ESO

Transmission Losses

January 2024

What are network losses?

When electrical currents travel on a network, some energy is dissipated in the form of heat, and is “lost” due to the electrical resistance in the network. This energy is known as network losses. The transmission network is the high voltage network which carries electricity from generation to the distribution network, or to large electrical users which are directly connected to the transmission network. The places where the transmission and distribution networks connect are called grid supply points[1] (GSP). Distribution losses happen between a GSP and a household.

Why do losses matter when we charge and bill for transmission system usage?

Our charges are based on the amount of volume that users put on or take off the system, so we need to ensure that we adjust the way we calculate charges to account for any network losses.

Balancing Services Use of System (BSUoS) charges recover the System Operator’s costs of operating the transmission system (we ensure that electricity is balanced on the system). In the calculation of BSUoS charges, transmission losses are allocated by scaling up (as the user offtakes electricity) the metered MWh volume of each BSUoS user. These scaling factors are called Transmission Loss Multipliers (TLMs) and are produced by Elexon. Using these TLMs, transmission users’ metered MWh volumes are converted into adjusted BMU MWh volumes. The ESO then uses the adjusted BMU values in BSUoS charging calculations.

Transmission Network Use of System (TNUoS) charges recover the allowed revenues of the Transmission Owners (they own and maintain all the assets on the system). In the calculation of TNUoS charges, metered volumes are not scaled up or down by the TLM.

How are users affected by transmission losses?

Due to network losses, generators must produce more energy to ensure that demand users receive all the energy they need. Rules are in place to make sure that the cost of transmission losses is recovered from all transmission network users in their transmission network charges.

How are losses accounted for on the transmission network?

When calculating how much volume generators or suppliers put on or take off the transmission system, we need to consider overall transmission system losses. Transmission Loss Multipliers help us calculate the adjustment we need to make. The TLM calculation uses a parameter called the Generation/Demand (G/D) split. This divides transmission losses between generators and demand users. The Current G/D Split ensures 45% of the losses are deducted from the metered volumes of generators, and the remaining 55% of the losses are added to the metered volumes of demand users.

Further details on the calculation of the TLM can be found detailed in the Balancing and Settlement Code, T2.

Elexon calculates TLMs on a zonal basis. You can find more information on TLMs on Elexon’s webpage: https://www.elexon.co.uk/operations-settlement/losses/

[1] Grid supply points are the points on the transmission network that a distribution network owner (DNO) takes electricity off the network to supply to its customers.

Transmission Losses vs Distribution Losses

On the Transmission network, the percentage of network losses is lower than on the distribution network. Citizens Advice suggests that about 1.7% of the electricity transferred over the transmission network is lost, and a further 5-8% is lost over the distribution networks[2].

This is because transporting electricity via a lower current and high voltage causes lower network losses. The transmission network operates at ultra-high voltages to transfer bulk energy across long distances –which minimises losses. However, higher voltages require better electrical insulation which makes the cost of building and maintaining the transmission network more expensive.

What are the voltages on the networks?

In Great Britain, the transmission network operates at 275kV and 400kV, and in Scotland it also operates at 132kV. Distribution networks operate at 132kV and below.

How to adjust your BSUoS volumes for transmission losses

For each BMU (Balancing Mechanism Unit), its half-hourly metered volume is adjusted for transmission losses, before the BSUoS charge is calculated. The adjustment is done using the TLM factor. TLMs are zone specific, and there are 14 geographic zones (corresponding to the DNO zones). TLMs vary at different times of year due to different flows and the weather.

Post-Adjusted BMU value = Pre-Adjusted BMU value × TLM (with zone specific losses applied)

A set of Transmission Loss Factors (TLFs) are used in conjunction with the G/D split, to calculate TLMs. TLFs allow for the allocation of different transmission losses depending on the geographical location of the BM Unit, and the values of TLFs can be either positive or negative. TLFs are also seasonal to account for different flow patterns.

[2] https://publications.parliament.uk/pa/cm201415/cmselect/cmenergy/386/38607.html

ESO

Worked example

The following formula can be used to calculate the indicative BSUoS charge for a demand unit:

BSUoS Charge = BSUoS Fixed Tariff x (Metered Volume x TLM)

Example:

A demand source in the same zone (zone 14) wants to work out their BSUoS charge using the following parameters:

BSUoS Fixed Tariff (£)	Metered Volume (MWh)	G/D Split (%)	TLF (zone 14, Summer)	Average Transmission Loss (%)
2	100	45	-0.01471	2

The calculation is given below:

= BSUoS Fixed Tariff x (Metered Volume x TLM)

= BSUoS Fixed Tariff x Metered Volume x (1 +TLF + Demand Loss Adjustment)

= 2 x 100 x [1 + (-0.01471) + 1 x 2% x (1-45%)]

= 2 x 100 x 1.02571

= £205.14

How are losses accounted for on the distribution network?

Distribution losses happen between a grid supply point (GSP) and a household. They're accounted for by Line Loss Factors (LLFs), which are multipliers and are used to scale energy consumed or generated to account for losses on the UK's Distribution Networks.

Elexon calculates LLFs on a zonal basis. You can find more information on distribution losses and LLFs on Elexon's webpage:

https://www.elexon.co.uk/operations-settlement/losses/

Where can I find further information?

For the full calculation that determines transmission loss allocation, please read BSC Section T2. A link to the BSC document on Elexon's website is here:

https://www.elexon.co.uk/bsc-and-codes/balancing-settlement-code/

For distribution losses and LLFs, please see Elexon's webpage below. LLFs are only applicable to distribution losses.

https://www.elexon.co.uk/operations-settlement/losses/

Elexon have published a guidance paper on transmission loss allocation:

https://www.elexon.co.uk/documents/training-guidance/bsc-guidance-notes/transmission-losses-2/

Contact us

We hope you found this guidance document useful. If you have any questions, please contact us using the details below.

TNUoS: TNUoS.Queries@nationalgrideso.com

BSUoS: BSUoS.Queries@nationalgrideso.com