Assessment Report

P350 'Introduction of a seasonal Zonal Transmission Losses scheme'

The Competition and Markets Authority (CMA) has enacted legislation and licence changes that require the introduction of a seasonal zonal transmission losses scheme from 1 April 2018. P350 delivers the specific solution mandated by the CMA, which is based on previous Proposed Modification P229.

The P350 Workgroup recommends **approval** of P350

This Modification is expected to impact:

- Generators
- Suppliers
- Distribution System Operators (DSOs)
- National Grid (National Grid)
- The Balancing Mechanism Reporting Agent (BMRA)
- The Central Data Collection Agent (CDCA)
- The Central Registration Agent (CRA)
- The Settlement Administration Agent (SAA)
- The BSC Auditor
- ELEXON

ELEXON

Phase

- Initial Written Assessment
- Definition Procedure
- Assessment Procedure
- Report Phase
- Implementation

Contents

About This Document

This document is the P350 Workgroup's Assessment Report to the Balancing and Settlement Code (BSC) Panel. ELEXON will present this report to the Panel at its meeting on 19 January 2017. The Panel will consider the Workgroup's recommendations, and will agree an initial view on whether this change should be made. It will then consult on this view before making its final recommendation to Ofgem on 9 February 2017.

There are five parts to this document:

- This is the main document. It provides details of the solution, impacts, costs, benefits/drawbacks and proposed implementation approach. It also summarises the Workgroup's key views on the areas set by the Panel in its Terms of Reference, and contains details of the Workgroup's membership and full Terms of Reference.
- Attachment A contains the final report from the load flow modelling exercise.
- Attachment B contains materiality analysis of the interaction between P350 and Contracts for Difference (CFD).
- Attachment C contains the draft redlined changes to the BSC for P350.
- Attachment D contains the full responses received to the Workgroup's Assessment Procedure Consultation.

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1 Summary

Why Change?

To implement a remedy from its energy market investigation, the CMA has enacted legislation and licence changes that require the introduction of a seasonal zonal transmission losses scheme from 1 April 2018. The CMA is mandating a specific technical solution based on previous Proposed Modification P229. The CMA has placed obligations on National Grid to raise a Modification to deliver this in the BSC and to make best endeavours to ensure that the Modification is implemented by 1 April 2018. If the Modification is not implemented in time, then National Grid will be required to implement the same technical solution on the same date but outside of the BSC.

Solution

As required by the CMA, P350 is based on P229. It involves an annual calculation of four locational Transmission Loss Factors (one per BSC Season) per Zone. Each Zone will be based on the geographic area covered by a Grid Supply Point (GSP) Group and each Balancing Mechanism (BM) Unit will be assigned to a Zone based on its geographic location. A BM Unit will receive the Transmission Loss Factor for its assigned Zone in the relevant BSC Season. For a non-Interconnector BM Unit, this means that its Transmission Loss Multiplier (which adjusts its Metered Volume to allocate a share of transmission losses) will now include a locational element through the Transmission Loss Factor. Each Interconnector BM Unit will continue to receive a zero allocation of transmission losses, retaining its existing fixed Transmission Loss Multiplier value such that its Transmission Loss Factor has no effect. The four seasonal Transmission Loss Factor values for each Zone will be published three months before the start of the BSC Year in which they apply.

Impacts & Costs

The central implementation costs will be approximately £130,000 to update Central Systems, undertake the relevant procurement exercises and calculate the Transmission Loss Factor values for use from the P350 Implementation Date. There will be on-going costs of approximately £19,000 per annum for ELEXON to operate the new processes.

There will also be impacts and associated costs for National Grid and DSOs to provide Network Data each year.

Implementation

The CMA is mandating that its remedy, and hence P350, is implemented on 1 April 2018. P350 is therefore proposed for implementation on 1 April 2018 if Ofgem's decision is received by 31 March 2017, consistent with P229's 12 month implementation lead time.

Recommendation

The Workgroup by majority (all but one member) believes that P350 **would** better facilitate the Applicable BSC Objectives compared with the existing arrangements, and so should be **approved**. Not all Workgroup members have the same views on each Objective, but a majority identify benefits to (a), (b), (c) and (g).

2 Why Change?

What are transmission losses?

When electricity is transmitted over the Transmission System some energy is 'lost'. This lost energy is commonly referred to as 'transmission losses'. Transmission losses are comprised of two main elements:

- 'Variable' losses arise due to the heat caused by the flow of current through transformers and lines (electrical resistance). They increase with current flow (and associated power flow) and the length of the line through which the current flows.
- Other 'fixed' losses do not vary significantly with power flow and electrical resistance. They arise in transformers (from magnetising the iron core) and overhead lines (dependent on voltage levels, length of line and climatic conditions).

'Total transmission losses' refers to the sum of fixed and variable losses. The total losses are the total energy lost from the Transmission System at any given time. Total losses are measured in each half-hour Settlement Period as the difference between total metered delivery to the Transmission System and total metered offtake from the Transmission System.

How are transmission losses currently allocated?

A Transmission Loss Multiplier (TLM_{ij}) is a factor used to scale each BM Unit's Metered Volumes in Settlement, where $_i$ represents the BM Unit and $_j$ represents the Settlement Period. The BSC generates a Transmission Loss Multiplier for each individual non-Interconnector BM Unit[1] in each individual Settlement Period based on two further values:

- a Transmission Loss Factor (TLF_{ij}); and
- a Transmission Losses Adjustment ($TLMO_j$).

The calculation for this is as follows:

$$TLM_{ij} = 1 + TLF_{ij} + TLMO_j$$

The Transmission Loss Factor is applied to BM Units on an individual basis. This is used to apply a differential allocation of some or all transmission losses, meaning each individual BM Unit could have its own specific Transmission Loss Factor applied to it. This parameter is currently set to zero for all BM Units and so has no effect in practice.

The Transmission Losses Adjustment is used to uniformly adjust all generation and demand to apportion transmission losses between BM Units (excluding any already allocated through the Transmission Loss Factor mechanism). This ensures an exact allocation of the actual level of total losses in a given Settlement Period.

Further Information

The calculations for the allocation of transmission losses can be found in BSC Section T 'Settlement and Trading Charges'.

Further information is also available on the Losses page of our website.

[1] Interconnector BM Units are exempt from the allocation of transmission losses, following European legislation transposed into the BSC through Approved Modification P278 'Treatment of Transmission Losses for Interconnector Users'. The CMA's mandated remedy does not remove this exemption: each Interconnector BM Unit will therefore retain its existing fixed Transmission Loss Multiplier of 1, such that it remains unaffected by P350's introduction of non-zero Transmission Loss Factor values.

Two separate Transmission Losses Adjustment values are calculated for each Settlement Period, one applied to BM Units in delivering Trading Units ($TLMO^{+}_{j}$) and one applied to BM Units in offtaking Trading Units ($TLMO^{-}_{j}$). The Transmission Losses Adjustment calculation includes a constant factor α (alpha), which determines the proportion of the total transmission losses to be uniformly allocated across all BM Units in delivering Trading Units. The remaining proportion is uniformly allocated across BM Units in offtaking Trading Units. This constant is set at 0.45, meaning:

- 45% of total losses are allocated across all BM Units in delivering Trading Units; and
- 55% of total losses are allocated across all BM Units in offtaking Trading Units.

Since the Transmission Loss Factor for all BM Units is currently zero, each non-Interconnector BM Unit's Transmission Loss Multiplier is determined solely by the Transmission Losses Adjustment values. This means two Transmission Loss Multipliers are currently applied to non-Interconnector BM Units in each Settlement Period:

- one to all BM Units in delivering Trading Units (which scales volumes down in magnitude); and
- one to all BM Units in offtaking Trading Units (which scales volumes up in magnitude).

The appropriate multiplier is applied to each BM Unit's Metered Volumes, depending on the direction of its Trading Unit's total (net) Metered Volume in that Settlement Period. Each Party's overall allocation of transmission losses is therefore dependent on the Metered Volumes across all of its BM Units.

The current arrangements result in all fixed and variable transmission losses being allocated to Parties on a uniform, non-locational basis in proportion to each Party's Metered Volumes. This allocation of transmission losses does not take account of the extent to which individual Parties can be considered to contribute to such losses through their geographic location.

What previous Modifications have been raised?

Several BSC Modifications have been raised in the past to examine the allocation of transmission losses.

In 2002 and 2003, Modifications P75 'Introduction of Zonal Transmission Losses', P82 'Introduction of Zonal Transmission Losses on an Average Basis', P105 'Introduction of Zonal Transmission Losses on a Marginal Basis without Phased Implementation' and P109 'A Hedging Scheme for Changes to TLF in Section T of the Code' were progressed to put forward various options. In 2003, Ofgem elected to approve P82. However, this decision was withdrawn in 2004 during a judicial review and P82 was not implemented.

In 2005 and 2006, four further Modifications were progressed: P198 'Introduction of a Zonal Transmission Losses scheme' (based on P82), P200 'Introduction of a Zonal Transmission Losses scheme with Transitional Scheme', P203 'Introduction of a seasonal Zonal Transmission Losses scheme' and P204 'Scaled Zonal Transmission Losses'. Following a Regulatory Impact Assessment, Ofgem issued a statement noting it was minded to approve P203. However, in 2008 Ofgem timed out on making a decision following a further judicial review.

In 2008, P229 'Introduction of a seasonal Zonal Transmission Losses scheme' was raised based on the P203 solution. The P229 Workgroup developed an Alternative Modification based on P204. Ofgem rejected P229 in 2011.

What has the CMA concluded?

The CMA initiated an investigation of the energy market[2] in 2014 at Ofgem's request. Its final report was published in June 2016.

One of the areas the CMA has considered is the absence of locational pricing for transmission losses. It notes that losses are higher the greater the distance electricity needs to be transported, and that the costs of these losses vary considerably by geographic location. For example, in an area with relatively high levels of demand and low levels of generation, consuming electricity will be associated with high losses because electricity has to be transported from further away to meet that demand. Similarly, in that area, generating electricity will be associated with low losses. The CMA believes that the current system of uniform charging for transmission losses creates a system of cross-subsidisation that distorts competition.[3]

As part of its investigation, the CMA has carried out a modelling exercise to assess the costs resulting from the absence of locational charges for transmission losses. It concludes that total efficiency costs vary between around £130m and £160m over the period 2017-2026, with these results robust to a variety of assumptions regarding fuel input costs. It also finds a moderate environmental cost arising from the absence of locational charges for transmission losses in the form of increased sulphur dioxide (SO_2) and mono-nitrogen oxide (NO_X) emissions, valued at between around £1m and £15m over the same period.

The CMA has concluded that the results of its modelling are similar, overall, to other cost-benefit analyses commissioned by the BSC Panel and Ofgem for previous BSC Modifications including P229 (see Appendix 1 for a list of, and links to, these). The CMA's overall conclusion is that the absence of locational pricing for losses is a feature of the wholesale electricity market in Great Britain that gives rise to an adverse effect on competition. It believes this is likely to distort competition between generators and to have both short- and long-term effects on generation and demand as follows:

- In the short run, costs will be higher than would otherwise be the case, because cross-subsidisation will lead to some plants generating when it would be less costly overall for them not to generate, and other plants – which it would be more efficient to use – not generating. Similarly, cross-subsidies will result in customer prices failing to reflect fully the costs of providing the electricity.
- In the long run, the lack of locational pricing may lead to inefficient investment in generation, including inefficient decisions over the extension or closure of plant. There could also be inefficiency in the location of demand, particularly high-consumption industrial demand.

To address this, the CMA is implementing a remedy that requires the introduction of a seasonal zonal transmission losses scheme from 1 April 2018.

[2] You can find all CMA documents relating to its investigation at this link, including its final report and a summary of that report. Appendices 5.2, 6.1 and 6.1a of the CMA's final report give further detail on its transmission losses conclusions, including the modelling results.

[3] Put another way, demand customers located close to an abundance of generation (and generators situated near a large amount of demand) pay some of the costs of transmitting electricity from generators to demand customers that are geographically distant from each other.

What is the CMA's remedy?

The CMA has powers under the Enterprise Act 2002 to impose Orders (secondary legislation) and amend licences.

To implement its locational transmission losses remedy, the CMA has enacted an Order ('The Energy Market Investigation (Electricity Transmission Losses) Order 2016'). To give effect to its provisions, the Order also includes changes to National Grid's Transmission Licence and supporting changes to the Generation Licence and Supply Licence. The CMA has also published an Explanatory Note, which explains how the Order and associated licence conditions are expected to operate. In amending licences, the CMA has had regard to Ofgem's statutory duties.

The Order and amended Transmission Licence provisions came into force on 15 December 2016. They require National Grid to:

- ensure that, from 1 April 2018, transmission losses are allocated on a locational basis under a solution which is identical in its technical aspects[4] to the P229 Proposed Modification (including the use of semi-marginal, rather than full marginal, Transmission Loss Factors[5]);
- progress a BSC Modification to modify the BSC, from 1 April 2018, in line with the P229 Proposed Modification;
- step in to implement the solution itself, outside the BSC, if the Modification is not implemented in time for 1 April 2018; and
- step in and assume responsibility for the calculation of the Transmission Loss Factors, if the Modification is implemented on time but ELEXON and/or the appointed BSC agent then subsequently fail to perform their duties.

The Order also recommends that Ofgem takes all necessary steps to support National Grid.

The Order takes precedence over the BSC. Both the Order and the supporting changes to the Generation and Supply licences state that, in the event of any conflict between the Order and the BSC regarding the calculation of Transmission Loss Factors, the provisions of the Order shall prevail.

Once the CMA's specified technical solution is in place on 1 April 2018, the Order and licence changes permit other BSC Modification Proposals to vary the solution. However, National Grid will continue to have an enduring obligation under the Order and its licence to ensure that, from 1 April 2018, the BSC arrangements comply with the following Transmission Losses Principle:

- 'the licensee shall ensure at all times that the costs of Transmission Losses are recovered from users of the national electricity transmission system in a manner which is sensitive to the relative impact on Transmission Losses of changes to each user's power flow as a result of their location on the national electricity transmission system' (new Transmission Licence Condition C3 1E).

This means that, while the solution for allocating transmission losses can be amended after 1 April 2018 to differ from P229, any replacement solution must continue to include a locational element. To facilitate this, the CMA has also introduced a new Applicable BSC

[4] Except for the inclusion of a small number of additional solution elements expressly permitted by the CMA, to reflect regulatory and technical developments since P229. See Sections 3 and 6.

[5] The P229 solution is a 'semi-marginal' scheme in that it only allocates variable losses locationally, and retains the existing uniform allocation of fixed losses.

Objective (g) 'compliance with the Transmission Losses Principle' into the Transmission Licence.[6]

What is the issue?

The CMA's Order and licence changes require National Grid to raise a BSC Modification in line with the P229 Proposed Modification, to be implemented by 1 April 2018. As P229 had a 12-month implementation lead time, National Grid raised this Modification in advance of the Order and licence changes coming into force to maximise the time available for assessment and implementation.

The CMA issued an informal consultation on its Draft Order and licence changes to interested Parties in August 2016. Recipients included ELEXON, National Grid, Ofgem, the BSC Panel and the P350 Workgroup. It then issued its formal public consultation in October 2016. During this consultation process, the CMA has engaged closely with ELEXON and the P350 Workgroup to ensure consistency between the Order (including its licence changes) and the P350 legal text. In its Explanatory Note, the CMA confirms its view that the P350 legal text is entirely in line with the final Order.

[6] As the Order and licence changes were not yet in force when the P350 Workgroup made its final recommendation on 5 December 2016, the Workgroup based its overall assessment of P350 on the original set of Applicable BSC Objectives (a)-(f). However, the Workgroup did also provide its views on the new Objective (g), noting that this would be in place by the time of the Panel's own recommendation.

3 Solution

Proposed solution

National Grid raised P350 'Introduction of a seasonal Zonal Transmission Losses scheme' on 4 July 2016, to implement the CMA's remedy in accordance with the Order and Transmission Licence obligations. As required by the CMA, P350 is based on Proposed Modification P229 as put forward in the final P229 legal text.

The CMA's Order requires P350 to be identical in its technical aspects to P229, except for the inclusion of a small number of additional solution elements expressly permitted by the CMA. These additional P350 solution elements are detailed later in this section and in more detail in section 6.

P229, and thus P350, involves the annual calculation of seasonal zonal Transmission Loss Factors for each BSC Year. The methodology can be summarised as follows (terms in bold are defined in the P229/P350 legal text).

Original P229 solution elements

1. ELEXON procures a new BSC Agent, the Transmission Loss Factor Agent (**TLFA**). The TLFA builds an electrical model of the Transmission System (a **Load Flow Model**), containing **Nodes** to represent points where transmission circuits meet or where energy flows on or off the Transmission System. National Grid identifies each Node on the Transmission System, and ELEXON allocates each Node to a specific **Zone** on the transmission network using a new **Network Mapping Statement** approved by the Panel. The Panel sets the Zones based on the geographic areas covered by GSP Groups.[7] Since there are currently 14 GSP Groups, this means 14 Zones.

2. The TLFA annually calculates Transmission Loss Factors in advance ('ex ante') for the forthcoming BSC Year (1 April – 31 March). The inputs to the calculation are historic Metered Volumes and Network Data for **Sample Settlement Periods** in a preceding 12-month period ending 31 August (the **Reference Year**). The Panel sets the Sample Settlement Periods and the CDCA provides the required Metered Volumes. National Grid and those DSOs with Offshore transmission circuits attached to their networks provide the Network Data.

3. Each year, the TLFA runs the Load Flow Model to calculate how an incremental increase in power at each individual Node affects the total variable losses from the Transmission System. The Load Flow Model's output is a **Nodal Transmission Loss Factor** value for each Node in each of the Sample Settlement Periods:

    - Positive values are produced for Nodes where an increase in the nodal power flow (i.e. an incremental increase in generation or reduction in demand) **decreases** total variable losses on the system. Conversely, a decrease in the power flow at such a Node (i.e. an incremental reduction in generation or increase in demand) increases total variable losses.

    - Negative values are produced for Nodes where an increase in the nodal power flow (i.e. an incremental increase in generation or reduction in demand) **increases** total variable losses on the system. Conversely, a

[7] For offshore Nodes connected to the Transmission System, the relevant onshore GSP Group in which the network is connected would be used as the basis for the applicable Zone.

decrease in the power flow at such a Node (i.e. an incremental reduction in generation or increase in demand) decreases total variable losses.

For example, if an injection of an extra 1kWh of energy at a Node increases variable losses by 0.02kWh, the Transmission Loss Factor value for that Node in that Settlement Period is -0.02. The TLFA averages the raw Nodal Transmission Loss Factor values across all the Nodes in each Zone by 'volume-weighted' averaging, to give 14 **Zonal Transmission Loss Factor** values for each Sample Settlement Period (one per Zone).

4. The TLFA then converts these Zonal Transmission Loss Factor values to **Seasonal Zonal Transmission Loss Factor** values by 'time-weighted' averaging, calculating a Seasonal Zonal Transmission Loss Factor value for each Zone for each BSC Season:

   - 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 – 28/29 February inclusive.

5. The TLFA adjusts the Seasonal Zonal Transmission Loss Factor values by a scaling factor of 0.5, so that the volume of energy allocated via the Transmission Loss Factor values is comparable to the volume of variable losses calculated by the Load Flow Model. ELEXON publishes these **Adjusted Seasonal Zonal Transmission Loss Factor** values no less than three months before they are first used in the Transmission Loss Multiplier calculation for the applicable BSC Year.

6. The Transmission Loss Factor applied to a BM Unit in the calculation of its Transmission Loss Multiplier is the Adjusted Seasonal Zonal Transmission Loss Factor value for the relevant Zone in the relevant Season. All BM Units within a Zone therefore receive the same single Transmission Loss Factor value for every Settlement Period in a BSC Season. [8] A positive Transmission Loss Factor value increases the Transmission Loss Multiplier value used to scale a BM Unit's Metered Volume (a benefit to generators and disadvantage to Suppliers), and a negative Transmission Loss Factor decreases the Transmission Loss Multiplier value (a benefit to Suppliers and disadvantage to generators).

7. The CRA registers the BM Unit specific Transmission Loss Factor values (as calculated by the TLFA) in BSC Systems, and the BMRA and SAA use these in the Balancing Mechanism Reporting Service (BMRS) and Settlement calculations respectively.

8. The remaining 'fixed' element of transmission losses continues to be allocated to BM Units on a non-locational basis through the Transmission Losses Adjustment values, and the overall 45:55 allocation of total transmission losses to generation and demand is retained. Because the Transmission Loss Factor values are determined ex-ante using historic data, the actual out-turn allocation of variable and other losses locationally and non-locationally will not be precise. Under- or over-recovery of variable losses through the pre-determined Transmission Loss

[8] Because the BSC Year starts on 1 April, P350 applies the 'Spring' Transmission Loss Factors in two different time periods within a BSC Year – from 1 April to 31 May at the start of the BSC Year and then again from 1 March to 31 March at the end of the BSC Year.

Factor values will be accounted for in the non-locational Transmission Losses Adjustment values.

9. There is no phased implementation or 'hedging' of exposure to the new Transmission Loss Factor values, which take full effect from the first Settlement Period on the Implementation Date.

Additional P350 solution elements

The P350 solution also contains additional drafting to P229 in the following four areas, resulting from regulatory and technical developments that have occurred since the original progression of P229 during 2008-2010. The CMA's Order reflects these changes, as clarified in the CMA's Explanatory Note. You can find the Workgroup's reasoning for the changes in Section 6.

1. Interconnector BM Units continue to be allocated a fixed Transmission Loss Multiplier value of 1 as currently, reflecting that P278 has been implemented since P229. This means that Interconnector BM Units' new locational Transmission Loss Factor values have no practical effect on their existing Transmission Loss Multiplier value. The Load Flow Model takes account of the impact of Interconnector flows on transmission losses in its calculation of Nodal Transmission Loss Factors (which feed into the Adjusted Seasonal Zonal Transmission Loss Factors), but the TLFA excludes Interconnector power flows from the zonal averaging. Any transmission losses not allocated to Interconnector BM Units (whether variable or fixed) are, as now, allocated to non-Interconnector BM Units through the Transmission Losses Adjustment in proportion to their Metered Volumes. Under P350, this effectively means that they are treated as fixed losses.

2. P350 contains provisions for High Voltage Direct Current (HVDC) circuits that are internal to the Transmission System, which P229 did not need to cater for. Because HVDC circuits (unlike AC circuits) are controlled directly by the System Operator, they are not included in the Load Flow Model. Instead the metered power flows between the HVDC asset and the AC Transmission System are included in the Load Flow Model at the relevant Nodes only. In the case of an HVDC circuit linking two Nodes on the AC Network, one of these will be treated as a point of delivery (or 'source') onto the rest of the Transmission System, and the other a point of offtake (or 'sink') from the rest of the Transmission System – accounting for any intervening losses over the circuit. Similar to the approach for Interconnectors, P350 treats the losses caused by HVDC energy flows onto or off the rest of the Transmission System as fixed losses and socialises them through the Transmission Losses Adjustment.[9]

3. P350 contains provisions to support National Grid's rights of 'step in' under the Order and its licence, enabling it to assume responsibility for the determination of Transmission Loss Factors if ELEXON or the TLFA fail in their duties under the BSC.

4. The P350 solution contains a defined calculation for a new value, the **Transmission Loss Factor Adjustment** ($TLFA_S$). The TLFA uses this to adjust all the Seasonal Zonal Transmission Loss Factors by the same value, so as to minimise any impact from P350 on the average amount of losses recovered through the Delivering Transmission Losses Adjustment ($TLMO^+_j$), and hence

[9] The P350 solution does not cater for offshore generation connected to the Transmission System using HVDC circuits as there are no such circuits currently planned. Changes to account for these would require a separate Modification Proposal.

remove an unintended anomaly in the strike price adjustment under the CFD. The strike price is a key parameter used in CFD generators payment calculations.

The application of this new value does not change the differentials between the Transmission Loss Factors for different Zones, and so does not affect the locational signals intended by P350 and the CMA. The resulting Transmission Loss Multipliers (and thus BSC Settlement) also remain unaffected. The P350 legal text reflects that the CMA has included this new value within the solution prescribed in its Order, but that the Order enables the CMA to determine (by 23 November 2017) that this value should be zero. This is to cater for the possibility that the unintended anomaly can be removed under the CFD governance arrangements from which it arises.

Further Information

CFD's are one of the elements of the Governments Electricity Market Reform Programme. They are private law contracts designed to encourage investment in new, low carbon generation and administered by the LCCC.

CFD generators are paid a 'difference payment' – the difference between their strike price (£/MWh) and a market reference price (£/MWh) multiplied by their metered volumes (MWh).

Legal text

The proposed changes to the BSC to deliver P350 can be found in Attachment C. These are largely identical to those for the P229 Proposed Modification, with the exception of the four areas identified above and a few non-material stylistic changes. The CMA has confirmed that the legal text is entirely in line with its Order.

Views of Assessment Procedure Consultation respondents

Question 2: Do you agree that the proposed redlining in Attachment B delivers the intent of P350?			
Yes	No	Neutral/No Comment	Other
8	2	8	1

Eight respondents to the Assessment Procedure Consultation agreed with the proposed redlining. Eight were neutral or provided no comment. Two disagreed:

- one believed it was not possible to determine whether the solution delivers the intent of P350 without seeing the final legal drafting for the CFD issue including the methodology for calculating the new $TLFA_S$[10]; and
- one believed the proposed legal text delivers the intent of P350 but that there were some more eloquent ways of writing parts of the text.

Most of the comments from the last respondent above relate to areas of the legal text that are not new for P350, and which have therefore been the subject of previous industry consultation under P229 and earlier Modifications. Because the BSC legal text needs to align with the wording of the detailed technical solution specified in the CMA's Order, and because the respondent's suggestions do not materially affect the meaning of the legal text, on balance it was considered better to retain the current wording.

One respondent had not reviewed the redlined text and so marked their responses as 'other'.

[10] The Workgroup's Assessment Procedure Consultation included its potential solution for determining the $TLFA_S$ but not the detailed legal drafting for that particular element of the P350 solution. The Workgroup subsequently agreed the supporting legal drafting for the $TLFA_S$ as set out in Attachment C, and the Report Phase Consultation will seek Parties' views on whether this drafting delivers the intended P350 solution. The CMA is mandating, through its Order, the inclusion of the $TLFA_S$ in the P350 solution.

National Grid provided some minor comments on the proposed 'step-in' provisions. These were subsequently incorporated into the legal text agreed by the Workgroup, as set out in Attachment C.

Are there any alternative solutions?

The Workgroup does not believe that there are any other solutions within the scope of P350's identified defect that would better facilitate the Applicable BSC Objectives compared to the Proposer's Proposed Modification.

As part of its Assessment Procedure Consultation, the Workgroup has requested industry views on whether there are any potential alternatives within the scope of P350 that should be taken into account. The Workgroup has considered the views put forward and agrees that there is still no Alternative Modification that better facilitates the Applicable BSC Objectives than the Proposed Modification.

Views of Assessment Procedure Consultation respondents

Question 4: Do you agree that there are no other potential Alternative Modifications within the scope of P350 that would better facilitate the Applicable BSC Objectives compared to the Proposed Modification?			
Yes	No	Neutral/No Comment	Other
10	3	4	2

Ten out of 19 respondents agreed that there are no other potential Alternative Modifications within the scope of P350 that would better facilitate the Applicable BSC Objectives compared to the Proposed Modification. Four respondents were neutral or provided no comment. Two respondents provided responses marked as 'other'. These respondents recognised that P350's scope (as constrained by the CMA's Order) left the Workgroup little latitude to consider alternatives.

Of the remaining three respondents who disagreed:

- one believed that the process for P350 had not sufficiently allowed for alternatives to be explored;
- one had misunderstood the intention of the Proposed Modification regarding the definition of Zones (subsequently clarified with ELEXON); and
- one identified an alternative algebraic approach for the calculations which they believed was more mathematically elegant and easier to explain to Parties (see section 6, page 35 for further details).

You can find the full non-confidential responses in Attachment D.

Potential alternatives considered but discounted by Workgroup

The Workgroup has considered the following potential alternative solutions, but is not progressing any of these further. Section 6 contains full details of the Workgroup's discussions in each area.

- A minority of Workgroup members and Assessment Procedure consultation respondents disagree with excluding Interconnector power flows from the zonal averaging. The CMA's final Order aligns with both the Proposer's Proposed Modification and the majority view of Workgroup members and respondents.

- The Workgroup has discussed but discounted the potential alternative algebraic approach suggested by a consultation respondent. It notes that this makes no difference to the resulting Transmission Loss Multipliers and is inconsistent with the algebra specific in the CMA's Order.

- The Workgroup has considered an alternative method for modelling HVDC circuits, as a safeguard in case the CMA's Order ended up constraining its solution in this area. The Workgroup's analysis has subsequently demonstrated that this method is less accurate and the CMA has amended its Order to allow the Workgroup flexibility. As a result, the Proposer's Proposed Modification (as issued for the Assessment Procedure Consultation) includes the Workgroup's preferred approach and the Workgroup has not considered this alternative method further.

- The Workgroup has considered whether or not P350's Transmission Loss Factor calculation should include a new value to address an unintended anomaly in the strike price adjustment under the CFD arrangements, and has sought the views of Assessment Procedure Consultation respondents on including this new value. Respondents' views were split. The Workgroup has subsequently obtained further clarifications from the Department of Business, Energy and Industrial Strategy (BEIS) and the Low Carbon Contracts Company (LCCC – who are signatories to the CFD as a subsidiary of BEIS), as well as analysis from ELEXON on the potential materiality.

  During discussion at the final Workgroup meeting, the CMA clarified that its Order would mandate the inclusion of the new value but with the ability for the CMA to direct the value to be set to zero (should a CFD governance solution subsequently prove possible). The Workgroup agrees that the P350 legal text should mirror the Order and the Proposer has therefore included this in the Proposed Modification.

  The final Order and P350 text therefore align on the inclusion of the new value and its intended purpose. The CMA's Order leaves it open as to how this new value is calculated – the Workgroup has discussed whether the P350 legal text should prescribe a mechanistic calculation or require the Panel to agree a methodology during implementation. A majority of members favour a mechanistic calculation and the Proposer's Proposed Modification is based on this approach.

- The Workgroup has discussed whether P350 should require ELEXON to provide BSC Parties with a tool or service for forecasting/modelling Transmission Loss Factors. A majority of Workgroup members and two respondents to the Assessment Procedure Consultation have expressed support for this. The Workgroup agrees that it would take time to gather Parties' requirements for, and explore the feasibility of, such a tool or service as its scope is not defined. The Workgroup also notes that it is not required by the Order. The Workgroup therefore agrees that it is inappropriate to delay the progression of P350 to develop it further since this would jeopardise the ability to implement P350 by 1 April 2018. However, by majority, the Workgroup recommends that the Panel instructs ELEXON to explore this further as a separate piece of work.

4 Impacts & Costs

Estimated central implementation costs of P350

The estimated central implementation costs for P350 are approximately £130,000. These comprise:

- approximately £46,000 in BSC Agent costs to ensure the changes developed for P82 in 2003 will still deliver the agreed solution; and
- approximately £84,000 (350 man days) for ELEXON to procure the TLFA and the Load Flow Model Reviewer[11], develop and implement the new documents and ongoing processes for determining Transmission Loss Factor values and manage the implementation project.

In addition, there will be approximately £19,000 (80 man days) in ongoing ELEXON effort per annum for operating the annual processes that support the determination and application of Transmission Loss Factors.

The costs associated with the TLFA's development of its systems and subsequent operation of the annual calculation process have not been assessed, and will not be known until the procurement exercise has been completed.

Indicative industry costs of P350

National Grid and any DSOs with offshore transmission circuits connected to their Distribution Systems will need to provide Network Data annually. National Grid has estimated around 10 man days of effort per annum to complete this process. DSOs have estimated one-off costs of around £5,000 and on-going costs of around £3,000 per annum (for each offshore Transmission System connected to their network) in providing this data.

An DSO respondent to the Assessment Procedure Consultation has commented that it is important to ensure that different DSOs use a consistent approach to determining the required Distribution Network Data. The P350 legal text sets out the high-level requirements for this, replicated from P229. As part of the P350 implementation project, ELEXON will provide DSOs with further guidance on producing the required data.

Other participants will need to make system, document and process changes. Cost estimates range from minimal to high, with costs of up to £1m cited.

You can find full details in the non-confidential Industry Impact Assessment responses, which are available on the P350 page of our website.

[11] A new BSC service provider who inspects and tests the TLFA's Load Flow Model, to give independent assurance that it complies with the Load Flow Model Specification approved by the Panel.

P350 impacts

Impact on BSC Parties and Party Agents	
Party/Party Agent	Impact
Generators	The allocation of transmission losses to generators and Suppliers will change under P350, with the variable element of losses now being allocated locationally based on geographic Zones. Parties may need to make changes to their own systems and contracts to support non-zero Transmission Loss Factor values.
Suppliers	
Distribution System Operator	Those DSOs which have offshore transmission circuits connected to their Distribution Systems will need to provide Distribution Network Data to support the implementation and annual calculation of the Transmission Loss Factor values.

Impact on National Grid
National Grid will need to provide Transmission Network Data and data on HVDC transmission circuits to support the implementation and annual calculation of the Transmission Loss Factor values. It will also need to support the Network Mapping Statement process. P350 also includes provisions to support National Grid's step-in powers under the Order and Transmission Licence (which require it to step in and assume responsibility for the determination of Transmission Loss Factors, should BSCCo or the TLFA fail in their duties under the BSC).

Impact on BSCCo	
Area of ELEXON	Impact
Procurement	As part of the P350 implementation project, ELEXON will need to procure a new BSC Agent (the TLFA) and a new service provider (the Load Flow Model Reviewer). An escrow agent will also be needed to hold a copy of the Load Flow Model.
BSC Operations	Amendments to other operational activities will be needed, and new operational activities introduced, to support the calculation and use of non-zero Transmission Loss Factor values.

Impact on BSC Systems and process	
BSC System/Process	Impact
BMRA	BSC Systems will need amending to account for changes in the Transmission Loss Factor values or to validate that the previous changes developed under P82 will still deliver the agreed solution.
CDCA	
CRA	
SAA	

Impact on BSC Agent/service provider contractual arrangements	
BSC Agent/service provider contract	Impact
Transmission Loss Factor Agent	Contractual arrangements for this new BSC Agent role will need to be put in place.
Load Flow Model Reviewer	Contractual arrangements for this new service provider will need to be put in place.
BSC Auditor	The scope of the BSC Audit will need to be extended to include the activities of the TLFA.

Impact on Code	
Code Section	Impact
Section E	Changes will be required to these documents. The proposed changes can be found in Attachment C.
Section H	
Section T	
Section V	
Section X Annex X-1	
Section X Annex X-2	

All of the documents in the remaining tables below will be produced or amended during the P350 implementation project.

Impact on Code Subsidiary Documents	
CSD	Impact
BSCP01	Changes are expected to be required to these documents.
BSCP15	
BSCP38	
BSCP41	
Communications Requirement Document	
Reporting Catalogue	
Interface Definition and Design	
BSC Agent Service Descriptions	New BSC Agent documents will be required for the TLFA. Changes may be required to relevant existing BSC Agent documents.
BSC Agent User Requirement Specifications	
Load Flow Model Specification	A new Code Subsidiary Document will be established to cover the calculations to be used in the Load Flow Model.

Other Documents	
Configurable Item	Impact
Network Mapping Statement	A Network Mapping Statement will be established to cover the allocation of BM Units to Zones. There will be two versions in a given year: a Reference Network Mapping Statement approved by the Panel each year and used by the TLFA in the annual calculation of Transmission Loss Factors; and a Prevailing Network Mapping Statement maintained by BSCCo throughout the year. The Prevailing Network Mapping Statement will be used to map any new BM Unit registrations to a Zone (i.e. BM Unit registrations that occur part-way through a BSC Year), so that they receive the already-calculated Transmission Loss Factor for the relevant Zone. The Prevailing Network Mapping Statement will also form the basis for the following year's Reference Network Mapping Statement.

Other Impacts	
Item impacted	Impact
BSC Guidance Notes	BSC Guidance Notes relating to transmission losses will need to be updated.

5 Implementation

Recommended Implementation Date

The CMA is mandating that its remedy, and hence P350, is implemented on 1 April 2018.

The Workgroup therefore recommends an Implementation Date for P350 of:

- **1 April 2018** if Ofgem's decision is received on or before 31 March 2017.

The CMA's choice of a 1 April date recognises Parties' preference (expressed under P229 and previous Modifications) for aligning the Implementation Date with their contract rounds. Its choice of 1 April 2018 reflects that P229 and other previous Modifications had a 12-month implementation timetable due to, among other activities:

- The BSC's need to procure the TLFA, develop TLFA systems and run the necessary calculations in order to publish Transmission Loss Factors three months before the Implementation Date; and
- Parties' need to amend their own systems to reflect non-zero Transmission Loss Factor values.

The P350 progression timetable agreed by the Panel in July 2016 means that the Panel will make its final recommendation to Ofgem at its meeting on 9 February 2017. In its Explanatory Note, the CMA 'agrees with the view reached by the BSC Panel that, for the purpose of implementing modification proposal P350 on 1 April 2018, a final modification report should be sent by the BSC Panel to GEMA [Ofgem] by mid-February 2017 at the latest'. Ofgem's recently-published implementation plan for the CMA's remedies states that it currently aims to make its P350 decision in March 2017.

Question 3: Do you agree with the Workgroup's recommended Implementation Date?

Yes	No	Neutral/No Comment	Other
11	5	2	1

11 of 19 respondents to the Assessment Procedure Consultation agreed with this Implementation Date and two were neutral. Five did not agree as follows:

- one requested an additional year on the basis that contracts had already been signed for 2018/19;
- one requested a three-year lead time to make the necessary changes to systems and processes;
- two requested a grace period and/or exemptions for generation projects that already exist or are in development; and
- one respondent felt more time should be given to ensure all issues have been thoroughly considered, but recognised that there is little scope for this due to the timing requirements of the CMA's Order.

One respondent, marking its answer as 'other', wanted the implementation delayed as long as possible to minimise the impact on its revenues.

The Workgroup noted all views but agreed that alternative implementation approaches would not deliver the CMA's Order.

You can find the full responses received in Attachment D.

How will the CMA's Order be implemented?

The CMA clarified to the Workgroup the process and timetable it is following to implement its remedy. The CMA confirmed that the scope of its Order and licence changes is constrained, in that these must deliver the remedies identified in its final report.

The Workgroup asked what would happen if it identified an issue with the P229 technical solution that meant the solution needed to be changed. The CMA advised that there was the potential to make minor enhancements to the solution (such as to cater for technical or regulatory developments since P229) providing that these still delivered the CMA's intended remedy. The CMA subsequently amended its draft Order to allow the Workgroup to make the changes identified in Section 3 (see below for the Workgroup's discussions on these areas). However, it confirmed that any material changes to the principles of the solution could not be made unless the CMA determined that there had been a significant material change of circumstance requiring reconsideration of its final report.

The Workgroup noted the Proposer's argument that P350 better facilitates the achievement of Applicable BSC Objective (a) by enabling National Grid to comply with its new licence obligations under the Order. It noted that the Order and licence changes would not be in place when it held its final P350 Workgroup meeting. One member highlighted the possibility that the Panel could therefore be considering P350 against a different baseline to the Workgroup. However, the Workgroup had sight of the draft Order and licence changes as the CMA consulted upon them, and the final versions came into force before the Workgroup agreed the final content of this Assessment Report.

One member highlighted that Ofgem had been minded to approve P229 against the Applicable BSC Objectives but ultimately rejected that Modification following consideration of its wider statutory duties. The CMA noted that it had considered Ofgem's reasons for rejecting P229, had undertaken its own cost-benefit analysis and had considered all of Ofgem's statutory duties before deciding on the remedy in its final report. It was also highlighted that, even if P350 was not in place, National Grid would be required under the Order and its licence to implement a technically-identical solution by 1 April 2018.

Load flow modelling exercise

The Workgroup considered what analysis it needed to perform as part of its assessment of P350. The Panel had asked the P350 Workgroup to, as a minimum, commission load flow modelling analysis to provide participants with indicative Transmission Loss Factor and Transmission Loss Multiplier values, including two or three sensitivity scenarios with varied input data (with one of these scenarios to be the inclusion of the planned HVDC Western Link in 2017). However, it left any further work up to the Workgroup to determine.

The Workgroup agreed that the load flow modelling exercise would have two purposes:

- it would establish indicative Transmission Loss Factor and Transmission Loss Multiplier values under the P350 solution, to help Parties prepare for the impact on them in the first year of implementation (1 April 2018 – 31 March 2019); and
- it would ensure that the P350 solution caters for technical and regulatory developments since P229 that impact the treatment of flows in the Load Flow Model.

The Workgroup noted that the CMA had undertaken a cost-benefit analysis as part of its investigation, as well as reviewing the wealth of similar analysis from the previous BSC Modifications. The CMA confirmed that this had included analysis of the financial distributional impacts (Appendix 6.1 of the CMA's final report). All of these pieces of analysis drew largely the same conclusions on the benefits that could be realised. The Workgroup therefore agreed that any further analysis was unlikely to add significantly to its assessment, particularly given that the P350 solution and implementation timescales are being mandated by the CMA.

However, the Workgroup noted that the Transmission Loss Factor values used in the CMA's cost-benefit analysis were calculated using 16 Nodes and Zones, rather than the actual BSC model inputs and GSP Group-based Zones that would be used for P350. It therefore agreed with the Panel that it would commission load flow modelling analysis to help Parties to establish indicative Transmission Loss Factor and Multiplier values using the full P350 solution. Members also noted that Parties could use these values to estimate the initial distributional effects on their organisations.

One member asked whether Ofgem would want to carry out a Regulatory Impact Assessment for P350, as it had for the previous transmission losses Modifications. The Ofgem representative noted that no decision had been made on this, but highlighted that legislation exists that allows Ofgem to draw upon impact assessments carried out by other statutory bodies such as the CMA.

The Ofgem representative also urged the Workgroup to ensure it was clear as to the rationale behind each modelling task it undertook. Another member agreed, noting past Modifications where Workgroups had requested large volumes of analysis with many iterations produced, but had only drawn upon a small part of this work in forming their conclusions. They agreed that each piece of analysis the P350 Workgroup undertook needed to answer a specific question.

Load flow modelling data and results

The results of the P350 load flow modelling exercise can be found in Attachment A.

You can also download the following load flow modelling data from the P350 page of our website:

- The full set of input data used for the exercise (an explanatory note on this data is included within the zip folder) and the specification given to the load flow modeller.
- The Transmission Loss Factor, Transmission Losses Adjustment and Transmission Loss Multiplier values calculated for the reference year covered by the exercise (1 June 2015 – 31 May 2016).

What scenarios should be considered?

The Workgroup agreed that a 'baseline' scenario should be carried out, producing indicative Transmission Loss Factor values based on the original P229 solution but using the latest available year of input data (1 June 2015 – 31 May 2016). It agreed that this would give Parties a good indication of the Transmission Loss Factor values that would apply to them from 1 April 2018 – 31 March 2019 (which would be based on a Reference Year of data from 1 September 2016 – 31 August 2017).

The Workgroup also agreed that ELEXON should use these Transmission Loss Factor values to calculate Transmission Losses Adjustment and Transmission Loss Multiplier values for every Settlement Period between 1 June 2015 and 31 May 2016. It believed that these would give Parties a good indication of the values that would apply to them in the 2018/19 BSC Year, noting that the Transmission Losses Adjustment and Transmission Loss Multiplier values applied to Parties in a particular Settlement Period under P350 would depend on the actual Metered Volumes in that Settlement Period rather than historic volumes.

In addition, the Workgroup agreed a second task should be undertaken to help it decide how to treat Interconnector power flows in the Transmission Loss Factor calculation following P278. The full details on this scenario and the results can be found later on in this section.

Previous cost-benefit analysis results

A list of all previous cost-benefit analysis exercises carried out can be found in Appendix 2.

The Workgroup discussed whether it was necessary for the P350 solution to include provisions for HVDC transmission circuits, as it was initially uncertain whether the CMA would permit such a change from the P229 legal text. It noted that it was not known when the HVDC Western link would become operational, and that it would only have an effect on the Transmission Loss Factors applied in the 2018/19 BSC Year if it was operational before 31 August 2017 (the end of the Reference Year).

The Workgroup agreed that P350 should, as a minimum, cater for HVDC circuits even if further Modifications were later required to refine the approach. It therefore agreed that a third task should be undertaken to help it decide how to cater for HVDC circuits in the Load Flow Model. This investigated two approaches: one that deviated from the P229 legal text and one that did not. The full details on this task and the results can be found later on in this section.

Some members initially suggested that it could be important to run other sensitivity scenarios, for example to model the future impact of new generation, plant closures or changes in the generation mix. They suggested that this would help establish how participants might respond to signals over time. However, the Workgroup agreed that these longer-term scenarios went beyond the purpose of the load flow modelling and duplicated areas considered in previous cost-benefit analyses. It therefore agreed not to include these.

What is a slack node?

A slack node is a Node in the Load Flow Model that acts as a sink for any surplus or deficit in power that arises as a result of approximations within the model, and which also acts as a reference Node for voltage and phase angle.

What were the key results?

The Workgroup noted that the pattern of Transmission Loss Factor values (the 'shape' of the graph, or differentials between the values) was as expected from similar modelling for other previous Modification Proposals such as P229[12], including the pronounced seasonal variance in values for the two Scottish Zones (based on the geographic areas covered by GSP Groups _N and _P).

It noted that the P350 modelling used Heysham as the 'slack node', rather than Cowley as under P229, as Heysham is now National Grid's standard slack node. While the absolute values of the Transmission Loss Factors are dependent on the location of the slack node in the load flow model (making the P350 values initially look 'higher' than those for P229), this has no impact on the allocation of transmission losses or on BSC cash flows, as it is the differentials between the values that provide the signals. The nature of the Transmission Loss Multiplier calculation is that the Transmission Losses Adjustment values adjust all the absolute Transmission Loss Factor values up or down by the same amount, while preserving the differentials, to deliver the correct overall allocation of losses in aggregate to delivering and offtaking BM Units. The Workgroup noted the graph and figures provided by the modeller demonstrating that the change of slack node had no effect on the differentials.

The Workgroup noted the 'dip' in the Spring value for the South Wales GSP Group (GSP Group _K) compared with the other seasons. Members suggested that this could relate to outage patterns or embedded generation.

One member queried whether the Metered Volume data used had accounted for any known errors being corrected via a Trading Dispute. They were aware of at least one Dispute in Scotland where a meter had recorded generation as demand. They considered that whether corrected data had been used would depend on when the corrections had

[12] The results of the P229 load flow modelling exercise can be found on the P229 page of our website.

begun to be made. It was confirmed that all data used in the load flow modelling was Settlement data drawn from BSC Systems, and had not been amended in any way following extraction.

The full results can be found in Attachment A.

What is the impact on Transmission Loss Multiplier values?

The Workgroup noted the Transmission Loss Multipliers calculated by ELEXON using the 'baseline' P350 Transmission Loss Factors. The 'spread' between minimum and maximum Transmission Loss Multiplier values is higher than seen previously under the P229 analysis, but this appears to be a feature of the current live Transmission Loss Multiplier values that is unconnected to P350.

These values can be downloaded from the P350 page of our website, and a summary of the results can be found in Attachment A.

How should HVDC circuits be accounted for?

When the P229 solution was developed, HVDC transmission circuits were not envisioned to be in use for many years. Subsequently, the P229 Workgroup did not include provisions for these within its solution. However, the HVDC Western Link is expected to become live at some point in 2017. Depending on its go-live date, it may be present for part of the Reference Year used for the first set of live Transmission Loss Factor values.

The CMA's remedy stated that the solution to be implemented under P350 needs to be identical to the P229 technical solution. P229's solution was developed assuming the entire Transmission System is made up of AC circuits, and its legal text was drafted accordingly. It was therefore unclear to the Workgroup initially whether the Western Link needed to be modelled as an AC circuit, or whether an amendment could be made to add HVDC provisions alongside the existing AC provisions without affecting the latter.

The Workgroup therefore considered two options as part of its load flow modelling exercise:

- **Option A:** This modelled each end of the Western Link as specific loads flowing on to or off of the system (as points of delivery and offtake, or sources and sinks, at corresponding Nodes). A volume of demand representing the energy being allowed to flow across the link was modelled at one of the corresponding Nodes, and an equivalent amount of generation (modified for losses across the connection) was modelled at the other Node. This allowed the model to accurately reflect how much energy was allowed to flow across the link. This was the Workgroup's preferred option; however it noted that it would require additional legal text provisions compared with P229.

- **Option B:** This modelled the Western Link as an AC connection between the two corresponding Nodes. This would enable the link to be modelled in line with the P229 technical solution, but would not be an ideal representation of the connection. A key feature of an HVDC connection is that the System Operator is able to control the current running along that part of the network. In contrast, the current flows on an AC circuit are determined by the electrical characteristics of the network and the users connected to it, and are not controlled directly by the System Operator. Modelling the Western Link as an AC circuit would result in the

HVDC Western Link

The HVDC Western Link is an offshore HVDC circuit linking Hunterston in North Ayrshire (GSP Group _N) to Deeside in Flintshire (GSP Group _D). It is intended to reduce transmission constraints that sometimes limit the power flow from Scotland to England.

Further information can be found on the Western Link Project website.

Load Flow Model calculating power flows (and hence losses) that did not reflect the actual flows or losses on the circuit, and would therefore introduce errors into TLF values across the system.

Input data for Option A

No actual metered volume data is available for the Western Link, but National Grid advised that an assumption of one third of the total flow between England and Scotland flowing over the Link should be used, subject to the Link's constraints. This assumption was therefore used for the purpose of the load flow modelling exercise.

One member felt that sensitivity testing on this assumption should be done, to assess how accurate it would be ahead of actual data becoming available for the Link. However, for the live calculations, only actual data will be fed into the Transmission Loss Factor calculations, and this assumption will therefore not be used outside of this indicative modelling exercise.

The Workgroup queried how the metered volumes from the HVDC Western Link would be obtained. The Proposer noted that National Grid will be installing operational metering at the Link. Some Workgroup members believed that if this data is to be used in determining Transmission Loss Factors then it should be recorded using Settlement metering, as with all other Metered Volumes feeding in to the Load Flow Model. One respondent to the Assessment Procedure Consultation also gave this view. However, the majority of the Workgroup concluded that it would be disproportionate to require Settlement metering to be installed only to provide Sample Settlement Period data for this single annual calculation, and believed that data from National Grid's operational metering would be sufficiently accurate. As the System Operator will control the operation of the link, then even if no operational metering data is available (for example due to a fault), it should still be able to provide data on the Link's behaviour in a given Settlement Period.

Input data for Option B

For Option B, National Grid advised that resistance and reactance values of 0.11 and 0.613 (per 100MVA) could be used to model an approximately equivalent AC circuit. It advised that these values were selected to give approximately equivalent behaviour under conditions of peak demand and high transfer from north to south.

Results of the modelling

Under both options, modelling of the HVDC Western Link caused Scottish Transmission Loss Factor values to become less extreme (that is, to become closer to the national average). This was as expected, as the additional link between England and Scotland should reduce the load and hence the transmission losses on existing circuits.

The effect on Scottish Transmission Loss Factor values was significantly higher under Option B than Option A, reflecting the fact that the calculated flows on the HVDC Western Link under Option B were significantly higher than the estimated flows under Option A. The Workgroup's view was that this illustrated the inherent difficulties with Option B. While it may be possible to calculate equivalent resistance and reactance values for a given set of operating conditions, it is not possible to determine resistance and reactance values that give realistic results in all Sample Settlement Periods.

While the modelling was being undertaken, the CMA also published an updated draft Order that allowed the P350 legal text to include extra provisions (not present in the P229 text) to cater for HVDC circuits. These would not change the technical solution developed for an AC network under P229, but would form an addition to account for new technology being incorporated into the network in the intervening years. The Workgroup agreed that Option A was therefore the most appropriate approach and the Proposer agreed to incorporate this in the P350 Proposed Modification for the Assessment Procedure Consultation. The P350 legal text is drafted to allow for any number of HVDC circuits connected to the Transmission System and not just the HVDC Western Link.

Should a signal be given to the System Operator for the operation of HVDC circuits?

A feature of Option A is that the losses on the Western Link itself (rather than the losses it causes or reduces on the rest of the network) are treated as part of 'fixed losses', and socialised across BSC Parties in proportion to their Metered Volumes. One Workgroup member queried whether any signals would be sent to the System Operator for how it should operate the Western Link and any other future HVDC transmission circuits. Without Transmission Loss Factor values being applied to the Link itself, they felt there would be no signal for the System Operator to schedule the most efficient flow of energy across the Link. They noted that the issue here is a principle of who should pay for losses.

Other members highlighted that transmission losses have only ever been applied to generation and demand from the Transmission System and not to the System Operator's actions. The purpose of the signals arising from transmission losses is to incentivise BSC Parties' behaviour through their Trading Charges, not the System Operator. The System Operator is already incentivised through the System Operator Incentives Scheme to manage the Transmission System in the most efficient manner, which would apply to its handling of the Link.

How should offshore HVDC networks be treated?

One Workgroup member queried how the P350 solution would account for offshore HVDC networks, which would form radial connections to the Transmission System rather than connect two points of the network. Under these arrangements, a generation site such as an offshore windfarm would be connected to an HVDC circuit, which would connect to the Transmission System onshore.

The Workgroup noted that no such connection is expected to be commissioned in the near future. Given the timescales associated with P350, members therefore did not believe that it was appropriate to develop a solution for these connections now as they could be considered separately through a further Modification. This would allow more time for the industry to understand how these connections would work, including their ownership. However, the Workgroup asked ELEXON to provide clarity on how the current P350 solution would cater for such offshore HVDC networks.

ELEXON believes that the P350 solution does not account for BM Units that are connected to HVDC systems (including offshore HVDC networks). The P350 legal text only covers HVDC assets that are internal to the Transmission System, such as the HVDC Western Link. Therefore, a further Modification would be required to account for BM Units that are connected to an HVDC system. Such a Modification would need to specify how power flows from or to such BM Units are taken into account in the load flow modelling.

How should Interconnector flows be treated?

The CMA has clarified in its Order and accompanying Explanatory Note that its remedy does not override the European legislation (transposed into the BSC by P278) that exempts Interconnector Users from the allocation of transmission losses. Therefore, Interconnector BM Units need to continue to be allocated a Transmission Loss Multiplier of 1 under P350. Some members noted that they had disagreed with the European legislation and therefore with P278, with one Member noting that they disagreed with the GB government's interpretation of the legislation at the time. However they agreed that this was not something that P350 could change. The Workgroup therefore considered how this would impact the calculation of the Transmission Loss Factors under P350.

Members considered that all power flows on the Transmission Network need to be accounted for in order to correctly attribute losses, meaning Interconnector power flows need to be included within the Load Flow Model. These flows will influence the losses across the whole system and so should be included in the calculation of Nodal Transmission Loss Factor values. For example, if the Interconnector was importing energy into the country when the Zone it was allocated to was importing high volumes of electricity from the Transmission System, this flow would be likely to reduce the level of losses within Great Britain (GB), and also reduce the marginal impact on losses of any additional generation within the Zone. Therefore, Interconnector power flows need to be accounted for when producing the loss factors at a Nodal level.

Members considered whether the flows should be accounted for when the losses calculated at a Nodal level are converted into Zonal values. Under P229, these flows would have been included in the same way as any other flow on the system, but this was before the introduction of P278.

As part of the load flow modelling exercise, the Workgroup therefore requested the inclusion of a scenario where the Interconnector flows were excluded from the calculation of Zonal Transmission Loss Factors. Under this approach, Interconnector flows remain within the calculation of Nodal Transmission Loss Factor and Nodal power flow calculations, but when these values are converted to Zonal Transmission Loss Factors the Interconnector flows are excluded from the Nodal power flow for the relevant Node. The Workgroup agreed that the resulting Zonal Transmission Loss Factors from this scenario could then be compared to those from the 'baseline' scenario to determine the best approach.

The results of this analysis suggested that there is very little difference in the results between the two approaches, and that the only Zones that are affected are those with an Interconnector. This prompted some members to believe that whichever approach should be followed was more a question of principle than material impact.

Some members believed that the Transmission Loss Factor values allocated to a Zone should continue to reflect all the Nodal Transmission Loss Factor values within that Zone, including those at Interconnector Nodes as per the (pre-P278) P229 solution, even though P278 prevents the Nodal signals being passed on to Interconnectors. They believed that this approach would be consistent with the view that all flows should be accounted for in determining Transmission Loss Factor values.

However, other members highlighted that this would mean that other generators and Suppliers in the same Zone as an Interconnector would be allocated a Transmission Loss Factor that reflected not just their own Nodal Transmission Loss Factor values, but also

GB Interconnectors

There are currently four external Interconnectors connecting the GB Transmission System to other countries' Transmission Systems:

- **IFA** has a 2,000MW capacity, links GB with France, and connects at Sellinge in Kent (GSP Group _J).
- **Moyle** has a 500MW capacity, links GB with Northern Ireland, and connects at Auchencrosh in South Ayrshire (GSP Group _N).
- **BritNed** has a 1,000MW capacity, links GB with Holland, and connects at the Isle of Grain in Kent (GSP Group _J).
- **East-West** has a 500MW capacity, links GB with Ireland, and connects at Deeside in Flintshire (GSP Group _D).

Further information can be found on the Interconnectors page of our website.

the Nodal Transmission Loss Factor values of the Interconnector. These members noted that the most cost-reflective signal for a Node is, in principle, its own Nodal Transmission Loss Factor value. However, these members noted that, during discussions on previous Modifications, the industry has (for practical reasons) chosen to accept zonal values which are less cost-reflective due to their averaging. This is because it is not possible to apply nodal values to demand customers (since all BSC demand data is aggregated at a GSP Group level), and consistent geographic aggregations are needed for generation and demand to avoid conflicting signals. Given this, these P350 Workgroup members believed that including Interconnectors in the zonal averaging would be inappropriate in principle because the Nodal Transmission Loss Factor values of the Interconnector (which is not subject to losses) would 'pollute' the Nodal Transmission Loss Factor values of the other generators and Suppliers within its Zone by making them less cost-reflective. The Workgroup considered the hypothetical example of a Zone which contained only one large Interconnector and one small generator. The most cost-reflective signal for the small generator would be its own Nodal Transmission Loss Factor, but this would be polluted by averaging it with the Interconnector's nodal value.

A majority of members agreed that, pre-P278, the principle of zonal averaging was accepted because all the Nodes whose values made up that zonal average received the same resulting Zonal Transmission Loss Factor. Post-P278, this principle would be undermined if Interconnector Nodes' values affected the zonal averaging without Interconnector BM Units receiving the resulting average Zonal Transmission Loss Factor. A majority of members, including the Proposer, therefore agreed that Interconnectors should be excluded from the zonal averaging. These members also agreed that power flows to and from HVDC transmission assets (such as the HVDC Western Link) should be excluded from the zonal averaging for the same reasons. This approach was therefore included in the Proposed Modification as part of the Assessment Procedure Consultation.

The Workgroup agreed to ask a specific consultation question in this area.

Question 5: Do you agree that power flows from or to Interconnectors (and HVDC transmission assets) should be excluded from the calculation of the Zonal Transmission Loss Factor values?			
Yes	No	Neutral/No Comment	Other
8	5	5	1

Eight of 19 respondents to the Assessment Procedure Consultation supported this approach and five were neutral. Five respondents did not support it as follows:

- Two had misinterpreted the solution as excluding Interconnector/HVDC flows from all aspects of the calculation, rather than just the zonal averaging, and believed it is important to consider the impact of these flows on transmission losses;
- Two believed that Interconnector flows should be included in the zonal averaging in order to provide the correct locational signals (one of these respondents did not comment on HVDC flows and the other was neutral on the treatment of these); and
- One disagreed with Interconnector Users' existing exemption from the allocation of transmission losses (i.e. P278).

One respondent marked their answer as 'other' and indicated they supported the approach for HVDC and noted the impact on generators. You can find the full responses received in Attachment D.

The Workgroup discussed all responses but members' views (and thus the Proposed Modification solution) remained unchanged. The Workgroup noted that the CMA had also updated its Order to exclude Interconnector/HVDC flows from the zonal averaging.

What historic data is used in the model?

The model will be an ex-ante model, using historic data from a Reference Year to produce Transmission Loss Factor values for the forthcoming BSC Year. This is the same approach that had been put forward under P229 and other previous Modifications. This means that any developments on the Transmission System that take place after the end of the Reference Year will not be included in the Transmission Loss Factor values subsequently produced and applied until the following BSC Year.

One member noted that the model of the Transmission System will be based on the prevailing intact network[13] at the time the Transmission Loss Factor calculations commence, but the data used to model the flows on the network will be based on historic data over the previous year. They queried whether the flows will be consistent with the network under this approach, or whether this 'lagging' of data means the model is not fully representative. It was noted that, as generation and demand would be modelled as sources or sinks at the relevant Nodes, if a particular site was commissioned or decommissioned mid-year then the load flow model would account for this since the input data would have zero Metered Volumes for this period of inactivity.

Another member noted that these questions had been raised under the previous Modifications. A key principle in the proposed method is that the model needs to use the same network for which it is receiving historic Metered Volume data, in order to ensure all Reference Year data received can be mapped to a Node. The solution for P229 (and for P203 and P82 before it) had always been an ex-ante model based on historical data, and to account for future changes to the network would be inconsistent with this approach. In addition, this is the solution being mandated by the CMA to implement its remedy.

How should the National Grid's step-in powers be incorporated?

The CMA's Order requires National Grid to step in and assume responsibility for the determination of Transmission Loss Factor values if it feels it necessary to do so to meet its licence obligations, and for this to be reflected in the BSC Modification. The P350 legal text therefore needs to reflect and support this.

National Grid, as the Transmission Company, already has similar powers regarding the accession of BSC Parties, the operation of the Modifications procedures, the publication of data on the BSC Website and the provision of data to Ofgem. The Workgroup agreed that similar wording to these provisions should be used for the new powers under P350, although members were keen to ensure that the wording is such that National Grid can only step in to ensure its licence obligations are met, rather than for any other reason.

The Workgroup made some minor changes to the legal text provisions in this area following comments provided by National Grid as part of the Assessment Procedure Consultation. The updated legal text aligns with the CMA's final Order. The proposed legal text can be found in Attachment C.

[13] The intact network is the complete Transmission System assuming all lines are in operation and no circuits are de-energised or disconnected.

How could P350 interact with the Contracts for Difference arrangements?

When setting the P350 Workgroup's Terms of Reference at its July 2016 meeting, the Panel asked the Workgroup to consider any interaction between P350 and the CFD arrangements.

A Panel Member was of the view, subsequently echoed by some Workgroup members, that the wording of the CFD would hold CFD generators neutral to the financial impact of P350, therefore diluting the benefits of the CMA's remedy. The view was that CFD generators would be protected against any changes in their *individual* allocation of transmission losses, meaning that they would not respond to the locational signals created by the introduction of non-zero Transmission Loss Factors under P350.

BEIS and the LCCC have subsequently confirmed that was not the policy intention, and is not the practical effect, of the CFD drafting. BEIS has confirmed that the intention was to hold CFD generators neutral to any change in the *average* transmission losses allocated to generators under the BSC, and P350 does not change the average percentage of losses allocated to generators.

This addressed the original context to the Panel's question. However, the Workgroup's investigations subsequently uncovered an anomaly in the CFD drafting that, if not addressed through P350 or CFD governance, means that the CFD will not achieve BEIS's stated policy intention and will result in arbitrary adjustments to CFD generators' strike prices. This occurs because, to represent the average losses paid by generators, the CFD drafting uses the Transmission Losses Adjustment (an interim stage in the BSC's calculation) rather than the Transmission Loss Multiplier (the end product of the BSC's calculation and the multiplier through which the BSC actually allocates losses). After discussing this anomaly further with ELEXON, the Workgroup, BEIS, LCCC and Ofgem, the CMA has decided on an approach to address this as part of its Order. P350 mirrors this approach, as required by the Order.

The rest of this section provides further detail.

Could the CFD contract affect the P350 signals?

As noted above, some Workgroup members initially believed that the strike price adjustment would protect CFD generators from the effects of P350. ELEXON agreed to seek further information on this from the LCCC.

The LCCC confirmed that the strike price adjustment is calculated each year based on the average of the transmission losses applied across all generators across the whole of the preceding year. This adjustment will therefore not compensate for that generator's individual Transmission Loss Factor value and CFD generators will still be exposed to the P350 signals.

The average transmission losses allocated to generators will not change under P350[14]. This is because P350 does not change the total amount of losses allocated to generators in aggregate (e.g. BM Units in delivering Trading Units still receive 45% of the total losses in

[14] They will not change in the sense that generators (in the sense of BM Units in delivering Trading Units) will continue to be allocated 45% of the metered transmission losses in each Settlement Period. If P350 reduces the total volume of transmission losses (which it is expected to do, by changing marginal despatch decisions) then this will reduce the average losses allocated to generators.

each Settlement Period), it simply changes how these aggregate losses are apportioned across individual generators.

How are CFD generators' difference payments adjusted for transmission losses?

CFD[15] generators' difference payments (payments made to the CFD generator under CFD settlement) are made for 'loss adjusted metered output', which is a BM Unit Metered Volume adjusted for:

- the Transmission Loss Multiplier allocated in accordance with the BSC; or
- any new or substituted multiplier or factor which is in the nature of, or similar to, a transmission loss multiplier.

The applicable Transmission Loss Multiplier depends on whether the BM Unit is in a delivering or offtaking Trading Unit. For example, Exempt Export generators (typically embedded) that belong to a Base Trading Unit will usually receive the offtaking Transmission Loss Multiplier, as Base Trading Units are generally net offtake in a Settlement Period (although North Scotland is sometimes delivering). Generators directly connected to the Transmission System will usually receive the delivering Transmission Loss Multiplier, unless they are in a Trading Unit with onsite demand and the demand outweighs the generation in a given Settlement Period.

BEIS has confirmed the policy intent of the CFD in relation to transmission losses as follows:

> *CFD metered volumes are adjusted for Transmission Losses using the Transmission Loss Multiplier (TLM) in accordance with the BSC. These contracts also set out the process for calculating and making an annual Strike Price Adjustment in relation to the difference between the cost assumptions made in the Strike Price setting process and the TLM charges in a given period. The intention of this Strike Price Adjustment is to ensure that it reflects the average annual TLM charges realised by the typical generator in Great Britain.*

The Workgroup noted that the first sentence related to the calculation of CFD difference payments, whilst the remaining text related to CFD strike price adjustments.

The Proposer and the Workgroup are satisfied that no action is necessary to address the impact of P350 on the calculation of 'loss adjusted metered output' as the interpretation of the CFD in this area is clear. BEIS has confirmed the policy intent and the LCCC has confirmed that it has not identified an impact in this area (see the LCCC's answer to question 6 in the Assessment Procedure Consultation responses in Attachment D).

How are CFD generator's strike prices adjusted for transmission losses?

Some CFDs contain a provision for adjusting the generator's strike price each year to protect it from changes in transmission losses (defined in the CFD as the 'TLM(D) Charge') beyond those anticipated when the contract price was originally set (defined in the CFD as the 'Initial TLM(D) Charge').

The LCCC has confirmed that the TLM(D) strike price adjustment applies to generators who are transmission-connected and/or Licensable (but not those who are embedded Exempt Export). It therefore applies to those generators who might reasonably be

[15] You can find the CFD Standard Terms and Conditions on the BEIS website here.

expected to have the delivering Transmission Loss Multiplier applied to all or most of their generation output.

As noted above, BEIS has confirmed that the policy intent is for the TLM(D) Charge (used in the strike price adjustment) to reflect the average annual Transmission Loss Multiplier charges realised by the typical generator in Great Britain. The Workgroup discussed what average annual Transmission Loss Multiplier charges means and whether it is a weighted and/or time weighted average or a simple arithmetic average. ELEXON has confirmed that we understand it to be a simple arithmetic average.

The CFD standard terms and conditions include the following definitions:

> *"Annual TLM(D) Charge" means, in respect of any calendar year, the TLM(D) applicable to electricity generators in Great Britain (excluding Embedded Generators) for the relevant calendar year (expressed as a decimal);*
>
> *"TLM(D)" means:*
>
> *(A) the transmission losses adjustment allocated in accordance with the BSC to BM Units belonging to delivering Trading Units and defined as at the Agreement Date in section T of the BSC as $TLMO^{+}_{j}$; or*
>
> *(B) any new or substitute multiplier or factor which is in the nature of, or similar to, that adjustment;*

Initially the Workgroup understood, based on published versions of early investment contracts,[16] that the strike price adjustment calculations for the early investment contracts were different to those in the generic CFDs that were awarded in the first allocation round. However, the LCCC has since clarified that an amendment was made to the early investment contracts such that the strike price adjustment provisions were aligned to the generic CFDs.

Currently Transmission Loss Factor values are all zero, so the relationship between the Transmission Loss Multiplier value and the Transmission Losses Adjustment value is fairly simple. But this will change when P350 introduces non-zero Transmission Loss Factor values. The Transmission Loss Multiplier values applied to non-Interconnector BM Units will then contain two separate components:

- The Transmission Loss Factor value sends a locational signal. These are zonal seasonal values, so in each BSC Season there will be 14 different Transmission Loss Factor values, one per Zone.
- The Transmission Losses Adjustment values (one for delivering Trading Units and one for offtaking Trading Units) are calculated in each Settlement Period. These ensure that the total volume of energy allocated through the application of Transmission Loss Multiplier values to BM Unit Metered Volumes matches the metered total of transmission losses in that Settlement Period, and that this is split 45:55 between BM Units in delivering Trading Units and those in offtaking Trading Units.

As the strike price adjustment is based on the Delivering Transmission Losses Adjustment values and not Transmission Loss Multiplier values, P350 will have an impact on CFD

[16] The Final Investment Decision Enabling for Renewables (FIDER) or early investment contracts were awarded by the Department for Energy & Climate Change (DECC) to eight projects in 2014, ahead of the first CFD contract round, and do not use the standard terms and conditions for the CFD.

generators depending on where the Load Flow Model's 'slack node' is placed (see below) unless some additional action is taken.

What were the results of the P350 modelling?

The results of the load flow modelling exercise indicate that the average annual Delivering Transmission Losses Adjustment value could change from around -0.0100 to -0.0140 as a result of P350. This is because applying locational Transmission Loss Factor values to BM Units in delivering Trading Units increases their total metered volumes by about 0.4%. The Delivering Transmission Losses Adjustment value calculation compensates for this by removing the extra 0.4% of energy in addition to allocating 45% of metered transmission losses.

This reduction in the Delivering Transmission Loss Adjustment value equates to a 0.0040 increase in the Actual TLM(D) Charge, and would therefore trigger an increase in strike prices for those generators subject to Delivering Transmission Loss Multiplier indexation.

What makes this potentially problematic is that:

- The 0.0040 increase in the Actual TLM(D) Charge does not actually represent a cost to generators. The costs faced by generators are driven not by the Delivering Transmission Losses Adjustment value but by the sum of this and the Transmission Loss Factor value. The introduction of P350 means generators will (on average) receive an extra payment of 0.4% through the Transmission Loss Factor value, but this will (by design) be cancelled out by a 0.4% increase in the charges levied through the Delivering Transmission Losses Adjustment value. Generators (on average) will neither gain nor lose out overall.
- The 0.0040 increase in the Actual TLM(D) Charge is an arbitrary consequence of which Node on the Transmission System is used as the slack node in the Load Flow Model. For the P350 modelling exercise the Workgroup used Heysham as the slack node, as this is National Grid's current practice. In contrast, for the P229 modelling Cowley was used as the slack node, in line with the current practice at that time. If Cowley had been used as the slack node for P350, all of the Transmission Loss Factor values would have been approximately 0.0166 lower. This would have meant that P350 would increase the Delivering Transmission Losses Adjustment values by 0.0126, rather than decreasing it by 0.0040 as has happened with Heysham as the slack node. As a result strike prices would have reduced by 1.26% rather than increasing by 0.4%.

It should be noted that the choice of slack node does **not** make any difference to the Loss Adjusted Metered Output or to cash flows under the BSC, but does change the Delivering Transmission Losses Adjustment value, and therefore impacts the strike price adjustment process. Changing the slack node moves all the Transmission Loss Factor values up or down, which causes an equal and opposite movement in the Transmission Losses Adjustment values, resulting in no overall change to the final Transmission Loss Multiplier values. It is the differentials between the Transmission Loss Factor values for each Zone, and not the absolute values, that give the locational signals under P350.

However, as the CFD contract has based its strike price adjustment on the Transmission Losses Adjustment values then a change in the slack node will impact this. If the choice of slack node moves the Transmission Loss Factor values in one direction, the Transmission Losses Adjustment values will be shifted in the opposite direction in response. This would then affect the strike price adjustment subsequently calculated.

What is the agreed way forward?

The Workgroup considered three possible scenarios in its final Workgroup meeting:

- Scenario 1: Take no action under the BSC;
- Scenario 2: Resolve the issue under the BSC by adjusting TLF values to ensure that (as far as possible) they have a zero net aggregate effect on the Delivering Transmission Losses Adjustment value.; and
- Scenario 3: Using a provision in the CFD contract, the LCCC uses data provided by ELEXON to resolve the issue in the strike price adjustment process without needing changes to the BSC

The Workgroup considered these as scenarios rather than options, as the decision ultimately rested on what the CMA included in its Order. The Workgroup consulted on Scenarios 1 and 2 in its Assessment Procedure Consultation. A consultation respondent subsequently identified Scenario 3 and ELEXON discussed all three scenarios with Ofgem, the CMA, the LCCC and BEIS before the Workgroup's final meeting on 5 December 2016.

Attachment B contains the materiality analysis of the impact of P350 on CFD generators' payments, carried out by ELEXON on the Workgroup's behalf.

Scenario 1 – take no action

The Workgroup believes that Scenario 1 is not appropriate as this would mean that P350 arbitrarily impacts CFD generators' strike price adjustments. The P350 solution calculates the Adjusted Seasonal Zonal TLF for each Zone in each BSC Season. The difference between Zones is determined by network data and historic Metered Volumes. These differences send a locational signal, as intended by the CMA's Remedy. However, the overall 'level' of the Transmission Loss Factors is arbitrary, based on the location of the slack node, and has no effect on the Transmission Loss Multipliers. For example, increasing all the Adjusted Seasonal Zonal TLF values by the same amount allocates less losses to BM Units in delivering Trading Units and more to BM Units in offtaking Trading Units. However, this effect is cancelled out as the Transmission Losses Adjustment values will move to restore the 45/55 split.

ELEXON's materiality analysis (see Attachment B) estimates that if the slack node is placed at Heysham under Scenario 1 then payments to CFD generators will increase by 0.4%, equating to £8 million per annum. Conversely, if the slack node is placed at Cowley, payments to CFD generators will decrease by 1.26%, equating to £20 million per annum. The materiality will be further increased if additional contracts subject to the same issue are awarded in subsequent allocation rounds.

The Workgroup considers that it is reasonable to expect P350 to move generation despatch to Zones with higher (and more favourable) Transmission Loss Factor values, which would further reduce Delivering Transmission Losses Adjustment values and increase strike prices.

Members have considered whether a slack node could be chosen that minimises the impact on CFDs. The Workgroup has agreed that it was likely this would be difficult to do and would effectively give the Panel the power to influence the payments to CFD generators. The Workgroup did not feel this was an appropriate role for the BSC Panel.

The Workgroup believes that it has been established via BEIS's policy intent statement and LCCC's response that there was no policy intent for P350 to affect the strike price adjustment process. Therefore, it believes that taking no action would be inappropriate.

Scenario 2 – neutralise the impact on CFDs using an adjustment value

This approach proposes to introduce an adjustment value into the calculation of the Transmission Loss Factor values so that the impact of P350 can be neutralised during the strike price adjustment process. This approach requires changes to the BSC using historic data.

The new BSC Section T Annex T-2 paragraph 8.5 would be updated to include a new value, the Transmission Loss Factor Adjustment ($TLFA_S$).

$$ATLF_{ZS} = (TLF_{ZS} * 0.5) + TLFA_S$$

The intent of this option is to remove any artificial effect of the slack node on CFD generators, by ensuring that the 14 different zonal Transmission Loss Factor values have a zero net aggregate effect on Delivering Transmission Losses Adjustment values. It would not change:

- the differentials between the Transmission Loss Factor values for each Zone;
- the locational signals provided by P350; or
- the resulting Transmission Loss Multipliers.

It would simply adjust all the absolute Transmission Loss Factor values up or down as required, such that the Delivering Transmission Losses Adjustment values do not need to make a counter-adjustment.

This amendment would seek to ensure that no net volume is put through the Transmission Loss Factor values, meaning the Delivering Transmission Losses Adjustment values post-P350 would be the same as they would have been without P350. The Workgroup considered whether the Transmission Loss Factor Adjustment value should be set according to a methodology approved by the BSC Panel, as was proposed in the Assessment Report Consultation, or whether the value should be fixed.

The advantages to the Panel being able to set and amend a methodology are that the Panel, through consultation, could decide how much to take previous year's errors into account for setting the forthcoming year's Transmission Loss Factor Adjustment values. This could reconcile (as far is possible) inherent errors gained from determining Transmission Loss Factor Adjustment values ex-ante using historic metered data that does not take into account the changes in despatch behaviour that P350 is intended to cause.

However, the Workgroup agreed that it was not the Panel's role to influence or correct strike prices. It believed that the BSC should set out the specific calculation rather than leave it to the Panel to determine the methodology. Members agreed that it should be a simple calculation that calculates Transmission Loss Factor Adjustment values for each Season of the forthcoming BSC Year based on metered data from the Reference Year. The Workgroup did not want P350 to include 'reconciliation' provisions for adjusting one year's $TLFA_S$ values to compensate for 'errors' in a previous year's $TLFA_S$ values. The proposed calculation as set out in the proposed legal text is:

$$TLFAS = -\Sigma_j \{\Sigma^+_{(non\text{-}I)} (QM_{ij} * TLF_{ZS} * 0.5) / \Sigma^+_{(non\text{-}I)} QM_{ij}\} / N$$

where Σ_j denotes the sum over all Settlement Periods in BSC Season within the Reference Year;

$\Sigma^{+}_{(non\text{-}I)}$ denotes the sum over all non-Interconnector BM Units in delivering Trading Units; and

N is the total number of Settlement Periods in that BSC Season of the Reference Year.

This approach would require ELEXON to provide the Transmission Loss Adjustment values ($TLMO^{+}_{j}$) to the LCCC. The BSC has existing provisions for ELEXON (as BSCCo) to provide the LCCC with the BSC data it needs (see BSC Section V5.2.1). ELEXON estimates that no more than one day's effort would be required to set up this report and no more than one day's effort would be needed each year to produce and send the data to the LCCC.

The Workgroup believed this approach was more transparent, alleviated members' concern over the Panel's potential ability to set strike prices, and would align the data used for setting Transmission Loss Factor and Transmission Loss Factor Adjustment values.

Question 6: Do you believe that a Transmission Loss Factor Adjustment value should be introduced to prevent the wording of the CFD contract creating an anomalous effect for CFD generators?

Yes	No	Neutral/No Comment	Other
5	5	5	4

The Workgroup sought views on progressing Scenario 2 as part of the Assessment Procedure Consultation. Respondents were split, with five in support, five against, five neutral and four 'other' comments. Of those who did not agree:

- three could not agree to this approach without further understanding the policy intent of the CFD, confirmation of which was not available at the time of this consultation;
- one respondent felt that this issue should not be resolved under the BSC, rather it should be resolved in the CFDs themselves; and
- one respondent disagreed on the basis that they identified an alternative solution (which subsequently became Scenario 3 below).

Following its consideration of the responses to the consultation, the policy confirmation from BEIS and the LCCC's support for Scenario 2, the Workgroup agreed that Scenario 2 was preferable to Scenario 1 and was required unless the LCCC confirmed that Scenario 3 could be used.

Scenario 3 – resolve the issue as part of the strike price adjustment process

One of the respondents to the Assessment Procedure Consultation identified a different solution. They suggested that the problem could be solved outside of the BSC in the strike price adjustment process.

Part B of the TLM(D) definition allows for 'any new or substitute multiplier or factor which is in the nature of, or similar to, that adjustment' where the Delivering Transmission Loss Adjustment values no longer meet the policy intent.

In place of the Delivering Transmission Loss Adjustment value, a volume-weighted average ($TLM_{ij} - 1$) could be used. This is on the basis that the volume-weighted average

represents the average losses applied to BM Units in delivering Trading Units. The calculation of TLM(D) would therefore be as follows:

$$TLM(D) = \Sigma^{+}_{(non\text{-}I)} (QM_{ij} * (TLM_{ij} - 1)) / \Sigma^{+}_{(non\text{-}I)} QM_{ij}$$

where $\Sigma^{+}_{(non\text{-}I)}$ denotes summation over all non-Interconnector BM Units in delivering Trading Units.

The Workgroup noted that there was an alternative way of writing the equation due to the way TLM_{ij} is defined:

$$TLM(D) = TLMO^{+}_{j} + TLF\_Net_{j}$$

where TLF_Net_{j} is the net volume-weighted average of TLF_{ij}:

$$TLF\_Net_{j} = \Sigma^{+}_{(non\text{-}I)} (QM_{ij} * TLF_{ij}) / \Sigma^{+}_{(non\text{-}I)} QM_{ij}$$

The Workgroup noted that the two equations are exactly equivalent. However, the first equation more clearly illustrates the link back to policy where TLM(D) should be based on the TLM charges realised by the typical generator, whereas the second equation more clearly illustrates what is changing for P350 where the adjustment is taking into account any net energy allocated through the TLF_{ij} values, as well as energy allocated through $TLMO^{+}_{j}$. The Workgroup agreed that the first equation was more appropriate because it clearly links back to the original policy intent.

As such, the LCCC could require ELEXON to provide it with a TLM(D) report so that it could incorporate the data into its strike price adjustment and neutralise the impact of P350. This would require the EMR Data Provision Schedule to be updated and approved by the Panel.

The Workgroup agreed that this approach has two clear benefits over Scenario 2: it only uses metered data and losses after the event and will not be based on historic data. This will result in more accurate allocation of the losses. It will also not require any BSC changes. However, at the time of the Workgroup's final meeting, the LCCC had not been able to confirm whether this approach could be adopted. The Workgroup agreed that this would be its preferred option should the LCCC confirm it is consistent with the CFD and the CMA incorporates it into its Order. This option would recover any costs incurred by ELEXON (as BSCCo) in the preparation of the data from LCCC through the existing BSC charging arrangements. ELEXON estimates that no more than one day's effort would be required to set up this report and no more than one day's effort each year to produce and send the data to LCCC.

What is the agreed way forward?

The CMA has included Scenario 2 in its Order. However, it has also included provisions that allow it to instruct that the Transmission Loss Adjustment Factor is set to zero, to cater for the possibility that the LCCC confirms Scenario 3 can be utilised (which would mean that the $TLFA_s$ is not required). In this event, the zero $TLFA_s$ value would have no effect. The CMA has confirmed that in practice it would issue a direction to National Grid, who would then issue a corresponding direction to ELEXON. This would be a one-off direction and would not be required to be issued annually.

What other P350 data should be made available?

The Workgroup and Proposer agreed that additional data items should be made publically available under P350, as this would be of value to BSC Parties and would support Parties in recreating, forecasting and reconciling calculations.

Under the Proposed Modification, in addition to the original P229 reporting requirements, ELEXON will therefore also be required to annually publish the following data, at the same time as publishing the Transmission Loss Factor values for the forthcoming BSC Year:

- The Seasonal Zonal Transmission Loss Factor values (TLF_{ZS});
- The Transmission Loss Factor Adjustment values ($TLFA_S$) used in the calculation of the Adjusted Seasonal Zonal Transmission Loss Factors ($ATLF_{ZS}$); and
- Indicative Transmission Loss Multiplier and Transmission Losses Adjustment values ($TLMO^+_j$ and $TLMO^-_j$) calculated using historic Metered Volume data for the Reference Year, and both with and without the Adjusted Seasonal Zonal Transmission Loss Factor values calculated for the forthcoming BSC Year.

The Workgroup agreed that nothing in the CMA's Order prevented this data from being published. It agreed that this information would be useful to Parties, especially the indicative Transmission Loss Adjustment values as these will be more meaningful indicators of Parties' potential losses allocation than the actual Transmission Loss Factor values.

Final views against the Applicable BSC Objectives

The Workgroup by majority (all but one member) believes that P350 **would** better facilitate the Applicable BSC Objectives on balance overall and so should be **approved**.

A minority of one Member believes that, while some Applicable BSC Objectives may be better facilitated by P350, this is outweighed on balance by negative impacts on other Objectives.

Workgroup's Voting *(9 voting members attended the final meeting, including the Proposer)*	
Does the Proposed Modification better facilitate the Applicable BSC Objectives than the current baseline?	
Votes for Proposed Modification	**8**
Votes for current baseline	1

As the Order and licence changes were not yet in force when the P350 Workgroup made its final recommendation on 5 December 2016, the Workgroup based its overall assessment of P350 on the original set of Applicable BSC Objectives (a)-(f). However, the Workgroup did also provide its views on the new Objective (g) for reference, noting that this would be in place by the time of the Panel's own recommendation. Objective (g) subsequently came into force on 15 December 2016, and so before the Workgroup agreed the final content of this Assessment Report.

While not all members had the same views on each Objective:

- All members identified benefits to Objective (a);
- A majority of members identified benefits to Objective (b) and a minority were neutral on this Objective;
- A majority of members identified benefits to Objective (c) – of the remainder, one identified a negative impact on this Objective and the rest were neutral;
- All but two members were neutral on Objective (d) – of the remaining two, one identified a positive impact and the other a negative impact;
- All members were neutral on Objective (e);
- All but one member were neutral on Objective (f), with the other member identifying a negative impact; and
- All members identified benefits to the new Objective (g) once in force, but agreed that their overall views on whether P350 should be approved were the same with or without this Objective.[17]

[17] This is because, since the new Transmission Losses Principle is in the Transmission Licence, Workgroup members considered this to be equivalent to existing Objective (a).

What are the Applicable BSC Objectives?

(a) The efficient discharge by the National Grid of the obligations imposed upon it by the Transmission Licence

(b) The efficient, economic and co-ordinated operation of the National Electricity Transmission System

(c) Promoting effective competition in the generation and supply of electricity and (so far as consistent therewith) promoting such competition in the sale and purchase of electricity

(d) Promoting efficiency in the implementation of the balancing and settlement arrangements

(e) Compliance with the Electricity Regulation and any relevant legally binding decision of the European Commission and/or the Agency [for the Co-operation of Energy Regulators]

(f) Implementing and administrating the arrangements for the operation of contracts for difference and arrangements that facilitate the operation of a capacity market pursuant to EMR legislation

(g) Compliance with the Transmission Losses Principle

Members' views against each of the Applicable BSC Objectives are summarised in the table below.

Summary of Workgroup's views against the Applicable BSC Objectives

Does P350 better facilitate the Applicable BSC Objectives?		
Obj	Proposer's Views	Other Workgroup Members' Views
(a)	• **Yes** – this Modification is required to ensure that National Grid can comply with the relevant provisions that the CMA will introduce to its Transmission Licence.	• **Yes (unanimous)** – agree with Proposer.
(b)	• **Yes** – the CMA's analysis has demonstrated that applying a locational factor into transmission loss allocation leads to lower total losses and thus increases the efficient, economic and co-ordinated operation of the Transmission System.	• **Yes (majority)** – agree with Proposer. • **Possibly** – agree with the benefits in principle but it remains to be seen if they materialise in practice. • **Neutral** – National Grid has been able to operate the Transmission System for over fifteen years without a zonal losses scheme. • **Neutral** – no impact.
(c)	• **Yes** – the CMA's assessment concluded this change would remove distortions in competition that exist under the current uniform allocation of transmission losses.	• **Yes (majority)** – agree with Proposer. • **Possibly** – agree with the benefits in principle but it remains to be seen if they materialise in practice. • **Neutral** – current renewables have been incentivised by central policy rather than competitive forces. • **Neutral** – no impact. • **No** – diminishes investment signals for flexible generators in the North.
(d)	• **Neutral** – no impact.	• **Neutral (majority)** – no impact. • **Yes** – it is more efficient to deliver the CMA's remedy under the BSC than to have National Grid implement it outside the BSC. • **No** – due to the central BSC implementation costs that would be incurred.
(e)	• **Neutral** – P350 is not incompatible with the EU Target Model and implementing this solution would not preclude a move further toward this design at a later point in the future.	• **Neutral (unanimous)** – no impact.

Does P350 better facilitate the Applicable BSC Objectives?		
Obj	Proposer's Views	Other Workgroup Members' Views
(f)	• **Neutral** – no impact.	• **Neutral (majority)** – including the new $TLFA_S$ value in the P350 solution keeps this neutral, but without this inclusion there could have been a negative impact from P350. • **No** – disagree with BEIS on the policy intent behind the CFD strike price adjustment.
(g)	• **Yes** – this Modification is required to ensure that National Grid can comply with the new Transmission Losses Principle in the Transmission Licence	• **Yes (unanimous)** – agree with Proposer.

Consultation respondents' views

Question 1: Do you agree that P350 would better facilitate the Applicable BSC Objectives compared to the current baseline and so should be approved?			
Yes	No	Neutral/No Comment	Other
11	4	3	1

11 out of 19 respondents to the Assessment Procedure Consultation believed that P350 would better facilitate the Applicable BSC Objectives compared with the current arrangements. Not all of these 11 respondents expressed a clear view on specific Objectives, but of those who did:

- 7 believed that P350 better facilitates Objective (a);
- 5 believed that P350 better facilitates Objective (b);
- 5 believed that P350 better facilitates Objective (c); and
- 3 believed that P350 would better facilitate Objective (g) once in place.

The views of these respondents generally aligned with those of the Workgroup.

Four respondents did not agree that P350 will better facilitate the Applicable BSC Objectives. One additional respondent, while answering neither yes nor no, confirmed in the substance of their response that they did not believe that P350 better facilitates the Objectives. Of these five respondents, three expressed a clear view on specific Objectives – arguing that P350 will not better facilitate Objective (c).

Views expressed against P350 generally related to:

- disproportionate impacts on certain types of generation (due to their location or inability to respond to signals);
- other factors that respondents believed would dilute the intended P350 locational signals; and/or
- volatility/uncertainty created by the new Transmission Loss Factors.

Workgroup members considered all responses before deciding on their final views as captured above.

Three respondents were neutral.

One of the respondents was concerned that P350 may be inconsistent with the European cap on transmission charges. EU Commission Regulation No. 838/2010 resulted in a number of industry changes, including P278 and Connection and Use of System Code (CUSC) changes to cap Transmission Network Use of System (TNUoS) charges. National Grid's and ELEXON's legal view is the cap, as set out in the Regulation, only applies to charges for access to the Transmission System and excludes transmission losses. This is consistent with Ofgem's statement to this effect in its decision letter on CUSC Modification Proposal 224 'Cap on the total TNUoS target revenue to be recovered from Generation Users'.

Workgroup's final views on Self-Governance

The Workgroup unanimously agrees and is recommending to the Panel that P350 **should not** be treated as a Self-Governance Modification Proposal.

The Workgroup believes that P350 **does not** meet Self-Governance criteria (a)(i), (a)(ii) or (a)(iii). Members expect P350 to have material effects on consumers, competition and operation of the Transmission System. Some also believe it could have a material effect on criterion (a)(iv).

What are the Self-Governance criteria?

A proposal that, if implemented:

a) is unlikely to have a material effect on:
   i. existing or future electricity consumers; and
   ii. competition in the generation, distribution, or supply of electricity or any commercial activities connected with the generation, distribution, or supply of electricity; and
   iii. the operation of the national electricity transmission system; and
   iv. matters relating to sustainable development, safety or security of supply, or the management of market or network emergencies; and
   v. the Code's governance procedures or modification procedures, and
b) is unlikely to discriminate between different classes of Parties

8 Recommendations

The P350 Workgroup invites the Panel to:

- **AGREE** that the P350 Proposed Modification:
    - **DOES** better facilitate Applicable BSC Objective (a);
    - **DOES** better facilitate Applicable BSC Objective (b);
    - **DOES** better facilitate Applicable BSC Objective (c); and
    - **DOES** better facilitate Applicable BSC Objective (g);
- **AGREE** an initial recommendation that P350 should be **approved**;
- **AGREE** an initial Implementation Date for P350 of:
    - 1 April 2018 if an Authority (Ofgem) decision is received on or before 31 March 2017.
- **AGREE** the draft legal text for P350;
- **AGREE** that P350 is submitted to the Report Phase;
- **NOTE** that ELEXON will issue the P350 draft Modification Report (including the draft BSC legal text) for consultation and will present the results to the Panel at its meeting on 9 February 2016; and
- **AGREE** that ELEXON should, separately to the P350 solution, explore the requirements for (and feasibility of) providing BSC Parties with a tool or service for forecasting/modelling Transmission Loss Factors.

Appendix 1: Previous Cost-Benefit Analysis Exercises

OXERA's cost-benefit analysis commissioned by ELEXON on behalf of the P198 Workgroup (2006):

https://www.elexon.co.uk/mod-proposal/p198-introduction-of-a-zonal-transmission-losses-scheme/

Brattle's critique of the P198 cost-benefit analysis commissioned by Ofgem as part of the P198/P200/P203/P204 Regulatory Impact Assessment (2008):

https://www.ofgem.gov.uk/ofgem-publications/61993/20081002brattlelossesreport.pdf

LE Ventyx's cost-benefit analysis commissioned by ELEXON on behalf of the P229 Workgroup (2009):

https://www.elexon.co.uk/mod-proposal/p229-introduction-of-a-seasonal-zonal-transmission-losses-scheme/

Brattle's review of the P229 cost-benefit analysis commissioned by Ofgem as part of the P229 Regulatory Impact Assessment (2010):

https://www.ofgem.gov.uk/sites/default/files/docs/2011/03/lot-report-1_0.pdf

Brattle's additional cost-benefit analysis commissioned by Ofgem as part of the P229 Regulatory Impact Assessment (2010):

https://www.ofgem.gov.uk/sites/default/files/docs/2011/03/lot-report-3_0.pdf

Redpoint's additional cost-benefit scenarios commissioned by Ofgem as part of the P229 Regulatory Impact Assessment (2010):

https://www.ofgem.gov.uk/sites/default/files/docs/2011/03/lot-report-2_0.pdf

Brattle's analysis of potential interactions with Project TransmiT commissioned by Ofgem as part of the P229 Regulatory Impact Assessment (2011):

https://www.ofgem.gov.uk/sites/default/files/docs/2011/05/p229-lot-4-report---potential-interactions_0.pdf

NERA's cost-benefit analysis commissioned by the CMA to support its provisional remedies (2016):

https://assets.publishing.service.gov.uk/media/56ebde9fe5274a14d9000006/Appendix_2.2_-_Modelling_the_impact_of_zonal_transmission_loss_multipliers.pdf

Appendix 2: Workgroup Details

Workgroup's Terms of Reference

Specific areas set by the BSC Panel in the P350 Terms of Reference
What has changed since P229 that needs to be accounted for in the P350 solution? The Workgroup should: • clarify the implications of using the P229 solution to model power flows on a Transmission System that includes HVDC circuits; • commission load flow modelling to establish indicative Transmission Loss Factor and Transmission Loss Multiplier values under the P350 solution, including two or three sensitivity scenarios with varied input data (with one of these scenarios to be the inclusion of the planned HVDC Western Link); • consider the interaction between P350 and P278; • consider what BSC legal drafting is needed to support the National Grid's additional powers of 'step in' under the CMA's remedy; and • consider any interaction with the Contracts for Difference arrangements.
What changes are needed to BSC documents, systems and processes to support P350 and what are the related costs and lead times?
Are there any Alternative Modifications? (The Workgroup should note that the CMA's remedy requires P350 to be 'in line with P229' and that its final report states that the remedy shall be 'identical in its technical aspects' to the P229 Proposed Modification.)
Does P350 better facilitate the Applicable BSC Objectives than the current baseline?

Assessment Procedure timetable

P350 Assessment Timetable	
Event	Date
Panel submits P350 to Assessment Procedure	14 Jul 16
Workgroup Meeting 1	26 Jul 16
Industry Impact Assessment	19 Sep 16 – 07 Oct 16
Workgroup Meeting 2	18 Oct 16
Assessment Procedure Consultation	04 Nov 16 – 25 Nov 16
Workgroup Meeting 3	05 Dec 16
Panel considers Workgroup's Assessment Report	19 Jan 17

Workgroup membership and attendance

P350 Workgroup Attendance				
Name	Organisation	26 Jul 16	18 Oct 16	05 Dec 16
Members				
Kathryn Coffin	ELEXON *(Chair)*	✓	✓	✓
David Kemp	ELEXON *(Lead Analyst)*	✓	✓	✓
Lawrence Jones	ELEXON *(Lead Analyst)*	✗	✓	✓
Alex Haffner	National Grid *(Proposer)*	✓	✓	✓
Joe Underwood	Drax	✓	✓	✓
Esther Sutton	Uniper	✓	✓	✗
James Anderson	Scottish Power	✓	✗	✓
Bill Reed	Npower	✓	✓	✓
Phil Russell	Independent	✓	✓	✓
Tom Edwards	Cornwall Energy	✗	✗	✗
Martin Mate	EDF	✓	✓	✓
Colin Prestwich	SmartestEnergy	✓	✓	✗
Lisa Waters	Waters Wye Associates	✓	✗	☎
Laurence Barrett	E.ON	✗	✓	✓
Helen Stack	Centrica	✓	✗	✓
Jeremy Guard	First Utility	✓	✗	✗
Andy Colley	SSE	✓	✓	✗
Libby Glazebrook	Engie	✗	✓	✗
Christoph Horbelt	DONG Energy	✗	✓	✓
Attendees				
John Lucas	ELEXON *(Design Authority)*	✓	✓	✓
Nick Brown	ELEXON *(Lead Lawyer)*	✓	✓	✓
Srdjan Ćurčić	Siemens *(Load Flow Modeller)*	✗	✓	✗
Jiebel Zhu	National Grid	✓	✗	✗
Edda Dirks	Ofgem	✓	✗	✓
Andrew Self	Ofgem	✓	✗	✗
Dominic Scott	Ofgem	✗	✓	✓
Pietro Menis	CMA	✓	✓	✓
Tony Curzon Price	CMA	✓	✗	✗
Richard Druce	NERA	✗	✓	✗
Ricky Hill	Centrica	✗	✓	✗

Appendix 3: Glossary & References

Acronyms

Acronyms used in this document are listed in the table below.

Acronyms	
Acronym	Definition
AC	alternating current
BEIS	Department for Business, Energy & Industrial Strategy *(Government department)*
BM	Balancing Mechanism
BMRA	Balancing Mechanism Reporting Agent *(BSC Agent)*
BMRS	Balancing Mechanism Reporting Service
BSC	Balancing and Settlement Code *(industry Code)*
BSCCo	Balancing and Settlement Code Company *(Code Administrator; ELEXON)*
CDCA	Central Data Collection Agent *(BSC Agent)*
CFD	Contract for Difference
CMA	Competition and Markets Authority
CRA	Central Registration Agent *(BSC Agent)*
CUSC	Connection and Use of System Code
DC	direct current
DECC	Department for Energy & Climate Change *(former Government department)*
DSO	Distribution System Operator *(BSC Party)*
FIDER	Final Investment Decision Enabling for Renewables
GB	Great Britain
GSP	Grid Supply Point
HVDC	High Voltage Direct Current
LCCC	Low Carbon Contracts Company
SAA	Settlement Administration Agent *(BSC Agent)*
TLFA	Transmission Loss Factor Agent *(new BSC Agent)*
TNUoS	Transmission Network Use of System

External links

A summary of all hyperlinks used in this document other than those provided in Appendices are listed in the table below.

All external documents and URL links listed are correct as of the date of this document

External Links	
Description	URL
BSC Sections page on the ELEXON website	https://www.elexon.co.uk/bsc-related-documents/balancing-settlement-code/bsc-sections/
Losses page on the ELEXON website	https://www.elexon.co.uk/reference/technical-operations/losses/
P278 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p278-treatment-of-transmission-losses-for-interconnector-users/
P75 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p075-introduction-of-zonal-transmission-losses/
P82 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p082-introduction-of-zonal-transmission-losses-on-an-average-basis/
P105 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p105-introduction-of-zonal-transmission-losses-on-a-marginal-basis-without-phased-implementation/
P109 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p109-a-hedging-scheme-for-changes-to-tlf-in-section-t-of-the-code/
P198 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p198-introduction-of-a-zonal-transmission-losses-scheme/
P200 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p200-introduction-of-a-zonal-transmission-losses-scheme-with-transitional-scheme/
P203 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p203-introduction-of-a-seasonal-zonal-transmission-losses-scheme/
P204 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p204-scaled-zonal-transmission-losses/

External Links	
Description	URL
P229 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p229-introduction-of-a-seasonal-zonal-transmission-losses-scheme/
The CMA's Energy Market Investigation page on the GOV.UK website	https://www.gov.uk/cma-cases/energy-market-investigation
P350 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p350/
Western Link Project website	http://www.westernhvdclink.co.uk/
Interconnectors page on the ELEXON website	https://www.elexon.co.uk/reference/interconnectors/
The Energy Market Investigation (Electricity Transmission Losses) Order 2016	https://assets.publishing.service.gov.uk/media/5851404c40f0b60e4c0000bb/energy-market-transmission-losses-order-2016.pdf
CMA Explanatory Note to the 'The Energy Market Investigation (Electricity Transmission Losses) Order 2016'	https://assets.publishing.service.gov.uk/media/58514061ed915d0b120000bb/energy-market-transmission-losses-order-explanatory-note.pdf
CMA Remedies Implementation Plan	https://www.ofgem.gov.uk/publications-and-updates/cma-remedies-implementation-plan
The BSC EMR Data Provision Schedule	https://www.elexon.co.uk/reference/emrs-website/
EU Commission Regulation No. 838/2010	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:250:0005:0011:EN:PDF
CUSC Modification Proposal 224	https://www.ofgem.gov.uk/ofgem-publications/90665/cmp224d.pdf
Low Carbon Contracts Company	https://lowcarboncontracts.uk/
Electricity Market Reform	https://www.gov.uk/government/publications/2010-to-2015-government-policy-uk-energy-security/2010-to-2015-government-policy-uk-energy-security