

ASSESSMENT REPORT for Modification Proposal P224 'Reactive Power Flows Associated with Exemptable Generating Plant'

Prepared by: P224 Modification Group

Date of Issue: 8 August 2008
Reason for Issue: For Panel Decision

Document Reference: P224AR
Version Number: 1.0

This document has been distributed in accordance with Section F2.1.10 of the Balancing and Settlement Code.¹

Proposed Modification P224 seeks to revise the Code to allow Reactive Power to be allocated to the Party responsible for the associated flow of Active Power (either Import or Export). The aim is to resolve anomalies in the allocation of Reactive Power flows on sites where Import demand (supplied by a Licensed Supplier) and Export from Exemptable Generating Plant (e.g. embedded wind powered generators) share a common connection to the Distribution System (referred to as 'shared sites' in this document).

Presently the Supplier responsible for the Active Import of such a shared site is held responsible for some Reactive Power flows caused by operation of the Exemptable Generating Plant, because the Code assigns the Reactive Power to the Import Metering System. This issue does not directly affect Settlement but can materially impact Distributors' ability to implement appropriate Distribution Use of System (DUoS) charging. P224 would allow Reactive Power to be more appropriately allocated for shared sites, and permit Distributors to improve DUoS charging.

No Alternative Modification has been developed.

MODIFICATION GROUP'S RECOMMENDATIONS

The P224 Modification Group invites the Panel to:

- **AGREE a provisional recommendation that Proposed Modification P224 SHOULD be made;**
- **AGREE a provisional Implementation Date for Proposed Modification P224 of 5 November 2009 if an Authority decision is received on or before 5 February 2009, or 25 February 2010 if an Authority decision is received after 5 February 2009 but on or before 14 May 2009;**
- **AGREE the draft legal text for Proposed Modification P224;**
- **AGREE that Modification Proposal P224 be submitted to the Report Phase; and**
- **AGREE that the P224 draft Modification Report be issued for consultation and submitted to the Panel for consideration at its meeting of 11 September 2008.**

¹ The current version of the Code can be found at <http://www.elexon.co.uk/bscrelateddocs/BSC/default.aspx>.

CONTENTS TABLE

| | |
|---|-----------|
| Summary of Impacted Parties and Documents | 3 |
| 1 P224 Summary..... | 4 |
| 2 Description of Modification..... | 6 |
| 2.1 Proposed Modification..... | 6 |
| 3 Areas Raised by the Terms of Reference | 10 |
| 3.1 Implications for parties affected by the issues caused by Reactive Power flows associated with Exemptable Generating Plant..... | 10 |
| 3.2 System impacts..... | 13 |
| 3.3 Impacts on any other codes or documentation (e.g. BSCPs, CoPs)..... | 14 |
| 3.4 Impact on CVA metering arrangements..... | 14 |
| 3.5 Implications and implementation of proposed materiality threshold | 15 |
| 3.6 Evidence and analysis regarding the defect | 17 |
| 3.7 Cost-benefit of P224 | 17 |
| 3.8 Assessment of the means of Reactive Power allocation..... | 20 |
| 3.9 Environmental Impact..... | 22 |
| 3.10 Implementation Approach and Costs..... | 23 |
| 3.11 Legal Text | 27 |
| 4 Assessment of Modification Against Applicable BSC Objectives | 28 |
| 4.1 Proposed Modification..... | 28 |
| 4.2 Final Recommendation to the Panel | 30 |
| 5 Terms Used in this Document | 30 |
| 6 Document Control..... | 30 |
| 6.1 Authorities..... | 30 |
| 6.2 References | 31 |
| Appendix 1: Draft Legal Text | 32 |
| Appendix 2: Process Followed | 32 |
| Appendix 3: Results of Assessment Procedure Consultation | 35 |
| Appendix 4: Results of Impact Assessment..... | 36 |

Intellectual Property Rights, Copyright and Disclaimer

The copyright and other intellectual property rights in this document are vested in ELEXON or appear with the consent of the copyright owner. These materials are made available for you for the purposes of your participation in the electricity industry. If you have an interest in the electricity industry, you may view, download, copy, distribute, modify, transmit, publish, sell or creative derivative works (in whatever format) from this document or in other cases use for personal academic or other non-commercial purposes. All copyright and other proprietary notices contained in the document must be retained on any copy you make.

All other rights of the copyright owner not expressly dealt with above are reserved.

No representation, warranty or guarantee is made that the information in this document is accurate or complete. While care is taken in the collection and provision of this information, ELEXON Limited shall not be liable for any errors, omissions, misstatements or mistakes in any information or damages resulting from the use of this information or action taken in reliance on it.

SUMMARY OF IMPACTED PARTIES AND DOCUMENTS

As far as the Modification Group has been able to assess, the following parties/documents would be impacted by P224.

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

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

1 P224 SUMMARY

P224 solution

P224 will amend the Code so that responsibility for Reactive Power is allocated to the Party responsible for the associated flow of Active Power. The Metering Systems of Half Hourly settled shared Import/Export sites will need to be capable of allocating Reactive Power to the Import or Export MSID on the basis of this methodology, though this requirement will not apply retrospectively.

LDSOs would not be obliged to make changes to their DUoS billing systems under P224. However, it is anticipated that LDSOs would amend their billing systems to ensure that the appropriate Party receives accurate charges relating to Reactive Power. This is because LDSOs would have access to more accurate data to allocate charges, and would be able to avoid the use of workarounds and reduce the likelihood of issues and disputes arising.

Main Arguments against the BSC Objectives

The Group established the following benefits against the Applicable BSC Objectives arising from P224:

- P224 allows for appropriate cost signals to be sent to participants regarding Reactive Power which will tend to ultimately facilitate efficient operation of the Transmission System - Objective (b)²; and
- P224 will rectify the inappropriate allocation of Reactive Power and associated DUoS charges and thereby remove a barrier to participation in the market - Objective (c)³.

Identified Costs

The Group noted that the implementation costs for the Proposed Modification were estimated to be circa **£71,000** (for the mandatory required changes to Party Agent systems and for amendment by ELEXON of the Code, CoPs and BSCPs to give effect to P224).

Materiality

The Group determined an estimate of the current materiality associated with the issue of inappropriate allocation of Reactive Power to be:

- Export Parties may be undercharged by £1.7 - 3.3M per annum; and
- Import Parties may be overcharged by £113.5 - 219.7M per annum.

The materiality is based on a comparison of the estimated current charging and potential 'P224' charging in relation to shared Import/Export sites, and assumes all charges that are calculated and assigned under the current charging methods are in fact levied in full (i.e. LDSOs do not 'shield' Parties from Reactive Power related charges).

The Group highlighted that the amount of distributed generation could be assumed to increase eightfold by 2020, in line with targets for electricity generation using renewable sources.

² Applicable BSC Objective (b) - efficient, economic and co-ordinated operation of the GB transmission system

³ Applicable BSC Objective (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

Cost-Benefit

The Group estimated that the costs incurred by full progression of the P224 solution (i.e. including anticipated but non-mandatory changes to LDSO and Supplier charging systems) for Parties would be:

- Industry Implementation cost - **£335,000**; and
- Estimated potential⁴ **increase** in distribution charges to Generators - **£1M** per annum⁵ until 2020 (i.e. a year on year increase, spread over all Generators associated with materially affected shared sites).

The Group estimated that the costs saved by full progression of the P224 solution for Parties would be:

- Avoidance of single LDSO implementation of alternative Reactive Power solution - **£200,000**;
- Increased cost to LDSOs of workarounds - **£200,000** per annum (NB – based on IA response information and assuming all workarounds already in place would remain operational); and
- Avoidance of an estimated potential **increase** in the materiality of the P224 issue to Import Parties of **£75M**⁶ per annum⁷ until 2020 (i.e. a year on year increase spread over all Import Parties associated with materially affected shared sites).

Impact on Metering Codes of Practice and Half Hourly Settled Sites

The detailed requirements of P224 will take effect is through the specific metering requirements within the Codes of Practice (CoP). This table describes these metering requirements at a high level, and notes the effect on Metering Systems governed by each CoP.

The information in this table is an extracted summary of information in the 'Impact on Code Subsidiary Documents' table in Appendix 4. Further details of the impacts on Metering CSDs can be found in Attachment 7 'Impact of P224 on Metering CSDs'.

| Code of Practice | P224 Implementation Impact | Effect of P224 |
|---|--|--|
| CoP1 'The Metering of Circuits with a Rated Capacity Exceeding 100MVA for Settlement Purposes' | Amendment to specify Reactive Energy requirements to effect P224 solution. | P224 solution applies. |
| CoP2 'The Metering of Circuits with a Rated Capacity not exceeding 100 MVA for Settlement Purposes' | Amendment to specify Reactive Energy requirements to effect P224 solution. | P224 solution applies. |
| CoP3 'The Metering of Circuits with a Rated Capacity not exceeding 10 MVA for Settlement Purposes' | Amendment to specify Reactive Energy requirements to effect P224 solution. | P224 solution applies. |
| CoP5 'The Metering of Energy Transfers with Max Demand of up to (and including) 1MW for Settlement Purposes' | Amendment to specify Reactive Energy requirements to effect P224 solution; additional amendment to mandate Reactive Power Demand Values. | P224 solution applies; Reactive Power requirements align with CoPs 1, 2 and 3. |

⁴ Alteration in the operating behaviour of Generators due to the new allocation of Reactive Energy under the P224 solution may reduce this impact.

⁵ Calculated by applying the Group's *conservative* charge estimate, assuming a linear increase in Distributed Generation to meet energy targets set and assuming no change to Generator operation due to P224.

⁶ Note that any increase due to increased charges by LDSOs would be limited by the cap applied to the amount of revenue LDSOs are permitted to recover.

⁷ Calculated by applying the Group's *conservative* charge estimate, assuming a linear increase in Distributed Generation to meet energy targets set and assuming all charges are applied, i.e. LDSOs do not employ workarounds to 'shield' Parties from Reactive Power related charges – note that Ofgem has indicated to LDSOs that they should charge in relation to Reactive Power.

| | | |
|---|--|---|
| CoP6 'Code of Practice for the Metering of Energy Imports via Low Voltage Circuits Fused at 100 Amps or Less Per Phase for Settlement Purposes' | No direct impact for P224 implementation. | P224 Code requirements effectively rule out the use of CoP6 Meters for Half Hourly Settlement. |
| CoP7 'Code of Practice for the Metering of Energy Imports via Low Voltage Circuits Fused at 100 Amps or Less Per Phase for Settlement Purposes' | No direct impact for P224 implementation. | Similar impact as that under CoP6. |
| <i>Proposed Smart Metering CoP:</i> CoP10 'Code of Practice for Whole Current Metering of Energy via Low Voltage Circuits for Settlement Purposes' | CoP10 document is currently being drafted; if P224 is implemented it is recommended that CoP10 should specify that measurement of Reactive Energy is not required (under the BSC, as provided for in the P224 solution). | Implementing P224 in the way recommended (i.e. such that CoP10 specifies that measurement of Reactive Energy is not required) would avoid a negative impact on Smart Metering by ensuring the requirements of CoP10 are not unduly onerous. |

Implementation

The Group agreed an Implementation Date for the Proposed Modification of:

- 5 November 2009 if an Authority decision is received on or before 5 February 2009; or
- 25 February 2010 if an Authority decision is received after 5 February 2009 but on or before 14 May 2009.

The Group agreed that the draft legal text delivers the intended solution for the Proposed Modification.

A description of the P224 solution is provided in Section 2. Further information regarding the Group's discussions of the areas set out in the P224 Terms of Reference is contained in Section 3, including details of the Group's recommended implementation approach. See Section 3.7 for more information on the cost-benefit assessment.

A summary of the Group's views regarding the merits of the Proposed Modification can be found in Section 4. A copy of the Group's full Terms of Reference can be found in Appendix 2, and a summary of the responses to the Assessment Procedure consultation and impact assessment can be found in Appendices 3 and 4 respectively.

2 DESCRIPTION OF MODIFICATION

This section outlines the solution for the Proposed Modification as developed by the Modification Group.

For a full description of the original Modification Proposal as submitted by E.ON UK plc ('the Proposer'), please refer to the [P224 Initial Written Assessment \(IWA\)](#).

2.1 Proposed Modification

Code Changes

The Proposed Modification solution is that changes are made to the rules in the BSC which govern the allocation of volumes of Reactive Power. The issue identified by P224 arises when two Parties share a common connection to the distribution system of an Import/Export site, and therefore different Parties are

responsible for Import and Export, though complications can also arise due to allocation to the inappropriate MSID even where only one Party is associated with an Import/Export site. The aim is that responsibility for Reactive Power flows is allocated more appropriately, by associating it with the flow of Active Power occurring at the same time. This will be accomplished by configuring the Meter to allocate Reactive Power to one of four registers, on a moment by moment basis, depending on both the direction of the Active Power flow and whether the Reactive Power is conventionally labelled 'Import' or 'Export' (i.e. whether it is leading or lagging). This is a change from current arrangements, which require only two Reactive Power registers. These changes in the BSC (and associated metering arrangements) will necessitate consequential changes to metering Codes of Practice (CoPs) and other Code Subsidiary Documents (CSDs).

No Retrospection

It should be noted that the solution proposed is not retrospective and is intended to align with the approach applied to the metering CoPs, i.e. that Metering Systems have to comply with the requirements (i.e. the version of the relevant CoP) in place when the site is first registered for the purposes of Settlement, as per Sections L and K of the Code. Therefore an existing shared Import/Export site will not be required to comply with the P224 rules until such time as a material change to its Metering Equipment means that, in accordance with Section L of the Code, a version of a CoP which requires compliance with P224 becomes relevant to the site. A material change to the Metering Equipment is described in Section L, and is a substantial alteration, such as replacement of a the Metering System's current transformers.

A change of Party associated with the Import and/or Export MSID of a Metering System **would not** on its own trigger a change to the CoP requirements for the site, and therefore *would not necessitate compliance with the P224 provisions*.

Availability of P224 compliant Meters

It is the understanding of the Group that a number of currently available Meters are capable of compliance with the P224 provisions, or can be made compliant with only minor changes to the Meter software to adjust how the Meter carries out allocation of Reactive Power to its registers. These registers are subsequently linked to the Import or Export MSID via the configuration of the Meter Technical Details (MTD). For any new registrations or material changes to Metering Equipment of shared Import/Export sites Parties will need to ensure that the site complies with P224, where applicable. The action required will depend on the capabilities of the Settlement metering in place at the time.

Configuration of Meter Registers

Currently four Measurement Quantity IDs are used for Meter Registers: Active Export (AE), Active Import (AI), Reactive Export (RE) and Reactive Import (RI). For shared Import/Export sites, the BSC prescribes that AE volumes are allocated to the Party associated with the Export of the site ('the Export Party') and AI volumes are allocated to the Party associated with the site's Import ('the Import Party').

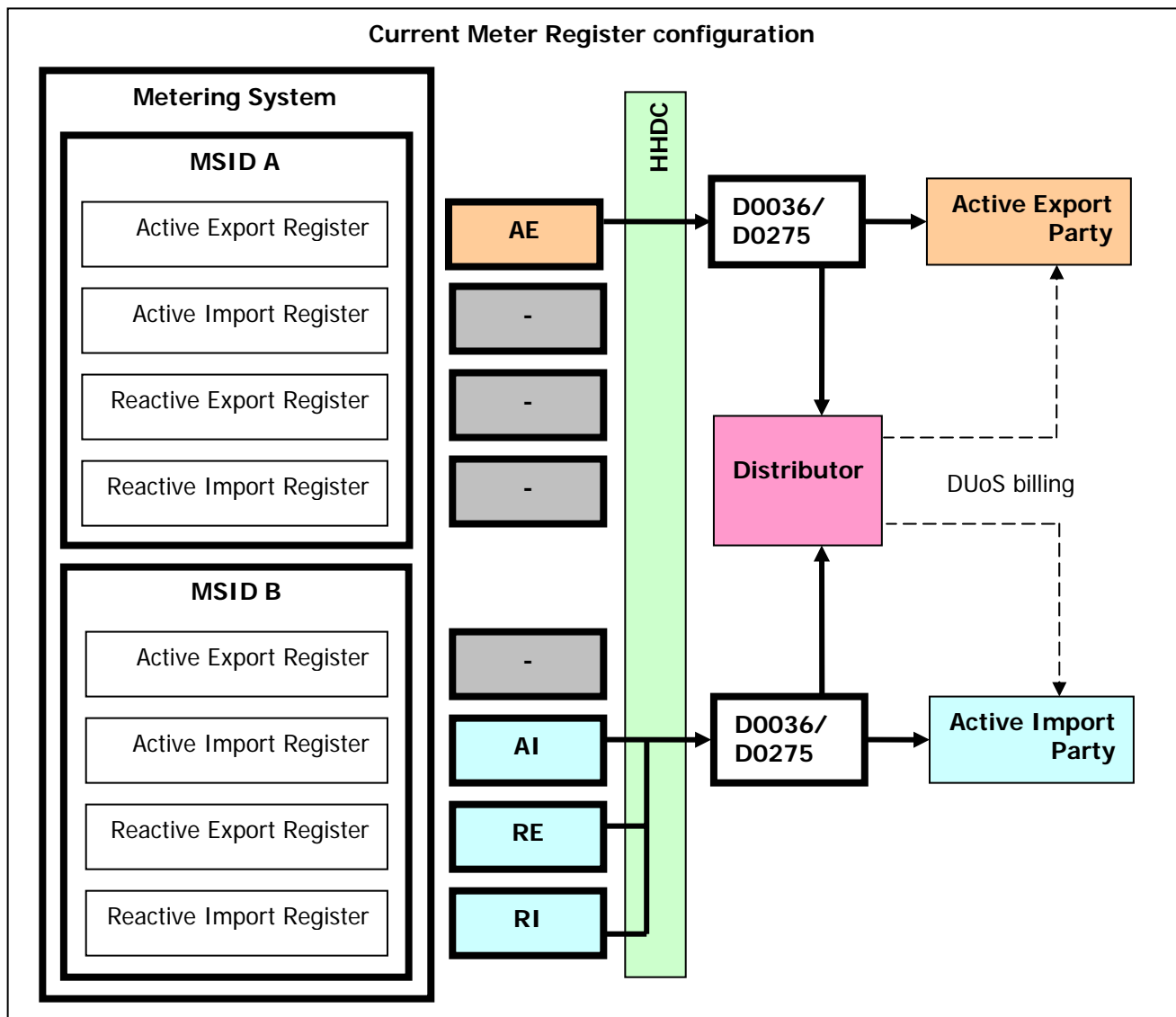


Figure 1: Current Meter Register configuration

The current BSC baseline obliges the Import Party to be allocated the RI volumes for shared Import/Export sites, and permits either the Import Party or the Export Party to be allocated the RE volumes for such sites. In practice both the RE and RI volumes are normally allocated to the Import Party (irrespective of whether those Reactive Power flows are associated with Active Import or Active Export). These configurations of the Meter Registers are translated into the structure of the data flows from HHDCs (or as the case may be the CDCA) which report RE and RI volumes to the Party and the relevant Licensed Distribution System Operator (LDSO), as shown in figure 1.

Under the P224 Proposed solution the Meter Register Measurement Quantity IDs would not be changed. The Group considered arguments that an additional 4 Measurement Quantities should be introduced to reduce the risk of errors occurring in initial set up. Any amendment of the Meter Register Measurement Quantity IDs would significantly increase the impact of implementation of the P224 solution on a number of Parties. The Group concluded that it was not necessary to change or supplement the existing Meter Register Measurement Quantity IDs in order for the P224 solution to function.

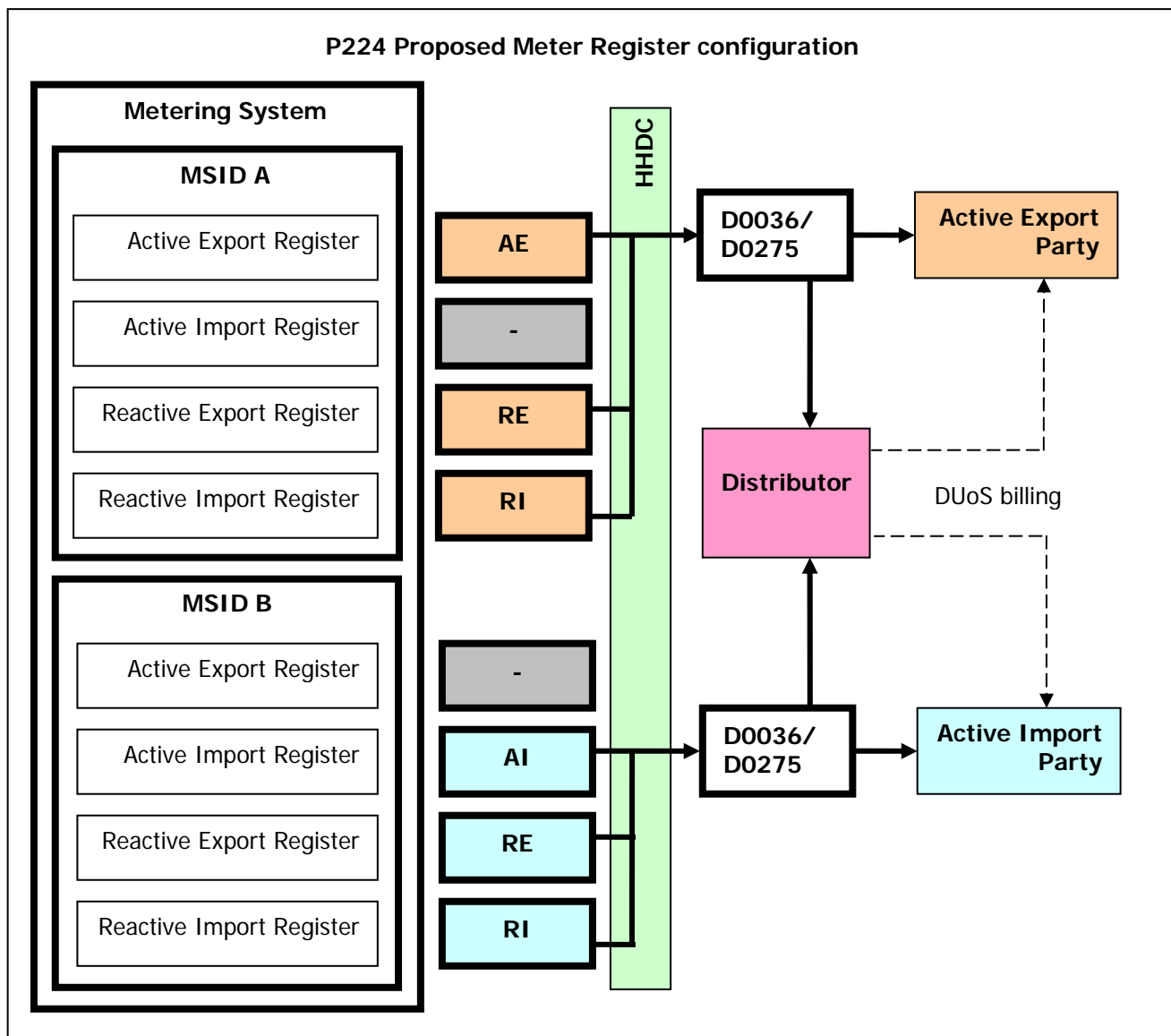


Figure 2 P224 Proposed Meter Register configuration

The proposed configuration of Meter Registers under P224 is illustrated in figure 2. Note that under P224 the existing Measurement Quantities will be used as follows:

- Measurement Quantity 'RI' (Reactive Import) on the Export MSID for leading power flows associated with Active Export;
- Measurement Quantity 'RE' (Reactive Export) on the Export MSID for lagging power flows associated with Active Export;
- Measurement Quantity 'RI' (Reactive Import) on the Import MSID for lagging power flows associated with Active Import;
- Measurement Quantity 'RE' (Reactive Export) on the Import MSID for leading power flows associated with Active Import.

If registers are configured as intended and Meter software is appropriately amended then the Metering Systems of shared Import/Export sites can allocate Reactive Power to the appropriate MSID as determined by the allocation methodology of the P224 solution. Guidance would be added to Annex C of the Master Registration Agreement (MRA) Data Transfer Catalogue regarding the new register configuration (see section 3.3).

Provision for alternative approaches to Reactive Power within CoPs within specific limits

The provisions of the P224 solution apply to shared Import/Export sites that are settled on a Half Hourly basis unless such a site meets both of the following criteria:

- Its use of Half Hourly metering is not mandatory (i.e. its Import is below the threshold for mandatory Half Hourly metering, currently 100kW, and its Export is below the microgeneration limit, currently set at 30kW); **and**
- There is specific provision for exception from the P224 provisions in the applicable metering CoP.

It is not proposed that such a provision permitting alternative arrangements be included in any of the existing Half Hourly CoPs. This option is intended for future CoPs that may be created for smart metering (or other similar applications). The Group believes this provision should be applied to the proposed CoP10 which is currently being assessed (see [DCP0033](#) ELEXON webpage).

The applicability of a CoP to a site is determined by the characteristics of that site, not by the Meter installed. This means even if the Meter installed on a site can measure Reactive Power, it is not required to do so unless the CoP applicable to the site requires that it must.

The Group agreed that P224 should include a materiality threshold and criteria to determine whether the P224 provisions should apply. The Group were primarily concerned with ensuring the solution did not create a potential barrier to competition by preventing the utilisation of future technology that may provide for small scale generation and Import, but not have any material issue relating to Reactive power allocation. The criteria detailed above are believed to accomplish this, as they allow the CoPs to be revised through the BSC Change Proposal (CP) process to accommodate any such technology, while maintaining an obligation on mandatory Half Hourly metered sites which cannot be changed by a CP.

3 AREAS RAISED BY THE TERMS OF REFERENCE

This section outlines the conclusions of the Modification Group regarding the areas set out in the P224 Terms of Reference.

3.1 Implications for parties affected by the issues caused by Reactive Power flows associated with Exemptable Generating Plant

3.1.1 Modification Group's Conclusions

The Group considered the implications of the P224 Proposed Modification for Parties affected by the issues around Reactive Power raised by P224. This includes Licence Exempt Generators (and Parties associated with them), Generators, Suppliers and LDSOs. The Group also considered the implications for Reactive Power charging.

The Group conducted analysis of a sample of shared Import/Export sites currently experiencing issues related to inappropriate allocation of Reactive Power (see Attachments 2 and 3). The analysis estimated the materiality of the issues for the Import and Export Parties associated with the affected sites. This was done by comparing the allocation of the Reactive Power and Capacity Charges under current arrangements with those under the P224 solution.

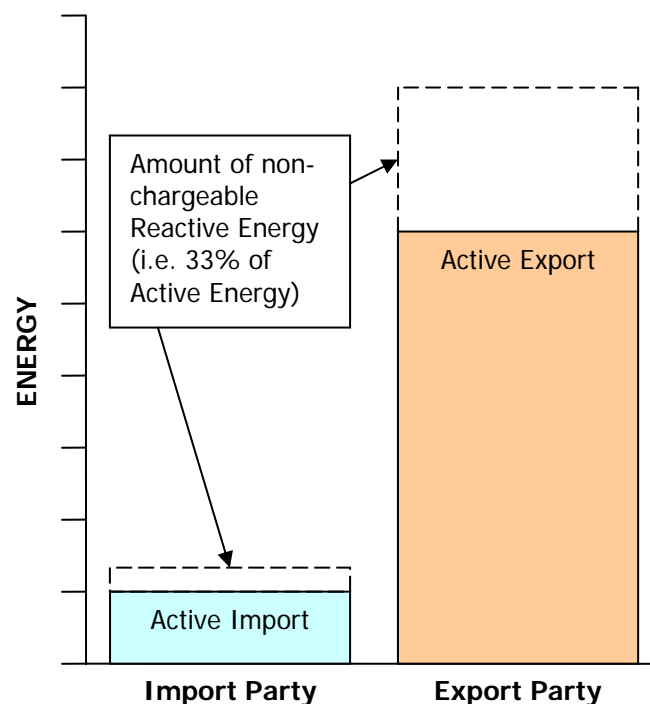
The analysis indicates that the Import Parties associated with the sites would experience a significant reduction in the DUoS charges they incur collectively for excess Reactive Power and for excess Distribution Capacity requirements. The analysis indicates that Import Parties could potentially benefit by a reduction in charges in the order of 90% (assuming these have been levied by the Distributor in the first place). Export Parties could, as a whole, experience the reverse, with an increase in their Reactive Power and Excess Capacity charges, though the financial value of this increase would be smaller than the magnitude of the decrease in the Import Parties' collective charges. See section 3.7 on cost-benefit for details.

Explanation of apparent discrepancy

The apparent discrepancy in the magnitudes of the reduction in charges for Import Parties and the much smaller increase in charges for Export Parties is due to the way Reactive Power charges are calculated, and the difference in the Import and Export maximum capacities for shared sites. Though the way LDSOs calculate DUoS charges varies, they generally set Reactive Power charges on the basis of the power factor of the Active Power flow. A unity Power Factor represents zero Reactive Power, and is ideal. LDSOs usually impose charges for Power Factors lower than 0.95 (leading or lagging), though this varies between LDSOs. In terms of volumes of energy, a 0.95 Power Factor threshold translates to charging for volumes of Reactive Energy in excess of 33% of the volume of Active Energy.

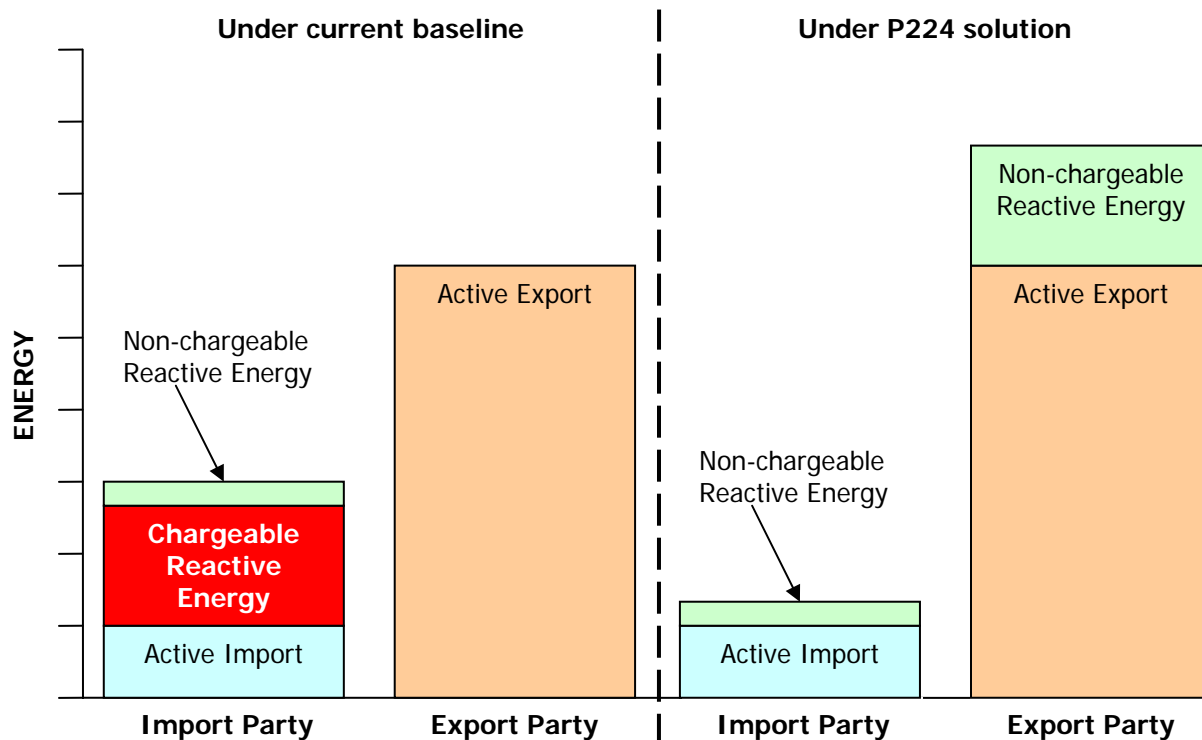
Since the Active Import of shared Import/Export sites is often much less than the Export (even if the Active Import is zero the present allocation method still assigns all Reactive Power to the Import MSID) the Reactive Energy of a shared site is much more likely to exceed the Reactive Energy percentage threshold (e.g. 33%) in relation to the site's Active Import than its Active Export.

The diagram below shows a volume of Active Import energy and a volume of Active Export energy associated with a shared site. The maximum amount of Reactive Energy which can be associated with each of these volumes is illustrated (33% of the volume of Active Energy).



Under P224, the Reactive Power would be allocated to either the Import or Export MSID depending on whether Active Import or Active Export is occurring. Because this means the Reactive Power can, and would often be, allocated to the Export MSID, the Reactive Energy percentage threshold is less likely to be exceeded, and hence the total amount of 'chargeable' Reactive Power for a shared Import/Export site is likely to be reduced under P224.

This is illustrated in the diagram below. Under the current baseline all of the Reactive Energy associated with the shared site is allocated to the Import Party; part of this Reactive Energy does not incur a charge, but the majority of it does, due to the relatively small amount of Active Import energy with which it is associated. In this example, under P224 most of the Reactive Energy is associated with the Active Export and allocated to the Export Party. Due to the larger amount of Active Export, the Reactive Energy falls within the permitted limit and the Export Party does not incur a charge. The Import Party still has some Reactive Energy allocated to it, but it is also now within the 33% threshold so does not incur a charge.



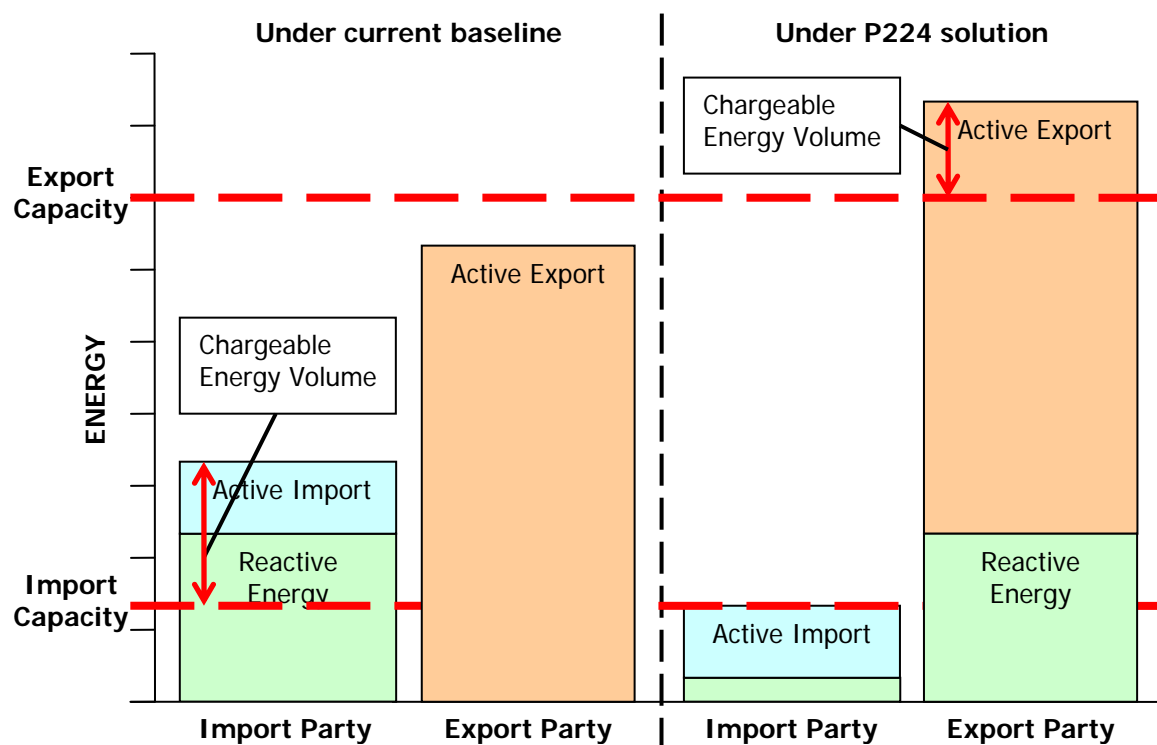
Impact of issue on capacity charging

A similar effect exists in relation to DUoS charges for use of excess Distribution System capacity. Shared Import/Export sites have agreed maximum capacities for Import and Export of power, the magnitude of which are based on the expected capacity requirement due to planned generation activities (Export) or anticipated supply activities (Import). Shared Import/Export sites often have a maximum Export capacity which is significantly greater than the maximum Import capacity. Currently, Reactive Power which the Import Party does not cause and has no control over is allocated to the Import MSID. This contributes to the Distribution Capacity regarded as used by the Import Party, and can contribute to the Import Party exceeding its agreed Maximum Capacity and thereby incurring Excess Capacity DUoS charges.

This is illustrated in the diagram below. Under the current baseline all the Reactive Energy of the site is allocated to the Import Party. Both the Active Import and Reactive Energy volumes use Distribution System capacity. They are therefore summed together and any volume in excess of the Import Party's agreed maximum Import capacity (which is based on the Import Party's planned Import activity) incurs a charge.

In this example, the Reactive Energy is due to the operations of the Export Party, and under P224 most of the Reactive Energy is associated with the Active Export and therefore allocated to the Export Party. This results in the Import Party falling below its maximum Import capacity, so it no longer incurs a charge. The energy allocated to the Export Party (i.e. the sum of Active Export and Reactive Energy associated with that Active Export) is now in excess of the Export Party's agreed maximum Export capacity.

However, note that though the total volumes of Active Import, Active Export and Reactive Energy are the same under the baseline and P224, the reallocation under P224 in this example results in the chargeable volume of the Export Party under P224 being less than the chargeable volume attributed to the Import Party under the baseline.



3.1.2 Views of Respondents to Assessment Procedure Consultation

The views of respondents were aligned with the conclusions of the Group. Respondents did not raise any issues in this area further to the Group's considerations.

3.2 System impacts

3.2.1 Modification Group's Conclusions

The Group considered the possibility of impacts on the systems of participants, Party Agents and BSC Agents due to P224. The Group also considered the potential impact of implementation of P224 on metering and data flows. Respondents to the P224 industry IA identified system impacts with a range of materiality.

LDSOs

LDSOs identified significant impacts on DUoS billing processes following implementation of the P224 Proposed solution. However, the Group considered that the majority, if not all, of the impacts on DUoS billing were due to changes that LDSOs (and Suppliers) would voluntarily make to improve their billing processes to benefit from P224 (especially in relation to no longer having to maintain workarounds), rather than changes that were necessary for implementation of the Proposed solution. The Group considered that the timescales associated with these impacts did not need to be taken into account when planning the implementation timetable for P224. However, the costs should be taken into account when considering the cost-benefit of the solution, as the impacts would be incurred in realising the benefit of P224, i.e. improved DUoS charging in relation to Reactive Power. The costs of LDSO system changes ranged from £20,000 - £100,000 depending on the current structure of each LDSO's billing system.

Party Agents

There were less significant impacts on HHDCs and MOAs, with process and system changes forming part of impacts which amounted in total to an estimated £5,000 cost per participant with timescales ranging from 2 to 6 months.

One HHDC respondent identified a greater impact due to requirements to upgrade and test its data management system if the P224 solution is introduced, with an estimated cost of £60,000 and a timescale of 12 to 18 months. It is understood that this impact relates to the particular structure of the respondent's systems, and the changes that are therefore necessary.

BSC Agent (CDCA)

The Group considered that there was a potential impact on the CDCA, due to the possibility of the Export of a generator being registered in CVA while its Import is registered in SVA. However the CDCA service provider did not identify any impact. The service provider noted that the proposed new Meter Register configuration implies that both the reactive import and export channels can be registered against the export channel of an MSID and against the import channel of a different MSID in CVA. The current CDCA system will allow this configuration if CVA registration details are received showing this configuration.

3.2.2 Views of Respondents to Assessment Procedure Consultation

The views of respondents were aligned with the conclusions of the Group. Respondents did not raise any issues in this area further to the Group's considerations.

3.3 Impacts on any other codes or documentation (e.g. BSCPs, CoPs)

3.3.1 Modification Group's Conclusions

BSC documentation

ELEXON's internal Impact Assessment identified impacts on various BSCPs and CoPs; these are detailed in Appendix 4 below.

MRA products

It was identified that P224 would necessitate changes to Annex C of the MRA Data Transfer Catalogue regarding the specific scenarios and examples for sending a D0268 for Import and Export MPANs. The Group agreed this would be necessary and noted that this update would assist MOAs and HHDCs to understand and implement the operation of the P224 solution with regard to the proposed new configuration of Meter Registers.

3.3.2 Views of Respondents to Assessment Procedure Consultation

Respondents did not raise any issues in this area further to the Group's considerations.

3.4 Impact on CVA metering arrangements

3.4.1 Modification Group's Conclusions

There is only a minor potential impact on CVA metering. In the specific scenario where a generator's Export is registered in CVA and its Import in SVA, the Metering System would need to be compliant with the P224 provisions (i.e. unless it is an existing shared Import/Export site whose Metering Equipment has not undergone a material changes). The Group did not envisage any particular issues in relation to this requirement.

3.4.2 Views of Respondents to Assessment Procedure Consultation

The views of respondents were aligned with the conclusions of the Group. Respondents did not raise any issues in this area further to the Group's considerations.

3.5 Implications and implementation of proposed materiality threshold

3.5.1 Modification Group's Initial Discussions

The P224 Proposed solution includes criteria for exception from the provisions proposed, as described in section 2. The Group decided on these criteria after initially considering that no materiality threshold or other criteria was necessary, and then considered several potential alternatives for P224 exception criteria. This section outlines the Group's considerations and describes the alternative criteria the Group considered and the reasons for their selection.

Initial Group Discussions and IA Responses

A materiality threshold of 100kW was included as part of the P224 Modification Proposal. The P224 Group initially determined that a threshold was not necessary, on the basis that the provisions of the P224 solution would apply only to shared Import/Export sites settled on a Half Hourly basis. Therefore the Group was comfortable that the P224 solution should encompass all shared Import/Export sites settled on a Half Hourly basis, regardless of whether Half Hourly Settlement was mandatory for the site (i.e. due to its associated Import/Export) or was due to the Party (or Parties) associated with the site voluntarily electing to engage in Half Hourly Settlement. The Group's view was that Parties choosing to undergo Half Hourly Settlement must derive some advantage from doing so, that it was appropriate that they should be subject to the same rules and obligations as other Parties settling on a Half Hourly basis, and that all such requirements could be taken into consideration when making a business decision whether to register for Half Hourly Settlement.

A majority of respondents to the P224 industry IA agreed with this view. Of 13 respondents, eight agreed that there should be no threshold, three were neutral or did not respond to the question and two disagreed and believed there should be some sort of threshold. Respondents supporting a no-threshold approach felt that a clear and consistent approach for all Half Hourly Metering Systems would be desirable. Some respondents noted that additional alternative arrangements would be necessary if a threshold is introduced, as all Half Hourly settled shared Import/Export sites would not be subject to the same requirements.

One respondent favoured dual threshold levels for Import and Export to determine whether a site must be P224 compliant. They supported an option considered by the Group of a materiality threshold for Import of greater than 100kW (aligning with the current Import level for Mandatory Half Hourly metering) and a 30kW minimum Export materiality level (aligning with the current Microgeneration limit for mandatory Half Hourly metering).

One respondent believed that a threshold was necessary and proposed an alternative approach. The respondent argued that mandating Reactive Power metering for small loads did not appear to be economic. They argued that applying a materiality threshold of a minimum kW or KWh would cause boundary and definition issues, and proposed applying the provisions on the basis of the CoP applicable to the Metering System concerned. The respondent suggested that the P224 solution should apply to customers equipped with CoP5 and CoP3 metering only, i.e. effectively incorporating the solution into CoP5 and CoP3. Several reasons were stated in support of this approach, as follows:

- Effectively targeting of those Import/Export sites that are the source of the issue;
- Avoids placing an enduring obligation on all future elective HH settled Import/Export sites – such an obligation could be a barrier to the roll out of smart metering and microgeneration; and
- More economic approach.

Further Group Discussions

The Group noted the responses to the P224 industry IA and noted that it was important that their consideration of P224 should consider any interaction with the work on smart or 'Half Hourly capable' metering. Despite the majority support for a solution without a materiality threshold, the Group was persuaded that further consideration should be given to the inclusion of a threshold or criteria of some kind in P224.

Some members of the Group believed that they should solve the existing problem and not seek to 'future proof' the P224 solution, and believed that it was appropriate that all Half Hourly Settlement metering should be subject to the same requirements. They also noted that it was potentially possible that technical issues could arise if the P224 provisions did not apply to all Half Hourly Settlement metering, because 2 different streams of data may be necessary, which would be likely to increase the impact on participants' billing systems.

However, the Group noted that the Energy Retail Association (ERA) had produced a smart Meter specification, which does not include measurement of Reactive Power. The aim is to make smart metering feasible and cost-effective. The Group also noted that it is not necessary to measure Reactive Power for very small sites, as the quantities involved are not material from a Distribution System perspective.

The Group considered that it was difficult to predict the effect of smart metering in future, but believed that it was a real possibility that Half Hourly Settlement of smart-metered sites with Import/Export is a likely development. The Group agreed that they should avoid causing any unnecessary impact on smart metering or creating a barrier to increased Half Hourly Settlement.

The Group agreed that the provisions of the P224 solution apply to shared Import/Export sites unless such a site meets both of the following criteria:

- Its use of Half Hourly metering is not mandatory (i.e. its Import is below the threshold for mandatory Half Hourly metering, currently 100kW and its Export is below the microgeneration limit, currently set at 30kW); and
- There is specific provision for exception from the P224 provisions in the applicable metering CoP.

These criteria are also set out in section 2 above. The Group believed that these criteria had the advantages that they ensured that all mandatory Half Hourly metered sites must comply with the P224 provisions, which the Group believed was appropriate, while allowing the flexibility in the individual CoPs to create specific exception for sites, providing they are not obliged to have Half Hourly metering.

3.5.2 Views of Respondents to Assessment Procedure Consultation

The views expressed by consultation responses were largely in agreement with the conclusions of the Group. However, one respondent disagreed because they believed the P224 solution would not form a barrier to either microgeneration or smart metering. The respondent also believed that the P224 solution should seek to address the defect identified via a robust solution, and that the scope of that solution should not be jeopardised by attempting to address potential future risks. The respondent was of the opinion that any issues, such as an impact on smart metering, should be addressed as they arise.

3.5.3 Modification Group's Conclusions

There was sympathy within the Group for the disagreeing respondent's view that the P224 solution should seek primarily to address the defect identified. However, the Group considered that it was appropriate that the P224 solution should ensure any impact on smart metering was either assessed as appropriate or was identified and managed. The Group concluded that use of the criteria described, which would allow a

different approach to Reactive Power within individual CoPs only beneath specific thresholds of materiality, would avoid an inappropriate impact on smart metering.

The Group concluded that such a provision for alternative treatment of Reactive Power should be part of the proposed new metering Code of Practice (CoP10, 'Code of Practice for Whole Current Metering of Energy via Low Voltage Circuits for Settlement Purposes'). The materiality of any reactive power associated with CoP10 meters is likely to be negligible, so application of the full P224 requirements would create an inappropriate barrier to CoP10, which is seeking to facilitate smart metering. This proposed CoP is being progressed through the BSC Change Process via [DCP0033](#); if both P224 and proposed CoP10 are approved, CoP10 should be amended such that the P224 requirements do not apply to Metering Systems registered against it which have Export less than the microgeneration limit (30kW) and Import less than 100kW.

3.6 Evidence and analysis regarding the defect

3.6.1 Modification Group's Initial Conclusions

The Group examined a number of examples of sites where issues have arisen regarding allocation of Reactive Power. The Group were satisfied that these examples were representative of the materiality of the P224 issue, and used these examples to analyse the average materiality for affected sites and to model the anticipated impact of introduction of the P224 solution in relation to current sites.

The Group noted that the examples considered and included in the analysis for P224 included sites with wind generation, landfill gas generation and hydroelectric generation. The information submitted in relation to the example sites is provided as Attachment 2, and the analysis conducted using these examples and information provided by P224 IA respondents is included as Attachment 3.

The analysis conducted is explained and discussed in Section 3.7, below.

3.6.2 Views of Respondents to Assessment Procedure Consultation

Respondents did not raise any issues regarding the evidence considered and the analysis conducted by the Group.

3.7 Cost-benefit of P224

3.7.1 Modification Group's Conclusions

Overall Cost-Benefit

Key Assumptions - when considering the estimated projections of potential cost impacts for Generators and Import Parties it must be noted that these estimations are based on the assumption that:

- All LDSOs would be levying specific charges in relation to reactive power; and
- In future all LDSOs will levy specific charges in relation to reactive power, the resultant revenue of which will increase in line with increased distributed generation and will not be limited by the cap applied to the amount of revenue LDSOs are permitted to recover.

Cost incurred by implementing P224:

- Industry Implementation cost - **£335,000**; and
- Estimated potential⁸ **increase** of cost to Generators - **£1M** per annum (i.e. a year on year increase, spread over all Generators associated with materially affected shared sites) until 2020.

⁸ Alteration in the operating behaviour of Generators due to the new allocation of Reactive Energy under the P224 solution may reduce this impact.

(NB – calculated by applying the Group's *conservative* charge estimate, assuming a linear increase in Distributed Generation to meet energy targets set and assuming no change to how generators operate due to P224)

Costs saved by implementing P224

- Avoidance of single LDSO implementation of alternative Reactive Power solution - **£200,000**;
- Increased cost to LDSOs of workarounds - **£200,000** per annum; and

(NB – based on IA response information and assuming all workarounds already in place would remain operational); and

- Avoidance of an estimated potential *increase* in the materiality of the P224 issue to Import Parties of **£75M⁹** per annum (i.e. a year on year increase spread over all Import Parties associated with materially affected shared sites) until 2020.

(NB – calculated by applying the Group's *conservative* charge estimate, assuming a linear increase in Distributed Generation to meet energy targets set and assuming all charges are applied, i.e. LDSOs do not employ workarounds to 'shield' Parties from Reactive Power related charges¹⁰)

See below for details of the analysis conducted by the Group and further discussion of the results.

Implementation Impact

Respondents to the P224 IA identified a total cost impact associated with implementing P224, and making other voluntary changes, of **£335,000**. This figure is composed of £65,000 direct implementation costs (HHDCs, MOAs) and £270,000 voluntary impact (LDSOs, Suppliers). Further details on this can be found in Appendix 3, part c).

Cost of Workarounds

LDSOs and Suppliers have indicated they employ a variety of 'workarounds' in relation to Reactive Power issues. These workarounds include calculating charges using data relating to another Party, billing using approximated data and absorbing costs (i.e. not passing costs on to the Party or customer). Respondents to the P224 IA identified a cost impact associated with their workarounds of **£335,000** per annum (NB this is *not* related to the £335,000 implementation impact noted above).

Costs related to Metering

There would not be a significant cost associated with metering impacts. Modern Meters can be made P224 compliant by adjustment/software upgrade combined with the necessary Meter Register configuration.

There would be a cost associated with the adjustment/update and reconfiguration (and the associated site visits) of the Meters of existing sites by MOAs, i.e. if the Metering Equipment of such sites undergoes a material change and therefore needs to become P224 compliant. However, if there is a material change the MOA would need to visit the site anyway; therefore no additional mandatory site visits by MOAs should be required due to the P224 solution.

Parties wishing to use the P224 solution on sites where it is not mandated may elect to have the necessary adjustment/update and reconfiguration of metering equipment carried out, provided the Party they share the site with consents to this. It must be noted however that this would be voluntary and would not be a direct and mandatory requirement of P224 implementation.

A respondent to the P224 IA estimated that the cost of a visit and reconfiguration by the MOA would be £250 - £400 per CoP 5 Meter and £450 - £600 per CoP 3 Meter. For older sites, replacement of the Metering

⁹ Note that any increase due to increased charges by LDSOs would be limited by the cap applied to the amount of revenue LDSOs are permitted to recover.

¹⁰ Ofgem has indicated to LDSOs that they should charge in relation to Reactive Power.

System may be required, i.e. if it does not have the necessary capabilities for compliance with P224. This would significantly increase the cost.

Assessed Impact of not implementing P224

Respondents to the P224 IA identified various impacts or P224 not being implemented. Several stated that the materiality of the issue would increase but could not quantify this increase or its effect.

Respondents assessed that their costs in terms of implementing increased workarounds, and the consequential 'lost' income, would increase to **£535,000** per annum.

One respondent identified confidentially that if P224 was not implemented they would need to implement a solution that would cost the respondent more than P224 and which would not be as effective as the P224 solution. The anticipated cost of this solution is **£200,000**.

Increase in the materiality of the P224 issue

The Group agreed that the likely increase in the materiality of the P224 issue could be extrapolated from the targets for increasing the amount of the UK's energy delivered by renewable sources. The increase in the UK's electricity is anticipated to come from increased Distributed Generation, such as wind farms, which are affected by the P224 issue.

The UK is committed to increasing its total energy drawn from renewable sources from 1.4% currently to 15% by 2020. For the electricity sector this means around an eightfold increase in energy from renewable sources. This is anticipated to come from increased amounts of Distributed Generation such as wind, hydro and biomass. The Renewable Energy Association (REA) referred the Group to documentation which breaks down the renewable targets ([Business Council for Sustainable Energy UK document](#)) and illustrates how they may be achieved ([REA/BERR Future Energy System slides](#)).

The Group therefore concluded that in assessing the future increase of the materiality of the P224 issue, the assumption could be made that Distributed Generation would increase by eight times by 2020, in line with the targets set. The further assumption was made that there would be a corresponding increase in the materiality of the P224 issues relating to inappropriately allocated Reactive Power over this 12 year period.

Analysis of current materiality

The analysis conducted indicates that, in relation to all shared Import/Export sites confirmed (via the P224 IA) to currently experience a material issue due to inappropriate allocation of Reactive Power:

- Export Parties may be undercharged by £1.7 - 3.3M per annum; and
- Import Parties may be overcharged by £113.5 - 219.7M per annum.

This assumes that the P224 methodology achieves correct charging, which the Group believes to be true, and compares the charges under the baseline methodology with what the charges calculated using P224 allocation. Note that the apparent discrepancy in these figures is largely due to the fact that the Export Parties (the Generators) have higher Maximum Capacity (kVA) limits, so allocation of Reactive Power volumes to these Parties rather than the Import Party does not result in them (the Export Party) incurring the same high charges.

For an average shared site:

- The Export Party may be undercharged by £3,500 to £6,700 per annum; and
- The Import Party may be overcharged by £230,000 to £446,000 per annum.

Note on analysis:

Example Import/Export sites supplied by Group members (Attachment 2) were used in the Group's analysis (Attachment 3). The Group examined these examples and concluded that they are representative of the

issues raised by P224 in regarding inappropriate allocation of Reactive Power. Therefore daily average figures were calculated for Excess Capacity (kVA) and Reactive Power (kVAr) usage for the Import Party and Export Party for each of the example Import/Export sites. These were then used to find an overall average daily figure for the excess kVA and Reactive Power usage for a 'typical' shared Import/Export site, both under the current baseline and also under P224 Reactive Power allocation.

Representative Reactive Power charges and Capacity charges were extracted from an Energy Networks Association (ENA) spreadsheet showing the current DUoS tariffs ([GB DNO DUoS and G-DUoS Final tariff tables April 2008.xls](#)). LDSO respondents to the P224 IA provided information on the number of shared Import/Export sites in their Distribution Network areas, and the number of these affected by material P224-type issues. This information was used to scale up the average charges calculated to model the impact on all the LDSOs which identified materially impacted sites. By scaling the daily figure up to a year, a per annum figure for all confirmed affected sites was calculated.

Because the charges for Reactive Power and Excess Capacity vary between LDSOs, the Group agreed to calculate upper and lower materiality estimates by using the 75% percentile and 25% percentile of the charges respectively.

The following assumptions were made in analysing the Reactive Power and Capacity usage:

- Reactive Power charges are applied only when Reactive Power exceeds 33% of the Active Power (and the Reactive Power is summed, rather than Reactive Export and Import being netted off) – in reality the methods used by LDSOs to calculate chargeable Reactive Power vary;
- 'Transition' Settlement periods in the example data, with both Active Import and Export, had associated capacity/Reactive Power allocated to the Import and Export Party proportional to the Active Import and Export in the Period; and
- Conversely, periods with zero Active Export and Import (NB this would not arise under the P224 solution as moment by moment the metered volume would be either Import or Export) had associated quantities allocated to the Import and Export Party equally.

3.7.2 Views of Respondents to Assessment Procedure Consultation

Respondents did not raise any issues regarding the Group's analysis and the assessment of the materiality of the issue and the cost-benefit of P224.

3.8 Assessment of the means of Reactive Power allocation

3.8.1 Modification Group's Initial Discussions

The Group considered the means of allocating responsibility for Reactive Power volumes in practice, and concluded that there were no practical or theoretical issues which would prevent the P224 Proposed solution from operating as intended.

The Group considered the impact of the need for compliant metering, and concluded that adequate metering was available to meet the requirements of the solution. A number of Meters currently in use have the necessary capabilities, though some may require software updates to carry out the allocation of Reactive Power prescribed by the P224 solution. In light of the fact P224 is not proposed to be retrospective, and would therefore only apply to new shared Import/Export sites and to any such sites that fall under the P224 provisions due to a material change to their Metering Equipment, the P224 Group believed that Meters are available which can accommodate the P224 solution, and that obtaining such metering would not be unduly onerous on Parties.

3.8.2 Views of Respondents to Assessment Procedure Consultation

The views of respondents were aligned with the conclusions of the Group. Respondents did not raise any issues in this area further to the Group's considerations.

3.8.3 Modification Group's Conclusions

The Ofgem representative for P224 raised an issue regarding the appropriateness of Reactive Power allocation under the P224 solution with regard to shared Import Export sites in particular circumstances. Under P224 any Reactive Power produced or consumed by the site load on a shared site at times of net Active Export will be allocated to the Export Party. The concern was that this may be inappropriate in the situation that a generator on a shared site operates such that it does not cause Reactive Power, but the load has related Reactive Power which is allocated to the Export Party.

The Group considered this scenario and concluded that there was no material issue in this area. The Group considered that the issue was one of site management rather than inappropriate allocation under the P224 solution. The Group noted that the issue could only potentially be of significance in relation to a shared site where the magnitude of Active Import and Active Export were comparable. They assessed the three possible scenarios and any materiality attached to them under the P224 solution:

(a) Generation significantly smaller than site load:

- The site is typically a net Importer of Active Power;
- The Reactive Power associated with the load is the dominant Reactive Power characteristic of the site (i.e. any Reactive Power of the generator is immaterial);
- Under P224 the Import Party is allocated and billed for the Reactive Power and could improve the load's Reactive Power characteristics employing Reactive Power compensation;
- The effect of P224 is to maintain the allocation achieved by the current arrangements.

(b) Generation significantly larger than site load

- This is the situation P224 is designed to correct;
- Generator's Reactive Power is dominant, and under P224 is appropriately allocated to the Export Party.

(c) Generation and site load of comparable magnitude

- This is the scenario where under P224 allocation of Reactive Power could potentially cause or maintain an issue;
- Relatively few such sites where the load and generation are comparable compared with the previous two scenarios. It is considered that on the basis of the evidence collected during the P224 assessment that the likelihood of this situation arising as an issue is limited.

Appropriateness of P224 Allocation

Shared sites with comparable generation and site load (scenario (c)) can exist at present, and such sites would be subject to the same arrangements described previously, i.e. all Reactive Power would be allocated to the Import Party at all times. The Group therefore considered that the question was whether the P224 solution would have a materially detrimental impact on this situation.

At present the allocation of the Reactive Power of such sites entirely to the Import Party is arguably an arbitrary arrangement. P224 could be considered as introducing the potential for Reactive Power in limited circumstances to be equally arbitrarily assigned to the Export Party.

The Group considered that it must be recognised that the allocation of Reactive Power under P224 is not perfect as it remains an approximation, albeit significantly more accurate and appropriate than the approximation under the current arrangements. Perfect allocation of Reactive Power could only be achieved by a higher impact solution, such as a very sophisticated metering solution or the mandating of separate metering for shared sites.

Practical Considerations

The Group noted that the physical operation of a customer's site is not directly affected by P224; it is the drivers behind how the customer chooses to operate their site which are impacted. The Group believed that P224 would facilitate improved management by customers of the operation of their sites.

A customer's site is a single connection to the Distribution System, which should be considered in its entirety as a single entity. The customer may have a consumer account and a generation account with different Parties (Suppliers) but they are a single 'Customer'. Though the site's use and production of electrical energy is traded across two MPANs for Import and Export, the flow of electricity at the connection at any instant of time is a single flow in one direction for which the single Customer is responsible.

The Customer must be expected to make rational decisions regarding the operation of the site as a whole, and present the net result of that operation to Settlement. If the Customer has poor Reactive Power characteristics at the Boundary Point then it is appropriate that the customer should bear any resultant charges incurred.

Potentially in scenario (c) the simplest method for the Customer to use to manage their Reactive Power would be to run the generator with a leading power factor, thereby presenting an improved overall Reactive Power characteristic to the Distribution System.

P224 would address the most significant negative impacts of the current inappropriate allocation of Reactive Power. While situations exist in which Reactive Power may still be allocated inappropriately (e.g. scenario (c)), the Group concluded that in these cases the impact of inappropriate allocation is less material and can be addressed by effective management of the operation of sites.

Conclusions

The Group concluded that the P224 solution is robust and is the most appropriate for all potential operating conditions for shared Import/Export sites.

The Group considered that the current method of allocating Reactive Power is an approximation of the source of Reactive Power and that the P224 solution remains an approximation, albeit significantly more accurate and appropriate. The Group acknowledged that the P224 solution is not perfect, but concluded they were satisfied that it would achieve a material increase in the accuracy and appropriateness of the allocation of Reactive Power compared with the current arrangements.

The Group also noted that any alternative solutions that could be implemented by LDSOs would be inferior in terms of accuracy and appropriateness of Reactive Power than the P224 solution in general and in the situation of a shared site with comparable Import and Export.

3.9 Environmental Impact

Modification Group's Conclusions

The Group noted the recent guidance issued by Ofgem regarding assessment of the environmental impact of proposed Modifications. Though this guidance is prospective and the Group was not obliged to specifically investigate this area, they agreed it would be beneficial if they gave some consideration to the environmental impact of P224.

The Group concluded that P224 would marginally better facilitate Applicable BSC Objective (b), and concluded that P224 would have a positive environmental impact which would fall under this Objective, for

the following reasons. If, as the Group believes, P224 appropriately targets charges to Parties that are responsible for Reactive Power volumes, creating an incentive for these Parties to manage their associated Reactive Power and any related issues, then:

- Transmission of Reactive Power should be reduced, causing a reduction in transmission losses;
- Transmission of Reactive Power should be reduced, allowing the deferral of activities to increase transmission capacity and/or Reactive Power compensation which would otherwise need to be undertaken sooner; and
- A potential ancillary market in Reactive Power could be facilitated, which could provide another option for the management of Reactive Power by enabling employment of participants to produce or absorb Reactive Power as necessary, instead of utilising conventional means of mitigating the effect of Reactive Power (i.e. increased transmission capacity and/or Reactive Power compensation) whose construction would have a negative environmental impact.

The Group noted that the positive impact on Objective (b) was marginal and extremely difficult to quantify, especially at this stage of the process. These benefits were considered to be less significant than the other benefits considered against the Objectives.

Additional National Grid response to P224 Transmission Company Impact Assessment

National Grid agreed that the P224 solution would better facilitate Applicable BSC Objective (b), though it was not clear the benefit would be material.

The Transmission Company Impact Assessment submitted in relation to P224 (see Appendix 4) did not contain reference to any improved facilitation of Applicable BSC Objective (b) under P224. The Group identified a benefit of P224 against (b) and therefore sought the views of National Grid in this area.

National Grid believed that P224 would tend to enable and encourage rational industry participants to make more informed, efficient decisions regarding the management of their Reactive Power characteristics. They believed that the potential for this to impact the operation of the Transmission System is dependent on whether this would reduce the amount of Reactive Power the System Operator needs to procure, which would be impacted by the following factors:

- The characteristics of explicit reactive charges levied by LDSOs;
- Whether there would be a cost benefit to Generators for improving their Reactive Power characteristics compared with charges levied by LDSOs; and
- Whether improved Reactive Power characteristics on the part of embedded generators would displace the need to run reactive assets on Distribution Networks or on the Transmission System.

National Grid's view is that P224 has the ability to better facilitate Applicable BSC Objective (b) by reducing the need for Reactive Power to be procured on assets connected to the Transmission System, though it is not clear whether such a reduction would be material. Furthermore National Grid reiterated that they believe the primary and material benefit of P224 is better facilitation of Applicable BSC objective (c).

3.10 Implementation Approach and Costs

3.10.1 Modification Group's Discussions

The Group considers that the P224 Proposed Modification, if approved, should be implemented as part of a planned BSC Release. The solution would not be retrospective, as the Group believed that this would be unduly onerous on participants. The Proposed Modification would apply only to shared Import/Export sites which are newly registered or whose Metering Equipment undergoes a Material Change following approval of P224. The Group believes that business drivers exist that will encourage Parties and Exemptable Generating

Plant associated with shared Import/Export sites to ensure such sites, where appropriate, comply with the P224 provisions.

As stated above, the Group believes that implementation of the Proposed Modification should be via requirements in the BSC, with provision that exceptions can be made within the specific applicable metering CoP, if other criteria are also met.

Implementation Date

The Group considered the impacts reported by respondents to the P224 IA, and considered the implementation timescales associated with these impacts. The Group noted that significant impacts had been reported by LDSOs, but considered that these impacts were not directly required for implementation (see Appendix 3, Section C) for further details). The Group therefore agreed that the Implementation lead time for P224, and the associated Implementation date should be determined by only non-LDSO impacts.

The Group agreed that if approved, P224 should be implemented as part of a standard BSC Release.

These considerations led the Group to conclude that a 9 month implementation period is required (based on a non Distributor Party's indicated lead time). This suggests an Implementation date in November 2009, assuming an Authority decision were to be received later in 2008. The Group noted that if any other impact timescales could be reduced, or also considered as optional, the overall P224 lead time could potentially be reduced, and an Implementation Date in June 2009 could become viable.

The Group therefore agreed a provisional recommended Implementation Date of November 2009. This was intended to allow a 9 month lead time for Implementation by all Parties, based on the responses to the P224 industry IA. The Group agreed a back-up P224 Implementation Date of February 2010, for use in the case an Authority decision was not received in time for November 2009 implementation.

'Timing Out' of the Authority's ability to make a decision

The Group noted the recent ruling that the Authority was unable to make a decision on the approval of Proposed Modifications after the decision cut-off dates specified in the Modification Report (see Ofgem's [Open Letter](#) of 17 July 2008 regarding the zonal transmission losses Modification Proposals). The Group considered that two concerns arose due to the effective expiry of the Authority's ability to make a decision if the final decision cut-off date is missed:

- The Authority may be inappropriately limited in its ability to make a decision; and
- If P224 is not implemented due to the Authority becoming unable to make a decision, the Authority may not be required to supply a rationale for rejection (as it would be expected to do when rejecting a Modification in usual circumstances).

The Group therefore considered structuring the recommended P224 Implementation Date (and associated decision cut-off date) in such a way that the risk of the Authority's ability to make a decision on P224 expiring could be avoided or mitigated. However, the Group concluded that it was not necessary to structure the recommended P224 Implementation Date in this manner for the following reasons:

- There is currently no recommended and consistent approach for structuring Implementation Dates to address this issue; and
- The Group did not believe that the process of making a decision on P224 would be complex enough to cause a material risk of expiry of the Authority's ability to make a decision (the Ofgem representative did not disagree).

3.10.2 Results of Proposed Modification Impact Assessment

PROPOSED MODIFICATION IMPLEMENTATION COSTS¹¹

| | Implementation Cost ¹² | Tolerance |
|---|-----------------------------------|-----------|
| Total Demand Led Implementation Cost | £65,000 ¹³ | +/- 10% |
| ELEXON Implementation Resource Cost | 30 man days £6,600 | +/- 10% |
| Total Implementation Cost | £71,000 | +/- 10% |

a) BSC Agent Impact

No BSC Agent impact identified.

A potential impact on the CDCA was assessed; this impact was that system changes might have been needed due to the requirement that the CDCA system is able to accommodate the Meter Register configuration necessary for the P224 Proposed solution. However, the CDCA service provider impact assessment confirms the current CDCA system is able to do this, and there is therefore no impact on the CDCA.

Further details of the assessment of BSC Agent impacts can be found in Appendix 4.

b) BSC Party and Party Agent Impact

HHDC and MOA

- Process and system changes;
- Training and documentation of new procedures; and
- Sourcing meters compliant with the P224 provisions.

Generally, required lead times identified for these activities range from 2 – 6 months. The associated costs are generally low, estimated at a total of £5,000 for all but one of the HHDC/MOA respondents to complete the required activities.

However - one HHDC identified a more significant impact, due to particular requirements to upgrade and test its data management system. The estimated lead time for this work is 12 - 18 months, at an estimated cost of £60,000.

LDSO and Supplier

The main impact of P224 implementation would generally be on LDSOs; however, the impacts are not obligatory. The changes identified by LDSOs are not directly necessary for implementation of P224 under

¹¹ An explanation of the cost terms used in this section can be found on the BSC Website at the following link:

http://www.elexon.co.uk/documents/Change_and_Implementation/Modifications_Process_-_Related_Documents/Clarification_of_Costs_in_Modification_Procedure_Reports.pdf

¹² Note that these are the maximum costs associated with implementation of P224 in a scheduled BSC Release; costs associated with project management etc may be reduced if other changes which impact the same areas are implemented in the same Release.

¹³ This cost is for changes to Party Agent systems which are mandatory for P224 implementation; costs for changes by LDSOs and Suppliers which are anticipated but not mandatory under the BSC are not included.

the BSC, and the P224 solution cannot mandate that LDSOs make changes to their billing systems etc, as this area is outside the scope of the BSC.

Some LDSOs reported no impact at all because they do not specifically charge for Reactive Power at present. Impacted LDSOs identified that changes would be needed to their DUoS billing systems, with implementation lead times of 6 - 9 months and associated costs ranging from £20,000 – 100,000 per LDSO.

Some Suppliers identified possible impacts to their billing systems and processes. One identified a 9 month lead time for implementation with costs of £50,000.

The impacts are considered non-mandatory for implementation of P224. These identified impacts might potentially be neglected in assessing the impact of P224 and planning its implementation.

The Group's view was that LDSO impacts would be directly relevant only if they concerned activities directly necessary for the implementation of P224, such as the ability to receive an impacted data flow or training staff in a revised registration process.

Note that the 'non-mandatory' impacts identified *are included* in the P224 cost benefit assessment. Though these changes are not directly required for implementation of the P224 solution from a BSC perspective, they are necessary for full realisation of the anticipated P224 benefits. The total cost identified by LDSOs and Suppliers for non-mandatory P224 related changes is £270,000.

Further details of the impact on Parties and Party Agents can be found in Appendix 4.

c) Transmission Company Impact

The Transmission Company identified no anticipated impact or issues as a result of P224.

The Transmission Company analysis noted a potential CUSC Amendment Proposal may amend the arrangements in the MSA for the provision of reactive power from embedded generation. Though it is not yet clear whether this proposal and related work will impact on or interact with P224, at present it is considered unlikely. The full Transmission Company Analysis and Impact Assessment can be found in Appendix 4.

The Transmission Company Impact Assessment was updated following identification by the Group of a benefit of P224 against Applicable BSC Objective (b), as discussed in Section 3.9; this additional update is also in Appendix 4.

d) BSCCo Impact

ELEXON would implement P224 as part of a BSC Release. ELEXON would make the changes to the Code, metering CoPs and BSCPs needed to effect the P224 solution.

ELEXON would also provide support and guidance to Parties implementing P224 in their systems and processes, and would provide support regarding any audit changes due to the revised requirements.

ELEXON's operational working procedures would also need to be updated to reflect the revised requirements; monitoring of submission of MTDs may potentially be undertaken.

The activities directly required for implementation of P224 by ELEXON (i.e. amendment of documentation and internal procedures) can be completed within around a month, at a cost of approximately £6,600. The support activities will continue over the period of P224 implementation by Parties, and any monitoring and operational changes will be ongoing; all these costs would be absorbed into ELEXON's operating costs.

See Appendix 4 for a detailed list of BSCCo impacts.

3.10.3 Views of Respondents to Assessment Procedure Consultation

All the respondents to the P224 consultation indicated that a November 2009 Implementation Date would allow sufficient time for implementation of P224. A slight majority indicated that a June 2009 date would be achievable and would be preferable, but this was predicated on LDSO impacts not being included in P224 implementation due to being not directly necessary for implementation under the BSC.

3.10.4 Modification Group's Conclusions

The Group concluded that a coordinated implementation of P224 by all impacted Parties, including the material but indirect impact on LDSOs, would be beneficial for all the market participants affected by P224.

The Modification Group therefore agreed the following recommended implementation approach for P224:

- An Implementation Date for the Proposed Modification of 5 November 2009; and
- A fall back Implementation Date for the Proposed Modification of 25 February 2010

3.11 Legal Text

The Group discussed the legal text required to implement the P224 via the Code, and concluded that Code changes should be kept to a minimum. The detail of the P224 solution requirements, such as metering requirements, will be set out in metering CoPs and BSCPs. The Group concluded that the Code should be amended to include the definitions necessary for P224, the basic principles of the P224 solution and to specify the circumstances in which different arrangements with regard to Reactive Power would apply.

The Modification Group has reviewed by correspondence the draft legal text, and has agreed that it delivers the P224 solution developed by the Group.

Plain-English explanation of draft P224 legal text:

- K1.1.4 - the terms Import and Export are retained, but new paragraph (f) specifies that these terms include Active Export and Active Export Related Reactive Energy and Active Import and Active Import Related Reactive Energy.
- New paragraph K1.2.6 - specifies that Active Export Related Reactive Energy and Active Import Related Reactive Energy should be measured separately - this is what means that the P224 solution, as detailed in the CoPs, must be used.
- New paragraph K1.2.7 - specifies where the Active Export Related Reactive Energy and Active Import Related Reactive Energy do not need to be measured separately, and why - i.e. cases where the P224 solution does not need to be used. These are:
 - (a) All NHH sites;
 - (b) All CVA-only sites;
 - (c) Non-mandatory HH sites where the relevant CoP specifies a different approach in relation to Reactive Energy; and
 - (d) Sites where the version of the relevant CoP (or Metering Dispensation) pre-dates the implementation of P224.

This means the P224 solution is applied to all HH Settled sites (even if they have elected to Settle on a HH basis) that are registered wholly or partly in SVA, unless they are subject to specific alternative arrangements under (c) or pre-date P224 implementation.

- L1.1 - makes the requirement more specific and directs to the requirements in K1.2.6.

- X-1 - introduces the terms Active Export, Active Import, Active Export Related Reactive Energy and Active Import Related Reactive Energy, and expands the definition of Reactive Energy to specify that it comprises Active Export Related Reactive Energy and Active Import Related Reactive Energy.

A copy of the draft legal text can be found in Appendix 1.

4 ASSESSMENT OF MODIFICATION AGAINST APPLICABLE BSC OBJECTIVES

This section outlines the views of consultation respondents and the Modification Group regarding the merits of P224 against the Applicable BSC Objectives.

4.1 Proposed Modification

4.1.1 Modification Group's Initial Discussions

This section outlines the initial views of the Modification Group regarding the merits of P224 against the Applicable BSC Objectives.

The initial **UNANIMOUS** view of the Modification Group was that the Proposed Modification **WOULD** better facilitate the achievement of Applicable BSC Objectives (b) and (c) when compared to the current Code baseline, for the following reasons:

Applicable BSC Objective (b)

- Levying accurate and correctly targeted charges relating to Reactive Power tends to have a positive impact on the operation of the Transmission System, as appropriate cost signals are sent to Parties which encourages them to consider the most economic manner of operation;
- If it is in Parties' economic interest to reduce the amount of Reactive Power they cause, this will tend to reduce the amount of Reactive Power on the Transmission System, which will reduce the actions National Grid is required to take to compensate for Reactive Power.

Applicable BSC Objective (c)

- Reactive Power would be allocated more appropriately and accurately to the Party actually responsible for them (or the MSID they should logically be assigned to), and therefore DUoS charges relating to Reactive Power will be more accurate and targeted correctly;
- More accurate DUoS charges relating to Reactive Power, and more correct targeting of charges to Parties actually responsible for Reactive Power flows, will facilitate competition;
- More appropriate allocation and metering of Reactive Power would facilitate potential creation of a competitive market in trading Reactive Power volumes;
- More appropriate allocation and metering of Reactive Power would facilitate a market for ancillary services for Exemptable Generating Plant, removing a potential barrier to the creation of new plant if Suppliers were reluctant to provide services due to inflated DUoS bills caused by inappropriate allocation of Reactive Power;
- The additional, more accurate data available would allow LDSOs not currently charging for Reactive Power to do so, and would facilitate competition in Distribution System operation to the benefit of Generators and Suppliers, thereby promoting competition among these participants and encouraging entry into the market; and
- Facilitate competition between Import Suppliers to Exemptable Generating Plant, as currently these plant are potentially restricted in their ability to switch Import Supplier due to reluctance by Suppliers to risk exposure to inflated DUoS bills.

The Group agreed that the Proposed Modification would have a neutral impact on Applicable BSC Objectives (a) and (d).

4.1.2 Views of Respondents to Assessment Procedure Consultation

The **UNANIMOUS** view of respondents to the Assessment Procedure consultation was that the Proposed Modification **WOULD** better facilitate the achievement of **Applicable BSC Objectives**. Not all respondents identified benefits against specific Objectives, but of those that did specify particular Objectives:

- All stated that **Objective (c)** would be better facilitated for the reasons given by the Group;
- The majority stated that **Objective (b)** would be better facilitated for the reasons given by the Group; and
- One stated that **Objective (d)** would be better facilitated due to the avoidance of the need for workarounds by LDSOs and Suppliers and the reduction of the administrative burden.

4.1.3 Modification Group's Assessment

The **UNANIMOUS** view of the Modification Group was that the Proposed Modification **WOULD** better facilitate the achievement of **Applicable BSC Objectives (b) and (c)** when compared to the current Code baseline, for the following reasons:

Applicable BSC Objective (b)

- For the same reasons set out in its initial discussions; and
- There would be a positive environmental impact due to:
 - Transmission of Reactive Power would be reduced, causing a reduction in transmission losses;
 - Transmission of Reactive Power would be reduced, allowing the deferral of activities to increase transmission capacity and/or Reactive Power compensation which would otherwise need to be undertaken sooner; and
 - A potential ancillary market in Reactive Power would be facilitated, which could provide another option for the management of Reactive Power by enabling employment of participants to produce or absorb Reactive Power as necessary, instead of utilising conventional means of mitigating the effect of Reactive Power (i.e. increased transmission capacity and/or Reactive Power compensation) whose construction would have a negative environmental impact.

Applicable BSC Objective (c)

- For the same reasons set out in its initial discussions.

The Group noted that the primary benefits of the Proposed Modification are against Objective (c), the anticipated improvement of facilitation of Objective (b) being less substantial and less quantifiable.

The Group agreed that the Proposed Modification would have a neutral impact on Applicable BSC Objectives (a) and (d). However, one Group member noted that while the impact of P224 on Objective (d) is neutral because there is no impact on efficiency in relation to the Balancing and Settlement arrangements, the member believed that there would be an efficiency benefit for the UK electricity market arrangements as a whole.

4.2 Final Recommendation to the Panel

On the basis of the above assessment, the Modification Group therefore agreed a **UNANIMOUS** recommendation to the Panel that the Proposed Modification **SHOULD** be made.

Details of the Group's recommended Implementation Date and legal text can be found in Section 3.

5 TERMS USED IN THIS DOCUMENT

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

| Acronym/Term | Definition |
|--|---|
| CDCA | Central Data Collection Agent |
| CVA | Central Volume Allocation |
| DUoS | Distribution Use of System |
| Exemptable Generating Plant | Generating plant that are exempt from the requirement to hold an electricity licence to operate because their export capability is below a threshold (100MW in England and Wales) |
| LDSO | Licensed Distribution System Operators |
| LEG | Licence Exempt Generator |
| MPAN | Metering Point Administration Number - a unique number relating to a Metering Point under the MRA (SVA equivalent of MSID) |
| MSID | Metering System Identifier – used for CVA Metering System (CVA equivalent of MPAN) |
| SVA | Supplier Volume Allocation |
| kVAr | Kilo Volt Amp Reactive – unit of Reactive Power |
| kVArh | Kilo Volt Amp Reactive hour – unit used for Reactive Power charging |
| Reactive Power Charges | LDSO charge for Party operation (i.e. Supply or Generation) that results in associated Reactive Power in excess of an agreed value (billed in units of kVArh) |
| Supply Capacity Charges (or Demand Capacity Charges) | LDSO charge for Party operation (i.e. Supply or Generation) that results in the Party exceeding their maximum capacity for power distribution (billed in units of kVA) (NB - Reactive Power occupies distribution capacity (in the same way as Active Power) so contributes to a Party potentially exceeding agreed capacity) |
| MRA | Master Registration Agreement |

6 DOCUMENT CONTROL

6.1 Authorities

| Version | Date | Author | Reviewer | Reason for Review |
|---------|----------|-----------------|-------------|-------------------------------|
| 0.1 | 25/07/08 | Dean Riddell | David Jones | For peer review |
| 0.2 | 25/07/08 | Dean Riddell | P224 Group | For Modification Group review |
| 0.3 | 05/08/08 | Dean Riddell | John Lucas | For technical review |
| 0.4 | 05/08/08 | Dean Riddell | David Jones | For quality review |
| 1.0 | 08/08/08 | Change Delivery | | For Panel decision |

6.2 References

| Ref. | Document Title | Owner | Issue Date |
|------|---|----------|--------------|
| 1 | Business Council for Sustainable Energy UK document | UKBCSE | May 2008 |
| 2 | REA/BERR Future Energy System slides | REA/BERR | 19 June 2008 |
| 3 | Energy Networks Association spreadsheet showing DUoS tariffs at April 2008 (GB DNO DUoS and G-DUoS Final tariff tables April 2008.xls). | ENA | April 2008 |
| 4 | Ofgem Open Letter regarding zonal transmission losses Modification Proposals | Ofgem | 17 July 2008 |

APPENDIX 1: DRAFT LEGAL TEXT

Draft legal text for the Proposed Modification is attached as a separate document, Attachment 1.

See Section 3.10 for a 'plain-English' description of the draft legal text.

APPENDIX 2: PROCESS FOLLOWED

Copies of all documents referred to in the table below can be found on the BSC Website at: <http://www.elexon.co.uk/changeimplementation/ModificationProcess/ModificationDocumentation/modProposalView.aspx?propID=248>.

| Date | Event |
|----------|---|
| 28/04/08 | Modification Proposal raised by E.ON UK plc |
| 08/05/08 | IWA presented to the Panel |
| 20/05/08 | First Assessment Procedure Modification Group meeting held |
| 28/05/08 | Second Assessment Procedure Modification Group meeting held |
| 06/06/08 | Requirements Specification issued for BSC Agent impact assessment |
| 06/06/08 | Request for Party/Party Agent impact assessments request issued |
| 06/06/08 | Request for Transmission Company analysis issued |
| 06/06/08 | Request for BSCCo impact assessment issued |
| 10/06/08 | BSC Agent impact assessment response returned |
| 18/06/08 | Party/Party Agent impact assessment responses returned |
| 18/06/08 | Transmission Company analysis returned |
| 18/06/08 | BSCCo impact assessment returned |
| 23/06/08 | Third Assessment Procedure Modification Group meeting held |
| 03/07/08 | Assessment Procedure consultation issued |
| 17/07/08 | Assessment Procedure consultation responses returned |
| 21/07/08 | Fourth Assessment Procedure Modification Group meeting held |
| 14/08/08 | Assessment Report presented to the Panel |

ESTIMATED COSTS OF PROGRESSING MODIFICATION PROPOSAL ¹⁴

| | |
|-------------------------------|------------------------|
| Meeting Cost | £2,000 |
| Legal/Expert Cost | £0 |
| Impact Assessment Cost | £5,000 |
| ELEXON Resource | 68 man days £14,405 |

These estimated costs have not changed from those provided in the IWA.

MODIFICATION GROUP MEMBERSHIP

| Member | Organisation | 20/05/08 | 28/05/08 | 23/06/08 | 21/07/08 |
|-----------------|-------------------------------------|-----------------|-----------------|-----------------|------------|
| David Jones | ELEXON (Chairman) | Y | Y | Y | Y |
| Dean Riddell | ELEXON (Lead Analyst) | Y | Y | Y | Y |
| Glenn Sheern | E.ON UK (Proposer's Representative) | Y | Y | Y | Y |
| William Hung | National Grid | N | N | N | N |
| Andrew Neves | Central Networks | Y | Y | Y | Tel (part) |
| Jonathan Purdy | EDF energy | Y | Tel (part) | Tel (part) | Y |
| Derek Lowe | Scottish and Southern | Y | Y | N | Y |
| Maurice Smith | Campbell Carr | N | N | N | N |
| Simon Brooke | Electricity North West | Y | Tel | Tel | Tel |
| Janice Thompson | Scottish Power | Y | N | Y | Y |
| Mike Smith | Western Power Distribution | Y | Y | Y | Y (part) |
| Howard Gregory | npower | Y ¹⁵ | Y ¹⁵ | Y ¹⁵ | Y |

| Attendee | Organisation | 20/05/08 | 28/05/08 | 23/06/08 | 21/07/08 |
|-------------|---------------------------|----------|----------|----------|----------|
| David Ahmad | ELEXON (Lawyer) | N | N | N | N |
| John Lucas | ELEXON (Design Authority) | Y | Y | Y | Y |
| Mike Smith | ELEXON (Metering) | N | N | N | Y (part) |

¹⁴ Clarification of the meanings of the cost terms in this appendix can be found on the BSC Website at the following link:

http://www.elexon.co.uk/documents/Change_and_Implementation/Modifications_Process_-_Related_Documents/Clarification_of_Costs_in_Modification_Procedure_Reports.pdf

¹⁵ As Attendee

| Attendee | Organisation | 20/05/08 | 28/05/08 | 23/06/08 | 21/07/08 |
|----------------------|--------------|----------|------------|----------|----------|
| Abid Sheikh | Ofgem | - | - | Y | Y |
| Nicholas Rubin | Ofgem | N | N | N | N |
| Gareth Evans | Ofgem | - | - | N | N |
| Neil McKeown | Electralink | Y | N | Y | N |
| Ceri Hughes | Centrica | - | Tel (part) | N | N |
| Matthew Hays-Stimson | EDF energy | - | - | - | Y |

MODIFICATION GROUP TERMS OF REFERENCE

Terms of Reference (Version 2.0)

Appendix for Modification Proposal P224

Modification Proposal P224 will be considered by the P224 Modification Group, formed from the Settlement Standing Modification Group, Volume Allocation Standing Modification Group and members with Distribution and exemptable generating experience, in accordance with the SSMG and VASMG Terms of Reference and the Appendix attached.

P224 – Reactive Power Flows Associated with Exemptable Generating Plant

Assessment Procedure

The Modification Group will carry out an Assessment Procedure in respect of Modification Proposal P224 pursuant to section F2.6 of the Balancing and Settlement Code.

The Modification Group will produce an Assessment Report for consideration at the BSC Panel Meeting on 14 August 2008.

The Modification Group shall consider and/or include in the Assessment Report as appropriate:

- Development and confirmation of the P224 solution;
- Implications for Licence Exempt Generators (and Parties associated with them), Generators, Suppliers, Licensed Distribution System Operators and Reactive Power charging;
- System impact (including implications for metering and data flows) for participants, Party Agents and BSC Agents;
- Impacts on any other codes or documentation (e.g. BSCPs, CoPs);
- Impact on CVA metering arrangements;
- Implications of the proposed 100kW materiality threshold, and how this would be implemented;
- Benefits of P224 and quantification of benefits/disadvantages against the Applicable BSC Objectives;
- Provision of evidence and/or analysis relating to the defect, including:
 - Examples of where the issue has arisen;
 - Confirmation of how the BSC definition of a traded site impacts or gives rise to the defect, and consideration of whether there would be a defect if the generator and the site load were separately metered; and

- A description of the physical layout of sites that are affected and an explanation of why wind farms are so affected;
- Quantification of the cost-benefit of P224 (note that analysis is dependent upon provision of data by industry in the form of DUoS billing information, or a similar data source, as the benefits are likely to be in this area);
- Any alternative solutions;
- Determination of the means of allocating responsibility for Reactive Power, including any limits in terms of:
 - Accuracy of allocation in practice;
 - Technical or theoretical constraints, such as the allocation of Reactive Power in the absence of any associated Active Power.
- Validation of the underlying assumption of the P224 'straw man' solution, that an allocation of responsibility based on associating Reactive Power with Active Power is more appropriate than the current arrangements; and
- Comparison of the cost-benefit associated with implementation of any different solutions available, including:
 - The proposed P224 'straw man' solution, i.e. change to the BSC with consequential changes to central metering and reporting, allowing revision of DUoS billing methodologies to make use of a new allocation of Reactive Power volumes and improved metered volume data;
 - Revision of DUoS charging methodologies, possibly with greater reliance on estimation than the straw man solution, and potential for bilateral contracting between affected Suppliers and operators of Exemptable Generating Plant to ensure provision of data and appropriate charging in relation to Reactive Power;
 - Any benefits or cost savings currently arising from the presence of Reactive Power.

APPENDIX 3: RESULTS OF ASSESSMENT PROCEDURE CONSULTATION

13 responses (representing 40 Parties and 6 non-Parties¹⁶) were received to the P224 Assessment Procedure consultation.

A summary of the consultation responses is provided in the table below (bracketed numbers represent the number of Parties and non-Parties represented by respondents).

¹⁶ One of the non-Parties was the REA, whose response was representative of the interests of a large number of embedded generators, which form a substantial part of the 530 REA members.

| Q | Consultation question | Yes | No | Neutral |
|----|---|-----|----|---------|
| 1. | Do you believe Proposed Modification P224 would better facilitate the achievement of the Applicable BSC Objectives? | 13 | 0 | 0 |
| 2. | Do you believe there are any alternative solutions that the Modification Group has not identified and that should be considered? | 1 | 12 | 0 |
| 3. | Given that P224 will impact Reactive Power allocation for Parties associated with shared Import/Export sites, do you believe the P224 solution will deliver appropriate Reactive Power-related charging (i.e. DUoS charges for excess Reactive Power and exceeding agreed Maximum Capacity)? (Views particularly sought from Suppliers and License Exempt Generators) | 12 | 0 | 1 |
| 4. | Do you agree with the inclusion in the P224 solution of exemption criteria (limited by maximum materiality thresholds) to provide for potential new technologies and future developments (e.g. in support of small scale shared Import/Export)? | 11 | 1 | 1 |
| 5. | Do you agree with the provisional recommended Implementation Date for P224 of November 2009? | 11 | 1 | 1 |
| 6. | The Group considered that because LDSOs are not <u>obliged</u> to revise their processes/systems under P224, P224 implementation should exclude LDSO impacts; this may permit an implementation lead time of less than 9 months, i.e. implementation in the June 2009 Release may be achievable - do you agree that a June 2009 Implementation Date would be appropriate? | 7 | 5 | 1 |
| 7. | Are there any further comments on P224 that you wish to make? | 3 | 10 | 0 |

Details of the arguments made by respondents can be found in Sections 3 and 4, along with the Modification Group's consideration of these arguments. Full copies of the consultation responses are attached as a separate document, Attachment 4.

APPENDIX 4: RESULTS OF IMPACT ASSESSMENT

During the Assessment Procedure an impact assessment was undertaken in respect of all BSC systems, processes, documentation and parties. The following have been identified as impacted by P224.

For details of the costs associated with these impacts, please refer to Section 3.

a) Impact on BSC Systems and Processes

| System / Process | Impact of Proposed Modification |
|------------------|--|
| CDCA | Service provider impact assessment confirms no impact on CDCA: the CDCA system must be able to accommodate the Meter Register configuration necessary for the P224 Proposed solution; the current |

| System / Process | Impact of Proposed Modification |
|------------------|---------------------------------|
| | CDCA system is able to do this. |

A copy of the full BSC Agent impact assessment is attached as a separate document, Attachment 5.

b) Impact on BSC Agent Contractual Arrangements

| BSC Agent Contract | Impact of Proposed Modification |
|--|---|
| LogicaCMG (CDCA) | Potential impact of P224 solution requirements assessed - service provider impact assessment confirms no impact on CDCA. |
| PwC (BSC Auditor, Certification Agent) | Potential audit requirement due to system changes. |

c) Impact on BSC Parties and Party Agents

13 responses were received to the P224 Party and Party Agent Impact Assessment. These included six responses from Parties which operate as LDSOs, five that are Suppliers and eight whose activities include a HHDC and/or MOA role.

HHDC and MOA

Respondents with HHDC and MOA functions identified impacts due to process and system changes that would be required, documentation and training in relation to new procedures and sourcing meters compliant with the P224 provisions. Costs associated with these activities were generally low, estimated at £5,000, with timescales ranging from 2 – 6 months. However, one HHDC identified greater impact due to requirements to upgrade and test its data management system if the P224 solution is introduced, with an estimated cost of £60,000 and a timescale of 12 - 18 months.

The total cost identified by the P224 IA respondents for these HHDC and MOA impacts is £65,000.

LDSO and Supplier

LDSOs generally identified the greatest impact, though some reported no impact because they do not currently bill in relation to Reactive Power specifically. Impacted LDSOs identified that changes would be needed to their DUoS billing systems, with associated costs ranging from £20 – 100,000 per LDSO and implementation timescales of 6 - 9 months. Some Suppliers also identified possible impacts to their billing systems and processes; one respondent identified costs of £50,000 and a 9 month timescale for implementation.

However, the P224 Group considered that though changes to LDSO DUoS billing systems are anticipated as a result of the P224 Proposed solution, they are not directly necessary for its implementation. This argument was also applicable to Supplier billing system changes which would be made if P224 were to be approved. The Group therefore believed that these identified impacts should not be taken into account when planning the P224 implementation. LDSO and Supplier impacts would be relevant only if they concerned activities directly necessary for the implementation of P224, such as the ability to receive an impacted data flow or training staff in a revised registration process.

Though it is anticipated (and some LDSOs have stated as much) that LDSOs will change (or introduce) Reactive Power billing procedures, processes and systems, approval of P224 cannot mandate that such changes be made. By the same rationale, though LDSOs and Suppliers reaction to approval of P224 should logically be to amend their billing systems to align with the new allocation method and to utilise new information that is available, these activities would not be directly relevant to implementation of P224 from a BSC perspective.

The impacts, and associated cost and lead times, identified are included in the assessment of the cost benefit of P224. This is because though these changes are not directly required for implementation of the P224 solution from a BSC perspective, they are necessary for full realisation of the anticipated P224 benefits. The total cost identified by the P224 IA respondents for these 'optional' changes is £270,000.

Full copies of the Party and Party Agent impact assessment responses are attached as a separate document, Attachment 6.

d) Impact on Transmission Company

P224 TRANSMISSION COMPANY ANALYSIS AND IMPACT ASSESSMENT

| Q | Question | Response |
|---|---|--|
| 1 | Please outline any impact of the Proposed Modification on the ability of the Transmission Company to discharge its obligations efficiently under the Transmission Licence and on its ability to operate an efficient, economical and co-ordinated transmission system. | None expected. |
| 2 | Please outline the views and rationale of the Transmission Company as to whether the Proposed Modification would better facilitate achievement of the Applicable BSC Objectives. | The Transmission Company believes that P224 would better facilitate the achievement of Applicable BSC Objectives c) and d) in particular by introducing more consistent accounting for reactive power absorbed by Distribution Networks and more consistent charging arrangements. |
| 3 | Please outline the impact of the Proposed Modification on the computer systems and processes of the Transmission Company, including details of any changes to such systems and processes that would be required as a result of the implementation of the Proposed Modification. | None expected. |
| 4 | Please outline any potential issues relating to the security of supply arising from the Proposed Modification. | None expected. |
| 5 | Please provide an estimate of the development, capital and operating costs (broken down in reasonable detail) which the Transmission Company anticipates that it would incur in, and as a result of, implementing the Proposed Modification. | None anticipated. |
| 6 | Please provide details of any consequential changes to Core Industry Documents and/or the System Operator Transmission Owner Code that would be required as a result of the implementation of the Proposed Modification. | None expected. |
| 7 | Please provide details of any impact on or interaction with any other Transmission Company related work, e.g. CUSC Amendment Proposal to Accommodate Reactive Power from Wind Farms. | A CUSC Amendment Proposal is expected to be put before the CUSC Panel this month amending the arrangements in the MSA for the provision of reactive power from embedded generation. The Grid Code Review Panel has agreed that a working group should begin examining in due course (probably Autumn 2008) the technical capability of |

| | | |
|---|--|---|
| | | new technologies to provide reactive power which will include renewable sources. It is not clear yet whether the CUSC Amendment Proposal and the work of the Grid Code Working Group will impact on or interact with P224 but at present this is considered unlikely. |
| 8 | Any other comments on the Proposed Modification. | No. |

ADDITIONAL RESPONSE TO BSC MODIFICATION P224 TRANSMISSION IMPACT ASSESSMENT

This is an addition to the Transmission Operator Impact Assessment submitted in Response to the Proposal of BSC modification P224, specifically in relation to objective B, the efficient, economic and co-ordinated operation of the GB Transmission System

In assessing the impact that P224 has on BSC objective B it is initially important to understand the impact this modification will have on the behaviour of economically rational industry participants.

The consultation report indicates that, In distribution networks where an explicit reactive charge is levied, the proportion of such charges currently being born by the relevant embedded generation is not proportional to the level of reactive power such generation causes to be required.

In these distribution networks, this modification will more accurately reflect the reactive costs incurred onto to the parties responsible. This will enable such parties to make more informed, efficient decisions regarding whether to install reactive equipment or to continue to implicitly procure that reactive requirement through the charges levied by the relevant distribution network operator.

Will this behaviour have an impact on the operation of the transmission system? This is dependent on whether this causes the system operator to procure less reactive power and this in turn will be impacted by a number of factors.

- Does the DNO levy an explicit reactive charge and what are the characteristics of that charge?
- Will the cost of installing reactive capability be a cost benefit in comparison to the charges levied by the DNO?
- In the event that an embedded generator installs reactive capability will it be displacing the need to run reactive assets on the distribution network or the national transmission system?

After further consideration the system operator is of the view that this modification has the ability to better facilitate BSC objective B by reducing the need for reactive power to be procured on assets connected to the transmission system. However it is not clear whether such a reduction would be material.

However as stated in our previous response we believe the material benefit of this modification is that it better facilitates BSC objective 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.

e) Impact on BSCCo

| Area of Business | Impact of Proposed Modification |
|-----------------------|---|
| Corporate Services | Implementation support, varying according to whether Consumption Component Classes in Settlement systems are affected. |
| Legal | Advising Modification Group and drafting legal text. |
| Change Implementation | <p>P224 implementation, including changes required to Code Subsidiary Documents that are impacted. Impacted Code Subsidiary Documents are detailed below; other Configurable Items which reference "Import Energy" or "Export Energy" (e.g. BSCP550) may require amendment.</p> <p>Management of implementation as part of a Release.</p> <p>Further impacts may be identified following any further development of the solution.</p> |
| Stakeholder Assurance | <p>Support and update the BSC Auditor, Qualification and TAA (PwC & C&C Group) of changes to audit, and audit against revised CoPs.</p> <p>Potential monitoring of correct submission of MTDs.</p> <p>Review of the redline changes and amendments to the Code and Code Subsidiary documents.</p> |
| Service Delivery | <p>Review of changes to BSCP20.</p> <p>Change to internal working procedures and documentation regarding CVA Metering Systems.</p> |

f) Impact on Code

| Code Section | Impact of Proposed Modification |
|--------------|---|
| K | <p>Amendment and introduction of terminology and change to obligations.</p> <p>Introduction of definitions of Active Export, Active Export Related Reactive Energy, Active Import and Active Import Related Reactive Energy.</p> <p>Introduction of a requirement that Active Export Related Reactive Energy and Active Import Related Reactive Energy should be measured separately (i.e. the P224 solution) and exceptions to this requirement.</p> |
| L | Amendment to makes the Reactive Energy requirements for Metering Equipment more specific by referencing to new requirements in Section K. |
| X-1 | Introduction of the new terms Active Export, Active Import, Active Export Related Reactive Energy and Active Import Related Reactive Energy, and expansion of the definition of Reactive Energy. |

A copy of the draft legal text to give effect to these changes can be found in Appendix 1.

g) Impact on Code Subsidiary Documents

| Document | Impact of Proposed Modification |
|---|---|
| BSCP20 'Registration of Metering Systems for Central Volume Allocation' | Registration of metering systems will be affected by the proposed new rules for allocation of Reactive Power. |

| Document | Impact of Proposed Modification |
|---|---|
| BSCP514 'SVA Meter Operations for Metering Systems Registered in SMRS' | Possible amendment to describe how to configure the D0268 appropriately. |
| BSCP502 'Half Hourly Data Collection for SVA Metering Systems Registered in SMRS' | Amendment to document the impact on HHDCs; to oblige HHDCs to send relevant data to the Supplier or the Party associated with Exemptable Generating Plant, as appropriate; and to update the terminology used. |
| BSCP601 'Metering Protocol Approval and Compliance Testing' | Changes to detail new requirements for Meter capabilities. |
| BSCP509 Appendix: MDD Entity Change Request Forms | MDD Entity Id 47 'Measurement Quantity' refers to 'Active Import' and 'Active Export', and may require amendment to refer also to 'Reactive Import' and 'Reactive Export'. Such references should align with the BSC terminology. |
| CoP1 'The Metering of Circuits with a Rated Capacity Exceeding 100MVA for Settlement Purposes' | Amendment to specify how Reactive Energy Measured Quantities and associated Demand Values shall be constructed, and to specify where Reactive Energy and Demand Values need not be separately measured. ¹⁷ |
| CoP2 'The Metering of Circuits with a Rated Capacity not exceeding 100 MVA for Settlement Purposes' | As for CoP1, above. ¹⁷ |
| CoP3 'The Metering of Circuits with a Rated Capacity not exceeding 10 MVA for Settlement Purposes' | As for CoP1, above. ¹⁷ |
| CoP5 'The Metering of Energy Transfers with Max Demand of up to (and including) 1MW for Settlement Purposes' | As for CoP1, above; additionally amend CoP5 to mandate Reactive Power Demand Values (aligning it with CoPs 1, 2 and 3). ¹⁷ |
| CoP6 'Code of Practice for the Metering of Energy Imports via Low Voltage Circuits Fused at 100 Amps or Less Per Phase for Settlement Purposes' | No direct impact for P224 implementation, but P224 would rule out the use of CoP6 Meters for Half Hourly Settlement (no alternative CoP6 provisions for Reactive Energy are recommended for P224 implementation). ¹⁷ |
| CoP7 'Code of Practice for the Metering of Energy Imports via Low Voltage Circuits Fused at 100 Amps or Less Per Phase for Settlement Purposes' | No direct impact for P224 implementation, but P224 would have a similar impact on the use of CoP6 Meters for Half Hourly Settlement as that under CoP6 (no alternative CoP6 provisions for Reactive Energy are recommended for P224 implementation) ¹⁷ |
| CoP10 'Code of Practice for Whole Current Metering of Energy via Low Voltage Circuits for Settlement Purposes' | <p>Draft CoP10 document is being considered as part of DCP0033 'Facilitating smart metering in the Half Hourly (HH) market' (see the DCP0033 ELEXON webpage).</p> <p>As part of P224 implementation CoP10 will be amended to specify alternative provisions for Reactive Energy to the extent permitted under the P224 solution.¹⁷</p> |

¹⁷ See Attachment 7 'Impact of P224 on Metering CSDs' for further details.

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

No impact.

i) Impact on Other Configurable Items

No impact.

j) Impact on BSCCo Memorandum and Articles of Association

No impact.

k) Impact on Governance and Regulatory Framework

No impact.