# Horizon Loss Factor Methodology 2022-23

**Horizon Energy Distribution trading as Horizon Networks**

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# 1 Introduction

The Electricity Authority (EA) requires that Electricity Distributors calculate and publish Reconciliation Loss Factor for each loss factor code in the registry each year. Losses are the energy lost in distribution from the point of connection to the end consumer, and are comprised of losses through transmission line resistance, transformer losses, network parasitic losses, metering errors, and unmetered energy.

This document presents the **Loss Factor** that can be applied to customer's metered energy to recover upstream losses on Horizon Networks. It outlines the methodology, assumptions and data used for the calculation of the loss factors effective 1 April 2022.

# 2 References

Reference documents that should be referred to in using this procedure are: -

*Guidelines on the calculation and use of loss factors for reconciliation purposes; EA 26th June 2018*

*Electricity Industry Participation Code 2010 (Code).*

# 3 Operating Procedure

## 3.1 Network Energy Losses

The three main categories of energy losses are summarised below:

### 3.1.1 Reconciliation Losses

***Reconciliation loss*** is the difference between the energy metered at the Grid Connection Point (GXP) and the sum of the energy metered at all the customers connection points.

Input energy sources are from Transpower for each GXP, large network embedded generators, and distributed generation embedded throughout the network.

Energy consumed is provided by retailers against each ICP. These are accumulated over a rolling 12-month period and are compared to the energy delivered at each GXP or injection point to produce the Loss Factors for each region.

### 3.1.2 Technical Loss Factors

***Technical losses*** are an engineering assessment of the losses in the distribution network. These are calculated using the methods below.

(i) **No-Load Losses (Iron Losses)** A fixed amount of energy that arises from the magnetisation requirements of power transformers. These losses are a constant for any given transformer, but each transformer has its own magnetisation energy requirement. No-load losses are obtained from manufacture nameplate data and test sheets. For calculation of no-load energy losses as follows:

*No-Load Energy (kWh) = No-Load Power (kW) x TH (hrs) …. (i)*

To calculate the annual no-load losses the energy is calculated from the nameplate no-load power in kilowatts multiplied by the number of hours in a year to get kilowatt/hours.

An example for a 100kVA transformer with no-load losses of 195 watts, the annual energy loss in kW is 0.19 5* 365 * 24 = 1708kWh

(ii) **Load Losses (Copper Losses**) A variable components arising from the heating effects of the resistance in the delivery conductors and transformers and is dependent on the load current they carry. These losses are also known as copper losses or $I^2R$ losses.

Load losses in kilowatt-hours (kWh) are derived using the following methods.

a) **33kV line losses** and zone substation transformer losses are modelled using load flow analysis tools. Horizon uses PSS®SINCAL. The network average loads are used to model the load flow for each feeder and network region. Average loads in kW are derived by taking the total annual customer metered kWh divided by the number of hours in the year.

b) **Distribution transformer losses** (known as load, or copper losses) are calculated using an Excel model that uses the average metered consumer energy supplied by retailers summated at each transformer for all loads connected at the transformer. Published transformer full load losses and impedance values are apportioned to the average load.

c) **Distribution Network Losses** are the losses in the 11kV distribution network from the zone substation to the end user. These technical losses are calculated using network modelling software and apply to the lines and cables used to distribute energy. Distribution transformers are excluded from the modelling and are described in paragraph b) above

The average load for each feeder is used to provide a loss factor for the load. Losses are calculated for each region described in section 3.1.4.

Major loads described in section 3.2 are removed from the load flow modelling so the losses represent the losses that apply to the end mass market user.

d) **Low Tension Losses** are the losses in the 400V distribution circuits These losses are not modelled nor easily able to be determined so a factor of 1% of the energy delivered is used as an approximation for low tension line and cable losses.

### 3.1.3 Non-Technical Losses

Reconciliation loss is the difference between the energy supplied by Transpower plus any embedded generation, and the energy metered at the customers premises.

Non-technical losses are losses that represent the difference between **reconciliation losses** and **technical losses**. These losses represent inaccuracies caused by measurement, data handling, modelling assumptions, metering and reading errors, and misappropriation.

Once the technical losses are calculated, the non-technical losses are calculated as follows:

*Non-Technical Losses = Reconciliation Losses – Technical Losses*

### 3.1.4 Loss Areas

Loss areas are determined for each GXP; Edgecumbe, Waiotahi, and Kawerau.

A separate loss area is Galatea which is embedded within the Edgecumbe GXP but is supplied normally by the Aniwhenua power station.

Galatea region loss factor is determined as if the network is connected to Edgecumbe. The benefit to the network of the embedded generation at Aniwhenua is determined by taking the difference between the losses in the network when supplied out of Aniwhenua and the losses as if Galatea is supplied out of Edgecumbe.

As Distributors are not permitted to financially benefit from the charging of loss factors, the benefits of the reduced losses in the network because of the Aniwhenua injection are shared equally among the entire network and the Generator.

## 3.2 Embedded Generation and Majors Loss Factors

**Technical Loss Factor for Generation sites**

The Technical loss factor for each generation site connected to the network is calculated at the average net injection from the site. The loss factor is calculated by assessing the impact on network losses with and without the generation operational using load flow modelling

**Major Customers (industrial) Loss Factor**

The Technical loss factor for each major customer with a peak demand of greater than 2MVA connected to the network is calculated based on the average load of the site.

If the customer is connected to the network by dedicated assets directly from the GXP or zone substation the assessment is restricted to those assets.

Where the major customer is connected to shared network assets, (zone substation transformers, distribution or sub-transmission circuits) the apportionment of losses, including no-load losses, is calculated by modelling all loads connected, then re-calculated with various loads removed to be able to apportion losses to each load zone.

$$\text{DLF for Majors} = 1 + \frac{\text{Total losses applicable to Major Customer(kWh)}}{\sum \text{Energy Major Consumption (kWh)}}$$

# 4 Loss Factors effective 1 April 2022

| Loss Factor Code | Category | Load (Consumption) | Export (Generation) |
|---|---|---|---|
| LF1 | Mass Market (Galatea) | 1.1290 | 1.0000 |
| LF104 | Timberlands Forests | 1.0814 | 1.0000 |
| LF105 | Whakatane Mills Ltd | 1.0328 | 1.0000 |
| LF106 | Fonterra | 1.0288 | 1.0000 |
| LF2 | Mass Market (Edgecumbe) | 1.0574 | 1.0000 |
| LFG1 | Aniwhenua | 1.0638 | 1.0400 |
| LF101 | Norske Skog Oxidation Ponds | 1.0174 | 1.0000 |
| LF102 | Tasman Lumber | 1.0112 | 1.0000 |
| LF103 | Asaleo care | 1.0098 | 1.0000 |
| LF107 | Sequal Lumber | 1.0158 | 1.0000 |
| LF3 | Mass Market (Kawerau) | 1.0390 | 1.0000 |
| LF109 | TAOM Geothermal | 1.0000 | 1.0000 |
| LF110 | Waiu Dairy Ltd | 1.0250 | 1.0000 |
| LF5 | Mass Market (Waiotahi) | 1.0911 | 1.0000 |
| LF6 | Mass Market (Te Kaha) | 1.0773 | 1.0000 |

## 5 Amendment Record

| Page No. | Context | Date |
|---|---|---|
| All | General issue | 28/01/2021 |
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