The impact of Locational Transmission Losses on transmission charges

Information I **National Grid**

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Purpose:

The current calculation of transmission losses will change following the Competition and Markets Authority's (CMA) energy market investigation, which mandates a locational adjustment in the calculation of transmission losses from 1st April 2018. This paper describes the effect that this change will have on the calculation of transmission system charges.

Background:

On the 24th June 2014 the Gas and Electricity Markets Authority referred the energy market for investigation by the CMA[1]. During this investigation the CMA identified that the absence of locational pricing for transmission losses in the wholesale electricity market in Great Britain was likely to distort competition between generators and have short and long term effects on generation and demand. Therefore the CMA made an order for a locational adjustment in the calculation of transmission losses from 1st April 2018. This has been progressed by industry through Balancing & Settlements Code (BSC) proposal P350 which was approved by the Authority on 24th March 2017.

What are Transmission Losses?

Transmission losses refer to the energy that is lost as electricity is transmitted across the transmission network from generation to directly connected demand or a grid supply point. Generally for a fixed type of line/cable/voltage; the greater the distance energy has travelled, the greater the energy lost during transit. Therefore the locational variability of losses is an important factor for generation and demand in particular locations. Elexon suggest that transmission losses account for just under 2% of all electricity transmitted.

How are Transmission Losses currently treated?

Currently the locational variability of transmission losses is not reflected in how they are calculated. The current methodology accounts for losses by calculating an average loss factor which is applied across the whole country, referred to as the Transmission Loss Multiplier (TLM). In order to allocate the losses for generation and demand, the TLM is used to scale metered volumes of Balancing Mechanism Units (BMUs) for transmission losses. A BMU can either represent a generator or a demand user and can include both demand and generation connected to the distribution network. This treatment of losses can be seen in the equation below:

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

1 The Energy Market Investigation (Electricity Transmission Losses) Order 2016

The TLM can be derived as = (1+TLF+TLMO)

and is comprised of the following elements:

- **Transmission Loss Factor (TLF):** This value is used to apply different allocations of losses to different BMUs. Currently this value is set to zero as there is no locational variation, so it is the same for all BMUs
- **Transmission Losses Adjustment (TLMO):** This factor adjusts generation and demand to ensure all losses are actually reflected. Two factors are used to represent the average loss for the delivery of units (generation) and the offtaking of units (demand).

Therefore the TLM currently reflects average losses of a BMU as the TLF does not have an impact on the locational signal.

What will the CMA recommendation change?

Changes to the calculation of transmission losses have been made through a BSC modification (P350) which is now approved. The code modification has not changed the calculation of the TLM, but has changed the value of the TLF; one of the components of the TLM. TLFs will be calculated for generation and demand on a zonal and seasonal basis as of 1st April 2018. Each zone now has an independent TLF for each seasonal period:

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

Further details on the calculation of the TLM can be found detailed in the BSC T2.3.1.

How could this affect me?

BSUoS

Metered values used in the calculation of Balancing Service Use of System (BSUoS) charges will continue to be adjusted with the TLM by Elexon (figure 1) and the TLM will now account for zone specific losses for each settlement period. National Grid then receive the adjusted BMU values that take account of locational losses to be used in BSUoS calculations. A worked example of how a BSUoS charge could potentially change for a user in a particular demand zone can be found at the end of this guidance note.

TNUoS

Metered values used in the calculation of Transmission Network Use of System (TNUoS) Generation Charges (for both negative and positive tariffs) and TNUoS Demand Charges will be unaffected by the introduction of locational losses as calculations are undertaken on the metered volume before adjustment for losses. The Annual Load Factor (ALF); used to determine a generator's TNUoS charge; is calculated using Final Physical Notification data and the generator's metered volume, which are both used before adjustment for losses (figure 1).

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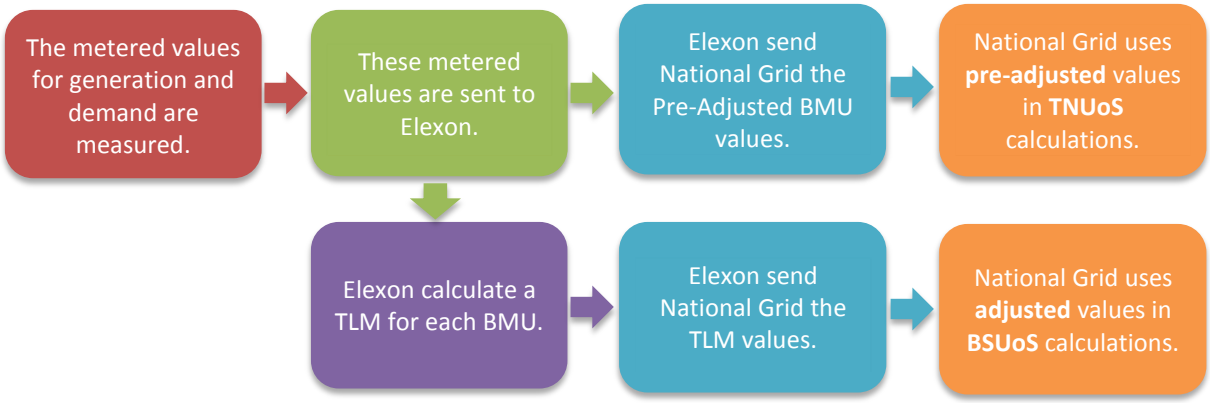

Figure 1: The adjustment of metered values to reflect the locational loss.

How does it work?

The following examples of how BSUoS tariffs are calculated with locational losses are illustrative based on the TLM figures shown in Table 1. Table 1 is taken from Elexon's P350 Load Flow Modelling Service Report:

Table 1: The calculated Adjusted Seasonal Average Zonal TLFs. The values were calculated from 630 Sample Settlement Periods between June 2015 and May 2016.

Zone Name	GSP Group	TLF Zone	Summer	Autumn	Winter	Spring
Northern Scotland	P	14	-0.01471	-0.01546	-0.04071	-0.00839
South Scotland	N	13	-0.01192	-0.00905	-0.01892	-0.0053
Northern	F	6	-0.00308	-0.00024	0.00069	0.00088
Northern Western	G	7	0.00273	0.00352	0.00388	0.00341
Yorkshire	M	12	-0.00065	0.0019	0.00516	0.00161
Merseyside and North Wales	D	4	0.00899	0.00898	0.01156	0.00978
East Midlands	B	2	0.00297	0.00738	0.01593	0.00661
Midlands	E	5	0.01233	0.01672	0.02423	0.01289
Eastern	A	1	0.00399	0.00993	0.01617	0.00544
South Wales	K	10	0.00446	0.00945	0.01716	-0.00338
South Eastern	J	9	0.0031	0.00969	0.01563	0.00188
London	C	3	0.01299	0.02087	0.02876	0.01339
Southern	H	8	0.01141	0.01907	0.02725	0.00945
South Western	L	11	0.01009	0.01773	0.02708	0.00606

Worked Examples:

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

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

Where:

TLM = 1+ TLF + TLMO

and:

TLMO (for a generator unit) = - (Average transmission loss x G/D split)

TLMO (for a demand unit) = Average transmission loss x (1- G/D split)

Example 1:

A generator in Northern Scotland (zone 14) wants an indication of how their BSUoS charge may change with the introduction of locational losses for a settlement period in the summer using Table 1 given that:

BSUoS Tariff = £2/MWh
Metered Volume = 100MW
TLMO = - (0.02 x 0.45) = -0.009

Potential BSUoS Charge	
Current BSUoS charge (TLF = 0)	= BSUoS Tariff x (Metered Volume x TLM) = BSUoS Tariff x (Metered Volume x (1 +TLF + TLMO)) = 2 x (100 x (1 + 0 – 0.009)) = 2 x (100 x 0.991) = 2 x 99.1 = £198.20
Indicative BSUoS charge (TLF = Adjusted Seasonal Average Zonal value, -0.01471)	= BSUoS Tariff x (Metered Volume x TLM) = BSUoS Tariff x (Metered Volume x (1 +TLF + TLMO)) = 2 x (100 x (1 + (-0.01471) – 0.009)) = 2 x (100 x 0.97629) = 2 x 97.629 = £195.26

Example 2:

A demand source in London (zone 3) wants an indication of how their BSUoS charge may change with the introduction of locational losses for a settlement period in the summer using Table 1 given that:

BSUoS Tariff = £2/MWh
Metered Volume = 100MW
TLMO = 0.02 x (1 - 0.45) = 0.011

Potential BSUoS Charge Change	
Current BSUoS charge (TLF = 0)	= BSUoS Tariff x (Metered Volume x TLM) = BSUoS Tariff x (Metered Volume x (1 +TLF + TLMO)) = 2 x (100 x (1 + 0 + 0.011)) = 2 x (100 x 1.011) = 2 x 101.1 = £202.20
Indicative BSUoS charge (TLF = Adjusted Seasonal Average Zonal value, 0.01299)	= BSUoS Tariff x (Metered Volume x TLM) = BSUoS Tariff x (Metered Volume x (1 +TLF + TLMO)) = 2 x (100 x (1 + (0.01299)+ 0.011)) = 2 x (100 x 1.02399) = 2 x 102.399 = £204.80