Energex

Distribution Loss Factors Methodology 2025

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Distribution Loss Factors Methodology

DISTRIBUTION LOSS FACTOR METHODOLOGY

The National Electricity Rules (Rules) requires that distribution loss factors (DLFs) be determined by a Distribution Network Service Provider (DNSP) for all connection points on its distribution network either individually or collectively.

According to the NER, DLFs notionally describe the average energy losses for electricity transmitted on a distribution network between a distribution network connection point and a transmission network connection point or virtual transmission node for the applicable financial year.

DLFs are to be used in the settlement process as a notional adjustment to the electrical energy - expressed in MWh - flowing at a distribution network connection point in a trading interval to determine the adjusted gross energy amount for that connection point in that trading interval.

For more information, please refer to clauses 3.6.3 and 3.15.4 of the NER which can be accessed on the Australian Energy Regulator (AER) website.[1]

Methodology

In broad terms, the Rules require that site-specific DLFs are calculated for:

- Embedded generators with greater than 10 MW of generation
- All customers of greater than 10 MW demand or 40 GWh annual consumption i.e. Individually Calculated Customers (ICCs)
- Generators of less than 10 MW or 40 GWh per annum capacity where the Generator meets reasonable costs for Energex to perform the necessary calculations.

DLFs for all other customers may be calculated on an average basis, which means determining DLFs for each voltage level of the network.

The methodology used by Energex involves a calculation of all DLFs (both average and site specific) every year.

The annual DLF review also requires that a reconciliation of the previous year's calculated DLFs be completed.

The DLFs of the previous financial year are used to calculate losses on the distribution network for that year. These are then compared to historical metered data and reasons for discrepancies are explained or reconciled.

[1] AER website - http://www.aer.gov.au/

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Site Specific Customer Calculations

Site Specific Customers (SSC) DLFs are calculated using load flow analysis based on the customers forecast demand data and network load data for the year in which the DLFs are to be applied.

The analysis involves load flow studies on the directly connected network between the customer connection point and the transmission network connection point.

The directly connected network is defined as all parts of the network which experience a change in power flow due to a change in customer loads.

In addition, iron losses of the transformers included in the directly connected network are calculated and apportioned based on the ratio of customer load and network load flowing through the transformer.

Energex uses the Marginal Loss Factor methodology to calculate site specific DLFs. This process involves determining the customer's losses by assessing the relativity between the change in system load associated with a change in the customer's load.

Calculation of Average Loss Factors

Average DLFs are calculated for each significant supply level in the network, whereas DLFs for major customers are calculated individually to determine the losses directly attributable to their loads.

The average DLF categories applied by Energex are:

- 132/110 kV Network
- 33 kV Network
- 11 kV bus
- 11 kV line
- LV bus
- LV line

The method used to calculate average DLFs is to carry out load flow studies to determine the losses at the coincident network peak, followed by the application of calculated Loss Load Factors (LLFs) to obtain the actual losses.

The transmission and sub-transmission systems are modelled using appropriate load flow packages. Losses on the 11 kV distribution network are calculated using forecast feeder peak demand data and feeder length data which is obtained from Energex's corporate database.

Losses at the LV bus are calculated based on the average impedance of distribution transformers, and losses in the LV network are calculated as the difference between the total losses (calculated by the difference between total purchases and total sales), and the losses resulting from the higher voltage network studies.

The DLFs for the network are calculated based on the formula:

$$DLF = \frac{\text{Losses (GW.h) for section of Network - ICC Losses}}{\text{Sum of sales (GW.h) for all sectors downstream and including that sector (excluding sales to ICCs)}}$$

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Calculation of Loss Load Factors

Loss Load Factors (LLFs) are calculated based on load duration curves, which are computed from half-hour average demands over a full year. The load duration curve is squared and averaged to obtain the LLF. The LLFs are applied to the losses calculated at peak demands to determine the actual losses.

Transmission (132 and 110 kV) Network

Load flow studies are carried out down to the 33 kV or 11 kV busbar at all bulk supply points and direct transformation substations. The 132/33 kV, 110/33 kV, 132/11 kV and 110/11 kV transformer losses are subtracted from the transmission system losses.

Losses calculated by these studies are converted to annual energy losses using the LLF for the system under consideration. The sum of the annual energy losses for all transmission network connection points excluding ICC losses are divided by the sum of all non-ICC energy sales through the 132 kV & 110 kV networks to obtain the DLF, viz:

$$\text{Transmission Average DLF} = \frac{\sum \text{Losses in GW.h - Transmission System ICC Losses}}{\sum \text{Energy Sales through the 110 kV Network in GW.h (excluding sales to ICCs)}}$$

Bulk Supply Networks

The bulk supply systems are modelled from the 33 kV busbar to the 11 kV busbar including 33/11 kV transformers. The peak losses in kW calculated from load flow studies are converted to annual energy losses using the LLF.

Losses attributed to the 132/33 kV, 110/33 kV, 132/11 kV and 110/11 kV transformers are added to the losses obtained from these load flows. The total energy supplied is taken from billed sales figures and the DLF derived by dividing the total losses excluding ICC losses by the total energy sales to non-ICC customers, viz:

$$\text{Bulk Supply + 11 kV Bus DLF} = \frac{\sum \text{Losses in GW.h} - \text{ICC losses in the system}}{\sum \text{Energy Sales through 33 kV network in GW.h (excluding sales to ICCs)}}$$

The bulk supply and 11 kV bus DLFs are separated from the total DLF using ratios. These ratios are recalculated each DLF review, subject to the latest network configurations and consumption patterns.

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11 kV Circuits

Losses on 11 kV feeders are modelled. The peak losses in kW, calculated from load flow studies are converted to annual energy losses using the LLF.

Annual loss energy is then produced for each feeder using LLFs, which are then summed to produce the total 11 kV feeder losses. The DLF is thus:

$$11\,\text{kV Circuit DLF} = \frac{\sum 11\text{kV Feeder Losses in GW.h} - \text{ICC Losses in System}}{\sum \text{Energy Sales through 11kV Feeders in GW.h (excluding sales to ICCs)}}$$

LV Bus and LV Circuits

LV losses are generally determined as being the remaining losses when all calculated losses for the higher voltage networks have been deducted from the total network losses (known from purchases - sales). LV losses need to be appropriately allocated between the LV Bus and LV Line categories. The ratios are recalculated each DLF review, subject to the latest network configurations and consumption patterns.

Procedure

Once the DLFs are calculated and reconciled, a report is prepared detailing the calculated site specific DLFs together with the average DLFs at each voltage level in the system.

The report is submitted for approval to the AER. Once approved, the DLFs are forwarded to the Australian Energy Market Operator to be published on its website by 1 April each year.

To apply for a review for LV bus DLF, please complete a QESI Queensland Electricity Supply Industry – Application for Review form which can be obtained on the Energex website.[2]

[2] QESI Form - https://www.energex.com.au/__data/assets/pdf_file/0009/1084068/QESI-application-for-review-3070155.pdf