P350 'Introduction of a seasonal Zonal Transmission Losses scheme'

The Competition and Markets Authority has concluded that the absence of locational pricing for transmission losses creates an adverse effect on competition. To deliver the CMA's remedy, P350 will introduce a Transmission Loss Factor for each Zone (which will align to the existing GSP Groups) for each BSC Season in order to allocate transmission losses on a geographical basis.

This Assessment Procedure Consultation for P350 closes:

5pm on **Friday 25 November 2016**

The Workgroup may not be able to consider late responses.

The P350 Workgroup initially recommends **approval** of P350

This Modification is expected to impact:

- Generators
- Suppliers
- Distribution System Operators
- The Transmission Company
- 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

The purpose of this P350 Assessment Procedure Consultation is to invite Balancing and Settlement Code (BSC) Parties and other interested parties to provide their views on the merits of P350. The P350 Workgroup will then discuss the consultation responses, before making a recommendation to the BSC Panel at its meeting on 12 January 2017 on whether or not to approve P350.

There are four 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 the draft redlined changes to the BSC for P350.
- Attachment C contains the specific questions on which the Workgroup seeks your views. Please use this form to provide your response to these questions, and to record any further views or comments you wish the Workgroup to consider.

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1 Summary

Why Change?

Following its review of the energy market, the Competition and Markets Authority (CMA) has concluded that the absence of locational pricing for losses gives rise to an adverse effect on competition. To implement its remedy, it is mandating that National Grid raises a BSC Modification in line with the P229 Proposed Modification, to be implemented by 1 April 2018.

Solution

A Transmission Loss Factor will be calculated for each Transmission Loss Factor Zone (which are based on the existing Grid Supply Point (GSP) Groups) for each BSC Season. Each BM Unit will be allocated the Transmission Loss Factor for the Zone it is allocated to for each Season, although Interconnector BM Units will continue to receive a Transmission Loss Multiplier of 1. The values for each Zone for a given BSC Year will be calculated and published three months before the start of that BSC Year.

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 on the Transmission Company and Distribution System Operators (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 the Authority's decision is received by 31 March 2017. This is consistent with the 12 month implementation lead time for P229.

Recommendation

The Workgroup initially unanimously 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 Applicable BSC Objective, but a majority identify benefits to (a), (b) and/or (c).

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:

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

'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 as the difference between total metered delivery to the Transmission System and total metered offtake from the Transmission System. Measuring total losses in this way includes errors in the measurement of flow to and from the Transmission System.

How are transmission losses allocated?

A Transmission Loss Multiplier (TLM_{ij}) is a factor used to scale each Balancing Mechanism (BM) Unit's Metered Volumes in Settlement. A Transmission Loss Multiplier is generated 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 (excluding any already allocated through the Transmission Loss Factor mechanism) between BM Units. This ensures an exact allocation of the actual level of total losses in a given Settlement Period. Two separate Transmission Losses Adjustment values are calculated for each Settlement Period, one to be applied to BM Units in delivering Trading Units ($TLMO^{+}_{j}$) and one to be 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:

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] The Transmission Loss Multiplier for all Interconnector BM Units is set to 1 in all Settlement Periods. This change was introduced by Approved Modification P278 'Treatment of Transmission Losses for Interconnector Users' to comply with European legislation. Therefore any Transmission Loss Factor value applied to an Interconnector BM Unit under P350 will have no practical effect.

- 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 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.

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, the Authority 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, the Authority issued a statement noting it was minded to approve P203. However, in 2008 the Authority 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. The Authority subsequently rejected P229 in 2011.

What has the CMA concluded?

The CMA initiated a review of the energy market in 2014 at the request of Ofgem. Its final report was published in June 2016.

One of the areas the CMA considered was the absence of locational pricing for transmission losses. It noted that losses are higher the greater the distance electricity needs to be transported, and that the costs of these losses vary considerably by

geographical 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 and generating electricity will be associated with low losses. The CMA believed that the current system of uniform charging for transmission losses creates a system of cross-subsidisation that distorts competition between generators and is likely to have both short- and long-term effects on generation and demand.

As part of its investigation, the CMA carried out a modelling exercise to assess the costs that are likely to arise as a result of the absence of locational charges for transmission losses. It concluded that the results were similar, overall, to those from previous modelling exercises and showed that total efficiency costs vary between around £130m and £160m over the period 2017 to 2026, with these results robust to a variety of assumptions regarding fuel input costs. It also found 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's overall conclusion was 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 believed this is likely to distort competition between generators and to have both short- and long-term effects on generation and demand.

To address this, the CMA is imposing an Order on National Grid, as the System Operator, and is amending its Transmission Licence conditions. These will 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 to the P229 Proposed Modification (including notably the use of semi marginal, rather than full marginal, Transmission Loss Factors[2]);
- progress a BSC Modification to modify the BSC, from 1 April 2018, in line with the P229 Proposed Modification; and
- step in to implement the solution itself if the BSC Modification is not implemented in time for 1 April 2018.

The Order also recommends that Ofgem takes all necessary steps to support the Transmission Company.

After 1 April 2018, these precisely defined initial obligations, which will be assumed to have been met, will cease, and changes in detail will be permitted. However, National Grid will continue to have enduring obligations under the Order and its licence to:

- ensure that, at all times from 1 April 2018, imbalance charges (and specifically the estimated volumes of imbalance) are calculated such as to be locationally sensitive to transmission losses; and
- assume responsibility for the calculation of the Transmission Loss Factors itself if the BSC Company (BSCCo) and/or any other agent appointed for that purpose fails to perform its duties.

This means that, while the solution can be amended after 1 April 2018 to differ from P229, any replacement solution for allocating transmission losses must continue to include a

[2] The P229 solution proposed a 'semi marginal' scheme in that it would aim only to allocate the volume of variable losses locationally, and would therefore aim to retain the existing uniform allocation of 'fixed' losses.

locational element. To facilitate this, a new Applicable BSC Objective (g) 'compliance with the Transmission Losses Principle' will be introduced by the licence changes.

The Order will be secondary legislation, and the CMA intends that both the Order and the Transmission Licence changes will take effect from December 2016[3]. The CMA is currently consulting on the draft Order and licence changes, with responses to its consultation due on 11 November 2016. ELEXON and the P350 Workgroup are working with the CMA to ensure consistency between the Order, the licence changes and the P350 legal text.

What is the issue?

The CMA Order will require that National Grid raises 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 has raised this Modification in advance of the Order coming into force to maximise the time available for assessment and implementation. The Order will be in effect by the time that the Panel makes its recommendation and the Authority makes its decision on P350.

[3] The CMA has powers under the Enterprise Act 2002 to impose an Order and amend licences.

3 Solution

Proposed solution

P350 'Introduction of a seasonal Zonal Transmission Losses scheme' was raised by National Grid on 4 July 2016. To implement the CMA's remedy, it proposes to progress the P229 Proposed Modification as put forward in the P229 Final Modification Report.

Under this solution, 14 Transmission Loss Factor Zones will be created based on the existing 14 GSP Groups. A Network Mapping Statement will be established to document the allocation of BM Units to Zones. One Transmission Loss Factor value will be calculated per Zone per BSC Season[4]. These values will be published three months prior to the start of each BSC Year (which starts on 1 April), and will be based on historical data from a 12 month period ending 31 August in the preceding BSC Year (the Reference Year). The Transmission Loss Factor for a given Zone will be applied to all BM Units allocated to that Zone for all Settlement Periods in the relevant BSC Season. A new BSC Agent, the Transmission Loss Factor Agent (TLFA), will calculate Transmission Loss Factor values using a Load Flow Model of the transmission network. The Load Flow Model calculations will be documented in a Load Flow Model Specification, which will be established as a new Code Subsidiary Document.

Transmission Loss Factor values will only aim to allocate variable losses. A scaling factor of 0.5 will be applied to the marginal Transmission Loss Factor values, so that the volume of losses allocated through the Transmission Loss Factor mechanism is approximately equal to the total volume of variable losses. Fixed and other losses will continue to be allocated via the Transmission Losses Adjustment values, and the calculation and application of these values, including the value of α, will remain unchanged from currently. 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 pre-determined semi-marginal Transmission Loss Factor values will be accounted for in the non-locational Transmission Losses Adjustment values.

Interconnector BM Units will be exempt from the application of transmission losses. Although they will be allocated non-zero Transmission Loss Factor values under P350, these will have no effect because they will continue to be allocated a Transmission Loss Multiplier of 1 in all Settlement Periods[5]. Under P350, Interconnector flows will be included in the calculation of Nodal Transmission Loss Factor values and Nodal power flows, but will be excluded from the calculation of the Zonal Transmission Loss Factors.

The P350 Workgroup recognises that P229 based its requirements for the TLFA's Load Flow Model on an alternating current (AC) transmission network. It did not include provisions for High Voltage Direct Current (HVDC) transmission circuits. P350 will account for such circuits by modelling each HVDC connection as a sink at one of the relevant Nodes and a corresponding source (accounting for any intervening losses over the circuit) at the other Node. The CMA has agreed that this amendment to the P229 solution can be made under P350, and this is reflected in its draft Order and explanatory note.

P350 will also reflect National Grid's obligation, under the Order and its licence, to step in and assume responsibility for the Transmission Loss Factor calculation if needed.

[4] As defined in BSC Section K3.4.9. As the BSC Spring Season spans the start of a BSC Year on 1 April, for the purposes of P350 BSC Spring for a given BSC Year is considered to be the periods 1 April to 31 May and 1 March to 31 March in that BSC Year.

[5] The CMA has confirmed that its Order will not supersede obligations arising from European legislation and therefore will not remove the existing exemption for Interconnector Users.

Where can I find the P350 business requirements?

The business requirements for P350 can be found in the P350 Industry Impact Assessment document, available on the P350 page of our website.

What is the method for calculating Transmission Loss Factors?

A summary of the method for calculating Transmission Loss Factors under P350, including the definitions of terms used throughout this document, can be found in Appendix 1.

Legal text

The proposed changes to the BSC to deliver P350 can be found in Attachment B. These are largely identical to those for the P229 Proposed Modification, with the exception of the areas identified above and a few non-material stylistic changes.

Assessment Consultation Question
Do you agree that the proposed redlining in Attachment B delivers the intent of P350? *Please provide your rationale.*
The Workgroup invites you to give your views using the response form in Attachment C

Are there any alternative solutions?

At this stage, 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.

The Workgroup has considered the following alternative options, but is not progressing any of these further. Full details of the Workgroup's discussions on each can be found in Section 6.

- The Workgroup debated how Interconnector flows should be treated within the calculation of Transmission Loss Factors. A majority of members agreed with the approach outlined above as they believed it would remove the potential for Interconnector flows to inappropriately skew non-Interconnector Users' Transmission Loss Factor values. Some members felt that Interconnector flows should be included in the calculation of the Zonal Transmission Loss Factor values, as they believed this would better reflect the impact the Interconnector flows have on the relevant Zone.
- The Workgroup considered whether the HVDC circuits should be modelled as an equivalent AC connection between the relevant Nodes, should the CMA not permit deviation from the P229 legal text, but agreed that this was a less accurate solution. Once the CMA agreed that the approach outlined above could be taken forward, the Workgroup agreed not to progress this alternative approach further.
- Some members felt it would be useful to develop a tool which participants could use to run their own Transmission Loss Factor scenarios. However, the Workgroup is unclear on the requirements for such a tool, and agreed there is not enough time to develop these as part of P350's progression. Some members also believe such a tool is not within the scope of P350. The Workgroup notes that the BSC Panel could instruct ELEXON to scope and develop such a tool separately to P350 but, at this time, is not recommending that the Panel does so.

Assessment Consultation Question
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? *Please provide your rationale and if 'No' please provide full details of your Alternative Modification(s) and your rationale as to why it/they would better facilitate the Applicable BSC Objectives than the Proposed Modification.*
The Workgroup invites you to give your views using the response form in Attachment C

4 Impacts & Costs

Estimated central implementation costs of P350

The estimated central implementation costs for P350 are approximately £130,000. This consists of:

- 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, 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.

Indicative industry costs of P350

The Transmission Company and any DSOs with offshore Transmission Systems connected to their Distribution System will need to provide Network Data annually. The Transmission Company 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.

Other participants will need to make system, document and process changes to account for the changes introduced by P350. 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.

P350 impacts

Impact on BSC Parties and Party Agents	
Party/Party Agent	Impact
Generators	BSC Parties, in particular generators and Suppliers, will be allocated transmission losses based on the GSP Groups their BM Units are situated in following implementation. Parties may need to make changes to their own systems to support non-zero Transmission Loss Factor values.
Suppliers	
Distribution System Operators	Distribution System Operators will need to provide Network Data to support the implementation and annual calculation of the Transmission Loss Factor values.

Impact on Transmission Company
The Transmission Company will need to provide 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. Step-in provisions will also be introduced to facilitate the Transmission Company's obligation (under the Order and Transmission Licence) to step in and assume responsibility for the Transmission Loss Factor calculations, should BSCCo or the TLFA fail in its duties under the BSC.

Impact on BSCCo	
Area of ELEXON	Impact
Procurement	ELEXON will need to procure a new BSC Agent (a Transmission Loss Factor Agent) and a new service provider (a Load Flow Model Reviewer) as part of the implementation project. 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 processes	
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 B.
Section H	

Impact on Code	
Code Section	Impact
Section T	
Section V	
Section X Annex X-1	
Section X Annex X-2	

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 load flow modelling method.

Other Documents	
Document	Impact
Network Mapping Statement	The Network Mapping Statement will be established to cover the allocation of BM Units to Zones. There will be two versions in a given year: the Reference Network Mapping Statement approved by the Panel each year; and the Prevailing Network Mapping Statement maintained by BSCCo throughout the year and which will 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 Workgroup recommends an Implementation Date for P350 of:

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

The CMA is mandating that its remedy, and hence P350, is implemented on 1 April 2018. In its final report, the CMA recognises Parties' preference for aligning the Implementation Date with their contract rounds. It also recognises that P229 (and other previous zonal transmission losses Modifications) had an implementation lead time of 12 months from the point of Authority approval, due to ELEXON needing to procure the TLFA before allowing it sufficient time to then calculate the Transmission Loss Factor values. This means that an Authority decision on P350 would need to be received by 31 March 2017. Under the P350 timetable agreed by the BSC Panel, the Panel will deliver its Final Modification Report to the Authority immediately following the February 2017 BSC Panel meeting.

The Workgroup agrees with this implementation approach.

Assessment Consultation Question
Do you agree with the Workgroup's proposed Implementation Date? *Please provide your rationale.*
The Workgroup invites you to give your views using the response form in Attachment C

How will the CMA's Order be implemented?

The CMA has confirmed to the Workgroup and the Panel that its final report in June 2016 concluded its two-year market investigation. The subsequent six months, up to December 2016, constitute the remedy 'implementation period'. The CMA has powers, delegated by Parliament, to implement secondary legislation and licence changes to enact the remedies detailed in its final report, and part of the work over the implementation period is to draft and consult on the detailed Orders and licence changes to deliver these. The CMA has confirmed that the scope of these Orders and licence changes is constrained, in that it must deliver the remedies identified in its final report.

The CMA has since issued an informal consultation to interested Parties in August 2016 (which included ELEXON, National Grid, Ofgem, the BSC Panel and the P350 Workgroup) on its draft transmission losses Order and its accompanying draft changes to the Transmission, Generation and Supply Licences. Having considered the comments from respondents, the CMA has now issued its formal public consultation, which closes on 11 November 2016. The CMA has confirmed to the Workgroup and the Panel that, because the wording of the Order and licence changes is constrained by its final report, the consultations are only to ensure that the drafting delivers the intent of the remedy. Following the November 2016 consultation, the CMA will finalise its Order and licence changes. These will take effect before the end of December 2016, in line with the CMA's statutory deadline.

The Workgroup asked what would happen if an issue was identified with the P229 technical solution that meant the solution needed to be changed. The CMA indicated that there could be potential to make minor enhancements to the solution (such as to cater for technical complexities or legislation arising 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 the Transmission Company to comply with its new licence obligations under the Order. It believed that it was likely the Order and licence changes would not be in place when it came to make its final recommendations to the Panel. However, it expected to have had sight of the drafts by then, and that the final versions will be in place when the Panel subsequently makes its recommendation to the Authority. One member highlighted the possibility that the Panel could therefore be considering P350 against a different baseline to the Workgroup; however another member noted that the Panel is not bound by the Workgroup's recommendation, and makes its own assessment against the Applicable BSC Objectives. One member highlighted that the Authority had been minded to approve P229 against the Applicable BSC Objectives but ultimately rejected that Modification following consideration of wider statutory details. The CMA noted that it had considered the Authority'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, the Transmission Company 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 to 31 March 2019 inclusive); and
- it would ensure that the P350 solution caters for technical and regulatory developments since P229 was assessed in 2009 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 were 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 establish 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 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 to 31 May 2016).

Previous cost-benefit analysis results

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

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 to 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 to 31 March 2019 (which would be based on a Reference Year of data from 1 September 2016 to 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 done 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.

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 to 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 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[6], including the pronounced seasonal variance in values for the two Scottish GSP Groups (GSP Groups _N and _P).

It noted that the P350 modelling used Heysham as the 'slack node'[7], rather than Cowley as under P229, as Heysham is now National Grid's standard slack node. While the absolute

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

[7] 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.

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 adjusts 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 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 P229 was developed in 2009, HVDC transmission circuits were not envisioned to be in use for many years. Subsequently, the P229 Workgroup did not include provisions for these within the P229 solution. However, the HVDC Western Link is currently 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:

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.

- **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 would be modelled at one of the corresponding Nodes, and an equivalent amount of generation (modified for losses across the connection) would be modelled at the other Node. This would allow the model to accurately reflect how much energy was allowed to flow across the link. This was the Workgroup's preferred option; however 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 allow the link to be modelled in line with the P229 technical solution, and so would not change the technical solution, but this would not be an ideal representation of the connection. A key feature of a HVDC connection is that the System Operator is able to control the current running along that part of the network. In contrast, it has no such control over an AC connection, which flows in line with the overall flow of energy across the whole system, and so cannot account for connections where a controlled volume of energy was allowed to flow. This would mean this approach would likely assume the wrong volumes of energy flowing across the HVDC connection.

Input data for Option A

No actual metered volume data is available for the Western Link, but National Grid had 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 has therefore been 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 this 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 should not need to be used outside of this modelling exercise.

The Workgroup queried how the metered volumes from the HVDC Western Link would be obtained. The Transmission Company noted that it would 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. However, the majority of the Workgroup concluded that requiring Settlement metering to be installed only to provide Sample Settlement Period data for this single annual calculation would be unreasonable, and felt that data from National Grid's operational metering would suffice. Furthermore, as the System Operator would control the operation of the link, then even if it had no operational metering data available (for example due to a fault), it should still be able to provide data on what the link had done in a given Settlement Period.

Input data for Option B

For Option B, National Grid advised that 'R' and 'X' values of 0.11 and 0.613 (per 100MVA) could be used to model an approximately equivalent AC circuit. They 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 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 R and X values for a given set of operating conditions, it is not possible to determine R and X values that give realistic results in all Sample Settlement Periods.

While the modelling was being undertaken, the CMA also published its latest draft Order which allows 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 solution.

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. In any event, 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. As such, and given the timescales associated with P350, members did not believe

this needed to be developed now, but could be considered separately via a further Modification. This would allow more time for the industry to understand how these connections would work, including the ownership of such connections. However, the Workgroup requested we provide clarity on how the current P350 solution would cater for such offshore HVDC networks.

Having investigated this further, we believe that the P350 solution does not account for BM Units that are connected to HVDC systems (including offshore HVDC networks). The current drafting of 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 draft Order and accompanying explanatory note that its remedy does not override the European legislation (reflected in the BSC through P278) that exempts Interconnector Users from the allocation of transmission losses. Therefore, Interconnector BM Units will 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 P278; however they noted 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.

However, it was queried 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 as with any other flow on the system, but this was before the introduction of P278. 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 approach would mean the 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 the Nodal Transmission Loss Factor values of the Interconnector. These members believed that this would be inconsistent with the principle that a Zonal Transmission Loss Factor value should be a volume-weighted average of the Nodal Transmission Loss Factor values of the market participants to which it is applied, and would therefore pollute the

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.

signals given to these other participants. They therefore felt that the Interconnector flows should be excluded from the calculation of the Zonal Transmission Loss Factor value, meaning that the other participants in that Zone are allocated a locational share of transmission losses that is based only on the average effect on losses of those participants that are eligible to be allocated losses.

As part of the load flow modelling exercise, the Workgroup requested a scenario be ran where the Interconnector flows were excluded from the calculation of Zonal Transmission Loss Factors. Interconnector flows would 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. This could then be compared to the 'baseline' scenario where Interconnector BM Units are treated like all other BM Units when Transmission Loss Factor values are calculated to determine the best approach to follow.

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.

Many Workgroup members felt they needed to take these arguments away and consider them further before they could determine which approach was the better. However, a majority of members initially felt that excluding the Interconnector flows from the Zonal Transmission Loss Factor values seemed the most appropriate approach. Noting this, the Proposer has elected to include this as part of the Proposed Modification, but the Workgroup welcomes the views of Assessment Procedure Consultation respondents on this element of the solution.

The Workgroup also agreed that power flows to HVDC transmission assets (such as the HVDC Western Link) should be treated in the same way as power flows to Interconnectors. The power flows should be included in the Load Flow Model, but, for consistency with the approach taken to Interconnectors, should not be included in the zonal averaging.

Assessment Consultation Question
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? *Please provide your rationale.*
The Workgroup invites you to give your views using the response form in Attachment C

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 all the other previous Modifications. This means that any developments on the Transmission System that take place after the end of the reference year (which is the 12 month period ending on 31 August preceding the relevant BSC Year) will not be included in the Transmission Loss Factor values subsequently produced and applied.

One member noted that the model of the Transmission System will be based on the prevailing intact network[8] at the time the Transmission Loss Factor calculations commenced, but the data used to model the flows on the network would be based on historic data over the previous year. They queried whether the flows would be consistent with the network under this approach, or whether this 'lagging' of data would mean the model wasn't fully representative. It was flagged 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 zero Metered Volumes for the period it was inactive would account for this in the model.

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

How should the Transmission Company's step-in powers be incorporated?

One element to be introduced under the CMA's remedy is the ability for the Transmission Company to be able to step in and assume responsibility for the determination of Transmission Loss Factor values if it feels it necessary to do so to ensure its licence obligations are met.

The Transmission Company already has such powers in relation to it stepping in to perform the processes for the accession of BSC Parties, the operation of the Modifications procedures or the publication of data on the BSC Website and the provision of data to the Authority. 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 the Transmission Company can only step in in relation to ensuring its licence obligations are met, rather than leaving it open for it to step in at any time it wishes. The proposed wording for this can be found in the proposed legal text in Attachment B.

How could P350 impact on the Contracts for Difference arrangements?

The Workgroup considered a potential interaction between P350 and the Contracts for Difference (CFD) arrangements. Some CFD contracts contain a provision for adjusting the strike price based on the transmission losses applied. By adjusting the Transmission Loss Multiplier values through introducing non-zero Transmission Loss Factor values, the Workgroup queried whether there could be any consequential impacts on the CFD arrangements.

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

Could the CFD contract affect the P350 signals?

Some members queried whether this strike price adjustment could protect CFD participants from the effects of P350, due to the adjustments for the losses being made. Members were concerned that, if this was the case, generators that are subject to a CFD would be effectively be held financially neutral by the CFD to the allocation of zonal transmission losses under the BSC. They would therefore not be exposed to the signals that P350 will introduce, which would be counter to the CMA's intent. These members believed this could dilute the benefits identified by the CMA. We agreed to seek further information on this from the Low Carbon Contracts Company (LCCC) that is responsible for the CFD arrangements.

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 is applied to all those CFD contracts to which the Transmission Loss Multiplier strike price adjustment applies, so the adjustment made to an individual contract will not compensate for that generator's individual Transmission Loss Factor value. Therefore, CFD participants would still be exposed to the variations in the Transmission Loss Multiplier values in each individual Settlement Period, and so would be exposed to the signals that P350 will introduce. It should be noted that the average transmission losses applied to generators will not change under P350. This is because P350 does not change the total amount of losses applied to generators in aggregate (e.g. BM Units in delivering Trading Units still receive 45% of the total losses in each Settlement Period), it simply changes how these aggregate losses are apportioned across individual generators.

What parameter does the CFD contract use?

One member queried whether the CFD contract expresses the adjustment as being based on the Transmission Loss Multiplier values or on the Delivering Transmission Losses Adjustment values. If the latter is used then P350 could have an unintended consequence.

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.

The standard terms and conditions for the CFD contract require Loss Adjusted Metered Output to be calculated using the Transmission Loss Multiplier value:

"Loss Adjusted Metered Output" means:

> *(A) if the Facility is not a Dual Scheme Facility, the BM Unit Metered Volume for the Facility in respect of a Settlement Unit as measured by the Facility Metering Equipment, adjusted for: (i) the transmission loss multiplier allocated in accordance with the BSC; or (ii) any new or substituted multiplier or factor which is in the nature of, or similar to, a transmission loss multiplier; or …*

However, the standard terms and conditions define strike price adjustment in relation to the Delivering Transmission Loss Multiplier value (TLM(D)), which relates to the Delivering Transmission Losses Adjustment value:

"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*

This represents a potential anomaly in the drafting of the standard terms and conditions for the CFD contract. CFD generators receive Difference Payments that depend on the Transmission Loss Multiplier value, but their strike price is indexed using the Delivering Transmission Losses Adjustment value, which is potentially very different. To date this hasn't been an issue. However, this is only because the BSC currently defines the Transmission Loss Factor value as zero in all Settlement Periods, meaning a BM Unit's Transmission Loss Multiplier is simply the corresponding Transmission Losses Adjustment value plus one.

This potential anomaly appears not to apply to the early investment contracts[9]. These contracts use a different definition of the Delivering Transmission Loss Multiplier value that refers to the Transmission Loss Multiplier value (rather than the Transmission Losses Adjustment value), and is therefore consistent with the definition of Loss Adjusted Metered Output:

"TLM(D)" means:

> *(A) the transmission loss multiplier allocated in accordance with the BSC for BM Units belonging to delivering Trading Units; and*
>
> *(B) any new or substitute multiplier or factor which is in the nature of, or similar to,the transmission loss multiplier allocated in accordance with the BSC for BM Units belonging to delivering Trading Units*

Note that, as explained above, the average amount of losses allocated to generators will not actually change under P350.

[9] 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.

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 Multiplier value equates to a 0.0040 increase in the Actual TLM(D) Charge, and would therefore presumably 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 presumably 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 hence potentially strike prices. 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, if the CFD contract has based its strike price adjustment on the Transmission Losses Adjustment values then a change in the slack node could impact this. If the choice of slack node moves the Transmission Loss Factor values in one direction, the Transmission Losses Adjustment values would be shifted in the opposite direction in response. This would then affect the strike price adjustment subsequently calculated.

What is the proposed way forward?

As there is no certainty that the CFD contract can be amended, the Workgroup is currently considering introducing an adjustment value into the calculation of the Transmission Loss Factor values. We have also discussed this potential approach with Ofgem, the CMA, the LCCC and the Department for Business, Energy & Industrial Strategy (BEIS).

To implement this option, a change is proposed to the calculation of the Adjusted Seasonal Zonal Transmission Loss Factor values ($ATLF_{ZS}$) under new BSC Section T Annex T-2 paragraph 8.5, adding 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, and hence would **not** impact the locational signals provided by P350. 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 would **not** change the resulting Transmission Loss Multipliers.

This amendment would seek to ensure 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 in place. The calculation of this Transmission Loss Factor Adjustment value has yet to be developed, but it is proposed that the TLFA would calculate annually a Transmission Loss Factor Adjustment value for each BSC Season according to a methodology approved by the BSC Panel. The P350 BSC legal text would contain provisions for the Panel to determine and approve the methodology to be followed, and for it to then review and update this methodology from time to time as necessary. ELEXON would work closely with the LCCC when developing the initial methodology to be presented to the Panel for approval.

The legal text would also need to contain a provision that ensures Settlement is not impacted if this Transmission Loss Factor Adjustment value is not calculated or approved. It is proposed that if no other value is approved by the Panel for the given Season or year, this Transmission Loss Factor Adjustment value would default to zero.

At this time, the Proposer and the Workgroup have not made a decision on whether to include this amendment under the P350 solution, and wish to gather views from Assessment Procedure Consultation respondents on this matter first. In parallel with this consultation, we will discuss the approach further with the CMA, as a change to the Order and Licence would be needed to allow the Workgroup to take it forward. We will also work with the LCCC to establish further the impact of the anomaly on CFD generators (e.g. the potential materiality) and what could be involved in determining a calculation methodology for the new Transmission Loss Factor Adjustment value. We will also work with BEIS to clarify the original policy intention behind the wording of the CFD contract. The Proposer and the Workgroup will then consider the Assessment Procedure Consultation responses and the results of our further work on this matter at its next meeting in December, where they will agree the final P350 solution.

Assessment Consultation Question
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? *Please provide your rationale.*
The Workgroup invites you to give your views using the response form in Attachment C

Should the model be made available to participants?

The Workgroup asked if the enduring P350 Load Flow Model could be made available to participants. It was noted that the legal text requires BSCCo to make available all the input and output data, but the model itself is likely (due to the specialised nature of the service) to be proprietary property of the company producing and running it. As an example, although the input and output data for Settlement is publically available, the systems that the existing BSC Agents use to perform the Settlement calculations are not publically available, and Parties cannot request access to these. The same conditions would be expected to be applied to the TLFA systems. However, one member commented that such access could be included as part of the contract for the TLFA service if BSC Parties wanted it to be, although this could then increase the costs the eventual service provider may request or affect who decides to apply for the service.

Some members considered that, as all the input data and the full specification the calculations would need to follow would be publically available, it should be up to individual participants to create their own models. Many participants have chosen to do this with existing BSC calculations, and there is a range of open, off-the-shelf software that could be used for this. Alternatively, Parties could choose to hire a consultant to perform this on their behalf. However, other members felt that smaller Parties may be less able to do this for themselves. In the interests of competition and transparency, they believed some form of centrally-available service should be available to all Parties.

We noted that, if the requirement was for Parties to be able to model their own future Transmission Loss Factor scenarios using modified input data, this did not necessarily require access to the actual 'live' Load Flow Model being used as the BSC System. We suggested that we could explore the feasibility of developing a separate modelling tool for use by Parties. Members asked us to examine this approach, believing its inclusion could form an Alternative Modification.

At this stage, we have not been able to produce any cost estimates for such a tool. We note that the requirements for this tool are unclear, and we would need to undertake a requirements gathering exercise with participants to scope out and understand what any tool would need to do. This will not be possible within the P350 progression timescales. We note that the simplest solution would be to allow Parties to feed their own modified input data into the tool to see how changes in scenario affect the Transmission Loss Factor values. However, this data is complex to manipulate and it is unclear whether smaller Parties would have the desire or capability to do so. There is a risk that Parties could misinterpret the data and base commercial decisions on erroneous results.

We recommended to the Workgroup that if it believes such a tool should be developed then it could recommend to the Panel that it instructs ELEXON to develop it separately to P350. This approach would ensure this tool would be developed if it was felt needed without impacting on P350's progression.

The Workgroup agreed with this approach. Some members considered that the potential scope of such a tool was too wide, with several members believing that it would be outside the scope of P350. The Workgroup has therefore dropped this as a potential P350 Alternative Modification, and at this time does not recommend to the Panel that such a tool be developed separately.

Workgroup's initial recommendation

At this stage, the Workgroup unanimously believes that P350 **would** overall better facilitate the Applicable BSC Objectives and so should be **approved**. Members' views against each of the Applicable BSC Objectives are summarised below.

Applicable BSC Objective (a)

The Proposer believes that P350 would better facilitate Applicable BSC Objective (a) as this Modification is required to ensure that National Grid can comply with the relevant provisions that the CMA will introduce to its Transmission Licence, and that this is the main Objective that is relevant to P350. They do note that the licence changes have not yet gone live, but these will be by the time the Assessment Report is presented to the BSC Panel in January 2017.

A majority of Workgroup members agree that Applicable BSC Objective (a) is better facilitated for similar reasons. One member also notes that P350 is being mandated by the CMA.

The remaining members believe P350 is neutral against Objective (a).

Applicable BSC Objective (b)

The Proposer believes that P350 will better facilitate Applicable BSC Objective (b) as 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.

A majority of Workgroup members agree that Applicable BSC Objective (b) is better facilitated for similar reasons, although one of these members believes this benefit is only in theory and is unconvinced as to whether it will materialise in practice.

The remaining members believe P350 is neutral against Objective (b), with one of these members noting the period of time in which the Transmission Company has been able to operate the Transmission System in the absence of a zonal transmission losses scheme.

Applicable BSC Objective (c)

The Proposer believes that P350 will better facilitate Applicable BSC Objective (c) as the CMA's assessment concluded this change would remove distortions in competition that exist under the current uniform allocation of transmission losses.

A majority of Workgroup members agree that Applicable BSC Objective (c) is better facilitated for similar reasons, although one of these members believes this benefit is only in theory and is unconvinced as to whether it will materialise in practice.

The remaining members believe P350 is neutral against Objective (c), with one of these members commenting that a lot of the renewable energy currently seen has been incentivised by centrally-led policy rather than by forces of competition.

What are the Applicable BSC Objectives?

(a) The efficient discharge by the Transmission Company 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

Applicable BSC Objective (d)

The Proposer and the majority of Workgroup members believe P350 is neutral against Applicable BSC Objective (d).

One member believes there may be a benefit under Objective (d). They consider that it would be more efficient to calculate and apply Transmission Loss Factor values under the BSC (through implementation of P350) rather than having the Transmission Company calculate and apply the values separately under the Order and licence (in the absence of P350).

One member believes P350 would be detrimental against Objective (d) due to the costs incurred in implementing and operating the solution.

Applicable BSC Objective (e)

The Proposer believes that P350 is neutral against Applicable BSC Objective (e) as the solution is not incompatible with the European Union Target Model and implementing this solution would not preclude a move further toward this design at a later point in the future. All other members agree P350 would have no impact against Objective (e).

Applicable BSC Objective (f)

At this stage, the Proposer and all Workgroup members believe P350 is neutral against Applicable BSC Objective (f). However, a couple of members have expressed concerns that this Objective could be detrimentally impacted depending on the outcomes of the further enquiries with the LCCC over how the CFD strike price adjustment is calculated.

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[10]
(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 (majority)** – agree with Proposer. • **Yes** – P350 is being mandated by the CMA. • **Neutral** – no impact.
(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** – no impact.

[10] Shows the different views expressed by the other Workgroup members – not all members necessarily agree with all of these views.

What is the new Applicable BSC Objective?

As part of the forthcoming Transmission Licence changes being implemented by the CMA's Order, a new Applicable BSC Objective will be introduced:

(g) Compliance with the Transmission Losses Principle

It is currently anticipated that this Applicable BSC Objective will not be in force when the P350 Workgroup makes its final recommendations to the Panel, but will be when the Panel makes its initial recommendations to the Authority and issues its Report Phase Consultation.

Does P350 better facilitate the Applicable BSC Objectives?		
Obj	Proposer's Views	Other Workgroup Members' Views[10]
(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** – no impact.
(d)	• **Neutral** – no impact.	• **Neutral (majority)** – no impact. • **Yes** – it would be more efficient to apply the solution under the BSC than to have the Transmission Company calculate these values separately. • **No** – due to the 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.
(f)	• **Neutral** – no impact.	• **Neutral (unanimous)** – no impact (subject to the outcome of the further investigations).

Assessment Consultation Question
Do you agree that P350 would better facilitate the Applicable BSC Objectives compared to the current baseline and so should be approved? *Please provide your rationale with reference to the Applicable BSC Objectives.*
The Workgroup invites you to give your views using the response form in Attachment C

Appendix 1: P350 Methodology

The P350 methodology is based on the final P229 Proposed Modification as set out in the final P229 legal text. This P229 methodology can be summarised as follows:

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

2. Transmission Loss Factors would be calculated on an ex-ante basis (i.e. calculated before the relevant year) for each BSC Year[11], using Metered Volumes and Network Data for Sample Settlement Periods from a preceding 12 month period (the 'Reference Year'). The required Metered Volumes and Network Data would be provided by the CDCA and the Transmission Company respectively.

3. Prior to the start of each BSC Year, the Load Flow Model would be run by the TLFA to calculate how an incremental increase in power at each individual Node would affect the total variable losses from the Transmission System. The output of the Load Flow Model would be a **Nodal Transmission Loss Factor** value for each Node in each of the Sample Settlement Periods.

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

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

    For example, if an injection of an extra 1kWh of energy at a Node increased variable losses by 0.02kWh, the Transmission Loss Factor value for that Node in that Settlement Period would be -0.02. The TLFA would average 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).

    The TLFA would then convert 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 (as applicable) inclusive.

[11] The BSC Year runs from 1 April to 31 March.

4. The TLFA would adjust the Seasonal Zonal Transmission Loss Factor values by a scaling factor of 0.5 so 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. These **Adjusted Seasonal Zonal Transmission Loss Factor** values would be made publicly available by BSCCo no less than three months prior to their use in the Transmission Loss Multiplier calculation for the applicable BSC Season.

5. Each BM Unit would be allocated to a specific Zone by BSCCo on the basis of the Network Mapping Statement, with any question or dispute over zonal allocation to be resolved by the Panel. The TLFA would determine the Transmission Loss Factor value to be applied to each BM Unit in the Transmission Loss Multiplier calculation for the applicable BSC Season, which would be the Adjusted Seasonal Zonal Transmission Loss Factor value for the relevant Zone.

   All BM Units within a Zone would therefore receive the same single Transmission Loss Factor value for every Settlement Period in the BSC Season. For non-Interconnector BM Units, a positive Transmission Loss Factor value would increase 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 would decrease the Transmission Loss Multiplier value (a benefit to Suppliers and disadvantage to generators). Interconnector BM Units will continue to be allocated a fixed Transmission Loss Multiplier value of 1 (meaning their new locational Transmission Loss Factor value will have no effect on their existing Transmission Loss Multiplier value).

6. The BM Unit specific Transmission Loss Factor values calculated by the TLFA would be registered in BSC Systems by the CRA, and would be used by the BMRA and the SAA within the Balancing Mechanism Reporting Service (BMRS) and Settlement calculations respectively.

7. The remaining 'fixed' element of transmission losses would continue to be allocated to non-Interconnector 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 would be retained.

8. There would be no phased implementation or 'hedging' of exposure to the new Transmission Loss Factor values, which would take full effect from the first Settlement Period on the P350 Implementation Date.

9. The applicable onshore Zones would be the geographical area defined by a GSP Group. For offshore Nodes connected to the Transmission System (including both direct current (DC) and AC offshore networks and offshore networks connected to Distribution Systems) the relevant onshore GSP Group in which the network is connected would be used as the basis for the applicable Zone subject to Panel determination using specific criteria.

10. Any HVDC circuits that are internal to the Transmission System would be included as a point of offtake at one of the corresponding Nodes and a point of delivery (accounting for any intervening losses over the circuit) at the other Node. Historical Metered Volume data for each of these circuits would be supplied by the Transmission Company in parallel with step 2 above.

Appendix 2: 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 3: 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 Transmission Company'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	07 Dec 16
Panel considers Workgroup's Assessment Report	12 Jan 17

Workgroup membership and attendance

P350 Workgroup Attendance			
Name	Organisation	26 Jul 16	18 Oct 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 4: 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)*
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)*

External links

A summary of all hyperlinks used in this document other than those provided in Appendix 2 are listed in the table below.

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

External Links		
Page(s)	Description	URL
4	BSC Sections page on the ELEXON website	https://www.elexon.co.uk/bsc-related-documents/balancing-settlement-code/bsc-sections/
4	Losses page on the ELEXON website	https://www.elexon.co.uk/reference/technical-operations/losses/
4	P278 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p278-treatment-of-transmission-losses-for-interconnector-users/
5	P75 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p075-introduction-of-zonal-transmission-losses/
5	P82 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p082-introduction-of-zonal-transmission-losses-on-an-average-basis/
5	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/
5	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/
5	P198 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p198-introduction-of-a-zonal-transmission-losses-scheme/
5	P200 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p200-introduction-of-a-zonal-transmission-losses-scheme-with-transitional-scheme/
5	P203 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p203-introduction-of-a-seasonal-zonal-transmission-losses-scheme/
5	P204 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p204-scaled-zonal-transmission-losses/

External Links		
Page(s)	Description	URL
5, 8, 17	P229 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p229-introduction-of-a-seasonal-zonal-transmission-losses-scheme/
5, 7	The CMA's Energy Market Investigation page on the GOV.UK website	https://www.gov.uk/cma-cases/energy-market-investigation
8, 11, 16, 18	P350 page on the ELEXON website	https://www.elexon.co.uk/mod-proposal/p350/
18	Western Link Project website	http://www.westernhvdclink.co.uk/
21	Interconnectors page on the ELEXON website	https://www.elexon.co.uk/reference/interconnectors/