

Overview of Transmission Losses

Introduction

This document provides a high level overview of Transmission Losses which is the term applied to lost power during the transmission of electricity through the Transmission System in Great Britain (GB). Further information is available from Section T of the Balancing and Settlement Code (BSC).

What are Transmission Losses?

The GB Transmission System is the high voltage electricity network owned and maintained by National Grid Electricity Transmission Ltd in England and Wales, SP Transmission Ltd in the South of Scotland and Scottish Hydro-Electric Transmission Ltd in the North of Scotland. Transmission voltages are 400kV and 275kV in England and Wales and 400kV, 275kV and 132kV in Scotland.

The Transmission System transfers power from Transmission connected generators to Distribution System Operators and Transmission connected customers. In addition, the Transmission System transfers power over the Interconnectors to and from France and Northern Ireland.

During the process of transferring power across the Transmission System, some of the power is 'lost'. This lost power is known as Transmission Losses and currently accounts for about 1.5 percent of the electricity transmitted.

Transmission Losses consist of two components, fixed and variable. Fixed losses (sometimes called iron losses) occur in transformers, overhead lines and cables. It is in transformers however, that most fixed losses occur where energy is dissipated in the iron core which is subject to an alternating magnetic field. Since this magnetic field is created by the voltage which by and large is constant, the iron losses do not vary.

Variable losses (sometimes called copper losses or I²R losses) account for most of the electricity lost on the Transmission System. Copper losses are caused by current flowing through the Transmission lines, transformer windings and cables causing them to heat up and dissipate energy. Since current is dependant on the volume of power transferred, copper losses are variable and increase with the distance electricity has to travel.

Treatment of Transmission Losses under the BSC

The actual metered data collected by the Central Data Collection Agent (CDCA), Supplier Volume Allocation (SVA) Half Hourly and Non Half Hourly Data Collectors does not take account of Transmission Losses. Since all energy has to be accounted for, the BSC needs a methodology to ensure that Transmission losses are allocated.

Transmission Losses are not applied to meter readings but are allocated to BM Units, the value being dependant on whether the BM Unit is in an Offtaking Trading Unit or a Delivering Trading Unit.

Trading Units

Trading Units are a collection of (one or more) Balancing Mechanism (BM) Units and are established under Section K of the BSC. If the Trading Unit is a net exporter of electricity over a Settlement Period (i.e. if the sum of the BM Unit Metered Volumes of the constituent BM Units is greater than zero), then the Trading Unit is termed a "Delivering Trading Unit" in

that Settlement Period. Alternatively, if it is a net importer (i.e. if the sum of the BM Unit Metered Volumes of the constituent BM Units is negative), it is termed an “Offtaking Trading Unit” in that Settlement Period.

Transmission Losses are the difference between the Metered Volumes of all BM Units belonging to Trading Units that are Delivering Trading Units in a Settlement Period and the metered volumes of all BM Units belonging to Trading Units that are Offtaking Trading Units in a Settlement Period.

Transmission Loss Factors

The BSC provides for each BM Unit to be allocated a specific Transmission Loss factor (TLF) that can be used to vary the weighting of Transmission Losses allocated to that individual BM Unit. The function of the TLF is to allow for the allocation of different Transmission losses depending on the geographical location of the BM Unit. At present all TLFs have been set to zero and would require a Modification to the BSC to change these values.

Transmission Loss Multipliers

The Transmission Loss Multiplier (TLM) that is applied to a BM Unit Metered Volume is a composite factor used to allocate a proportion of Transmission Losses to an individual BM Unit. It comprises two components, a TLF allocated to the BM Unit and an adjustment depending on whether the BM Unit is in an Offtaking Trading Unit or a Delivering Trading Unit.

Since all TLFs are set to zero, the TLMs for all BM Units in an Offtaking Trading Unit are the same, as are all the TLMs for all BM Units in a Delivering Trading Unit.

Two TLMs are calculated by the Settlement Administration Agent (SAA) for every Settlement Period. One TLM is used to scale down every BM Unit belonging to a Delivering Trading Unit and the other TLM is used to scale up every BM Unit belonging to an Offtaking Trading Unit.

The proportion of Transmission Losses allocated to BM Units in Offtaking and Delivering Trading Units respectively is determined by a ‘BSC System Parameter a’. A proportion (a) of the Transmission Losses is allocated to BM Units in Delivering Trading Units and a proportion (a-1) is allocated to BM Units in Offtaking Trading Units. The BSC System Parameter a is currently set at 0.45 which means that 45 percent of the quantity of Transmission Losses is allocated to BM Units in Delivering Trading Units and 55 percent to BM Units in Offtaking Trading Units. The rationale for this split is that generators connected to the Transmission System have their energy metered on the high voltage side of the generator transformer i.e. the losses in the transformer are allocated to the generator whereas the energy being transferred from the Transmission System to a Distribution System is measured on the low voltage side of a Grid Supply Transformer i.e. the losses in the transformer are included in the overall Transmission Losses.

In addition to the above, TLMs are used in the following Settlement calculations:

- Scaling the payments and charges associated with accepted Bid and Offers in the Balancing Mechanism.
- Determining the System Buy and System Sell prices.
- Calculating the Balancing Services Volumes.
- Scaling the payments and charges associated with non delivery in the Balancing Mechanism.