Attachment 2

ERGON ENERGY PUBLISHED DISTRIBUTION LOSS FACTOR METHODOLOGY

1. Introduction

Section 3.6.3(g) of the National Electricity Rules (NER) requires that the Distribution Network Service Providers (DNSPs) publish the methodology used by them to determine Distribution Loss Factors (DLFs).

DLFs are calculated annually by DNSPs in accordance with the requirements of the NER in order to determine the amount of energy dispatched to supply customers.

Loss factors are applied by retailers in accordance with the NER.

This report describes the method used to establish DLFs for the following nodes in the Ergon Energy Network:

- All sites requiring site specific DLFs, Individually Calculated Sites (ICSs) (in accordance with clause 3.6.3(b)2(i) of the National Electricity Rules)
- All Sub-transmission Bus and Line Customers on an averaged zonal basis
- All 22/11kV Bus and 22/11kV Line Customers on an averaged zonal basis
- All LV Bus and LV Line Customers on an averaged zonal basis.

A diagrammatic representation of each of the zonal basis sections is provided in the Network Configuration Diagram (see section 5).

2. Definition of zones

The zones used for the calculation of DLFs align with the network pricing zonal boundaries as defined in the Network Tariff Guide.

3. Methodology

3.1 Forecast Quantities and Parameters

The NER now requires DLFs to be calculated using quantities and parameters projected to the year in which the DLFs are intended to apply. Customer and generator demands, individual and bulk energy sales, and energy dispatched quantities used are therefore all forecast quantities for the year of application.

All forecast quantities employed in the DLF calculation process are taken from the detailed demand and energy forecasts which Ergon Energy is required to produce for planning, network pricing and statutory purposes. Forecasts produced are intended to reflect the 'most likely' or 'base' case for 'average' weather conditions.

The forecasting methodology follows.

At Connection Point and Bulk Supply Point level, ten-year demand and dispatched energy forecasts are prepared based on regression analysis of up to 15 years of recorded data (typically five-seven years), corrected for switching and other system anomalies. Maximum demands are extrapolated with adjustments to accommodate confirmed and anticipated developments and other known local factors. An independent consultant is also retained annually to produce top-down forecasts using methodology incorporating demographic and econometric techniques. These forecasts are used to provide a check of and validate the internally produced forecasts. Ergon Energy's forecasts are also reviewed by and agreed with Powerlink for mutual planning purposes. Forecasts are also produced for all Zone substations by a similar process to that for Bulk Supply Points.

Energy sales figures are forecast in a similar manner by customer class and, for larger customers, based on their individual projections.

The network model used for load flow analysis is modified to reflect the forecast state of the network in the applicable year by incorporating the configuration changes and asset upgrades contained in the capital works program leading up to that year.

3.2. DLFs for ICS (Site-Specific Calculations)

Calculation of DLFs for all ICSs has been performed using the Marginal Loss Factor approach. This technique is detailed below.

The appropriate part of the sub-transmission network is modelled by including all directly connected 132kV, 66kV, 22kV, and 11kV customers along with direct connected loads representative of the 22kV and 11kV lines (lumped at the 22kV and 11kV busses). The ICSs are modelled to their metering point. The bulk supply point (transmission system connection point) is modelled as an infinite bus.

The modelled loads reflect the forecast demand for the year in which the DLFs are to be applied at the time of the coincident peak of the network being studied, ie the peak of the bulk supply/connection points.

DLF = 1 + total losses/energy delivered.

3.3. DLFs for sub-transmission and substation 11/22kV busbars

Calculation of DLFs for the sub-transmission system nodes and 11/22kV busbars are performed using a similar MLF approach to that described above.

Using the appropriate DLFs as calculated and forecast annual energy consumption data, the energy losses of the Network Sector are derived. The calculated values are validated using projected metering data where possible. Where appropriate data is available, the following process is used:

- Starting with the total network losses (by zone), deduct the losses attributable to the ICSs. This gives the losses to be shared across the remainder of the customers.
- The network sector loss factor for customers (other than ICSs) connected at the sub-transmission level is determined by calculating the sum of the forecast losses in this network sector and dividing by the sum of the forecast sales in the network sector and all downstream sales (other than ICSs).
- This process is repeated for the 11kV and 22kV busses.

The total losses allocated are reconciled with projections based on data extracted from the metering data collection system where available.

DLFs for 22/11kV Lines and SWER Lines

DLFs for 22/11kV and Single Wire Earth Return (SWER) Lines are calculated using a MLF approach derived from sample sets of representative feeders.

Sample sets of distribution feeders, representative of feeders throughout Ergon Energy's area of supply, are modeled on a zone substation basis with the 22kV or 11kV busbar being the infinite bus. Using forecast peak loads for the substation, the demand is allocated across all connected loads on all the lines at the substation. No distribution transformers are included in the model as the loads are applied directly to the high voltage line.

Load flow studies are run for each sample substation feeder system and the DLFs are calculated using the MLF approach described previously.

All distribution feeder systems are then classified according to their similarity to the characteristics of the sample sets and allocated the appropriated DLFs calculated as per above. They are then divided into East and West zones and weighted average loss factors are calculated for line customers based on the forecast energy supplied from each zone substation.

Zonal average values are then calculated and the network sector losses for 11/22kV line customers are determined by calculating the sum of the losses in this Network Sector and dividing by the sum of the sales in the Network Sector and all downstream sales (other than ICSs).

3.5. LV and SWER Customers

The technique described in this section is used to determine the losses in distribution transformers and to determine the appropriate allocation of energy (sales and network sector losses) to LV Bus and LV Line customers in each zone.

A list is obtained of the number, size and voltage rating (11kV/415V or 22kV/415V & SWER) of all distribution transformers in each zone. Typical no load and full load losses in Watts for each different type of transformer have been obtained from test certificates. The maximum demand and projected installed transformer capacity in the zone being examined is used to calculate the peak full load losses of distribution transformers in that zone. The total kWh of losses in distribution transformers for each zone is then calculated by adding the Peak Full Load Losses multiplied by the Load Loss Factor for the zone being examined to the no load losses for that zone.

The break up of the percentage of network sector losses allocated to LV Line and LV Bus customers is estimated by allocating all transformers with two or less customers to LV Bus and the remainder to LV Line. The break up of the percentage of LV energy sales used in the East and West zones is obtained by obtaining and projecting LV usage from Customer Information System (CIS) records. Energy on lines in each zone is then summated to determine the total LV energy sales supplied in each zone.

The network sector loss factor for the LV Bus category is calculated by dividing the projected network sector losses in distribution transformers in the relevant zone by the sum of the projected LV bus sales. This value is then added to the 22/11kV line loss factor to obtain the loss factor for LV bus customers.

The network sector loss factor for the LV Line category is calculated by dividing the residual losses by the projected LV Line energy sales including streetlights. This value is then added to the 22/11kV line loss factor to obtain the loss factor for LV line customers. The network sector loss for LV Line is the residual loss calculated from projected purchases less projected sales less all other network sector losses.

4. Reconciliation and Reporting

Calculated DLFs are applied and checked to ensure energy balances are valid throughout the supply network. In addition, reconciliation calculation is performed annually for the previous year by applying the published DLFs to actual recorded energy dispatches and sales.

A report detailing the calculations methodology and the detailed results is prepared each year and submitted for approval to the Australian Energy Regulator. Following approval, the DLFs are forwarded to the Australian Electricity Market Operator which publishes them on its website by April of each year.

5. Network Configuration Diagram