus these installations should not incur any LV network losses nor the fixed and variable losses in the distribution transformer. Thus two values of loss factors apply.

### 2.3 Methodology

Aurora has adopted the following methodology in determining the loss factors.

The average of the last five years loss percentage for the distribution network as declared for Information Disclosure purposes is calculated. A single year's data is considered to be insufficient as it can be unduly influenced by a poor calculation by the retailers for the accrual value of kWh in the "normalised" sales reports forwarded by retailers each month or due to poor data quality problems associated with the competitive market.

Once the average loss percentage value is obtained then the kWh lost is determined for the year. The total "fixed" annual losses are determined from the data for the zone substation and distribution substation transformers. The total variable losses are the result of deducting the fixed losses from the total losses.

The variable losses are allocated to each half hour of the year using the total network demand for each half hour as these variable losses are a ratio of the square of the kW demand for each half hour. Once the variable component is determined for each half hour, the fixed component is added back and the "loss kWh" is thus available for each half hour. From this is calculated the loss factor for each half hour.

Average loss factors have also been calculated for each of the following time zones by calculating the loss kWh for the zone and then determining the average loss factor:

Summer day	September to April	0700 - 2300 hours
Summer night	September to April	2300 - 0700 hours
Winter day	May to August	0700 - 2300 hours
Winter night	May to August	2300 - 0700 hours

## 2.4 Halfway Bush & South Dunedin GXP Areas

The average 5 year loss for the Dunedin area is 5.79% based upon the five years 1999-2003 and the individual values are:

2003	6.27%
2002	5.63%
2001	5.61%
2000	5.60%
1999	5.82%

The declared loss factors for the Halfway Bush & South Dunedin GXP areas are listed in Schedule 1.

## 2.5 Clyde, Cromwell and Frankton GXP Areas

The average loss used for the Central Otago area is 7.70% based upon the five years 1999-2003. The losses are slightly higher for the Central network due to the greater percentage of small distribution transformers which are less efficient than large distribution transformers, and the greater length of delivery conductor needed on a per consumer basis compared to Dunedin. The individual values are:

2003	6.60%
2002	8.31%
2001	6.99%
2000	7.5%
1999	9.0%

The declared loss factors for the Clyde, Cromwell & Frankton GXP areas are listed in Schedule 2. A 33kV loss factor has also been declared since there are several 33kV connections to the network.

**SCHEDULE 1****AURORA ENERGY LTD**  
***Halfway Bush & South Dunedin GXP areas*****LOSS FACTORS**  
**- APPLICABLE 1 OCTOBER 2003**

The following Loss Factors are to be used by Retailers to multiply the kWh recorded on the meter at each Connected Customer's Installation in order to determine the Electricity Retailer's responsibility for the purchase of kWh within the Distribution Network.

LOSS FACTORS AND CODE			HV metered	LV metered
			DEHV	DELV
Summer	Day	0700 - 2300 hrs	1.0447	1.0596
Summer	Night	2300 - 0700 hrs	1.0408	1.0544
Winter	Day	0700 - 2300 hrs	1.0525	1.0700
Winter	Night	2300 - 0700 hrs	1.0430	1.0574

*Note:* Winter months are May - September inclusive.  
Summer months are October - April inclusive.  
Time is NZ Standard Time or Daylight Saving Time as applicable.

Dunedin area - the Aurora Distribution Network connected to the Transpower grid exit points at Halfway Bush and South Dunedin.

**SCHEDULE 2**

**AURORA ENERGY LTD**  
*Clyde, Cromwell & Frankton GXP areas*

**LOSS FACTORS**  
**- APPLICABLE 1 OCTOBER 2003**

The following Loss Factors are to be used by Retailers to multiply the kWh recorded on the meter at each Connected Customer's Installation in order to determine the Electricity Retailer's responsibility for the purchase of kWh within the Distribution Network.

LOSS FACTORS AND CODES	SUPPLY @ 33kV	SUPPLY @ 11kV/6.6kV	GENERAL 400V
	CE33	CEHV	CELV
Summer Day	1.0381	1.0634	1.0846
Summer Night	1.0235	1.0555	1.0741
Winter Day	1.0583	1.0786	1.1049
Winter Night	1.0421	1.0689	1.0918

*Note:* Winter months are May - September inclusive  
 Summer months are October - April inclusive  
 Day is 7:00 am to 11:00 pm  
 Night is 11:00 pm to 7:00 am  
 Time is NZ Standard Time or Daylight Saving Time as applicable.

Central area - the Aurora Distribution Network connected to the Transpower grid exit points at Frankton, Cromwell and Clyde.