

Stage 03: Attachment A: Detailed Assessment for P278

P278 'Treatment of Transmission Losses for Interconnector Users'

What stage is this document in the process?

01 Initial Written Assessment

02 Definition Procedure

03 Assessment Procedure

04 Report Phase

Contents

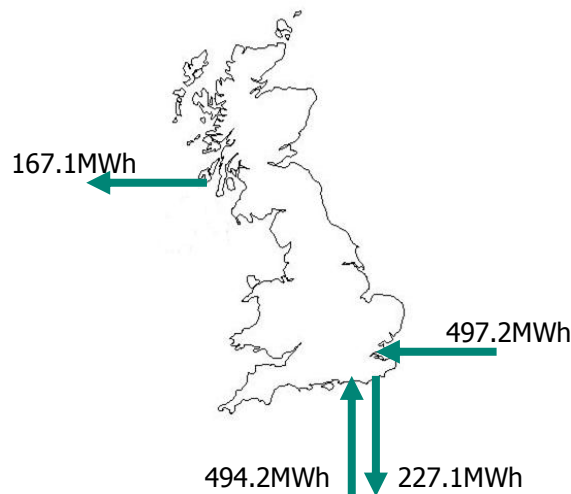
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About this Document

This is Attachment A to the P278 Assessment Consultation. It provides additional details of the Workgroup's analysis and discussions.

Measuring Interconnector flows

In a given Settlement Period, different Parties may be trading in opposite directions across different Interconnectors, or even across the same Interconnector. For example, the Interconnector flows in Settlement Period 1 (00:00-00:30) of 1 April 2011 were as follows:



Note: All MWh volumes are Settlement data (measured at the boundary of the GB Transmission System)

So, in this example, the net flow into GB (across all Interconnectors) is 597.2MWh, while the gross-net flow (i.e. netting within each Interconnector, but not across different Interconnectors) is 764.3MWh into GB, and 167.1MWh out of GB. The difference between net and gross-net flows is the transit of electricity across GB, i.e. 167.1MWh in this period.

Neither of the above ways of calculating the total Interconnector flow take account of superpositioning; i.e. logical flows of power that are in the opposite direction to the physical flow on a given Interconnector. If these are taken into account (i.e. no netting of positions, even within a single Interconnector) then this gives the gross-gross flow, which in the above example was 991.4MWh into GB and 394.2MWh out of GB.

Electrical losses caused by Interconnectors

It should be noted that P278 only addresses the allocation of electrical losses caused on the GB Transmission System by Interconnector flows. It does not propose any change to the arrangements for allocating electrical losses incurred on the Interconnector itself. These remain outside the scope of the BSC (and are not visible to BSC Systems, as the BSC requires the flows on the Interconnector to be measured at the point of connection to the GB Transmission System).

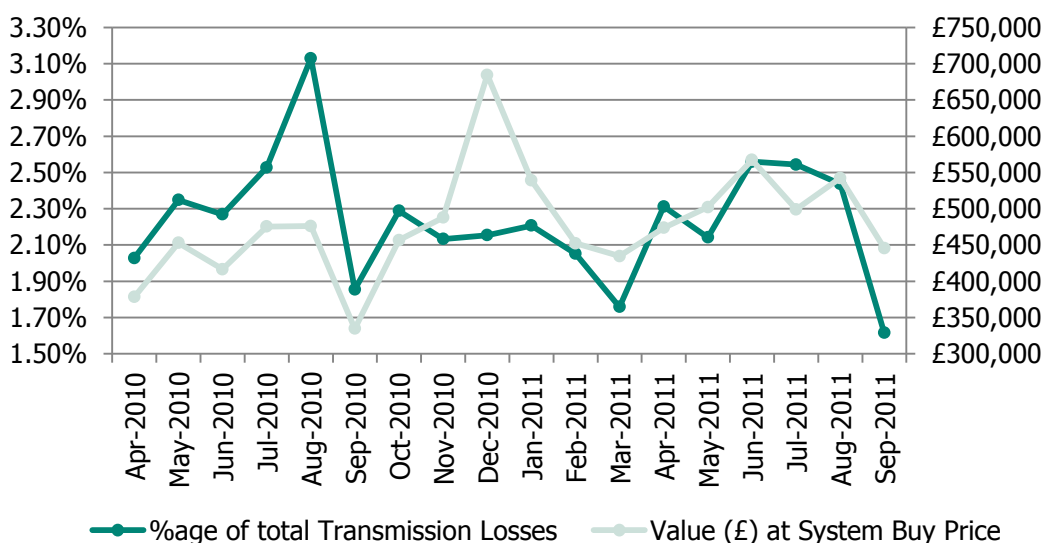
In practice, losses on the Interconnector itself will make themselves apparent as a discrepancy between the volumes notified to the Interconnector Administrator by Users, and the Interconnector flow metered for BSC purposes. This discrepancy will typically be addressed in the Interconnector Agreement, by scaling down notified volumes to allow for estimated losses. Any residual error will automatically be allocated to the Interconnector Error Administrator (IEA) by BSC Systems.

Current allocation of transmission losses

Under the current BSC baseline, the total GB transmission losses in each Settlement Period are shared uniformly amongst users of the Transmission System (45% going to delivery, which for this purpose includes Interconnector Users bringing power into GB; and 55% going to offtake, which for this purpose includes Interconnector Users taking power out of GB). In practice this means that the volume of GB transmission losses allocated to Interconnector BM Units is approximately 9,000MWh per month, which equates to just over 2% of the total (see graph below).

The financial impact of this volume adjustment depends on the imbalance position of the Lead Party for each Interconnector BM Unit:

- If they do not make any adjustment to their contractual position to cover the losses, they will (assuming they were otherwise in balance) be exposed to System Buy Price (SBP) on the volume of losses. The graph below therefore uses SBP to convert the loss volume into financial terms. On this basis, the financial value of the GB transmission losses allocated to Interconnector BM Units is approximately £500k per month.
- Alternatively, the Lead Parties for Interconnector BM Units may be able to buy energy to cover the losses (avoiding the exposure to SBP). The £500k per month cost (which is based on SBP) should therefore be regarded as a 'worst case'.



It should be noted that the 'share' of GB transmission losses currently allocated to Interconnectors is proportional to the gross-gross flow volume (i.e. superpositions on the same Interconnector are treated as both offtake and delivery for transmission loss purposes). The BSC does allow Interconnector Users on a single Interconnector to combine their BM Units into a single Trading Unit for purposes of transmission losses. This mechanism would potentially allow Interconnector Users to reduce their 'share' of GB transmission losses, so that it was based on the gross-net flow volume (i.e. netting off superpositions). However, no Interconnector Users have so far applied to form Trading Units of this type.

Distributional impact of P278

The graph above shows that the volume of GB transmission losses allocated to Interconnector BM Units associated with current Interconnectors (i.e. IFA, Moyle and BritNed) is approximately 9,000MWh per month (equating to approximately £500k per month if valued at SBP). The distributional impact of P278 would therefore be to reallocate that volume of losses to non-Interconnector (i.e. generator and Supplier) BM Units.

Of course, this does not take into account new Interconnectors that may be built over the next few years. The pilot version of the ENTSO-E Ten Year Network Development Plan¹ (TYNDP), published in 2010, identifies four such projects:

Potential new Interconnectors identified in the TYNDP				
Description	TYNDP Ref	Status (as of 2010)	Commissioning (as of 2010)	Capacity
East West Interconnector	461	Under Construction	2011	500MW
Project Nemo (Richborough to Zeebrugge)	443	Planned	2016	1,000MW
New subsea DC link, between GB and FR, possibly with a capacity of 1000MW (still to be determined)	62	Under Consideration	~ 2017	1,000MW
New connection between Western Norway and UK	424	Under Consideration	2017-2020	1,400MW

Inter-TSO Compensation Scheme (ITC)

The mandatory Inter-TSO compensation mechanism (regulation 838/2010²) includes provisions for TSOs (including National Grid in the GB context) to be compensated for losses caused on their systems by transit flows. The relevant volume of losses is established through load flow modelling (with the transit flows included, and with the transit flows removed) for a number of snapshot periods (72 per annum). These loss volumes are then compensated at a price reflecting the value of power in that specific country. In the case of GB, National Grid establishes the price for losses from an average forward baseload price for generation, and submits it to the European Network of Transmission System Operators for Electricity (ENTSO-E) in November (for use in the following year).

Although the Workgroup was unable to find published results from the ENTSO-E load flow modelling, it seems safe to assume that this approach to modelling losses will lead to the conclusion that transit flows **reduce** the total losses on the GB system. This is because the GB system generally carries power from North to South, whereas transit flows are overwhelmingly in the opposite direction i.e. South to North. The following table summarises how many Settlement Periods exhibited each type of transit flow in the eighteen months from April 2010 to September 2011³:

¹ <https://www.entsoe.eu/index.php?id=232>

² <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:250:0005:0011:EN:PDF>

³ Note that the BritNed Interconnector was not operative for most of this period (with first significant power flows recorded in February 2011).

Frequency of different types of transit flow (Apr 10 – Sep 11)	
Type of Transit Flow	No of Settlement Periods
South to North transit: power flowing in from IFA and out from Moyle (with BritNed inactive)	11,890 (45.2%)
No transit flows – power flowing into GB only	6,298 (23.9%)
South to North transit: power flowing in from IFA and BritNed, and out from Moyle	4,760 (18.1%)
No transit flows – power flowing out of GB only	2,306 (8.8%)
Power flowing in from IFA, out from BritNed and Moyle	717 (2.7%)
Power flowing in from IFA, out from BritNed	207 (0.8%)
All other configurations (including North to South transits)	126 (0.5%)

So, under the ITC, National Grid is compensating other TSOs for the reduction in GB transmission losses caused by transit flows. These payments (together with other elements of compensation payable under the ITC) are included in the costs recovered through Transmission Network Use of System (TNUoS), which means that the cost is borne by GB Suppliers and generators.

Potential impact of Trading Units on Interconnector losses

Currently, Interconnector BM Units have the ability to form Trading Units with other BM Units related to the relevant Interconnector (i.e. other Interconnector BM Units on that Interconnector and any other BM Units with Dedicated or Contiguous Assets linked to the Interconnector). To date, no Interconnector BM Units have ever elected to form such a Trading Unit.

Over the 18-month period from April 2010 to September 2011, with no Interconnector Trading Units, the total Interconnector Metered Volumes were 13,612,064MWh in delivering Trading Units, and -7,251,262MWh in offtaking Trading Units.

If Interconnector Users took full advantage of the Trading Unit rules by forming a single Trading Unit per Interconnector, this would reduce to 12,789,834MWh in delivering Trading Units (6.04% reduction), and -6,429,032MWh in offtaking Trading Units (11.34% reduction).

In summary, the total reduction in losses allocated to Interconnector Users that could be achieved through forming Trading Units would be less than 10%.

Potential Impact of Trading Units on Interconnector Metered Volumes (Apr 10 – Sep 11)			
Trading Unit	No Interconnector Trading Units	Single Trading Unit per Interconnector	Reduction in Metered Volumes
Delivering	13,612,064MWh	12,789,834MWh	6.04%
Offtaking	-7,251,262MWh	-6,429,032MWh	11.34%

2 Calculation of $TLMO^+$ and $TLMO^-$

TLM algebra

The existing calculation of the Transmission Loss Multiplier (TLM) in BSC Section T2 is as follows:

$TLM_{ij} = 1 + TLF_{ij} + TLMO^+_{ij}$ (for BM Units which are in delivering Trading Units in the Settlement Period); or

$TLM_{ij} = 1 + TLF_{ij} + TLMO^-_{ij}$ (for BM Units which are in offtaking Trading Units in the Settlement Period).

TLF_{ij} is currently zero for all BM Units.

P278 will set the value of TLM to 1 for all Interconnector BM Units in all Settlement Periods, regardless of whether they are in delivering or offtaking Trading Units. TLMs for all other BM Units will continue to be calculated using the above equations, and will be <1 for BM Units in delivering Trading Units and >1 for BM Units in offtaking Trading Units.

Current equations for $TLMO^+$ and $TLMO^-$

The current equations for calculating the Delivering and Offtaking Transmission Losses Adjustment ($TLMO^+$ and $TLMO^-$), which are given in Section T2.3 of the Code, are as follows:

$$TLMO^+_{ij} = - \{ \alpha (\Sigma^+ QM_{ij} + \Sigma^- QM_{ij}) + \Sigma^+ (QM_{ij} * TLF_{ij}) \} / \Sigma^+ QM_{ij}$$

$$TLMO^-_{ij} = \{ (\alpha - 1) (\Sigma^+ QM_{ij} + \Sigma^- QM_{ij}) - \Sigma^- (QM_{ij} * TLF_{ij}) \} / \Sigma^- QM_{ij}$$

Where:

- Σ^+ is the sum over all BM Units which are in delivering Trading Units in the Settlement Period;
- Σ^- is the sum over all BM Units which are in offtaking Trading Units in the Settlement Period; and
- All other symbols and acronyms are as defined in the BSC.

For $TLMO^+$, this equates to:

$$\frac{45\% \text{ of the total metered volumes of all BM Units}}{\text{total metered volumes of all delivering BM Units}}$$

For $TLMO^-$, this equates to:

$$\frac{55\% \text{ of the total metered volumes of all BM Units}}{\text{total metered volumes of all offtaking BM Units}}$$



Calculation Parameters

The Transmission Loss Factor (TLF_{ij}) is fixed at zero for all BM Units.

The value of α is fixed at 0.45.

Proposed equations for TLMO⁺ and TLMO⁻

P278 requires a change to the TLMO algebra to ensure that the total volume of GB transmission losses is recovered from non-Interconnector BM Units. To do this requires excluding the Interconnector BM Units from some (but not all) of the summations.⁴

The proposed equations for calculating TLMO⁺ and TLMO⁻, which would be used if P278 is implemented, are as follows:

$$TLMO^+_j = - \{ \alpha (\Sigma^+ QM_{ij} + \Sigma^- QM_{ij}) + \Sigma^+_{(non-I)} (QM_{ij} * TLF_{ij}) \} / \Sigma^+_{(non-I)} QM_{ij}$$

$$TLMO^-_j = \{ (\alpha - 1) (\Sigma^+ QM_{ij} + \Sigma^- QM_{ij}) - \Sigma^-_{(non-I)} (QM_{ij} * TLF_{ij}) \} / \Sigma^-_{(non-I)} QM_{ij}$$

Where:

- $\Sigma^+_{(non-I)}$ is the sum over all BM Units other than Interconnector BM Units which are in delivering Trading Units in the Settlement Period;
- $\Sigma^-_{(non-I)}$ is the sum over all BM Units other than Interconnector BM Units which are in offtaking Trading Units in the Settlement Period;
- Σ^+ and Σ^- are as defined above; and
- All other symbols and acronyms are as defined in the BSC.

For TLMO⁺, this equates to:

$$\frac{45\% \text{ of the total metered volumes of all BM Units}}{\text{total metered volumes of all non-Interconnector delivering BM Units}}$$

For TLMO⁻, this equates to:

$$\frac{55\% \text{ of the total metered volumes of all BM Units}}{\text{total metered volumes of all non-Interconnector offtaking BM Units}}$$

Impact on Section T data items and BSC Trading Charges

P278 directly impacts the calculation of the Transmission Loss Multiplier (TLM_{ij}), which then feeds through into the following data items:

- Credited Energy Volumes (QCE_{iaj}) values for Interconnector BM Units will no longer be adjusted for GB transmission losses, while QCE_{iaj} values for other BM Units will have larger transmission losses adjustments applied to them.
- TLM_{ij} values are also applied to Bid-Offer volumes for purposes of calculating Period BM Unit Cashflow (CBM_{ij}) and the main cash-out price. So P278 will slightly decrease Bid-Offer payments to non-Interconnector BM Units in delivering Trading Units, and slightly increase Bid-Offer payments to non-Interconnector BM Units in offtaking Trading Units. (Bid-Offer Acceptances from Interconnector BM Units would no longer be adjusted for GB transmission losses, but this is hypothetical only as the cross-border balancing arrangements needed to issue BOAs against Interconnector BM Units are not currently in place).

⁴ The only summation that still includes Interconnector BM Units is $(\Sigma^+ QM_{ij} + \Sigma^- QM_{ij})$, which is calculating the total volume of GB transmission losses and therefore remains unchanged.

- These changes then feed through into the calculation of Account Energy Imbalance Volume ($QAEI_{aj}$) and Account Energy Imbalance Cashflow ($CAEI_{aj}$). P278 means that Interconnector Users will no longer have to take account of GB transmission losses in managing their BSC imbalance charges, while other Parties will have to allow for increased transmission losses adjustments.

Impact on Settlement Reports

The above calculation and data item changes will be reflected in the SAA-I014 Settlement Reports issued to Parties.

One possible impact is that it will no longer be apparent from the SAA-I014 whether an Interconnector BM Unit was in a delivering Trading Unit or an offtaking Trading Unit (as it is the TLM_{ij} value that currently indicates this). However, this is mitigated by the fact that all Interconnector BM Units are currently in Sole Trading Units and so their 'delivery' or 'offtake' status is dependent only on their own BM Unit Metered Volume.



Operational requirements

This section summarises the operational solution requirements for P278.

The P278 solution does not impact any reporting flows. For example, the SAA-I014 will still report each BM Unit's TLM value in the same way as currently.

Detailed Solution Requirements

For the full detailed solution requirements, please refer to the P278 Draft Solution to Identify Impacts Document which was issued for industry impact assessment and which is available on the [P278](#) page of the ELEXON website.

Requirement 1

The Transmission Loss Multiplier (TLM) for Interconnector BM Units will be fixed at 1

Settlement Administration Agent (SAA) systems will be amended to allocate a TLM of 1 to all Interconnector BM Units from the first Settlement Period on the P278 Implementation Date. The TLM calculations for non-Interconnector BM Units will be unchanged, except for the revised calculations of $TLMO^+_j$ and $TLMO^-_j$ (see draft legal text in Attachment B).

Any Parties who load the TLM values into their systems may need to amend their systems to accept TLM values of 1 for their Interconnector BM Units.

The Balancing Mechanism Reporting Agent (BMRA) will need to revise the calculation of Estimated TLMs (ETLMs) used in the derived data calculations on the Balancing Mechanism Reporting Service (BMRS), so that these are set to 1 for Interconnector BM Units.

Requirement 2

The losses previously allocated to Interconnector BM Units will be redistributed across all other BM Units

The SAA systems will be amended to use the revised equations for $TLMO^+_j$ and $TLMO^-_j$ in the calculations of $TLMO^+_j$ and $TLMO^-_j$ from the first Settlement Period on the P278 Implementation Date. The revised TLMO calculation will redistribute the GB transmission losses that would have been allocated to Interconnector BM Units across all other BM Units instead, in proportion to their Metered Volumes and according to whether they are part of a delivering or offtaking Trading Unit in a given Settlement Period.

ELEXON will need to develop a revised methodology for calculating the Estimated TLMOs (ETLMOs) used on the BMRS, and will need to present this to the Imbalance Settlement Group for approval.

The BMRA will need to use the revised ETLMOs provided by ELEXON in the BMRS calculations.



Equations for $TLMO^+$ and $TLMO^-$

The current and proposed calculations for $TLMO^+_j$ and $TLMO^-_j$ can be found in Section 2 of this document.

Workgroup's Terms of Reference

Specific areas set by the BSC Panel in the P278 Terms of Reference

What changes are needed to BSC documents, systems and processes to support P278 (including any impact on Parties' systems), and what are the related costs and lead times?

Should the BSC still 'charge' Interconnector Users for transmission losses? Is the original principle behind the existing BSC rules still appropriate within the wider context of Europe?

Should P278 be implemented in a BSC Systems Release or on another date (e.g. to coincide with Parties' contract rounds)?

What are the benefits to the Applicable BSC Objectives? Are there any wider benefits or principles that Ofgem should consider?

Would treating Interconnector Users differently to other Parties be due or undue discrimination?

What would be the cashflow implications of P278? (The Workgroup should provide clear worked examples of how the ITC works and how it interacts with TNUoS and the BSC's losses allocation.)

Assessment Procedure timetable

P278 Assessment Timetable

Activity	Date
Panel submits P278 to Assessment Procedure	13 Oct 11
Workgroup Meeting 1	25 Oct 11
15WD Impact Assessment undertaken	14 Nov 11 – 05 Dec 11
Workgroup Meeting 2 (Joint with P277)	08 Dec 11
15WD Industry Consultation undertaken	13 Jan 12 – 03 Feb 12
Workgroup Meeting 3 (Joint with P277)	14 Feb 12
Panel considers Workgroup's Assessment Report	08 Mar 12

Workgroup membership and attendance

P278 Workgroup attendance			
Name	Organisation	Meeting 1 25/10/11	Meeting 2 08/12/11
Members			
Kathryn Coffin	ELEXON (Chair)	✓	✓
David Kemp	ELEXON (Lead Analyst)	✓	✓
Iain Pielage	National Grid Electricity Transmission plc (Proposer)	✓	✓
Gary Henderson	IBM for Scottish Power	✓	✓
Esther Sutton	E.ON	☎	✓
Martin Mate	EDF	✓	✓
Mark Thomas	RWE Supply & Trading	✓	✓
Kris Kennedy	SONI	✗	✗
Andy Colley	SSE	✓	✗
Vince Hammond	National Grid Interconnectors Limited	✗	✓
Attendees			
John Lucas	ELEXON (Design Authority)	✓	✓
Charlotte Ramsey	Ofgem	✓	✗
Matthew Grant	Ofgem	✗	✓
Alan Brady	SONI	✗	☎