



Commission for Electricity Regulation

An Coimisiún um Rialáil Leictreachais

Treatment of Transmission and Distribution Losses

5 April 2000

Losses

1. INTRODUCTION

This short paper sets out the treatment of transmission and distribution losses following the introduction of competition to the market for electricity in Ireland on the 19th February. To date, the subject of losses has been referred to in a number of papers¹. This paper collects together the key facts and issues to summarise and clarify how losses are currently being treated.

2. PRINCIPLES

The key principles associated with the treatment of transmission losses are:

- The costs of transmission and distribution losses are borne by market participants, not by the system as a whole.
- All settlement is assumed to take place at the interface between the transmission and distribution grid². This ensures all quantities are calculated on a consistent basis:
 - Supplier contract nominations and metered consumption for each distribution-connected customer are scaled by a distribution loss factor.
 - Contract nominations and metered generation for each generator are scaled by the generator's transmission loss factor and further scaled by the distribution loss factor if the generator is embedded in the distribution network.

2.1. Principles - Transmission Losses

Losses are incurred on the transmission system as electricity is transported from generators to the transmission / distribution interface. In settlement, the transmission losses are allocated to generators (including generators embedded in the Distribution System) using Transmission Loss Adjustment factors. Some generators are responsible for proportionally more transmission losses than others depending on their point of connection to the grid. For this reason, transmission loss adjustment factors are site specific.

The following parties are subject to transmission losses:

- Generators (including green) connected to the transmission network

¹ Relevant papers include the Commission's Final Proposals for a Transitional Electricity Trading and Settlement System, published 27/1/00 (page 10 –11), ESB's Transmission and Distribution Losses Treatment papers, published 7/2/00, Transmission and Distribution Use of System Charges, published 18/12/00, and the Trading and Settlement Code (published 18/2/00).

² Studies are used to estimate Transmission and Distribution losses and hence to assign loss factors to generators.

- Distribution connected (embedded) generators³, including green, connected after 19/2/00

The following principles apply to the treatment of transmission loss factors:

- Loss factors are calculated by the TSO (See current Transmission Loss Adjustment Factor Table below) and approved by the Commission on an annual basis.
- The Transmission Loss Adjustment Factors are derived by the TSO using marginal⁴ loss factors derived for each affected generator based on forecast assumptions of average system demand and average generation dispatch for the designated seasons.
- The marginal loss factors are scaled by the TSO to ensure that throughout the year only average losses are recovered. These final values, after scaling, are the Transmission Loss Adjustment Factors (TLAFs). Marginal loss factors are scaled to derive the TLAFs so that the allocation they produce will always equal predicted average transmission losses⁵.
- The TLAFs will result in values for certain generators being greater than one because output could have the effect of reducing, rather than increasing, transmission losses. Most TLAFs, however, will have values of less than one.
- The SSA uses the Transmission Loss Adjustment Factors assigned by the TSO for each generating unit for the purposes of settlement. The SSA uses the loss factors to adjust all generator dispatch instructions, metered outputs, and ex-post unconstrained schedule quantities.
- Generators take into account losses when trading by using the applicable loss factor(s) to determine tradable quantities available.
- For purposes of energy market settlement, all interconnector transfers across the Interconnector during day hours and night hours will be adjusted by the Transmission Loss Adjustment Factor for the applicable season and transfer flow direction (See *Interconnector Loss Adjustment Factors* Table below).

3 To not subject embedded generators to transmission loss payments would encourage generators to by-pass the transmission system. This would reduce the efficiency of the transmission network and raise the costs of the electricity system to all users. Existing embedded generators have been developed under different charging mechanisms and as their overall burden on the transmission system is so small, they have been exempted from the effect of transmission losses as a transitional arrangement.

4 Marginal loss factors are adopted as a starting point in order to encourage efficient real-time dispatch of the system. Marginal loss factors can also serve to aid the efficient location of generating plant.

5 How reconciliation between losses allocated and actual losses takes place will be addressed at a later date.

Table 1 - Transmission Loss Adjustment Factors applicable to Generation Users and Interconnector Users

Station	Season Units	Spring-Autumn		Summer		Winter	
		Day	Night	Day	Night	Day	Night
Aghada	AD1, AT1, AT2, AT4	0.991	0.995				
Ardnacrusha	AA1, AA2, AA3, AA4	0.994	1.010				
Bellacorick	BK1, BK2	1.079	1.046				
Edenderry Power		-	-				
Erne	ER1, ER2	1.052	1.064				
Erne	ER3, ER4	1.054	1.063				
Golagh	GOW	1.055	1.063				
Great Island	GI1, GI2	1.004	0.993				
Great Island	GI3	1.004	0.993				
Lanesboro	LA2, LA3	1.001	0.982				
Lee	LE3	0.999	1.008				
Lee	LE1, LE2	0.999	1.008				
Liffey	LI1, LI2	0.980	0.981				
Marina	MR1, MRT	1.007	1.006				
Moneypoint	MP1, MP2, MP3	0.951	0.964				
North Wall	NW4, NW5	0.966	0.972				
North Wall	NW1, NW2, NW3	0.970	0.972				
Poolbeg	PB1, PB2, PB3	0.967	0.972				
Poolbeg	PB4, PB5, PB6	0.969	0.969				
Rhode	RH3	0.973	0.964				
Shannonbridge	SH2, SH3	0.990	0.984				
Shannonbridge	SH1	0.993	0.987				
Tarbert	TB1, TB2	0.957	0.976				
Tarbert	TB3, TB4	0.969	0.978				
Turlough Hill	TH1, TH2, TH3, TH4	0.975	0.980				

Table 2 – Interconnector Loss Adjustment Factors

Flow Direction	Day Hours Factor	Night Hours Factor
North to South	0.980	0.980
South to North	1.018	1.018

Ref: Agreed Procedure 6, attached to the Trading and Settlement Code. These loss factors are in effect from 19/2/00 to 31/3/00.

2.2. Principles - Distribution Losses

Losses are incurred in the distribution of electricity from the transmission / distribution interface to end user sites. Distribution Loss adjustment factors are the means by which distribution losses are apportioned to end users in the settlement process.

Distribution loss adjustment factors apply to both consumption and embedded generation.

2.2.1. Distribution loss factors for consumption

The distribution loss factors used in settlement differ in respect of the voltage level at which customers are connected but otherwise are not site specific (see *Indicative Distribution Loss Adjustment Factors* Table below). This is not only because it would be impractical to calculate loss factors for individual customers or suppliers but also because of a desire on the part of the Government not to see locational differences in end-user tariffs. The following applies:

- The Distribution System Operator (DSO) calculates distribution loss adjustment factors (DLAFs)⁶.
- The Commission approves these loss factors.
- The Meter Registration Service Operator (MRSO) applies the DLAFs to the meter readings of end users and provides adjusted readings to the settlement system administrator.
- Suppliers take into account losses when purchasing from generators to meet their customers' needs. For example, a supplier with contracts to meet 100MW of demand will need to purchase in excess of 100MW depending on the Distribution loss factor.

Table 3 – Indicative Distribution Loss Adjustment Factors

Level	Time Period	
	Day	Night
38kV	1.018	1.015
MV	1.050	1.041
LV	1.107	1.087

⁶ Refer to ESB's submission on Distribution Loss Adjustment Factors (7/2/00) for details of how factors are calculated and applied.

2.2.2. Distribution loss factors for embedded generators

Embedded Generators can reduce the overall level of losses on the distribution system and, to the extent that they do, should be compensated for the service they provide⁷.

The following applies:

- The DSO determines a site specific loss factor for each embedded generator
- The generator's output is then scaled by the site specific distribution loss adjustment factor for the generator. The factor could be greater or less than one, depending on whether the embedded generator in question reduces or increases distribution system losses.

⁷ In general terms, embedded generators have two counteracting effects on distribution system losses. On the one hand, they reduce losses on the parts of the distribution system shared with end-users. On the other hand, they tend to increase losses on the connecting network. The net effect of a particular embedded generator will depend on the point of connection to the main distribution network (and particularly the voltage level of the connection), the loading on the part of the network to which the generator is connected and on the electrical characteristics of the connecting network.