REQUIREMENTS SPECIFICATION for Modification Proposal P229 'Introduction of a seasonal Zonal Transmission Losses scheme'

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Proposed Modification P229 seeks to change the Transmission Losses arrangements in the BSC so a Transmission Loss Factor (TLF) for each BSC Season is calculated for each 'TLF Zone'. Each year TLFs for each BSC Season would be calculated for the following year using historical data. The aim is to allocate transmission loss costs across generators and demand customers on the GB transmission system such that they better reflect the source of losses.

Overview of P229 Requirements Specification

- **Background** - the BSC Panel considered the P229 Initial Written Assessment on 11 December 2008 and submitted P229 to an 8-month Assessment Procedure conducted by the P229 Modification Group. The Group has met and agreed the requirements for the Proposed Modification.
- **Impact Assessment** - this document sets out the requirements agreed by the Group, and should be used to support assessment of the impact of P229 by BSC Agents, BSC Parties and the Transmission Company.
- **Questions** - any queries regarding the impact assessment requirements should be addressed to Dean Riddell (020 7380 4366, dean.riddell@elexon.co.uk).

Potential impacts:

- **Parties:** Generators, Suppliers, Licence Exemptable Generators, Interconnector users, the Transmission Company, Distribution System Operators and Non-Physical Traders
- **BSC Agents:** the Central Data Collection Agent (CDCA), Central Registration Agent (CRA), Settlement Administration Agent (SAA), and Balancing Mechanism Reporting Agent (BMRA)

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SUMMARY OF IMPACTED PARTIES AND DOCUMENTS

As far as the Modification Group has been able to assess, the following parties/documents would be impacted by P229.

Please note that this table represents a summary of the full initial impact assessment contained in Section 4.

Parties		Sections of the BSC		Code Subsidiary Documents	
Distribution System Operators	☒	A	☐	BSC Procedures	☒
Generators	☒	B	☐	Codes of Practice	☐
Interconnectors	☒	C	☐	BSC Service Descriptions	☒
Licence Exemptable Generators	☒	D	☐	Party Service Lines	☐
Non-Physical Traders	☒	E	☒	Data Catalogues	☒
Suppliers	☒	F	☐	Communication Requirements Documents	☒
Transmission Company	☒	G	☐	Reporting Catalogue	☒
Party Agents		H	☒	**Core Industry Documents**	
Data Aggregators	☐	I	☐	Ancillary Services Agreement	☐
Data Collectors	☐	J	☐	British Grid Systems Agreement	☐
Meter Administrators	☐	K	☐	Data Transfer Services Agreement	☐
Meter Operator Agents	☐	L	☐	Distribution Code	☐
ECVNA	☐	M	☐	Distribution Connection and Use of System Agreement	☐
MVRNA	☐	N	☐	Grid Code	☐
BSC Agents		O	☐	Master Registration Agreement	☐
SAA	☒	P	☐	Supplemental Agreements	☐
FAA	☐	Q	☐	Use of Interconnector Agreement	☐
BMRA	☒	R	☐	**BSCCo**	
ECVAA	☐	S	☐	Internal Working Procedures	☒
CDCA	☒	T	☒	**BSC Panel/Panel Committees**	
TAA	☐	U	☐	Working Practices	☒
CRA	☒	V	☒	**Other**	
SVAA	☐	W	☐	Market Index Data Provider	☐
Teleswitch Agent	☐	X	☒	Market Index Definition Statement	☐
BSC Auditor	☒			System Operator-Transmission Owner Code	☐
Profile Administrator	☐			Transmission Licence	☐
Certification Agent	☐				
Other Agents					
Supplier Meter Registration Agent	☐				
Unmetered Supplies Operator	☐				
Data Transfer Service Provider	☐				

Roles and documents that would be introduced by P229
BSC Agent - Transmission Loss Factor Agent
CSD - Load Flow Model Specification
Other items - Network Mapping Statement; Load Flow Model Reviewer

1 REASONS FOR PROPOSED CHANGE

1.1 Background

When electricity is transmitted over the Transmission System some energy is 'lost'. The energy lost from the Transmission System is commonly referred to as 'transmission losses'. Transmission losses may be considered as comprised of two main elements, 'fixed' losses and 'variable' losses.

Fixed losses are losses which do not vary significantly with power flow. Fixed losses arise in:

- Transformers - from magnetising the iron core; and
- Overhead lines - include losses dependent on voltage levels, length of line and climatic conditions.

Variable losses are due to the heat caused by the flow of current through transformers and lines. Variable losses increase with:

- Current flow (and associated power flow); and
- Length of the line in which it flows.

'Total transmission losses' means the sum of fixed and variable losses. The total losses are the total energy lost from the Transmission System at any given time, which equates to the difference between total metered generation and total metered demand[1].

1.2 Existing Transmission Losses Arrangements

The existing mechanism for allocating transmission losses to Parties is set out in Section T of the Balancing and Settlement Code ('the Code'). Under the existing Code provisions, fixed and variable transmission losses are allocated to Parties on a uniform (i.e. non-locational) basis in proportion to each Party's metered energy. The current allocation of transmission losses therefore does not take account of the extent to which individual Parties give rise to such losses.

Although a parameter for differential allocation of some or all transmission losses is included in the Code, it is currently set to zero so has no effect in practice. This parameter is represented in the Section T2 calculations by the Transmission Loss Factor (TLF), which is currently set to zero (TLF = 0). A modification of the Code is necessary to amend the TLF value. A simplified version of the Section T calculation of each BM Unit's share of total transmission losses in any given Settlement Period is:

Transmission Loss Multiplier = 1 + Transmission Loss Factor + Transmission Losses Adjustment

Or: **TLM = 1 + TLF + TLMO**

A Transmission Loss Multiplier (TLM) is a factor used to scale each BM Unit's Metered Volumes in Settlement. A TLM is generated for each individual BM Unit. The Transmission Losses Adjustment (TLMO) is used to allocate the proportion of transmission losses not already allocated via the TLF. The delivering TLMO uniformly adjusts generation by all BM Units in delivering (exporting) Trading Units; the offtaking TLMO uniformly adjusts demand from all BM Units in offtaking (importing) Trading Units.

TLMO calculation includes a factor α (alpha), which is a constant of 0.45. The result is uniform adjustment of the total transmission losses for the Settlement Period such that:

- 45% of losses are allocated across all delivering Trading Units in aggregate; and
- 55% of losses are allocated across all offtaking Trading Units in aggregate.[2]

[1] At any point in time the total metered energy drawn from the Transmission System to meet demand is less than the electrical energy delivered to the Transmission System by generation.

Since the value of TLF is presently zero the TLMO determines the calculation of each BM Unit's TLM. This means two uniform TLM values are currently applied - one to all BM Units in delivering Trading Units, and one to all BM Units in offtaking Trading Units. Each Party's overall allocation of transmission losses is dependent on the Metered Volumes of the BM Units to which the TLM is applied. Transmission losses are allocated to Parties as part of their Trading Charges.

P229 proposes to change the transmission losses arrangements so that the allocation of transmission loss costs across generators and demand customers on the GB transmission system better reflects the source of losses. TLF Zones would be determined, and a TLF for each BSC season calculated for each TLF Zone annually.

1.3 Related Changes

Between December 2005 and July 2006 four Modification Proposals were raised which all concerned Zonal Transmission Losses schemes, and were:

- P198 - Introduction of a Zonal Transmission Losses scheme
- P200 - Introduction of a Zonal Transmission Losses scheme with Transitional Scheme
- P203 - Introduction of a seasonal Zonal Transmission Losses scheme
- P204 - Scaled Zonal Transmission Losses

On 17 July 2008, the Authority published an open letter stating it was no longer in a position to reach a decision on these four Modification Proposals. The Modification Proposals are therefore closed.

The solution proposed by P229 is essentially the same as that proposed by P203, with the addition of a proposed method for dealing with offshore connections to the Transmission System.

1.4 Partial Implementation of Modification P82

Before the Modification Proposals noted above, in May 2002 Modification Proposal P82 'Introduction of Zonal Transmission Losses on an Average Basis' was raised. P82 was approved for implementation, but this approval was quashed by the High Court in January 2004 following judicial review. P82 was remitted to the Authority for re-decision and subsequently rejected.

Though P82 was not implemented, the development work was completed prior to the judicial review's conclusion. Much of the original P82 functionality (legal text, system development, Code Subsidiary Document changes and BSCCo working procedures) is re-usable and owned by BSCCo. Exceptions are the Load Flow Model and the Transmission Loss Factor Agent (TLFA), the new BSC Agent which would have been created by P82 to calculate TLFs using the Load Flow Model. An organisation was procured to fill the TLFA role but because P82 was not implemented, the TLFA was not required and the TLFA contract was terminated. If P229 is approved a new TLFA procurement would be required.

Further detail regarding P82 can be found in the P82 Business Requirements Specification (Reference 1).

[2] This is intended to deliver a 50:50 allocation in practice, allowing for the effect of metering for most generation connections being on the high voltage side of supergrid transformers, while metering for demand is on the low voltage side. The 45:55 allocation of transmission losses aims to take into account transformer losses for demand connections which are in addition to the metered flow.

2 SUMMARY OF P229 SOLUTION

P229 was raised on 28 November 2008 by RWE Npower ('the Proposer'). P229 proposes to change the arrangements in the BSC for allocating transmission losses, and associated costs, across generators and demand customers on the GB transmission system. Under P229 TLF Zones would be created based on the 14 GSP Groups. Historical data would be used to annually calculate a TLF for each BSC season for each TLF Zone for the following year.

As noted above and in the P229 Modification Proposal, the P229 solution is substantially the same as that proposed by P203. The P203 solution was based in turn on the P198 Alternative solution. The main areas in which P229 differs from some or all of the previous Transmission Losses Modifications (P198, P200, P203 and P204) are:

- P229 uses seasonal TLF values, not annual TLFs;
- P229 does not include any transitional scheme/phased implementation; and
- P229 includes a proposal for the treatment of offshore connections to the Transmission System.

The P229 solution can be summarised as follows:

1) Load Flow Model

An electrical model of the Transmission System (the 'Load Flow Model') would be built, containing 'Nodes' to represent points where transmission circuits meet or energy flows on or off the Transmission System. Each Node would be identified by the Transmission Company, and allocated to a specific TLF Zone on the transmission network using a 'Network Mapping Statement' maintained by BSCCo. The TLF Zones would be set by the Panel, based on the geographic areas covered by GSP Groups. Since there are currently 14 GSP Groups, there would therefore be 14 TLF Zones.

2) TLF calculation

TLFs would be calculated on an ex-ante basis (i.e. calculated before the relevant year) for each BSC Year, using Metered Volumes and Network Data for Sample Settlement Periods from a preceding 12-month period (the 'Reference Year'). The required Metered Volumes and Network Data would be provided by the Central Data Collection Agent (CDCA) and the Transmission Company respectively.

3) Transmission Loss Factor Agent

Prior to the start of each BSC Year (1 April – 31 March), the Load Flow Model would be run by a Transmission Loss Factor Agent ('the TLFA'). The TLFA would calculate how an incremental increase in power at each Node would affect the total variable losses of the Transmission System. The output of the Load Flow Model would be a TLF value for each Node in each of the Sample Settlement Periods.

- Positive TLF values would be produced for Nodes where an incremental increase in generation (or reduction in demand) had the effect of decreasing variable losses.
- Negative TLF values would be produced for Nodes where an incremental increase in generation (or reduction in demand) had the effect of increasing variable losses.

For example, if an extra 1kWh injection at a Node increased variable losses by 0.02kWh, the TLF for the Node in that Settlement Period would be -0.02. The TLFA would average the Nodal TLFs across all Nodes in each TLF Zone by volume-weighted averaging, to give a Zonal TLF value for each TLF Zone for each Sample Settlement Period.

The TLFA would convert these Zonal TLF values to Seasonal Zonal TLFs by time-weighted averaging, calculating four Seasonal Zonal TLFs for each TLF Zone – one for each BSC Season, as defined in Section K of the Code:

- BSC Spring: 1 March – 31 May inclusive;
- BSC Summer: 1 June – 31 August inclusive;
- BSC Autumn: 1 September – 30 November inclusive; and
- BSC Winter: 1 December – 28 February inclusive (or 29 February in a leap year).

4) Adjusted Seasonal Zonal TLFs

The TLFA would adjust the Seasonal Zonal TLFs by a scaling factor of 0.5 such that the volume of energy allocated via the TLFs is comparable to the volume of variable losses calculated by the Load Flow Model. These Adjusted Seasonal Zonal TLFs would be published by BSCCo no less than three months prior to their use in the TLM Settlement calculation for the applicable BSC Season.

5) Treatment of BM Units

Each BM Unit would be allocated to a TLF Zone by BSCCo using the Network Mapping Statement. Any question or dispute over allocation would be resolved by the Panel. The TLFA would determine the TLF value to be applied to each BM Unit in the TLM Settlement calculation for the applicable BSC Season (i.e. the Adjusted Seasonal Zonal TLF value for the relevant TLF Zone). All BM Units in a Zone would receive the same TLF value for every Settlement Period in a BSC Season.

A positive TLF would increase the TLM value used to scale a BM Unit's Metered Volume, which would be a benefit to generators and a disadvantage to Suppliers. A negative TLF would decrease the TLM value, which would be a benefit to Suppliers and a disadvantage to generators.

6) BM Unit-Specific TLFs

The Adjusted Seasonal Zonal TLF that applies to, and is registered against, a particular BM Unit is referred to in this document as a 'BM Unit-Specific TLF'. Note that all BM Units in the same Zone and for a particular Season would be assigned the same BM Unit-Specific TLF.

The BM Unit-Specific TLFs calculated by the TLFA would be registered in BSC Systems by the Central Registration Agent (CRA). The BM Unit-Specific TLFs would be used by the Balancing Mechanism Reporting Agent (BMRA) in the Balancing Mechanism Reporting Service (BMRS) and the Settlement Administration Agent (SAA) in Settlement calculations.

7) Fixed Losses

Fixed transmission losses would continue to be allocated to Parties on a non-locational basis through the TLMO. The 45:55 allocation of total transmission losses across generation and demand would be retained.

8) No P229 mitigation

There would be no phased implementation or 'hedging' of exposure to the Zonal TLFs (the Zonal TLFs would therefore take full effect from the first Settlement Period on the Implementation Date).

9) Offshore Nodes and Zones

TLF Zones would be based on the geographical areas of GSP Groups. For offshore Nodes connected to the transmission system (including both DC and AC offshore networks and offshore networks connected to distribution systems) the onshore GSP Group to which the network is connected would be the basis of allocating Nodes to TLF Zones, subject to Panel determination using specific criteria.

3 DETAIL OF PROPOSED MODIFICATION SOLUTION REQUIREMENTS

3.1 Transmissions Loss Factor Agent and Load Flow Model Reviewer

3.1.1 Procurement of Transmissions Loss Factor Agent

Under P229 the Transmission Loss Factor Agent (TLFA) would calculate TLF values. For the P229 impact assessment, assume that the TLFA role would be filled by a new BSC Agent.

ELEXON would procure the TLFA in accordance with the BSC procurement process in Section E of the Code, and would establish the required documentation, such as a Service Description and Tender Framework Statement.

3.1.2 TLFA Service Description

ELEXON would produce a TLFA Service Description in accordance with Section E of the Code, which would be a Code Subsidiary Document. The Panel would need to approve this new Service Description, and any subsequent changes to it, in line with the existing BSC change processes. The TLFA Service Description would include standard areas required by Section E1.3 of the Code, such as specification of the service, performance levels and disaster recovery.

The functional services to be provided by the TLFA would include, but not necessarily be limited to:

- The establishment, adoption, modification and application of a Load Flow Model;
- The provision of right of access to the Load Flow Model by the Load Flow Model Reviewer (and to the arbitral tribunal in the event of any arbitration;
- The annual calculation of Nodal TLFs;
- The annual calculation of Zonal TLFs;
- The annual calculation of Seasonal Zonal TLFs;
- The annual calculation of Adjusted Seasonal Zonal TLFs;
- The annual determination of BM Unit-specific TLFs;
- The annual provision of specific output data to ELEXON;
- The provision of any support to the Trading Disputes Committee (TDC) which the TDC may require for the Trading Disputes process; and
- The ability to recalculate TLFs on an ad-hoc basis if required.

The non-functional services to be provided by the TLFA would include, but may not necessarily be limited to:

- The provision of right of access by the BSC Auditor to the Load Flow Model and TLFA data and processes;
- The provision of a helpdesk service;
- The provision of a change management service, including provision of impact assessments for any proposed changes to TLFA Systems, processes and/or documentation;
- The provision of a consultancy service as required by ELEXON (e.g. provision of analysis); and
- Any other standard non-functional requirements for BSC Agents which are specified in Section E1.3 of the Code (e.g. arrangements for data retention and transfer, security controls).

The nature of the TLFA role does not require any 'real time' system operation, reporting, or direct interface with any participants other than ELEXON, the Load Flow Model Reviewer and the BSC Auditor. It is envisaged that the TLFA would provide a helpdesk service on a Business Day, rather than a 24-hour, basis. The helpdesk would be a single point of contact and would receive incoming helpdesk calls only from ELEXON, the Load Flow Model Reviewer and the BSC Auditor.

3.1.3 Load Flow Model Specification

The TLFA would be required to establish, adopt, apply, and from time to time modify a Load Flow Model of the Transmission System in accordance with a Load Flow Model Specification. The Load Flow Model Specification would be established as a new Code Subsidiary Document.

The purpose of the Load Flow Model is to support the calculation of Nodal TLF values; therefore, the Load Flow Model Specification would only specify the derivation of Nodal TLFs. The conversion of Nodal TLFs to Seasonal Adjusted Zonal TLFs, and the determination of BM Unit-specific TLFs, would not be part of the Load Flow Model. These activities would be carried out separately by the TLFA using the calculations detailed in the TLFA Service Description.

The Load Flow Model Specification would contain full detailed requirements for the Load Flow Model, which may include but not necessarily be limited to:

- The key objectives of the Load Flow Model;
- The compliance requirements for the Load Flow Model;
- The type of Load Flow Model to be used;
- The assumptions and approximations to be used in the Load Flow Model;
- Details of the input data to be used by the Load Flow Model;
- A statement regarding the location of the slack node within the Load Flow Model; and
- The full methodology for deriving Nodal TLFs through the application of the Load Flow Model (including the actual equations for computing power flow data and Nodal TLFs).

Note that the methodology and power flow equations for calculating Nodal TLFs are unchanged from P203, and P82 before that. Thus only minimal changes to the P82 Load Flow Model Specification text are likely to be required to reflect the few key differences in P229 (e.g. the slack node location; extension of calculations to the whole of GB; and the change to the start and end dates for the Reference Year).

3.1.4 User Requirements Specification

The TLFA would need to develop a User Requirements Specification (URS), based on the TLFA Service Description and Load Flow Model Specification. This document would define how the TLFA would meet its service requirements and would be subject to the BSC change process.

Other documentation such as system specifications and/or design specifications might need to be developed by the TLFA. The BSC Auditor, the Load Flow Model Reviewer and BSCCo would have the right to access the URS and all other systems documentation.

3.1.5 Appointment of Load Flow Model Reviewer

Under P229 an independent Load Flow Model Reviewer would be appointed. The Load Flow Model Reviewer would ensure the Load Flow Model complies with the Load Flow Model Specification, and would not be a BSC Agent. The Panel would appoint a Load Flow Model Reviewer, assisted by ELEXON.

The Panel would approve terms of reference for the Load Flow Model Reviewer. The terms of reference would detail the process and timescales for reporting on the compliance of the Load Flow Model.

3.2 Load Flow Model

Under P229 the TLFA would establish, adopt, apply, and from time to time modify the Load Flow Model. The TLFA would also be required to develop accompanying systems, processes and documentation.

3.2.1 Load Flow Model establishment

The TLFA would be required to establish a Load Flow Model in accordance with the Load Flow Model Specification and the following requirements:

1) Function

A load flow model is a mathematical model of an electrical network which represents power flows between pairs of adjacent nodes on the network. The P229 Load Flow Model would support derivation of Nodal TLFs.

2) Inputs

The inputs to the Load Flow Model would be:

- A Network Mapping Statement provided by ELEXON to the TLFA;
- A list of Load Periods and Sample Settlement Periods provided by ELEXON to the TLFA;
- Network Data provided by ELEXON to the TLFA; and
- Metered Volume data provided by ELEXON to the TLFA.

3) Key Objectives

The key objectives of the Load Flow Model would be to:

- Comply with the Load Flow Model Specification at all times;
- Accurately represent the physical characteristics of the GB transmission network via a Direct Current (DC) load flow model;
- Utilise Network Data for an intact network;
- Use Metered Volume data to calculate power flows, in order to capture delivery (injections) onto the network and offtake (withdrawals) from the network at individual Nodes; and
- Generate Nodal TLFs that are representative of the changes in variable losses arising from marginal changes in demand or generation at each Node on the network, with network balance being maintained by a slack node.

4) Assumptions and Approximations

The Load Flow Model would use some assumptions and approximations to model the network. Only electrical losses associated with power flows between adjacent Nodes forming part of the network would be used in determining Nodal TLFs. Several assumptions would be made with respect to power flow between adjacent Nodes, e.g. that there is no Reactive Power component.

5) Slack Node

The Load Flow Model would contain a slack node that acts as a sink for any surpluses or a source for any deficits in power flow arising from deficiencies in the model. It is also a reference Node for calculating the phase angle of the power flow between each pair of adjacent Nodes in the model. In a DC load flow model, the choice of slack node affects the absolute values of TLFs but does not affect the differentials between TLFs for different Zones (and therefore does not affect the resulting TLM values).

The Load Flow Model Specification and any TLFA System Specification would state the designated slack node as agreed between the TLFA, ELEXON and the Transmission Company, and ELEXON would publish the slack

node location for each year's TLF calculation. The same slack node must be used in the all TLF calculations for a given year.

6) Approval and Compliance

Once established by the TLFA the Load Flow Model would need to be approved by the BSC Panel before it can be adopted and applied by the TLFA. The Panel's decision on approval would be based on a report from the Load Flow Model Reviewer on whether the Model is fit for purpose. The Load Flow Model Reviewer would inspect the Model and report on its fitness to fulfil its requirements. Once approved, the Load Flow Model must continue to comply with the Load Flow Model Specification.

7) Escrow Arrangements

Once the Load Flow Model has been approved by the Panel and adopted by the TLFA, the TLFA shall place a copy of the Load Flow Model with an escrow agent to ensure its integrity. ELEXON would need to agree the escrow agent to be used, and set the terms and conditions for the agent (which do not require Panel approval). The TLFA would pay all fees due to the escrow agent.

3.3 Network Mapping Statement

3.3.1 Purpose of Network Mapping Statement

P229 requires the development of a Network Mapping Statement by ELEXON, to be used by the TLFA in determining TLFs. The Network Mapping Statement would be the definitive statement of the mapping of Volume Allocation Units to Nodes, Nodes to Zones, and BM Units to Zones, for the purposes of determining TLFs. ELEXON would develop the Network Mapping Statement using information it holds and data from the Transmission Company. The TLFA would use the Mapping Statement for the following purposes:

- **Volume Allocation Unit (VAU) to Node mapping:** to convert Metered Volume data for Volume Allocation Units into power flows by Node, in order to derive Nodal TLFs via the Load Flow Model;
- **Node to Zone mapping:** to derive Zonal TLFs from Nodal TLFs; and
- **BM Unit to Zone mapping:** to derive BM Unit-specific TLFs from Zonal TLFs.

3.3.2 Content of Network Mapping Statement

The Network Mapping Statement would contain a statement of the following:

1) For each VAU (other than a GSP Group or BM Unit embedded in a Distribution System), the Node which represents or best represents that VAU or (as the case may be) the Boundary Point(s) at which that VAU is connected to the Transmission system (since one Node may represent several such points);

2) For each Node which represents or best represents a Volume Allocation Unit, the Zone in which the Node lies or should best be considered to lie; and

3) For each BM Unit, the Zone in which the BM Unit lies, on the basis of the same correspondences as established under 1) and 2) above, except that:

   a) Interconnector BM Units shall lie in the Zone in which the Node for the relevant Interconnector lies; and

   b) Supplier BM Units and other BM Units embedded in a Distribution System shall lie in the Zone which represents the geographical area of the corresponding GSP Group.

Only Nodes which correspond to VAUs and which have a power flow either onto or off the Transmission System need to be mapped to Zones for the purposes of the Network Mapping Statement.

3.3.3 Types of Network Mapping Statement

Under P229 there would be two versions of the Network Mapping Statement in each BSC Year, each having a different purpose, as follows:

- **Initial Network Mapping Statement:** a version of the Network Mapping Statement used in the TLFA's annual calculation of TLF values for each BSC Year; and
- **Prevailing Network Mapping Statement:** a version of the Network Mapping Statement updated and maintained by ELEXON between the annual issue of the Initial Network Mapping Statement, in order to reflect any ad-hoc changes in Nodes, BM Unit registrations, and/or zonal boundaries. Used to derive TLFs for any new BM Unit registrations which occur part-way through a year.

The Initial Network Mapping Statement affects BM Units' TLF values for the forthcoming BSC Year and would therefore be subject to annual industry consultation and Panel approval. Review/approval of the Prevailing Network Mapping Statement is not required because changes in Nodes, BM Units and Zones that occur part-way through a BSC Year do not affect other BM Units until TLFs for the next BSC Year are calculated (based on a new Initial Network Mapping Statement).

Maintaining an updated Prevailing Network Mapping Statement allows new BM Units which register part-way through a year to be mapped to a Zone and assigned TLF values for the remainder of that year. The TLFs assigned to a new BM Unit would be the Adjusted Seasonal Zonal TLFs already derived by the TLFA for that year (using the Initial Network Mapping Statement) for the Zone the BM Unit is mapped to. TLFs already calculated for existing BM Units for a BSC Year would not be retrospectively recalculated due to a subsequent change in any BM Unit's registration (retrospective recalculation could only occur due to an upheld Trading Dispute).

Because the Prevailing Network Mapping Statement must be updated as necessary the Network Mapping Statement would not be a Configurable Item (and not subject to the standard BSCP40 'Change Management' process) but would be subject to a specific change process introduced by P229.

3.3.4 Inputs to Network Mapping Statement

The main inputs to the Network Mapping Statement would be:

a) A list of Nodes provided by the Transmission Company;

b) A list of Zones determined by the Panel;

c) A list of Volume Allocation Units provided by ELEXON; and

d) A list of BM Units provided by ELEXON.

The Transmission Company, Licensed Distribution System Operators (LDSOs), the CDCA and the CRA would be required to provide any information to ELEXON and/or the Panel that is required to prepare the Network Mapping Statement. Additional information may be required, e.g. information on split substations from the Transmission Company. Further details of input requirements are given below.

1) Nodes

As part of implementation of P229 the Transmission Company would need to identify each Node on the Transmission System in operation during the Reference Year preceding implementation and provide ELEXON a list of these Nodes. This list would be required as soon as possible following approval of P229 by the Authority, though under normal operation the list of Nodes would be updated over the course of each year.

Under ongoing operation of P229 the Transmission Company would update the list of Nodes from time to time as required to reflect any changes, and provide the updated list to ELEXON. Any changes in Nodes that occur after the Panel approval of the Initial Network Mapping Statement would be captured in the Prevailing Network Mapping Statement.

The Transmission Company analysis of P229 should include estimates of the impact and lead time of developing the initial list of Nodes for implementation, and for subsequently updating the list to reflect any changes to Nodes (e.g. following a BM Unit registration/deregistration).

2) Zones

Under P229 the Panel would determine the constitution of TLF Zones. Each Zone would correspond to the geographic area of a GSP Group. Since there are currently 14 GSP Groups, there would be 14 Zones. In determining Zonal boundaries the Panel may apply such criteria as it may decide at its discretion. The Panel may, but would not be required to, consult any Party regarding the determination of any part of a Zonal boundary if it considers there is material doubt over the boundary.

ELEXON would support the Panel in determining Zones, including providing any analysis required by the Panel. Under P229, any Nodes that constitute Offshore Transmission (including DC and AC offshore networks and offshore networks connected to distribution systems) would be allocated to a TLF Zone on the basis of the onshore GSP Group to which the Node is connected, as determined by the Panel.

After determining the TLF Zones the Panel would be required to publish a description of the Zones. This could be accomplished by ELEXON publishing the description, possibly as part of the Network Mapping Statement.

Under the ongoing operation of the provisions introduced by P229, the Panel would be able to review and, upon reasonable notice to Parties, change its determination of any TLF Zones, where there is a change in one or more GSP Groups or upon the application of a Party or upon its own initiative. Any change in the determination of any Zones would be effective only in relation to BSC Years for which (at the time the change is made) TLFs have not already been determined by the TLFA, i.e. TLFs would not be recalculated during a BSC Year as a result of any changes to Zonal boundaries.

3) Volume Allocation Units and BM Units

As part of P229 implementation, ELEXON would compile lists of the VAUs and BM Units to be included in the Initial Network Mapping Statement for calculating TLFs for the BSC Year of P229 implementation.

The list of VAUs would include all VAUs that were registered at any point during the Reference Year (whether or not they are registered when the list is compiled, or operated throughout the entire Reference Year). This would ensure that all Nodes that influenced power flows during the year can be mapped.

The list of BM Units would include all BM Units that were registered when the Initial Network Mapping Statement was issued for industry consultation (whether or not they had been registered during the Reference Year), enabling the TLFA to derive their BM Unit-specific TLFs for the forthcoming BSC Year.

ELEXON would update the Prevailing Network Mapping Statement with any BM Unit registrations or deregistrations that occur between the annual consultations on the Initial Network Mapping Statement, and would determine how to reflect these changes within the Prevailing Network Mapping Statement.

BM Units that register after the Initial Network Mapping Statement is issued for consultation shall be assigned TLFs by ELEXON according to the Zone in which the BM Unit is located. The TLF assigned would be the TLF already calculated by the TLFA and assigned to that Zone.

3.3.5 Developing and Maintaining the Network Mapping Statement

1) Initial Network Mapping Statement

The processes for preparing the Initial Network Mapping Statement would be:

a) ELEXON prepares a draft Initial Network Mapping Statement (after P229 implementation the draft Initial Network Mapping Statement would be based on the latest version of the Prevailing Network Mapping Statement);

b) ELEXON provides the draft Initial Network Mapping Statement to the Panel, and issues it to all BSC Parties for consultation by a specified date, giving Parties ten Working Days to provide comments on the draft Initial Network Mapping Statement to ELEXON;

c) ELEXON presents to the Panel any representations or comments received from Parties, and any question or dispute regarding the mapping of Nodes to VAUs and/or Zones shall be determined by the Panel at its discretion;

d) The Panel approves the draft Initial Network Mapping Statement with any amendments it decides to make, taking into account any consultation responses and Panel determinations;

e) ELEXON publishes the approved Initial Network Mapping Statement and provides the approved Initial Network Mapping Statement to the TLFA by a specified date; and

f) The TLFA uses the approved Initial Network Mapping Statement to calculate TLFs for the forthcoming BSC Year.

2) Prevailing Network Mapping Statement

The operational processes for maintaining the Prevailing Network Mapping Statement would be:

a) Following annual approval of the Initial Network Mapping Statement ELEXON updates the Prevailing Network Mapping Statement from time to time to reflect any changes to:

- The list of Nodes;
- The definition of any Zone;
- Any changes in BM Unit registrations;
- Any changes in Transmission System Boundary Points or Systems Connection Points; and/or
- Any determination made by the Panel regarding mapping disputes.

b) ELEXON publishes any update to the Prevailing Network Mapping Statement. Due to the frequency of BM Unit registrations/deregistrations ELEXON may batch changes to the Prevailing Network Mapping Statement such that updates are made on a monthly basis.

The Prevailing Network Mapping Statement does not need to be sent to the TLFA, unless the TLFA is required to use it to retrospectively recalculate TLFs as a result of an upheld Trading Dispute.

3) Mappings Disputes

Parties would be able to question or dispute the allocation of Nodes to Volume Allocation Units and/or Zones, and thereby effectively 'appeal' the allocation of BM Units to particular Zones.

Any such question or dispute would be determined at the Panel's discretion after consulting with the Transmission Company and the Lead Parties of the BM Units. In making its determination the Panel would consider the parts of the Transmission System in which power flows are typically most influenced by changes in power flows at the relevant Node or BM Unit.

The Transmission Company, each LDSO, the CRA and the CDCA would be required to cooperate with ELEXON and the Panel, and provide such information as they may require, in preparing the Network Mapping Statement and making a determination with regard to any question or dispute.

Any question or dispute regarding mapping would need to be raised no later than the closing date of the Initial Network Mapping Statement consultation in order to be taken into account in the determination of TLFs for the forthcoming BSC Year. The mapping of BM Units included in the approved Initial Network Mapping Statement would be binding for the purpose of applying TLFs in the forthcoming BSC Year, and

could not be retrospectively changed due to a dispute. New BM Units registering after the Initial Network Mapping Statement is approved would have an opportunity to challenge the mapping to be applied for the remainder of the BSC Year, but such a challenge would affect only which existing TLF value is applied and would not affect mapping or TLF values for existing BM Units.

In practice any disputes would be raised via ELEXON. Guidelines for mapping disputes and appeals may be developed to assist Parties, if appropriate. Note that Parties would only be able to appeal the Zone to which a BM Unit is mapped, not the TLF values applied to Zones ('disputes' in this context are not the equivalent of Trading Disputes as defined in the Code). TLF values could be challenged only through a Trading Dispute, in accordance with a narrow set of defined criteria.

3.4 TLFA input data

Under P229 ELEXON would be required to provide the TLFA with input data for use in the Load Flow Model and/or TLF calculation.

3.4.1 Load Periods and Sample Settlement Periods

Under P229 the Panel would be required to annually determine a set of Load Periods and Sample Settlement Periods to be used by the TLFA to calculate TLFs for each forthcoming BSC Year. The processes for the determination of Load Periods and Sample Settlement Periods would be:

1) The Panel divides the Reference Year into a number of different Load Periods, such that:
    a) Each Settlement Period in the Reference Year falls into one and only one Load Period; and
    b) The Load Periods represent typically different levels of load on the Transmission System, defined by:
        - Time of day;
        - Day of week;
        - Season; and
        - Such other factors as the Panel considers relevant.
2) The Panel specifies for each Load Period a representative number of Sample Settlement Periods within that Load Period;
3) The specification of Load Periods and Sample Settlement Periods is issued to the Transmission Company and all BSC Parties for consultation by ELEXON on behalf of the Panel;
4) After considering any consultation responses, the Panel approves the final specification of Load Periods and Sample Settlement Periods to be used in the TLF calculation for the forthcoming BSC Year;
5) ELEXON provides the Panel's specification of Load Periods and Sample Settlement Periods to the TLFA (for use in the derivation of Nodal TLFs), and to the Transmission Company and CDCA (for use in providing Network Data and Metered Volumes to the TLFA) by a specified deadline; and
6) ELEXON publishes the Panel's specification of Load Periods and Sample Settlement Periods by a specified deadline.

After initially determining the Load Periods and Sample Settlement Periods as part of P229 implementation, the Panel would annually confirm whether these remain appropriate for the forthcoming BSC Year (e.g. changes could be required to reflect changes in the dates of public holidays). An annual review and consultation would be required under P229 even if no change is proposed. ELEXON would support the Panel in determining Load Periods and Sample Settlement Periods, including providing any analysis required by the Panel.

It is anticipated that the specification of Load Periods/Sample Settlement Periods considered for use under P203, and P82 before that, would continue to be appropriate under P229. The suggested methodology for determining samples[3] is:

- Two Load Periods are identified for each week of the Reference Year, representing Working Days and Non-Working Days respectively;
- Each Load Period is divided into six Electricity Forward Agreement (EFA) Blocks of four hours;
- Within each Load Period, a Sample Settlement Period is selected for each EFA Block; and
- The Sample Settlement Period selected for each combination of EFA Block and Load Period is that whose demand is closest to the average demand across the EFA Block and Load Period combination.

Alternatively, it could be appropriate to develop a different specification methodology for P229. For example it may be possible to develop a methodology that is more appropriate for the calculation of TLFs on a seasonal basis, rather than an annual basis (as under P82). The TLF calculations would work regardless of whether Load Periods fall within seasons or span more than one season.

ELEXON would determine the most appropriate formats in which to provide the specification of Load Periods and Sample Settlement Periods to the TLFA, Transmission Company and CDCA. A new data flow was previously established for sending the data to the CDCA, and it would be reasonable to anticipate that the same flow would be used under P229.

3.4.2 Network Data

Under P229 the Transmission Company would provide ELEXON with Network Data for each Sample Settlement Period within the Reference Year by a specified deadline. This data would be used to calculate TLFs for the forthcoming BSC Year. Network Data means the following Transmission System data:

- Identification of each pair of adjacent Nodes; and
- For each such pair of Nodes, values of the resistance and reactance between the Nodes.

P229 would require that Network Data is established on the assumption of an 'intact' network (i.e. disregarding any planned or other outage of any part of the Transmission System).

The Transmission Company would establish Network Data based on its operational knowledge of the Transmission System, and in accordance with any relevant assumptions of the Load Flow Model Specification. In the absence of any manifest error, no Party would be able to challenge or question the validity or correctness of the Network Data determined by the Transmission Company. Other than in the case of a manifest error, there would be no ability to retrospectively amend the Network Data once TLFs have been calculated for a BSC Year. The term 'manifest error' in this context is not equivalent to Manifest Errors as defined in Section Q of the Code.

After receiving the Network Data from the Transmission Company ELEXON would verify that all expected data has been received then provide the data to the TLFA by a specified deadline. Facilitated by ELEXON, the Transmission Company and TLFA would be required to agree the most appropriate format and medium for data provision, to ensure its compatibility with the Load Flow Model. ELEXON would make the properly formatted Network Data (which would not contain confidential or commercially sensitive information) available to any Party or non-Party on request.

3.4.3 Metered Volumes

The CDCA would, by a specified deadline, provide ELEXON with Metered Volumes in MWh for each Volume Allocation Unit (other than GSP Groups and BM Units embedded in a Distribution System) in each Sample

[3] Panel paper 61/008 proposed this methodology for P82.

Settlement Period within the Reference Year. This could be achieved by using the flow created for P82 for the CDCA to provided Metered Volume data to the TLFA (the CDCA-I063 'Metered Volume Data for Sample Settlement Periods'). Because ELEXON will act as the intermediary for all data between the TLFA and other BSC Agents this flow would be amended so that ELEXON is the recipient (under P82, the CDCA would have provided Metered Volume data directly to the TLFA).

After receiving the Metered Volume data from the CDCA, ELEXON would be required to provide this data to the TLFA by a specified deadline. ELEXON would agree the most appropriate format for the data. The TLFA should validate receipt of Metered Volume data for every Sample Settlement Period and Volume Allocation Unit in the Network Mapping Statement before using it for TLF calculation, and notify ELEXON immediately if it identifies any missing data or other inconsistency between the data and the Network Mapping Statement. ELEXON would make the Metered Volume data available to any Party or non-Party on request.

No Party would be able to challenge or question the validity or correctness of the Metered Volume data provided by the CDCA, except in the case of a manifest error. Except in the case of a manifest error, there would be no ability to retrospectively amend Metered Volume data once TLFs have been calculated for a BSC Year. The term 'manifest error' in this context is not equivalent to Manifest Errors as defined in the Code.

3.5 Calculate TLFs

Under P229 the TLFA would be required to annually calculate TLF values.

3.5.1 Derive Nodal TLFs

Under P229 the TLFA would have the following annual requirements:

- Derive Load Flow Model power flows[4] in accordance with the Load Flow Model Specification;
- Translate Metered Volume data (provided by ELEXON) into Nodal power flows[5] for each Node, by:
    - Applying the assumption that Nodal power flows are constant in a Settlement Period;
    - Using the Initial Network Mapping Statement provided by ELEXON; and
    - Taking into account any other requirements, assumptions and formulas set out in the Load Flow Model Specification; and
- Apply the Load Flow Model to derive a Nodal TLF (TLF_{Nj}) for each Node in each Sample Settlement Period, in accordance with the TLFA Service Description, Load Flow Model Specification, TLFA System Specification and TLFA User Requirements Specification.

The TLFA would provide ELEXON with the following data, in a format agreed by ELEXON:

- The Load Flow Model power flows from the Load Flow Model;
- The Nodal power flows from the Load Flow Model; and
- A Nodal TLF value for each Node in each Sample Settlement Period.

To correctly achieve the intent of P229 in the TLM calculation:

- Positive TLFs must be produced where an increase in generation (or reduction in demand) has the effect of decreasing total losses; and
- Negative TLFs must be produced where an increase in generation (or reduction in demand) has the effect of increasing total losses.

[4] Load Flow Model power flows are the power flows between pairs of adjacent Nodes in the Load Flow Model (including circuit and transformer power flows).
[5] Nodal power flows are the power flows at each Node in the Model.

The TLFA would be required to ensure that the signs of the TLFs produced are consistent with this principle. ELEXON would make any of this data available to any Party or non-Party on request.

3.5.2 Calculate Zonal TLFs

For each BSC Year the TLFA would annually determine a set of Zonal TLFs by volume-weighted averaging. For each Sample Settlement Period, the TLFA would determine the Zonal TLF (TLF_{Zj}) for each Zone in accordance with the following formula:

$$TLF_{Zj} = \Sigma_N (TLF_{Nj} * QM_{Nj}) / \Sigma_N QM_{Nj}$$

Where for that Settlement Period, and for each Node in that Zone (determined by the TLFA on the basis of the Initial Network Mapping Statement):

TLF_{Nj} is the value of Nodal TLF; and

QM_{Nj} is the absolute value of the Nodal Power Flow.

And Σ_N is summation by Node in a Zone.

The calculation of Zonal TLF values would not form part of the Load Flow Model, but would be carried out separately by the TLFA using the Nodal TLFs derived by applying the Model. Because there would be 14 Zones the output of this calculation would be 14 different Zonal TLF values for each Sample Settlement Period in the Reference Year (so 623 Sample Settlement Periods (a number used in Load Flow Modelling to support assessment of losses Modifications) would therefore produce 8,722 Zonal TLFs for that BSC Year).

The Zonal TLF values for each Zone in each Sample Settlement Period would be an internal output of the TLFA calculations, and would not need to be sent to ELEXON or made available to the industry under P229.

3.5.3 Calculate Seasonal Zonal TLFs

For each BSC Year the TLFA would annually determine a set of Seasonal Zonal TLFs by time-weighted averaging using the calculated Zonal TLFs. For each BSC Season (the 'relevant' BSC Season) in each BSC Year, the TLFA would determine the Seasonal Zonal TLF (TLF_{Zs}) for each Zone in accordance with the following formula:

$$TLF_{Zs} = \Sigma_p ((\Sigma_s TLF_{Zj} / S_{ps}) * J_{ps}) / \Sigma_p J_{ps}$$

Where for the Reference Year:

S_{ps} is the number of Sample Settlement Periods within a Load Period which fall within the relevant BSC Season;

J_{ps} is the total number of Settlement Periods falling within a Load Period which fall within the relevant BSC Season;

Σ_s is summation by Sample Settlement Periods within a Load Period which fall within the relevant BSC Season; and

Σ_p is summation by Load Period within the relevant BSC Season.

The calculation of Seasonal Zonal TLF values would not form part of the Load Flow Model, but would be carried out separately by the TLFA. Because there would be 14 Zones the output of this calculation would be 14 different Seasonal Zonal TLF values for each of the four BSC Seasons in the BSC Year, i.e. 56 Seasonal Zonal TLFs for each year.

The Seasonal Zonal TLF values would be an internal output of the TLFA calculations, and would not need to be sent to ELEXON or made available to the industry under P229.

3.5.4 Calculate Adjusted Seasonal Zonal TLFs

For each BSC Year, the TLFA would annually determine a set of Adjusted Seasonal Zonal TLFs by applying a scaling factor of 0.5 to the Seasonal Zonal TLFs it generated. The TLFA would determine Adjusted Seasonal Zonal TLF ($ATLF_{Zs}$) for each Zone and each BSC Season in accordance with the following formula:

$$ATLF_{Zs} = TLF_{Zs} * 0.5$$

The calculation of Adjusted Seasonal Zonal TLF values would not form part of the Load Flow Model, but would be carried out separately by the TLFA. Because there would be 14 Zones, the output of this calculation would be 14 different Adjusted Seasonal Zonal TLF values for each of the four BSC Seasons in the BSC Year, i.e. 56 Adjusted Seasonal Zonal TLFs for each year.

The TLFA would send the Adjusted Seasonal Zonal TLFs to ELEXON by a specified deadline, in a format agreed by ELEXON. ELEXON would be required to publish the four Adjusted Seasonal Zonal TLFs for each Zone such that Parties have three months' notice to factor the TLF values into their contracts prior to their use in Settlement. ELEXON would determine the most appropriate format for publishing the Adjusted Seasonal Zonal TLF values (and could publish the four Adjusted Seasonal Zonal TLF values for each Zone with the date ranges in which they will be applied in Settlement, so this is clear to Parties).

The Panel would not be required to approve or endorse the Adjusted Seasonal Zonal TLF values, and Parties would not be able to appeal TLF values. The Load Flow Model Reviewer would have confirmed the compliance of the Load Flow Model prior to its use, and upon any change to the Model, and TLF values would only be retrospectively recalculated due to a Trading Dispute.

3.5.5 Determine BM Unit-Specific TLFs

Under P229 four TLF values would apply to each BM Unit for each BSC Year, one for each BSC Season in the year. The value of TLF_{ij} for each BM Unit which is used in the calculation of $TLMO^{+/-}$ and TLM in a particular Settlement Period would be the Adjusted Seasonal Zonal TLF ($ATLF_{Zs}$) for the applicable BSC Season and the Zone in which the BM Unit is located.

Determination of BM Unit-specific TLF values would not be part of the Load Flow Model, but would be carried out separately by the TLFA using the BM Unit to Zone mappings in the Initial Network Mapping Statement (as provided by ELEXON). The TLFA would determine the BM Unit-specific TLFs for each BM Unit in the Initial Network Mapping Statement.

The TLFA would be required to send these BM Unit-specific TLFs to ELEXON by a specified deadline in a format agreed by ELEXON.

3.6 Register TLFs in CRA systems

Under P229 the CRA would be required to enter BM Unit-specific TLF (TLF_{ij}) values for each BM Unit for each BSC Season into Central Registration Service (CRS) Systems. These TLF values would also need to be reported to other participants.

3.6.1 Development of CRA Systems and Documentation

Under the Code baseline the CRA is required to hold TLF values for each BM Unit in CRS, and is required to report these TLF values to ELEXON and the Transmission Company via the existing CRA-I020 flow ('Operations Registration Report') and to the BMRA and the SAA via the existing CRA-I015 flow ('BM Unit, Interconnector and GSP Registration Data'). ELEXON is also required by existing Code provisions to report 'live' TLF values for each BM Unit as part of the BM Unit registration data published on the BSC Website.

P229 would not change these existing requirements and flows, but in practice they would report zonally-differentiated TLF values for each BM Unit, rather than a uniform zero TLF value as under the Code baseline.

Development work for P82 introduced functionality to hold non-zero TLF values in CRA systems, though this was never used in live operation. This functionality could be used for P229, but the CRA would be required to retest this functionality as part of P229 implementation. Additionally, under P229 the CRA would be required to:

- Hold four different seasonal TLF values per BM Unit for each BSC Year;
- Recognise which Adjusted Seasonal Zonal TLF values is applicable to a BM Unit in a given Settlement Period throughout each year; and
- Report the correct TLF value for that BM Unit and Settlement Period via the CRA-I020 and CRA-I015 flows.

The CRA would need to develop an automated script to be used in loading TLF values, which would need to be tested appropriately.

Because BSC Spring is 1 March – 31 May, it covers the beginning of the BSC Year on 1 April, meaning there would effectively be five TLF values per BM Unit held in CRS for each BSC Year (though the two Spring values would be the same), with the following start and end dates:

- Spring TLF 1 (1 April – 31 May);
- Summer TLF (1 June – 31 August);
- Autumn TLF (1 September – 30 November);
- Winter TLF (1 December – 28/29 February); and
- Spring TLF 2 (1 March – 31 March).

Spring TLF 1 and Spring TLF 2 would have the same value as calculated by the TLFA for the BSC Spring season. But when the seasonal TLFs are entered into CRS this value would need to be split to cover the particular BSC Year. The Spring TLF value applicable to a BM Unit therefore changes on 1 April each year (i.e. part way through BSC Spring).

3.6.2 Annual Registration of TLFs

ELEXON would be required to send the BM Unit-specific TLF values for each BM Unit included in the Initial Network Mapping Statement (received from the TLFA) to the CRA by a specified deadline. It is anticipated that the existing CRA-I029 ('Transmission Loss Factors') data flow would be used to do this.

On the date it sends the TLFs to the CRA, ELEXON would also send to the CRA the BM Unit-specific TLF values for any BM Units which registered in the period after the Initial Network Mapping Statement was issued for consultation. ELEXON would determine these additional BM Unit TLF values by using the Prevailing Network Mapping Statement to allocate each new BM Unit the four Adjusted Seasonal Zonal TLF values for the Zone to which the BM Unit is mapped. The CRA would register the BM Unit-specific TLFs in CRS, to be used from the appropriate dates.

There would be no functionality within CRA Systems to identify instances where an Adjusted Seasonal Zonal TLF is not correctly allocated to a BM Unit. ELEXON could validate TLFs recorded in CRA Systems by comparing them with those received from the TLFA following:

- The annual loading of TLF values for each forthcoming BSC Year;
- The registration of each additional TLF value assigned to a new BM Unit on an ad-hoc basis throughout a BSC Year; and
- Following any ad-hoc reloading of TLFs as a result of an upheld Trading Dispute and subsequent retrospective recalculation of TLFs.

3.6.3 Ad-Hoc Registration, Deregistration and Re-Registration of TLFs

ELEXON would derive TLF values for any BM Units which register between the annual submissions of each year's BM Unit-specific TLFs to the CRA. ELEXON would:

- Map each new BM Unit to a Zone in accordance with the Prevailing Network Mapping Statement;
- Assign to each BM Unit the four Adjusted Seasonal Zonal TLF values already calculated by the TLFA for its Zone; and
- Send the TLF values to the CRA for registration and use in Settlement for the rest of the BSC Year.

If an upheld Trading Dispute results in any retrospective changes to one or more already calculated TLF values, the CRA would be required to replace TLFs held in CRS for the affected BM Units with new TLF values provided by ELEXON.

ELEXON would update the Prevailing Network Mapping Statement to reflect any BM Unit deregistrations during a BSC Year, but no processes would be needed to deregister TLF values in this situation because deregistration of a BM Unit in CRA Systems would result in an end-date being assigned to all attributes of the BM Unit.

3.7 SAA uses TLFs

P229 would require the SAA to use BM Unit-specific TLF values in Settlement, and the BMRA to use them as part of BMRS derived data calculations. P229 would allow for TLFs to be recalculated, and reapplied in Settlement, as a result of an upheld Trading Dispute.

3.7.1 Application of TLFs in SAA Systems

The SAA would be responsible for applying the BM Unit Specific TLFs (as received from the CRA) in Settlement. The Settlement calculations for using TLFs in the derivation of TLM and TLMO values would not change from those currently in Section T2.3 of the Code. However, the value of TLF_{ij} would no longer be zero for all BM Units, as currently specified in Section T2.2; under P229 TLF_{ij} for each BM Unit would be the BM Unit-specific TLF provided by the CRA.

The SAA would report to each Party, via the existing daily SAA-I014 ('Settlement Report') flow, the TLF_{ij} values used in Settlement for each BM Unit for which that Party is the Lead Party. P229 would not impact SAA Systems, documentation or processes, because:

- TLF values (though set to zero) are already used in the Settlement calculations, and the values of TLF_{ij} would be provided by the CRA via the existing CRA-I015 data flow;
- TLF values are already reported by the SAA as part of the SAA-I014 flow (though they are set to zero) and this flow would continue to be used for TLF_{ij} values; and
- Though the SAA would be required to enable settlement errors in TLF values to be rectified if an upheld Trading Dispute results in retrospective changes to TLFs for one or more BM Units, this requirement would utilise existing SAA processes for retrospective amendment of Settlement data as a result of a Dispute.

As the structure of the SAA-I014 flow would not be changed, no changes are required to ELEXON's Trading Operations Market Monitoring and Analysis System (TOMAS). However, ***Parties that do not currently recognise/utilise the TLF field in the SAA-I014 (since it is set to zero under the baseline) would need to amend their systems to accept TLF values*** that would be calculated and used under P229.

3.7.2 Retrospective Recalculation of TLFs

Parties would only be able to challenge their TLF values through the Trading Disputes process, and TLF values would only be recalculated as a result of an upheld Trading Dispute.

1. Circumstances where a Trading Query or Dispute could be raised

P229 would introduce rules specifying circumstances in which TLFs may *not* be challenged. A Party would not be able to raise a Trading Query or Trading Dispute against the Load Flow Model once the Load Flow Model Reviewer has confirmed the Model's compliance to the Panel. The report on the compliance of the Load Flow Model with the Specification would be final and binding until a change is made to the Model or Specification (the Load Flow Model Reviewer would then re-inspect the Model and submit a new report).

ELEXON would provide advice regarding circumstances in which Parties could challenge TLFs under P229. In summary, a Party could raise a Trading Query or Trading Dispute against:

- The Load Flow Model if any input data to the Load Flow Model contains any manifest errors, or is incorrectly applied within the Model, leading to the incorrect calculation of Nodal TLFs and Adjusted Seasonal Zonal TLFs;
- The translation of Nodal TLFs to Adjusted Seasonal Zonal TLFs if any Adjusted Seasonal Zonal TLFs have been incorrectly calculated by the TLFA;
- The derivation, registration and/or use of BM Unit-specific TLFs, if the BM Unit's TLF does not match the prevailing Adjusted Seasonal Zonal TLF for the Zone to the BM Unit is mapped to, meaning BM Unit-specific TLFs were incorrectly determined, incorrectly registered or incorrectly applied in Settlement.

Any Trading Query or Trading Dispute raised in respect of TLFs would be progressed by ELEXON and considered by the TDC in accordance with the existing Disputes processes, with additional provisions requiring the Load Flow Model Reviewer and TLFA to assist the TDC if requested. The Load Flow Model Reviewer's report to the TDC on Nodal TLFs would be final and binding on all Parties, and Parties could not challenge it for the remainder of the BSC Year. Nodal TLFs determined by applying the Load Flow Model would be definitive unless the input data contains manifest errors.

A Trading Dispute would only be upheld where a Settlement error is identified.

2. Manifest Errors for the purposes of TLF Input Data and Disputes

The intention of ex-ante TLF calculation under P229 is that TLFs are fixed for a year to give certainty to Parties so they can be incorporated into contracts. Unless there is a manifest error in the input data used in the TLF calculation, Parties would therefore not be able to challenge the input data.

Because the Load Periods, Sample Settlement Periods and Initial Network Mapping Statement used in the annual TLF calculation are all approved by the Panel after industry consultations, manifest errors in this data would be limited to self-evident mistakes made in sending data (e.g. the Load Periods and/or Sample Settlement Periods provided to the TLFA do not match those approved by the Panel, or the version of the Network Mapping Statement that was provided to the TLFA was not that approved by the Panel).

Under P229 no Party would be able to challenge or question the validity or correctness of the Network Data determined by the Transmission Company except in the case of a manifest error.

The Metered Volumes provided to the TLFA by the CDCA would be based on the latest Settlement Run data available on the date of extraction from CDCA Systems; this Metered Volume data would therefore not be revised (and TLFs would not be retrospectively recalculated) as a result of any changes to Metered Volumes arising after this date as a result of later Settlement Runs because such adjustments would be due to the normal Settlement process, not a Settlement error. Similarly, Parties would not be able to appeal TLF values

on the grounds that their Metered Volumes in the Reference Year were based on atypical behaviour, since it is the nature of the ex-ante calculation that each year's TLFs are based on behaviour in the previous year.

Similarly, if the Metered Volume data held in CDCA Systems on the day that the data is extracted for use by the TLFA is subsequently determined to contain a Settlement error (as a result of a Trading Dispute unrelated to TLFs) it is envisaged that TLFs would not be retrospectively recalculated.

3. Recalculating TLFs

If one or more TLF values need to be recalculated as a result of an upheld Trading Dispute then, as necessary, the Transmission Company would provide amended Network Data, the CDCA would provide amended Metered Volume data, ELEXON would provide an updated version of the Network Mapping Statement and the TLFA would (using any amended input data) re-determine and send to ELEXON Load Flow Model power flows, Nodal power flows, Nodal TLFs and/or Adjusted Seasonal Zonal TLFs.

ELEXON would republish any revised input/output data and if required would re-determine BM Unit-specific TLFs based on the Adjusted Seasonal TLFs for the Zone the BM Unit is mapped to, and send these to the CRA. The CRA would amend its registration of one or more BM Unit-specific TLFs as required, and the SAA would retrospectively apply amended TLFs in Settlement as required.

The BMRA would not be retrospectively required to amend any BMRS calculations as a result of any TLF recalculations. It is not envisaged that significant numbers of TLF related Trading Disputes would be raised, since the criteria for challenging TLFs would be narrow, reports from the Load Flow Model Reviewer on Load Flow Model compliance/Nodal TLF calculation for a given BSC Year would be binding, and Trading Queries would need to be raised within the standard timescales in the Code and BSCP11.

If an upheld Trading Dispute required a change to the TLFA Service Description and/or TLFA User Requirements Specification, such changes would be progressed via the BSCP40 CP change process (including approval by the Panel or appropriate Panel Committee).

3.8 Derive ETLMOs for the BMRS

Under the Code baseline, Estimated Transmission Losses Adjustments ($ETLMO^+$ and $ETLMO^-$) are used in derived data calculations on the BMRS, since the actual metered data that determines the values of $TLMO^+$ and $TLMO^-$ is not available until after BMRS data must be published. Though ETLMO impact is not a direct requirement of P229, in practice ETLMO values would need to be revised to reflect the locational TLF component of the TLMO calculation under P229.

The Code requires the Panel to determine values of ETLMO+ and ETLMO- from time to time as required, for use by the BMRA in the calculation of the indicative prices and charges reported soon after real time on the BMRS. Under the Code baseline ETLMOs are based on actual TLMOs from the previous year (since all TLF values are zero). Currently one annual value of $ETLMO^+$ and one annual value of $ETLMO^-$ are produced that do not vary by location.

This approach would not be appropriate under P229, and a revised methodology would be required. It would be necessary to calculate four $ETLMO^+$ values and four $ETLMO^-$ values for each BSC Year (i.e. one for each BSC Season) for each of the 14 TLF Zones. The Code currently provides the Panel with the ability to revise ETLMOs; in practice, the Panel has delegated its authority in this area to the ISG. Any revised methodology must therefore be approved by the ISG before new ETLMOs can be used in BMRS calculations.

The changes to ETLMO values would not impact BMRA Systems, processes or documentation, since the BMRA shall continue to use the values provided by ELEXON as it does at present. ETLMO values are published on the BSC Website, though this is not a Code requirement; it is anticipated that ELEXON would continue to publish any revised ETLMO values that are necessary under P229.

The BMRA would also need to use BM Unit-specific TLFs, as provided by the CRA, in BMRS calculations. This requirement does not impact BMRA Systems, processes or documentation, since TLFs are already used by the BMRA (though they are set to zero).

3.9 Implementation Options

BSC changes are usually implemented in one of three scheduled BSC Systems Releases each year (February, June or November) due to the efficiency benefits of this approach and the mitigation of impacts on Parties achieved by coordinated implementation. However, P229 would need to be implemented on either 1 April, to coincide with Parties' annual contractual rounds, or 1 October to align with mid-yearly contract rounds.

Previous assessment of Modification P203, which proposed essentially the same solution as P229, indicates that a 12 month implementation lead time would be required for P229 (subject to P229 impact assessment).

A twelve-month P229 implementation timescale would include TLFA procurement and Load Flow Model Reviewer appointment; establishment and adoption of the Load Flow Model by the TLFA; development of TLFA systems, processes and documentation; calculation of Adjusted Seasonal Zonal TLFs; and the three months' notice required by Parties between Adjusted Seasonal Zonal TLFs being published and being used in Settlement. Parties would effectively have nine months to amend their own systems, processes and documentation before TLFs are first published.

The final P229 Modification Report is due to be issued to the Authority in September 2009. It is not feasible for the Authority to make a decision on P229 by 1 October 2009 and thus enable implementation on 1 October 2010. Therefore it is currently anticipated that P229 would be implemented on 1 April 2011, if approval is received before April 2010 (subject to the P229 impact assessment and further considerations of the P229 Modification Group).

The next available implementation date, if approval is received after March 2010 but before October 2010, would be 1 October 2011. However, implementing P229 on 1 October would be more complicated than implementation on 1 April (though timescales would not be affected) due to the need to apply half the normal TLFs for that year (i.e. the TLFs applicable until April 2012). Any views from participants regarding an appropriate back-up P229 implementation date (i.e. October 2011 or April 2012), for instance due to any industry impacts that have not been identified so far, would be welcome.

Note that there would be no 'phased' implementation of P229 (i.e. there would be no gradual linear introduction of non-zero TLFs, or 'grandfathering' scheme limiting application to above a certain volume of energy, as proposed in relation to previous Losses Modification Proposals).

4 ESTIMATED IMPACT OF MODIFICATION ON SYSTEMS, PROCESSES AND DOCUMENTATION

The information in this section is based on the initial assessment of impacts as included in the P229 IWA.

a) Impact on BSC Systems and Processes

BSC System / Process	Potential Impact of Proposed Modification
BM Unit Registration	The CRA would be required to amend its BM Unit registration process so that Adjusted Seasonal Zonal TLF values for each BM Unit are obtained from the TLFA (via BSCCo) for each BSC Year, and are registered in BSC Systems. These values would be reported using existing data flows.
Central Data Collection	The CDCA would be required to provide the TLFA (via BSCCo) with Metered Volume data for the Sample Settlement Periods used in the Load Flow Model.
BMRS	The BMRA would be required to receive Adjusted Seasonal Zonal TLF values for each BM Unit from the CRA, and to use these values in BMRA reporting during the applicable BSC Year.
Settlement Administration	The SAA would be required to receive Adjusted Seasonal Zonal TLF values for each BM Unit from the CRA, and to apply these values in Settlement calculations during the applicable BSC Year.
Derivation of Zonal TLFs	A new BSC process, with supporting systems, would be introduced for the TLFA to derive TLFs through the application of a Load Flow Model in accordance with a Network Mapping Statement, Load Flow Model Specification, and new calculations in Section T of the Code. The output of this new process would be a set of four Adjusted Seasonal Zonal TLF values (one per BSC Season in the year) for each of the 14 TLF Zones. All BM Units within a Zone would receive the Adjusted Seasonal Zonal TLF value for that Zone in the relevant BSC Season.

b) Impact on BSC Agent Contractual Arrangements

BSC Agent Contract	Potential Impact of Proposed Modification
Transmission Loss Factor Agent	**New agent.** A full BSC Agent procurement exercise would be required, and appropriate contractual arrangements created, for the TLFA, in accordance with Section E of the Code.
BSC Auditor (PwC)	Extended the scope of the BSC Audit to include the TLFA.
LogicaCMG	BMRA, CRA, CDCA, SAA may be impacted.

c) Impact on BSC Parties and Party Agents

Parties may wish to verify the allocation of their BM Units to Zones. Parties that have developed their own systems to monitor the Settlement calculations would need to amend these to take account of non-zero TLF values varying by BSC Season.

LDSOs would be affected only to the extent that they would need to provide any additional information that ELEXON and/or the Panel may require to prepare the Network Mapping Statement.

No impact on any Party Agents.

d) Impact on Transmission Company

- Support BSCCo and the Panel in establishing and maintaining the Network Mapping Statement, including maintenance of an up-to-date list of all Nodes on the Transmission System, and assistance in resolving any questions or disputes over the allocation of individual BM Units to Zones; and
- Support the TLFA and the Panel in maintaining the Load Flow Model, including the provision of relevant Network Data and any necessary information to aid the Panel in determining Load Periods.

e) Impact on BSCCo

Area of Business	Potential Impact of Proposed Modification
Change Implementation	A special release would be required to deliver the TLFA service, requiring (at a minimum) the following: • Procurement of new BSC Agent (TLFA) and new service provider (Model Reviewer), managed as a procurement project within the P229 Release. • Testing of TLFA system for production of Annual TLFs. • Implementation and review of TLFA documentation, CDCA URS and related docs and the IDD Part 2, and other CSD changes. • Changes due to requirement for CRA to store and use seasonal TLFs.
Change Coordination	Implement approved changes to the Code and Code Subsidiary Documents.
Corporate Assurance & Finance teams	Support procurement and implementation.
Governance & Regulatory Affairs	Implementation and management of operational impact on the Panel.
Legal	Support development and assessment of P229.
Commercial Management and Procurement	Procurement would be required as part of implementation of P229.
Central Services Data and Planning	Support majority of the operational processes during lead up to implementation and on an ongoing basis after go-live.
Customer Operations	Training for the ELEXON helpdesk and OSM service regarding new processes.

f) Impact on BSC Panel

- Approval of the Load Flow Model, the Load Flow Model Specification, the TLFA Service Description, the Load Flow Model Reviewer Terms of Reference and the Network Mapping Statement;
- Establishing the definitive list of TLF Zones for use in the Network Mapping Statement and Load Flow Model, including resolution of any question or dispute over the mapping of individual BM Units to Zones;

- Establishing a number of different Load Periods to represent varying levels of load on the Transmission System for use in the Load Flow Model;

- Establishing the number of Sample Settlement Periods to be used in each Load Period for use in the Load Flow Model;

- Establishing a revised BSC Audit Scope incorporating the TLFA; and

- With the aid of an independent Load Flow Model Reviewer, ensuring that the Load Flow Model complies with the Load Flow Model Specification (including retrospectively, where the calculation or use of TLFs is the subject of a Trading Dispute).

g) Impact on Code

Code Section	Potential Impact of Proposed Modification
Section E 'BSC Agents'	Add TLFA to the list of BSC Agents in Section E.
Section H 'General'	Add the Load Flow Model Specification to the list of Code Subsidiary Documents in Section H.
Section T 'Settlement and Trading Charges'	Amend to detail the rights and obligations of all relevant parties regarding the derivation of Adjusted Seasonal Zonal TLFs and their use in Settlement.
Section V 'Reporting'	Amend to detail the provision by BSCCo of the following TLF data to Parties on request: • The Network Data and Metered Volumes used in the TLF calculation for the applicable BSC Year; • The raw nodal power flows calculated by the Load Flow Model and used in the TLF calculation for the applicable BSC Year; and • The raw Nodal TLFs calculated by the Load Flow Model and used in the TLF calculation for the applicable BSC Year.
Section X 'Definitions and Reporting'	Amend to detail any new Code-defined terms or acronyms for P229.

h) Impact on Code Subsidiary Documents

Document	Potential Impact of Proposed Modification
BSCP01 'Overview of the Trading Arrangements'	Amend to reflect the derivation of non-zero TLFs and their use in Settlement calculations.
BSCP15 'BM Unit Registration'	Amend to include the process for allocating four Adjusted Seasonal Zonal TLF values to each BM Unit in the applicable BSC Year.
BSCP38 'Authorisations'	Amend to include an authorisation process for Parties to request input and output data files relating to the Load Flow Model (Network Data, Metered Volumes, power flows and Nodal TLFs).
BSCP41 'Report Requests and Authorisations'	As above.
Reporting Catalogue	Amend to reflect new/amended reporting requirements.

Document	Potential Impact of Proposed Modification
Communications Requirement Document	Amend to reflect rules for communicating with the TLFA via BSCCo.
BSC Agent Service Descriptions	Amend BMRS, BSC Auditor, CDCA, CRA and SAA Service Descriptions to reflect new obligations on these Agents in respect of zonal TLFs. New Service Description – for the TLFA.
Load Flow Model Specification	New Code Subsidiary Document – establish the specification for the TLFA Load Flow Model.

i) Impact on Core Industry Documents/System Operator-Transmission Owner Code

No impact.

j) Impact on Other Configurable Items

Document	Potential Impact of Proposed Modification
User Requirements Specifications	The BMRS, BSC Website, CDCA, and CRA URSs would need to be amended to reflect the new obligations on these Agents in respect of zonal TLFs. New URS required – for the TLFA.

k) Impact on BSCCo Memorandum and Articles of Association

No impact.

l) Impact on Governance and Regulatory Framework

The following impacts fall outside the scope of the Code and can not therefore form part of assessment of P229 against the Applicable BSC Objectives. However these areas could be taken into account by the Authority in the context of its wider statutory duties:

- Impact on consumers (through the passing on of costs or cost-savings by Parties, or changes in the location of demand);
- Impact on the existing locational signals provided by the Transmission Company's TNUoS charging.

5 DEVELOPMENT PROCESS

For the purposes of the impact assessment, respondents should assume that P229 would be implemented as a stand-alone development project managed by BSCCo.

BSCCo has not identified any interaction between the requirements or implementation of P229 and any approved Modification or Change Proposal.

6 TERMS USED IN THIS DOCUMENT

Other acronyms and defined terms take the meanings defined in Section X of the Code.

Acronym/Term	Definition
α (alpha) factor	The scaling factor applied to total transmission losses such that 45% are allocated to delivering Trading Units and 55% are allocated to offtaking Trading Units.
BM Unit-Specific TLF	The Adjusted Seasonal Zonal TLF that applies to, and is registered against, a BM Unit (same value for all BM Units in the same Zone and for a particular Season).
Ex-ante	Calculated beforehand.
Fixed losses	The element of transmission losses which is independent of the distance travelled by electricity.
Load Flow Model	An electrical model of the Transmission System, used to generate Transmission Loss Factor values.
Node	Used in a Load Flow Model to represent points where energy flows on or off the Transmission System.
Total transmission losses	The sum of fixed losses and variable losses in any given period.
Transmission losses	The energy lost from the Transmission System in transporting electricity (calculated as the difference between total generation and total demand).
Transmission Loss Adjustment (TLMO)	The parameter for recovering the costs of the proportion of transmission losses which are not recovered through the Transmission Loss Factor, and which is applied on a uniform basis.
Transmission Loss Factor (TLF)	The parameter for allocating some or all transmission losses on a non-uniform basis, and which is currently set to zero.
Transmission Loss Factor Agent (TLFA)	The entity responsible for calculating Transmission Loss Factor values.
Transmission Loss Multiplier (TLM)	The factor used to scale BM Unit Metered Volumes in Settlement in order to recover the costs of total transmission losses from Parties.
Variable losses	The element of transmission losses which occurs through heat, and which increases with the distance travelled by electricity.

7 DOCUMENT CONTROL

7.1 Authorities

Version	Date	Author	Reviewer	Reason for Review
0.1	02/02/09	Dean Riddell	Sarah Jones	For technical review
0.2	03/02/09	Dean Riddell	P229 Modification Group	For Modification Group review
1.0	09/02/09	P229 Modification Group		For impact assessment

7.2 References

Ref.	Document Title	Owner	Issue Date	Version
1	P82 Business Requirements Solution (see ELEXON website)	ELEXON	09/03	2.0
2	P229 Initial Written Assessment (see ELEXON P229 webpage)	ELEXON		1.0