

11 March 2010

Mr Chris Pattas
General Manager
Network Regulation South
Australian Energy Regulator
GPO Box 520
Melbourne VIC 3001



Dear Mr Pattas

ENERGEX Distribution Loss Factors for 2010-11

Under clause 3.6.3(i) of the National Electricity Rules, ENERGEX is required to provide distribution loss factors (DLFs) to AEMO for publication by 1 April each year. The clause requires these DLFs to be approved by the Australian Energy Regulator prior to receipt by AEMO.

Consistent with the requirements set out in your letter of 19 October 2009, please find attached:

- ENERGEX's 2010-11 Proposed DLFs determined following a full recalculation of both average and site specific DLFs per ENERGEX's published methodology;
- a copy of the current published methodology with which ENERGEX DLFs were calculated. The published methodology will be updated from 1 July 2010 to reflect the recalculated ratios for Bulk Supply System, 11kV Bus, LV Bus and LV Bus categories determined as part of the full review, subject to the AER's approval of the 2010/11 DLF's; and
- a letter from independent consultants, Intelligent Energy Systems, to confirm that the DLFs calculated by ENERGEX are consistent with the published methodology.

ENERGEX looks forward to approval of its Proposed DLFs by 25 March 2010, for subsequent provision, by ENERGEX, to AEMO.

If you have any further questions concerning this matter, please contact Mick Ryan, Regulatory Affairs Manager - Operations, on (07) 3223 1788.

Yours sincerely

A handwritten signature in blue ink that reads 'Kevin Kehl'.

Kevin Kehl
Executive General Manager – Strategy and Regulation

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ENERGEX Limited
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10 March 2010

Louise Dwyer
Group Manager Regulatory Affairs
Energex Limited
GPO Box 1461
QLD 4001

Dear Louise,

REVIEW OF ENERGEX DISTRIBUTION LOSS FACTORS FOR 2010/11

Intelligent Energy Systems Pty Ltd (IES) has undertaken a review (audit) of the Distribution Loss Factors (DLFs) for 2010/11 financial year calculated by Aurecon Australia Pty Ltd (Aurecon) who were commissioned by Energex. The IES audit examined the proposed DLFs with regard to their consistency with Energex's published methodology which is the published methodology operating in Queensland as at 31 December 2009.

The DLF calculation methodology of Energex requires that a full DLF calculation be conducted every three years. In addition to the review of calculated DLFs a full DLF review requires examination of the load flow studies to calculate the DLFs. A full DLF review was last conducted by IES for Energex's 2007/08 DLFs, therefore a full DLF review is now due. In particular the following aspects of the review of Energex's load flow studies were performed:

- the requirements for measurement of peak MLFs in the network were examined ;
 - input data was validated, for example, peak load values used;
 - the location of measurements in the load flow studies (selection of swing bus) were examined;
 - the modelling assumptions used were examined;
- the calculations performed on the data after execution of load flows were checked.

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The review of the load flow studies was conducted prior to detailed examination of calculated specific DLFs, this review concluded that the load flow studies were conducted in accordance with published methodology and were Rule compliant.

For its 2010/11 DLF calculations, Aurecon (on behalf of Energex) has followed the methodology implemented by Energex in previous DLF reviews. It makes use of a well structured set of spreadsheets that clearly show the application of the approved methodology, the inputs, intermediate values and final DLF numbers. Energex provided IES with a document titled "2010/11 Distribution Loss Factor Full Review Distribution Loss Factor Study ENERGEX", dated 5 March 2010, outlining its proposed DLFs for 2010/11. The report also included the methodology for the calculation of DLFs, discussion of results and outcomes of its reconciliation of losses for 2008/09. Energex's submission was clear and concise, the calculations consistent with the published methodology and, DLF values correctly determined.

Energex has submitted proposed DLFs for 2010/11 that have changed slightly from those for 2009/10. The proposed DLFs for tariff class customers are shown in Table 1 and for Independently Calculated Customers (ICCs) as well as Embedded Generators in Table 2 along with the existing DLFs and the percentage changes based on the new calculated 2010/11 values.

The changes in the DLFs proposed for tariff class customers compared to the current DLFs vary from between 0.28% and 0.08% from the 2009/10 values, indicating no significant increases or decreases in DLFs (greater than 1%). The proposed tariff class DLFs to apply in financial year 2010/11 should not have a significant impact on Energex's customer costs.

Any significant increases or decreases in DLF values for ICCs (greater than 1%) from last year's DLFs were explained by Energex to the satisfaction of IES. The changes in the main related to decreases in forecast demand and energy resulting in a decrease in load factor for the particular ICC. Also reconfiguration of some ICC networks has resulted in a more direct path to the connection point, resulting in a reduction in losses. The only ICC that had an increase in DLF greater than 1% was due to an increase in forecast demand and a decrease in forecast energy. This particular ICC is sensitive to changes in network and ICC loading.

IES has examined the data provided by Energex (in the form of spreadsheets) and are of the opinion that they have estimated their projections in accordance with the published methodology.

Energex uses a forward looking approach in the calculation of its DLFs. The forward looking approach uses projected loads and generation for the year the DLFs are to apply in, and these projections are based on the most recent

historical and generation data available for a consecutive 12 month period, as specified by the Rules. For its current calculations, projections are based on historical data for 2008/09.

Energex states that "sales are forecast using a 'bottom-up' approach, which is based on the application of econometric and time series analysis to forecast energy consumption by large individual customers and market segments", employing a range of macro-economic and demographic factors, and that "purchases are forecast using a 'top-down' approach, which is based on an analysis of energy purchases from Powerlink". It states that the "two approaches are reconciled to ensure they meet certain reasonableness criteria with respect to a range of variables and output measures".

Energex has carried out a reconciliation of losses for financial year 2008/09 in accordance with the National Electricity Rules' requirements. Energex found that when applying the 2008/09 DLFs to its actual sales figures for 2008/09, reconciled purchases overstated actual energy purchased by only 0.56%. Considering a forward looking approach has been used, where forecasts of sales and purchase figures are utilised this is an excellent result.

In summary IES are of the opinion that the DLFs calculated by Energex for 2010/11 as shown in Tables 1 and 2 are consistent with the published methodology and, thereby correctly determined.

Yours Sincerely

A handwritten signature in dark ink, appearing to be 'Bryan Whitlock', with a stylized, flowing script.

Bryan Whitlock

Senior Energy Analyst

Table 1 Energex proposed 2010/11 DLFs for tariff classes				
Non-ICC Connection Categories	DLF Code	Existing DLF	Proposed DLF	Change in DLF (%)
		2009/10	2010/11	
110 kV connected	FSSS	1.0047	1.0058	0.11
33 kV connected	F3CL	1.0147	1.0173	0.26
11 kV bus connected	F1ZH	1.0201	1.0230	0.28
11 kV line connected	F1CH	1.0287	1.0314	0.26
LV bus connected	F1CL	1.0463	1.0492	0.27
LV line connected	FLCL	1.0701	1.0709	0.08

Table 2 Energex proposed 2010/11 DLFs for ICCs and Embedded Generators

Individually Calculated Customer	DLF Code	NMI	DLF Applied In 2009/2010	DLF To Be Applied In 2010/2011	Change In DLF (%)
Existing ICCs					
	F3CL	3120041782	N/A	1.01188	N/A
	FAPM	QB02572591	1.02307	1.02371	0.06%
	FCAL	QB03674681	1.01224	1.00962	-0.26%
	FICT	QB03675327	1.01945	1.01054	-0.87%
	FBCC	QB00703630	1.01551	1.01525	-0.03%
	FBOC	QB13786415	1.02265	1.01888	-0.37%
	FBAC	QB07156049	1.03200	1.03121	-0.08%
	FAPB	3116941403	1.01954	1.02414	0.45%
	FLMD	3120007259	1.02020	1.02163	0.14%
	FQCL	QB03187888	1.03849	1.04548	0.67%
	FCRL	QB00011835	1.06753	1.03396	-3.14%
	FRBH	QB03674151	1.01049	1.00945	-0.10%
	FQG	QB03674177	1.02225	1.01745	-0.47%
	FQBH	QB09709916	1.00083	1.00117	0.03%
	FQB	QB09750568	1.00517	1.00000	-0.51%
	FQBW	QB05850851	1.00179	1.00000	-0.18%
	FQCB	QB07417373	1.00040	1.00053	0.01%
	FQC	QB03187390	1.00027	1.00002	-0.03%
	FQL	QB07480580	1.00048	1.00061	0.01%
	FQR	QB12757888	1.00022	1.00096	0.07%
		New Connection	N/A	1.00028	N/A
	FQT	QB08485399	1.00006	1.00000	-0.01%
	FQW	3117476607	1.00097	1.00005	-0.09%
	F1CH	QB03675025	N/A	1.00959	N/A
	FRAF	3120001083	1.03895	1.00222	-3.53%
	FSWP	QMRGW00156	1.01127	1.00987	-0.14%
	FSC	QB09455507	1.00971	1.01927	0.95%
	FSTC	QB07047011	1.01772	1.01254	-0.51%
	FACI	QB08144664	1.05577	1.07962	2.26%
	FTD	3117267111	1.01386	1.00822	-0.56%
	FUQ1	3116852575	1.00968	1.00688	-0.28%
	FUQ2	3116852583	1.01229	1.00627	-0.60%
	FVP	QB12021814	1.00679	1.01134	0.45%
Embedded Generation:					
	FRPT	QB14097800	1.00125	1.00066	-0.06%
	FHPR	QB10995285	1.16755	1.15299	-1.25%

PROPOSED DISTRIBUTION LOSS FACTORS

2010 -2011

ENERGEX LIMITED
ABN 40 078 849 055



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TABLE 1 ICC DISTRIBUTION LOSS FACTORS

NMI	DLF Code	DLF Applied In 2009/2010	DLF To Be Applied In 2010/2011	Change In DLF (%)
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TABLE 2 AVERAGE DLFS FOR NON-ICC CUSTOMERS

Non-ICC Connection Categories	DLF Code	DLF Applied In 2009/2010	DLF To Be Applied In 2010/2011	Change in DLF (%)
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ENERGEX's PUBLISHED DLF METHODOLOGY

ENERGEX LIMITED
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Distribution Loss Factor Methodology

Introduction

Section 3.6.3 of the National Electricity Rules (NER) requires that Distribution Network Service Providers each year calculate Distribution Loss Factors (DLFs) for their networks. Distribution Loss Factors (DLFs) are defined in the National Electricity Rules as a notional description of the average electrical energy losses incurred by the transmission of electricity on a distribution network between the Transmission Network Connection Point (TNCP) and the Distribution Network Connection Point (customer's point of connection) for the financial year period. They are used in the settlement process as a notional adjustment the electrical energy metered at the distribution network connection point (customer billed energy) to the gross energy purchased at the transmission network connection points.

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 GW.h annual consumption i.e. Individually Calculated Customers (ICCs); and
- 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 effectively means determining DLFs for each voltage level of the network. The methodology used by ENERGEX involves a full recalculation of all DLFs (both average and site specific) every three years. In the intervening years, site specific DLFs are calculated, but all average DLFs are simply reviewed, based on allocation of network losses in the same proportions as was determined at the last full recalculation.

The annual DLF review also requires that a reconciliation of the previous year's calculated distribution loss factors be completed. The DLFs of the previous financial year are used to calculate the losses on the distribution network for that year. These are then compared to historical metered data and reasons for discrepancies are explained/reconciled.

Site specific customer calculations

Regardless of whether a full re-calculation of DLFs is being undertaken (every third year), or only a review, the methodology for determining DLFs for Site Specific Customers is identical.

Site specific 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 network which will 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 losses for the customer by assessing

the relativity between the change in system load associated with a change in the customer's load.

Calculation of average loss factors (for full recalculation)

Average DLFs are calculated for each significant supply level in the network, with DLFs for major customers being calculated individually in order to determine the losses directly attributable to their loads (as discussed above).

The average DLF categories applied by ENERGEX are:

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

The method used to calculate average DLFs is to carry out a series of 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 subtransmission systems are modelled using appropriate load flow packages. Losses on the 11 kV distribution system 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 then calculated based on the formula:

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

1.1 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 then averaged to obtain the LLF. The LLFs are then applied to the losses calculated at peak demands to determine the actual losses.

1.2 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 loss load factor for the system under consideration. The sum of the annual energy losses for all Transmission Network Connection Points (TNCPs) excluding ICC losses are then divided by the sum of all non-ICC energy sales through the 132 & 110 kV networks to obtain the DLF, viz:

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

1.3 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 is then converted to annual energy losses using the loss load factor. Losses attributed to the 132/33 kV, 110/33 kV, 132/11 kV and 110/11 kV transformers are to be 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 11kV bus DLFs are then to be separated from the total DLF using ratios. The ratios currently used by ENERGEX are 0.651358 for the Bulk Supply System DLF and 0.348642 for the 11kV Bus DLF. These ratios are based on the 2007-08 DLF report by Connell Wagner Consultants. However, these ratios are to be validated during each full review. If these ratios are found to be no longer appropriate, they are to be recalculated, subject to the latest network configurations and consumption patterns.

1.4 11 kV circuits

Losses on 11 kV feeders are calculated using the length of each feeder and forecast peak demand data. The formula for determining 11 kV losses is as follows:

$$\text{Feeder losses} = (\text{Peak Demand})^2 * \text{Resistance} * \text{Branching Factor}$$

The feeder lengths are obtained from ENERGEX's corporate database, and allow calculation of the resistance of each feeder based on average overhead and underground resistances per unit length. The peak demand is also obtained from a corporate database, and a load growth is applied to determine peaks during the forecast year. Average branching factors are calculated for urban, rural and high-density feeders based on losses obtained for each 11 kV feeder during each full review. This data allows losses to be calculated for each 11 kV feeder.

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

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

LV 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 then just need to be appropriately allocated between the LV Bus and LV Line categories. Studies undertaken in 2007 by Connell Wagner Consultants for the 2007-08 full review determined appropriate ratios for splitting LV losses between these categories. The calculated ratios are LV Bus = 0.422574 and LV line = 0.577426 of total LV losses. However, these ratios are to be validated during each full review. If these ratios are found to be no longer appropriate, they are to be recalculated, 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. This report must be submitted for approval to the Australian Energy Regulator (AER). Once approved, the AER forwards the DLFs to AEMO. The approved DLFs are then published by AEMO on its website by 1 April each year.