

TCFT BUSINESS SERVICES

Integral Energy Distribution Loss Factors

Proposed for 2010-11

Independent Review of Integral Energy's

**Application of its Distribution Loss Factors Calculation
Methodology**

4th March 2010

Executive Summary

TCFT Business Services (TCFT) has undertaken a review of the process undertaken by Integral Energy to derive the proposed distribution loss factors for 2010 -11. TCFT has concluded that Integral Energy has used the appropriate data, has applied its established calculation methodology and that the results are a fair statement of the applicable loss factors.

1. Introduction

TCFT has been engaged by Integral Energy to undertake an independent review of the process undertaken by Integral Energy to develop distribution loss factors (DLFs) for 2010 -11. The review was intended to establish a view on whether the process complied with the calculation methodology.

Integral Energy has determined a calculation methodology for distribution loss factors under Clause 3.6.3 of the National Electricity Market Rules. This document was published in January 2008.

TCFT has undertaken a review of the process through examination of several documents and a copy of the main calculation spreadsheet provided by Integral Energy and through discussion with Integral Energy staff. The review was intended to establish whether Integral Energy had followed the published methodology, not to check or repeat the actual calculation process.

TCFT undertook a similar review for Integral Energy in 2008 and 2009 and notes that Integral Energy has applied the same methodology in the calculations for 2010-11.

2. Process review

In the sections following, the requirements of the DLF calculation process are set out and commentary is provided on the process undertaken by Integral Energy.

2.1. Use of most recent data for a consecutive 12 month period

A DNSP must use the most recent actual load and generation data available for a consecutive 12 month period.

Integral Energy has used load and generation data extracted from systems maintained by the company for the 2008-09 financial year, the most recent completed year. 15 minute metering data is the main source of data used. TCFT has seen examples of the data and has confirmed that data in the main calculation spreadsheet has been updated from the previous year.

2.2. Reconciliation for previous year

The NEM Rules require that each distributor undertake a reconciliation for the previous financial year of the adjusted gross energy for its entire network and the amount of energy flowing at all connection points in its network and the total losses incurred in its network.

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Integral Energy has undertaken this reconciliation for the 2008-09 financial year (the most recent completed financial year). The results are included in the submission to the AER, together with the reconciliation for the previous three financial years for comparison. TCFT notes that the forecast error as a percentage of total energy distributed for 2008-09 is a low figure – 0.49%.

2.3. Identification of connection points requiring site specific DLFs

Site specific DLFs are derived for connection points for embedded generators with actual generation of more than 10 MW, or connection points for an end-user with actual or forecast load of more than 40 GWh or a peak load of more than 10MW.

In addition, where a generator makes a request and meets the cost, a DNSP must calculate a site specific DLF for a generating unit of less than 10 MW or 40GWh per annum capacity.

Integral Energy has reviewed the generation output and load data for all generators and customers which have potential to meet this limit. This data is incorporated in the calculation spreadsheet. Site specific loss factors have been calculated for 2010-11 for the 24 load connection points and four generation connection points where a criterion is met. TCFT has reviewed the load and generation data and confirms the identification of relevant connection points.

Integral Energy advised TCFT that no requests were made for calculation of site specific DLFs for 2008-09 by generators which did not meet the criterion.

2.4. Forward looking data

The NEM Rules promote the use of forecast data to provide “forward-looking DLFs”. In practice this means applying a forecast adjustment to the metering data.

Integral Energy has used forecast peak load data derived for each of its zone substations. This data was developed by Integral Energy’s forecasting group. As peak loads have recently been growing at a greater rate than total energy growth, scaling all the previous year energy data using the peak load forecast would over-estimate loads. Accordingly, Integral Energy applies a scaling factor to normalise the load data to match the forecast total load. This scaling factor is derived through an iterative process to find the factor which provides the best fit with the forecast energy load data. TCFT has sighted the spreadsheet used to undertake this process and has confirmed that the relevant forecast has been applied.

In addition, a DNSP needs to consider planned changes in its network in the coming year. Integral Energy works from the capital program developed by its planning group to identify changes in the network during the forecast year. As well as inclusion of the new assets in the network modelling, adjustments are made to the load data to allow for the network changes. Integral Energy has undertaken this process where necessary, notably for network adjustments arising from commissioning of the new Macarthur bulk supply point.

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2.5. Treatment of electricity theft and metering inaccuracy

Although not specifically mentioned in the NEM Rules, correct calculation of distribution loss factors requires that appropriate allowance is made for theft and metering inaccuracy.

Integral Energy has assumed an overall amount for theft of 0.5% of total sales and has applied this figure for a number of years. TCFT has been advised that this amount was agreed by the former DLF working group as a reasonable approximation. TCFT has not seen any evidence to suggest a need to change this estimated figure.

2.6. The adjustment amounts from application of the DLFs should equal losses

The aggregate of the adjusted gross energy amounts for the distribution network using the DLFs should equal as closely as possible the sum of the measured energy flowing at connection points and the actual total losses in the network. This is the fundamental aim in calculation of losses.

Integral Energy achieves this by undertaking an overall estimation of losses in the coming year. Losses are then calculated using load flow studies or shunt loss calculations to derive the losses at progressively lower levels in the network. The residual losses are then assumed to occur in the low voltage network. This methodology inherently achieves the objective set out above.

2.7. Customer classes for loss calculation

The Rules require that each distribution connection point must be assigned to a class of distribution network connection points based on the location of, voltage of and pattern of electrical energy flows (Clause 3.6.3 (d), (e)). So far as practicable, this assignment must be consistent with the geographic boundaries of the pricing zones for use in distribution pricing and the voltage levels incorporated within those pricing zones.

Integral Energy does not apply geographic pricing zones so connection points are assigned to particular voltage categories for calculation of DLFs.

Integral Energy uses the standard classes for loss factor calculation, as set out in the former IPART guidelines, that is:

- 132kV network (addition to IPART categories)
- Transmission substation
- Sub-transmission network
- Zone substation
- High Voltage network (22 and 11kV, sometimes also referred to as medium voltage)
- Distribution substation
- Low voltage network

2.8. Calculation of Losses

The DLF for a non-specific DLF site is determined using a volume weighted average of the average electrical energy loss between the assigned transmission connection point or node and each distribution connection point in the relevant class.

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Integral Energy calculates losses progressively on a hierarchical basis for each level of the distribution network. Average losses are calculated at each level progressively. Losses to a particular connection point are a weighted sum of the losses in each level of the network used to supply that point.

Integral Energy uses load flow techniques to calculate series losses down to, but not including, distribution networks at 11/22kV and 400/230V. A different load flow methodology is applied at the distribution substation level. Manufacturer's data on transformers is used to calculate shunt losses.

Integral Energy has developed a sophisticated set of software to manage the overall calculation process. TCFT has sighted the application and has observed some sample calculations for elements of the process.

TCFT's brief did not include detailed assessment of the application or appropriateness of the specific techniques employed. Nevertheless, it would be expected that this approach would yield robust results. TCFT notes that other DNSPs have used a similar approach, although the Integral approach of undertaking load flows down to 11kV appears more sophisticated than other DNSPs have used in previous years.

DLFs for specific customers are to be determined using the average electrical energy loss between the distribution network connection point and the transmission connection point to which it is assigned.

Integral Energy calculates the loss factor for each specific site customer using a similar approach to that for all other customers. However, at each level the losses due to specific site customers and other customers are separated. For series losses, separate load flows are run for the specific site customers and for the other customers. Shunt losses at each level are proportioned to site specific and other customers on the basis of average energy load. The losses for each specific site customer are then added from each relevant level and a loss factor calculated.

TCFT has reviewed the application of this process within Integral Energy's main DLF calculation spreadsheet.

For embedded generators, Integral Energy analyses losses with the generator in service and out of service to calculate the appropriate loss factor. TCFT has also reviewed the application of this process within Integral Energy's main DLF calculation spreadsheet.

3. Documents Reviewed

Integral Energy – Evaluation of Distribution Loss Factors 2010-2011. February 2010

Integral Energy – Calculation of Distribution Loss Factors. Special Report Study No. S537, February 2008

Integral Energy – Loss Factor Calculation V6 Revised Final Report – spreadsheet.

IPART – Assessment and Approval Process for Distribution Loss Factors proposed by DNSPs, Guideline. November 2007.