Balancing Mechanism Reporting Agent

User Requirements Specification

Synopsis	This document describes the user requirements for the Balancing Mechanism Reporting Agent (BMRA) system.
Version	17.~~0~~2
Effective date	~~29 November 2012~~16 December 2014

Table of Contents

Amendment History

Date	Version	Description of Change	Mods/ Panel/ Committee Refs
24/06/2010	16.0	Document rebadged and amended for November 2010 Release (P243, CP1333)	Change Implementation
29/11/2012	17.0	P278 for the November 2012 Release	ISG138/10
16/12/2014	17.1	P291, P295 for the December 2014 Release	
16/12/2014	17.2	Updated following industry review	

1. Introduction

This document is the User Requirements Specification (URS) for the Balancing Mechanism Reporting Agent (BMRA) role within the Balancing and Settlement Code Services. It is one of a set of documents forming the baseline for requirements of the seven BSC central services. This document set comprises:

- BMRA URS;

- CRA URS;

- SAA URS;

- ECVAA URS;

- CDCA URS;

- FAA URS

- SVAA URS

- Interface Specifications.

The objective of this document is to provide a complete specification of the requirements that the BMRA service must meet, from the users' point of view. For this purpose, the "users" include Ofgem, National Grid as the balancing mechanism operator, BSCCo Ltd (as the client), other Service Providers, BSC Parties, and the BMRA Service Provider's own operators.

This User Requirements Specification forms the input to the System Specification for the BMRA Service. The System Specification constitutes the definition of the computer system requirements to be built in support of the BMRA Services.

~~It should be noted that whereas this URS describes the requirements of the BMRA *Service* in isolation, the computer hardware and operating system built to support these requirements will host both the BMRA and ECVAA applications and databases.~~

The BMRA functional requirements include calculations of derived market data that are much in common with those implemented by the SAA. In order to maintain consistency between both systems, and minimise maintenance costs, common source code shall be applied where appropriate in the SAA and BMRA.

1.1 Purpose

The purpose of this document is to provide a complete specification of the set of business requirements that the BMRA Service must satisfy for all of its various User types. Similar documents define the requirements for the other Services.

A convention has therefore been used for uniquely identifying the requirements in each document. This ensures that the fulfilment of each requirement can be unambiguously traced through the subsequent functional specification, design and implementation.

The requirements that have been identified have been divided into four categories:

- Functional (F), a specific business requirement of the service.

- Non-functional (N), which includes auditing, security, resilience etc. The majority of these will probably be associated with the General (GEN) service.

- Service (S), which includes all time-related service delivery requirements, including performance and volumetrics.

- Interface (I), a requirement for data exchange between services or to / from external parties.

These requirements are catalogued in sections 5 to 8 respectively.

1.2 References

The code listed in the final column is used as a cross reference in the detailed requirement specifications listed in section 5.

It should be noted that these references do not form part of the BMRA User Requirements Specification (except for the non-functional requirements that are common to BSC central systems, defined in CRA URS).

Source	Author	Reference
Service Description for Balancing Mechanism Reporting	BSCCo	BMRA SD
Balancing Mechanism Reporting Business Process Models	BSCCo	BMRA BPM
Settlement Administration Business Process Models	BSCCo	SAA BPM
Interface Definition and Design - Parts 1 and 2	BSCCo	INTERFACE
Central Registration Agent User Requirements Specification	BSCCo	CRA URS
BMRA & SAA Interface Specification	National Grid	NGC IS
ETSO Balancing Process Results Management Document Implementation Guide Version1.0 Release 0	ETSOVista	ETSO BPRM

2 Management Summary

The Balancing Mechanism Reporting Agent (BMRA) is one of the suite of seven services to be provided to support the operation of the Balancing and Settlement Code (BSC).

The BMRA role is critical to the successful operation of the BSC, as it facilitates the opening of the wholesale electricity trading market in Great Britain under the NETA arrangements. Its role is to provide near to real-time reporting of all market information disseminated by the System Operator (SO) and submitted to the Balancing Mechanism (BM) from market participants. The principal business processes involved may be summarised as:

- The capture of data from the SO, relating to the operation of the BM in each half hour;

- For each Settlement Period, calculation of preliminary estimates of derived marked data, i.e. system sell and buy prices;

- Distribution of market data to BSC Parties, including near real-time BM and SO data and derived market data for each Settlement Period;

- Displaying real-time market data on dynamically updateable screens.

The purpose of this document is to provide a complete specification of the set of business requirements which the BMRA service must satisfy for all of its various user types. These range from the BSC Parties to BSCCo Ltd and its various agents, including the operators of the BMRA central system and the other BSC services. Similar documents will be produced to define the requirements for the other services. A convention has therefore been used for uniquely identifying the requirements in each document, so as to ensure that the fulfilment of each requirement can be unambiguously traced through the subsequent functional specification, design and implementation. ~~This will be of particular importance for the implementation of the BMRA and ECVAA services, which will use a single integrated computer system. This document does not, however, attempt to describe the integration of those services, which would be inappropriate for this BMRA User Requirement Specification (URS).~~ The requirements which have been identified have been divided into four categories:

- Functional requirements - those requirements relating to a specific business activity, usually requiring some degree of automated support;

- Interface requirements - the requirements for the exchange of data between the BMRA, the other BSC services shown above, and the external participants; (and covered in more detail in the Interface Definition and Design (IDD) documents;

- Non-functional requirements - those requirements relating to such activities as security (both physical and user access related), audit, and system housekeeping (systems backups and archiving etc.). It is anticipated that the majority of these will be common to all of the services to be provided;

- Service requirements - the underlying requirements for implementing and operating the overall BMRA service, including issues such as performance, service availability, etc.

3   Scope of Specification

This document provides a specification of the requirements for the Balancing Mechanism Reporting Agent (BMRA) Service within the NETA programme. The requirements are described from the point of view of the BMRA Service users.

The document is divided into the following chapters.

- Chapter 4, Business and System Overview - describes the business context of the BMRA Service. It includes a definition of the BMRA Service user population.

- Chapter 5, Functional Requirements - describes the functional requirements of the Service from the point of view of the Service users.

- Chapter 6, External Interfaces - lists the interfaces with the external users of the Service.

- Chapter 7, Non-Functional Requirements - describes the non-functional requirements of the Service.

- Chapter 8, Service Requirements - describes the service delivery requirements of the Service, such as performance and volumetrics;

- Chapter 9, User Roles and Activities - describes the roles supporting day to day operation of the Service and external users of the Service, such as other Service Providers and BSCCo Ltd;

- Chapter 10, Future Enhancements - describes potential functional enhancements;

- Appendix A, Glossary - includes a glossary of terms and acronyms;

- Appendix B, Requirements Compliance Matrix - shows the mapping of requirements defined by this document to requirements set out in the BMRA Service Description;

- Appendix C, BMRA external data flow timings - lists the source and timings of all data items published by the BMRA;

- Appendix D, BMRA forecast data time line - shows the time relationship of published forecast data items;

- Appendix E, BMRA settlement period time line - shows the time relationship of published data items relative to a settlement period;

- Appendix F, Logical Data Model;

4 Business and System Overview

This section provides an overview of the Balancing Mechanism Reporting Agent (BMRA) business requirements and is for indicative purposes only. The definitive statement of requirements are given in the following chapters.

4.1 Summary of Business Requirements

The Balancing Mechanism Reporting Agent (BMRA) is responsible for collecting, displaying and providing Balancing Mechanism and other market information near to real-time to market participants and other interested parties, such as energy customers. The information needs to provide the necessary visibility of electricity market and balancing mechanism trading conditions to encourage liquidity in bid-offer submission pre-gate closure, and so has to be published in an intuitive graphical form where appropriate, but within time-scales that allow traders to take action on the basis of what is published.

The BMRA shall provide a continuous service. As information is received from the System Operator it shall be stored and published. If for some reason the data that has been received cannot be processed and stored, then the BMRA will inform either the SO or the CRA of the difficulties encountered. Thus a small degree of automatic validation is included in the service.

To avoid raising unnecessary barriers to market information there will be two levels of service provision:

1. a high grade 24x7 real-time service, providing defined delivery times for high performance market data that is "pushed" onto BMR service user screens. This service shall be provided at cost to the BMR service user, and will require a high performance private WAN and software licences for event driven client software;

2. a low grade service via the public Internet, with consequently no guarantees on access times. This service shall be available to the general public, and require no additional software other than a Java enabled Web browser;

Entire BMRA data will be available to both grades of service users. In order to provide market signals on a timely basis, the BMRA is also required to calculate certain market information in advance of its calculation, some days later, by the Settlement Administration Agent. These calculations are not official and only represent indicative estimates to the market. The information that the BMRA will derive and publish includes the following:

- Period bid and offer acceptance volumes;

- Period BM Unit total accepted bid-and offer volumes;

- Period balancing mechanism bid and offer cashflows;

- System sell price and system buy price;

- Total Bid/Offer Volumes and Total Accepted Bid/Offer Volumes.

The Balancing Mechanism Reporting Agent is required to be available 24 hours a day, 7 days a week with no interruptions for resilience activities such as backup and archiving. The requirement for a continuous IT operation will be met by running two hardware and operating system platforms, each of which runs a duplicate copy of the application and database. These two copies will be mirrored so that no problems of database synchronisation are introduced, and the live application can switch between copies, allowing uninterrupted access to the same data.

4.2 Service Context

The following diagram illustrates the context of the BMRA service within the wider market of the Balancing and Settlement Code. This is a simplified view for clarity; section 6 describes the interfaces from the BMRA service to other parties in detail.
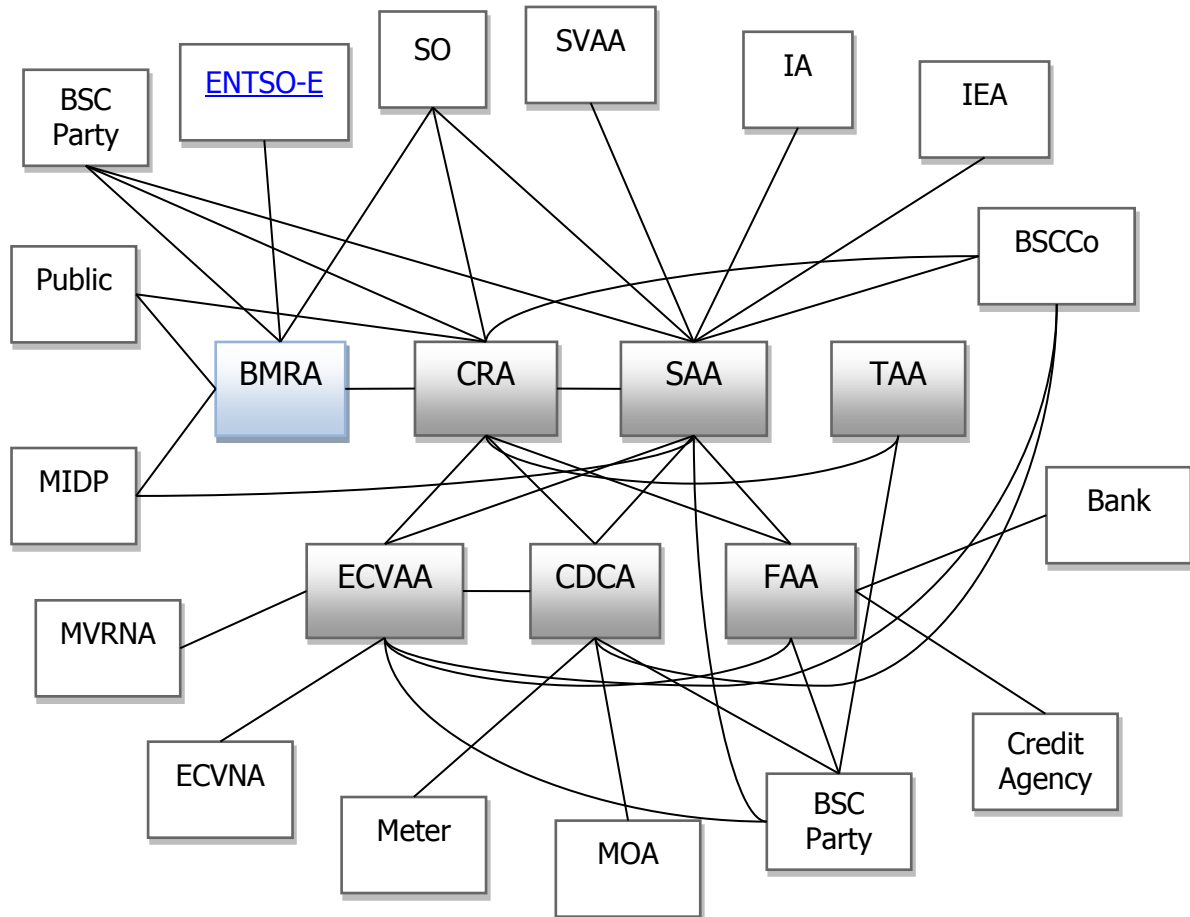
Item	Description
Bank	A bank which receives debit and credit instructions from the Funds Administration Agent.
BMRA	Balancing Mechanism Reporting Agent.
BSC Party	Any user of Balancing and Settlement Code services.
BSCCo Ltd	The Balancing and Settlement Code Company.
CDCA	Central Data Collection Agent.
CRA	Central Registration Agent
Credit Agency	A credit agency which provides credit cover data on Traders.
ECVAA	Energy Contract Volume Aggregation Agent.
ECVNA	Energy Contract Volume Notification Agent.
FAA	Funds Administration Agent.
IA	Interconnector Administrator.
IEA	Interconnector Error Administrator
Meter	A physical meter registered within the Balancing and Settlement Code arrangements.

Item	Description
MOA	Meter Operation Agent.
MVRNA	Meter Volume Reallocation Notification Agent
Public	A member of the general public.
SAA	Settlement Administration Agent.
SO	System Operator
SVAA	Supplier Volume Aggregation Agent, equivalent to the current Initial Settlement and Reconciliation Agent (ISRA).
TAA	Technical Assurance Agent.

4.3   Numbering Scheme for Requirement Definitions

A User Requirements Specification shall be prepared for each of the seven BSC Services of the central BSC systems.

The common services (such as help desk) and common non functional requirements (e.g. general requirements for security, audit trail etc.) shall be defined in the CRA URS.

The present solution for the seven BSC Services is supported across four computer systems, plus a set of manual processes. Each requirement across the set of services is therefore uniquely identified. This allows each individual requirement to be traced from URS to System Specification (i.e. functional specification) and then to Design Specification (technical specification). There will be a separate System Specification (SS) for the BMRA system, which will include functions supporting the requirements derived from this URS.

In keeping with industry good practice, the URS adopts a requirements numbering system that works as follows:

1.   Each requirement is associated with either an individual service, or as common to all services supported by the central systems. If a requirement applies to more than one service, but not all (e.g. two out of six), then the requirement is restated for each, i.e. there will be two separately numbered requirements (which happen to be the same).

Each requirement is therefore prefaced by one of the following codes, as a clear indicator as to which service generates the business need:

- CRA (Central Registration Agent);

- SAA (Settlement Administration Agent);

- CDCA (Central Data Collection Agent);

- ECVAA (Energy Contract Volume Aggregation Agent);

- BMRA (Balancing Mechanism Reporting Agent);

- FAA (Funds Administration Agent);

- GEN (General).

1. Requirements shall be categorised into the following headings:

    - Functional (F), a specific business requirement of the service.

    - Non-functional (N), which includes auditing, security, resilience etc. The majority of these will probably be associated with the General (GEN) service.

    - Service (S), which includes all time-related service delivery requirements, including performance and volumetrics.

    - Interface (I), a requirement for data exchange between services or to external parties.

2. Within a service, each requirement shall have a unique number in the range 001 to 999. Numbers are not unique across services. Leading zeroes are always included.

Combining 1, 2 and 3 thus gives the following format for numbering each requirement (including a separator character):

[Service]-[Category][Number]

For example:

- CRA-F001

- BMRA-S022

- GEN-N112

- SAA-I033

4.4 Attributes of Individual Requirements

For each identified requirement, the following items of information are represented in a tabular format:

Requirement ID: a unique identifier for the requirement, as described above.

Status: while the majority of BMRA requirements are be mandatory for the Go Live date, others may not necessarily be. This field indicates whether the requirement is Mandatory (M) or Optional (O) in this context.

Title: a short descriptive title for the requirement.

BSC reference: a cross reference to the BSC documentation which is the original source of the business need. In most cases this will include a reference to the relevant Service Description and where appropriate, any Change Proposals or Modifications that have affected a particular requirement. Note that there may be detailed requirements identified in the User Requirements Specification which are not individually described in the BSC; in this case this field is used to reference the alternative source of the requirement, for instance a specific workshop with the customer's user community.

Man/auto: this field provides an indication as to whether a given requirement is likely to be satisfied by a manual, as opposed to automated, mechanism. This is not however intended to be prescriptive, and the approach to supporting any individual requirement will be made definitively during the design phase.

Frequency: an indication of how often a business event will take place. Minimum, maximum and average frequencies, and any timing or scheduling requirements, are also identified here, as appropriate.

Volumes: data volumes associated with the requirement are identified here; this may include an estimate of the initial volume, and subsequent growth rates.

The requirement is then described in detail, with any associated specific non-functional and interface requirements separately identified.

We also identify any outstanding issues relating to the requirement definition, as a way of documenting these for resolution in subsequent versions of the User Requirements Specification.

5 Functional Requirements

This section describes the detailed set of business requirements for the Balancing Mechanism Reporting Agent. To ensure traceability through to other deliverable documents such as the System Specification and Design Specification, each requirement is assigned uniquely numbered, based on the convention described in section 4.

5.1 BMRA-F001: Calculate Period Bid and Offer Acceptance Volumes

Requirement ID: BMRA-F001	Status: Mandatory	Title: Calculate Period Bid and Offer Acceptance Volumes	BSC reference: BMRA SD 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.9, BMRA BPM 3.3, CR009.
Man/auto: Automatic	Frequency: Once, for each settlement period.	Volumes: Between 1000 - 5000 BM units. At least 1 FPN data per BM unit. For those BM units that receive bids and offers (estimated 1000), at most 10 Bid-Offer Pairs and 30 Bid-Offer Acceptances per BM unit, per settlement period.	

Functional Requirements:

A large number of intermediate calculations are required to produce the Period Bid and Offer Acceptance Volumes. All calculation steps in this requirement are included here.

1: The value of Final Physical Notification, $FPN_{ij}(t)$ shall be defined for spot times, t, falling within Settlement Period j by linear interpolation from the values of Point FPN ($fFPN_{it}$), submitted for that Settlement Period j, for BM Unit i.

2: For any value of Bid-Offer Number, n, the Bid-Offer Volume ($qBO^n_{ij}(t)$) at any spot time t shall be defined by linear interpolation from the values of Point Bid-Offer Volume ($^fqBO^n_{it}$) submitted for spot times t in Settlement Period j for BM Unit i.

3: The Bid-Offer Upper Range $BOUR^n_{ij}(t)$ at any spot time t shall be defined for Bid-Offer Pairs with positive Bid-Offer Pair Numbers, as follows:

$$BOUR^n_{ij}(t) = FPN_{ij}(t) + \Sigma^{n+}qBO^n_{ij}(t); \text{ and}$$
$$BOUR^0_{ij}(t) = FPN_{ij}(t)$$

Where Σ^{n+} represents a sum over all positive Bid-Offer Pairs, 1 to n.

The Bid-Offer Lower Range $BOLR^n_{ij}(t)$ at any spot time t shall be defined for Bid-Offer Pairs with negative Bid-Offer Pair Numbers, as follows:

$BOLR^n_{ij}(t) = FPN_{ij}(t) + \Sigma^{n-}qBO^n_{ij}(t)$; and
$BOLR^0_{ij}(t) = FPN_{ij}(t)$

Where Σ^{n-} represents a sum over the range of Bid-Offer Pair Numbers -1 to n.

4: The Acceptance Volume ($qA^k_{ij}(t)$) attributable to each Bid-Offer Acceptance shall be defined through processing the Point Acceptance Volumes that define the MW output levels that the System Operator requested the BM Unit to operate for certain times within the Balancing Mechanism Window Period.

Linear interpolation shall be used to define the profile of power output in MW expected to be delivered in each Settlement Period within the Balancing Mechanism Window Period as a result of Bid-Offer Acceptance, k.

For spot times within the Balancing Mechanism Window Period prior to the first value Point Acceptance Volume for Bid-Offer Acceptance k, the value of the Acceptance Volume is set to the last calculated value of Acceptance Volume for those spot times. If no such previously calculated value of Acceptance Volume exists, then the Acceptance Volume will be set to the value of Final Physical Notification ($FPN_{ij}(t)$) for those times.

Acceptance Volumes are then ordered by reference to increasing values of k.

The diagram below shows a Bid-Offer Acceptance in relation to Point Acceptance Volumes and the Bid-Offer Upper and Lower Ranges.
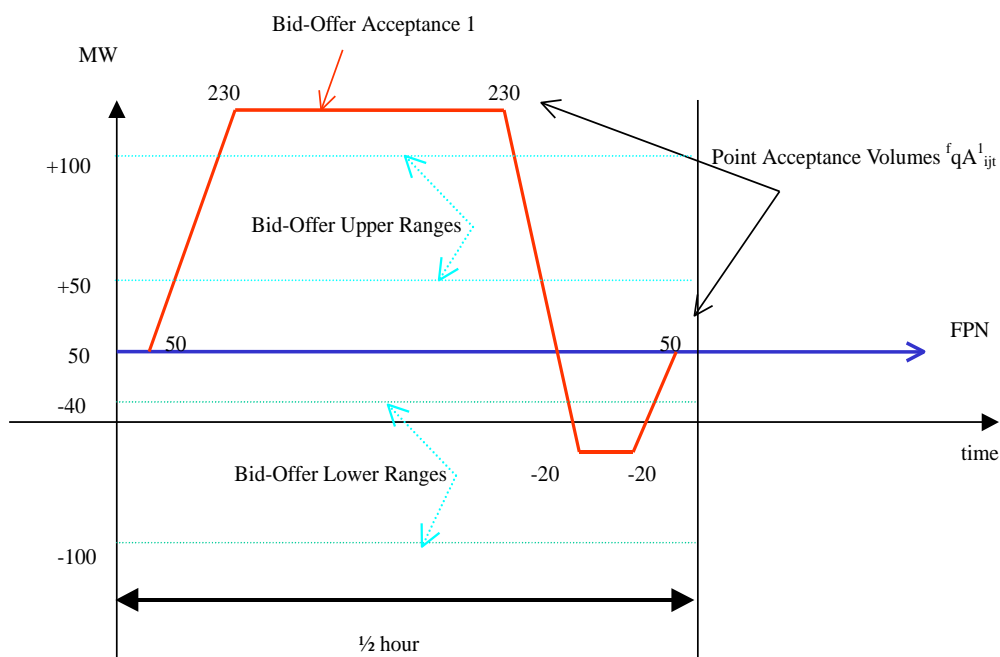
5: The Accepted Bid-Offer Volumes ($qABO^{kn}_{ij}(t)$) shall be defined in MW of a Bid or Offer from Bid-Offer Pair n accepted as a result of Bid-Offer Acceptance k in Settlement Period j from BM Unit i. This is determined as follows:
For n>0,

$qABO^{kn}_{ij}(t) = Max\{Min(qA^k_{ij}(t), BOUR^n_{ij}(t)), BOUR^{n-1}_{ij}(t)\} - Max\{Min(qA^{k-1}_{ij}(t), BOUR^n_{ij}(t)), BOUR^{n-1}_{ij}(t)\}$

For n<0,

$$qABO^{kn}_{ij}(t) = Min\{Max(qA^{k}_{ij}(t), BOLR^{n}_{ij}(t)), BOLR^{n+1}_{ij}(t)\} - Min\{Max(qA^{k-1}_{ij}(t), BOLR^{n}_{ij}(t)), BOLR^{n+1}_{ij}(t)\}$$

Where, from all Bid-Offer Acceptances for which an Acceptance Volume has been determined for Settlement Period j, k- represents that Bid-Offer Acceptance with the Bid-Offer Acceptance Time (T^{k-}_{it}) most recently preceding that of Bid-Offer Acceptance k.

If, there is no Bid-Offer Acceptance, for which an Acceptance Volume has been determined in Settlement Period j which has a Bid-Offer Acceptance Time that precedes that of Bid-Offer Acceptance k, the value of $qA^{k-}_{ij}(t) = FPN_{ij}(t)$.

6: The Accepted Offer Volume ($qAO^{kn}_{ij}(t)$) and Accepted Bid Volume $qAB^{kn}_{ij}(t)$ shall be defined in MW by splitting the positive and negative parts of the Bid-Offer Acceptance Volume.

The Accepted Offer Volume ($qAO^{kn}_{ij}(t)$) represents the volume (in MW) of Offer n accepted as a result of Bid-Offer Acceptance k from BM Unit i at spot times t within Settlement Period j. It is the positive part of the Bid-Offer Acceptance Volume, calculated by:

$$qAO^{kn}_{ij}(t) = Max\{qABO^{kn}_{ij}(t), 0\}$$

Similarly, the Accepted Bid Volume ($qAB^{kn}_{ij}(t)$) represents the volume of Bid n accepted as a result of Bid-Offer Acceptance k from BM Unit i at spot times t within Settlement Period j. It is the negative part of the Bid-Offer Acceptance Volume, calculated by:

$$qAB^{kn}_{ij}(t) = Min\{qABO^{kn}_{ij}(t), 0\}$$

The diagram below represents the volumes of Bids and Offers bought or sold as a result of a Bid-Offer Acceptance.
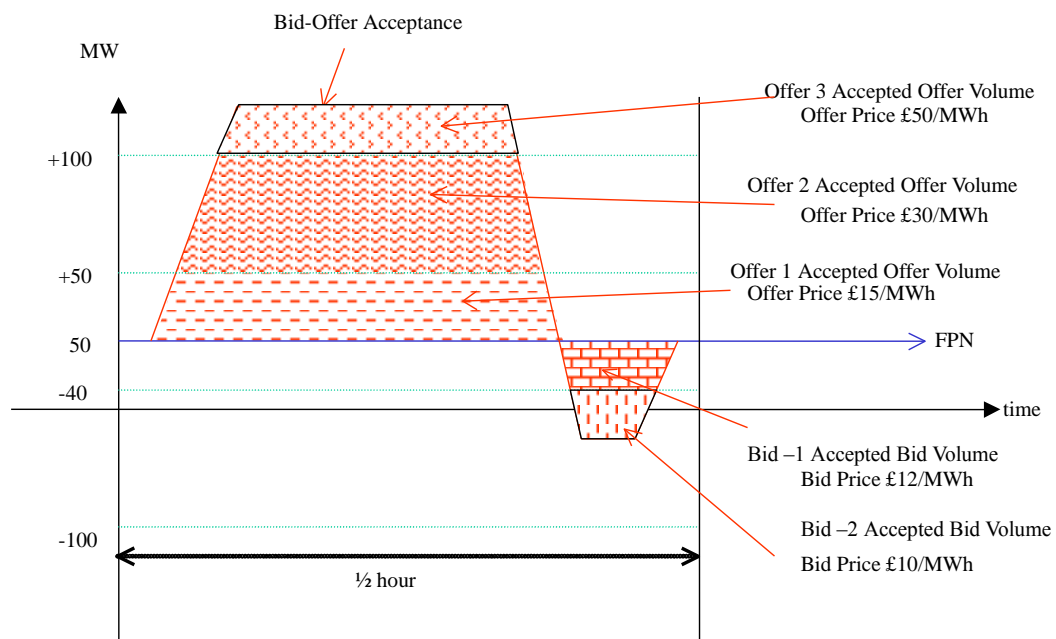
7: The Period Accepted Offer Volume (QAO^{kn}_{ij}) and Period Accepted Bid Volume (QAB^{kn}_{ij}) shall be calculated by integrating the Accepted Offer Volume and Accepted Bid Volume over all spot times in the Settlement Period.

The Period Accepted Offer Volume (QAO^{kn}_{ij}) is determined by integrating the Accepted Offer Volume over all spot times t in Settlement Period j. It represents the half-hourly integrated volume of Offer n, in MWh, accepted as a result of Bid-Offer Acceptance k.

The Period Accepted Bid Volume (QAB^{kn}_{ij}) is determined by integrating the Accepted Bid Volume over all spot times, t, in Settlement Period, j. It represents the half-hourly integrated volume of Bid n, in MWh, accepted as

a result of Bid-Offer Acceptance k.	
For more information on the method used for performing linear interpolation and integration please refer to the BMRA System Specification.	

Non Functional Requirement:

If there is insufficient data to calculate Period Bid and Offer Acceptance Volumes, an exception report shall be sent to the SO and BSCCo Ltd.

Interfaces:

BMRA-I001, BMRA-I002, BMRA-I006.

Issues:

5.2   BMRA-F002: Calculate Period BM Unit Total Accepted Bid and Offer Volume

Requirement ID: BMRA-F002	Status: Mandatory	Title: Calculate Period BM Unit Total Accepted Bid and Offer Volume.	BSC reference: BMRA SD 9.8, BMRA BPM 3.3
Man/auto: Automatic	**Frequency:** Once, for each settlement period.	**Volumes:** Between 1000 - 5000 BM units. At least 1 FPN data per BM unit. For those BM units that receive bids and offers (estimated 1000), at most 10 Bid-Offer Pairs and 30 Bid-Offer Acceptances per BM unit, per settlement period.	

Functional Requirement:

The Period BM Unit Total Accepted Offer Volume shall be calculated as follows:

$$QAO^n_{ij} = \Sigma^k QAO^{kn}_{ij}$$

The Period BM Unit Total Accepted Bid Volume shall be calculated as follows:
$$QAB^n_{ij} = \Sigma^k QAB^{kn}_{ij}$$

This is the total MWh volume of Offer or Bid n accepted from all Bid-Offer Acceptances k.

Non Functional Requirement:

 f there is insufficient data to calculate Period BM Unit Total Accepted Bid and Offer Volume, an exception report shall be sent to the SO and BSCCo Ltd..

Interfaces:

BMRA-I001, BMRA-I002, BMRA-I006.

Issues:

5.3 BMRA-F003: Calculate Estimated Period Balancing Mechanism Bid and Offer Cashflows

Requirement ID: BMRA-F003	Status: Mandatory	Title: Calculate Estimated Period Balancing Mechanism Bid and Offer Cashflows.	BSC reference: BMRA SD 9.8, BMRA BPM 3.3
Man/auto: Automatic	Frequency: Once, for each settlement period.	Volumes: Between 1000 - 5000 BM units. At least 1 FPN data per BM unit. For those BM units that receive bids and offers (estimated 1000), at most 10 Bid-Offer Pairs and 30 Bid-Offer Acceptances per BM unit, per settlement period.	

Functional Requirement:

A number of intermediate calculations are required to produce the Estimated Period Balancing Mechanism Bid and Offer Cashflows. All calculation steps in this requirement are included here.

1: The estimated BM Unit Transmission Loss Multiplier $ETLM_{ij}$ shall be calculated for each non-Interconnector BM Unit as:

$ETLM_{ij} = 1 + TLF_{ij} + ETLMO^+$ for all BM Units that are in Trading Units that are attributable to production accounts,

$ETLM_{ij} = 1 + TLF_{ij} + ETLMO^-$ for all BM Units that are in Trading Units that are attributable to consumption accounts.

$ETLMO^+$ and $ETLMO^-$ are estimated values for $TLMO_j^+$ and $TLMO_j^-$ respectively. They shall be user definable parameters, initially set to zero.

For each Interconnector BM Unit, the estimated BM Unit Transmission Loss Multiplier $ETLM_{ij}$ shall be set as: $ETLM_{ij} = 1$

irrespective of whether the Interconnector BM Unit is attributable to a production or consumption account..

For each BM unit:

- TLF_{ij} is the Transmission Loss Factor assigned to each BM Unit, and shall apply to all settlement periods until a change is received from the Central Registration Agent (CRA);
- the BM unit type (production or consumption) shall be received from the Central Registration Agent (CRA) and shall indicate whether the BM unit is attributable to a production or consumption account. (This data will be received from the CRA on a daily basis with the TLF_{ij} values.)

$ETLM_{ij}$ is calculated for each BM unit and applies for all settlement periods, until a change to either TLF_{ij}, $ETLMO^+$ or $ETLMO^-$ prompts re-calculation.

Note that, by default, a BM Unit not comprising a Trading Unit with other BM Units shall be considered to be a 'Sole Trading Unit' for the purposes of these calculations. The production and consumption status of such a Trading Unit shall therefore be determined using the metered volume of the single BM Unit comprising that Trading Unit.

2: The Period Acceptance Offer Cashflow CAO^{kn}_{ij} shall be calculated as:

$CAO^{kn}_{ij} = QAO^{kn}_{ij} * PO^n_{ij} * ETLM_{ij.}$

The Period Acceptance Bid Cashflow CAB^{kn}_{ij} shall be calculated as:

$CAB^{kn}_{ij} = QAB^{kn}_{ij} * PB^n_{ij} * ETLM_{ij}$

Where QAB^{kn}_{ij} is the Period Accepted Bid Volume; QAO^{kn}_{ij} is the Period Accepted Offer Volume; PB^n_{ij} is the Bid Price for the corresponding Bid; PO^n_{ij} is the Offer Price for the corresponding Offer; and $ETLM_{ij}$ is the Estimated Transmission Loss Multiplier for BM Unit i.

The Period Acceptance Bid Cashflow (CAB^{kn}_{ij}) and Period Acceptance Offer Cashflow (CAO^{kn}_{ij}) represent the Estimated Transmission Loss adjusted Cashflow relating to BM Unit I for Balancing Mechanism action in Settlement Period j, allocated to Offer or Bid n, as a result of Bid-Offer Acceptance k. Under normal circumstances, the Period Acceptance Bid Cashflow will be negative as QAB^{kn}_{ij} is negative and PB^{n}_{ij} is normally positive.

The Period Acceptance Bid Cashflow and the Period Acceptance Offer Cashflow need to be stored if required for reporting purposes.

3: The Period BM Unit Offer Cashflow (CO^{n}_{ij}) shall be calculated as:

$CO^{n}_{ij} = QAO^{n}_{ij} * PO^{n}_{ij} * ETLM_{ij}$ ($=\Sigma^{k}CAO^{kn}_{ij}$)

The Period BM Unit Bid Cashflow (CB^{n}_{ij}) shall be calculated as:

$CB^{n}_{ij} = QAB^{n}_{ij} * PB^{n}_{ij} * ETLM_{ij}$ ($=\Sigma^{k}CAB^{kn}_{ij}$)

These represent the Estimated Transmission Loss adjusted cashflows relating to BM Unit i for Balancing Mechanism action in Settlement Period j, allocated to Offer or Bid n. Under normal circumstances the Period BM Unit Bid Cashflow will be negative.

Non Functional Requirement:

If there is insufficient data to calculate Estimated Period Balancing Mechanism Bid and Offer Cashflows, an exception report shall be sent to the SO and BSCCo Ltd.

Interfaces:

BMRA-I001, BMRA-I002, BMRA-I006.

Issues:

The method used in section 1 for calculating the estimated transmission loss multiplier for each BM unit ($ETLM_{ij}$) is as agreed at the BMRA URS workshop of the 28th January 2000.

5.4   BMRA-F004: Calculate Estimated System Buy and Sell Prices

Requirement ID: BMRA-F004	Status: Mandatory	Title: Calculate Estimated System Buy and Sell Prices	BSC reference: BMRA SD 9.8, BMRA BPM 3.3, CR003, P8, P10, P18A, P72, P78, P194, P217
Man/auto: Automatic	Frequency: Once, for each settlement period.	Volumes: Between 1000 - 5000 BM units. At least 1 FPN data per BM unit. For those BM units that receive bids and offers (estimated 1000), at most 10 Bid-Offer Pairs and 30 Bid-Offer Acceptances per BM unit, per settlement period.	

Functional Requirement:

A number of intermediate calculations are required to produce the Estimated System Sell/Buy Prices (known in the BSC as 'Indicative System Sell/Buy Prices'). All calculation steps in this requirement are included here.

1: For Settlement Days before the P217 effective date apply the P194 methodology, as defined in BMRA-F004a. For Settlement Days after, and including, the P217 effective date apply the P217 methodology, as defined in BMRA-F004b.

Non Functional Requirement:

If there is insufficient data to calculate Estimated System Sell/Buy Prices, the calculation shall be delayed and an exception report shall be sent to the SO and BSCCo Ltd.

Interfaces:
BMRA-I001, BMRA-I002, BMRA-I006, BMRA-I012, BMRA-I014, BMRA-I031.[P295]

Issues:

5.4.1   BMRA-F004a: Calculate Estimated System Buy and Sell Prices using the P194 methodology

Requirement ID: BMRA-F004a	Status: M	Title: Calculate Estimated System Buy and Sell Prices using the P194 methodology	BSC reference: P194
Man/auto: Automatic	**Frequency:** Once, for each Settlement Period.	**Volumes:**	

Functional Requirements:

1: Identify Short-Duration Acceptances.

Short-Duration Acceptances are excluded from the price calculations as they may distort the results. The rules for identifying Short-Duration Acceptances are:

a. Acceptances for each BM Unit are grouped into sets of overlapping acceptances (for the avoidance of doubt, if the last spot time of one acceptance matches the first of another the two are considered to overlap).

b. The overall duration of the group is computed (earliest spot time of any acceptance in a group to latest spot time of any acceptance in a group).

c. If the overall duration is less than the Continuous Acceptance Duration Limit, $CADL_d$ then the Short Duration Acceptance flag for each acceptance in the group is set to show that it is a Short-Duration Acceptance. If $CADL_d = 0$ then no acceptances are "Short-Duration Acceptances". $CADL_d$ will be an integer number of minutes from 0 to 30.

d. All acceptance volumes (QAO^n_{ij} or QAB^n_{ij})for periods intersected by one or more Short-Duration Acceptances (for the same BM Unit i) are "Short-Duration Volumes" and are excluded from the price calculations (if the last spot time of a Short-Duration Acceptance is on a period boundary then the period starting at that spot time **is** intersected by the acceptance, similarly if the first spot time of a Short-Duration Acceptance is on a period boundary, the period ending at that spot time **is** intersected by the acceptance).

e. Short-Duration volumes have priced acceptance volumes set to 0:

$QAPO^n_{ij} = 0$
$QAPB^n_{ij} = 0$

All other volumes have priced acceptance volumes equal to acceptance volumes:
$QAPO^n_{ij} = QAO^n_{ij}$
$QAPB^n_{ij}0 = QAB^n_{ij}$

2: Compute total volumes:

a. Total Volume of Offers

$TQAO_j = \Sigma_i \Sigma^n QAO^n_{ij}$
Σ_i represents the sum over all BM Units;
Σ^n represents the sum over **all** accepted Offers

b. Total Unpriced Volume of Offers
$TQUAO_j = \Sigma_i \Sigma^n QAO^n_{ij} - \Sigma_i \Sigma^n QAPO^n_{ij}$
Σ_i represents the sum over all BM Units;
Σ^n represents the sum over **all** priced accepted Offers;

c. Total Volume of Bids
$TQAB_j = \Sigma_i \Sigma^n QAB^n_{ij}$
Σ_i represents the sum over all BM Units;
Σ^n represents the sum over **all** accepted Bids

d. Total Unpriced Volume of Bids
$TQUAB_j = \Sigma_i \Sigma^n QAB^n_{ij} - \Sigma_i \Sigma^n QAPB^n_{ij}$
Σ_i represents the sum over all BM Units;

Σ^n represents the sum over **all** priced accepted Bids.

3: Identify "De Minimis Acceptance Volumes".

Acceptances with a volume less than the De Minimis Acceptance Threshold (i.e. where values of $QAO^n_{ij} <$ $DMAT_d$ or $QAB^n_{ij} > -DMAT_d$) are "De Minimis Acceptance Volumes" and are excluded from the price calculations as they may distort the results.

If $DMAT_d$ is set to 0, then no bid or offer volumes will be excluded in this way. $DMAT_d$ will always be a positive number or 0.

4: For each settlement period, all accepted offers and bids for all BM units are listed in order of offer price (PO^n_{ij}) and bid price (PB^n_{ij}) respectively, as illustrated in the following example:

	Offers			Bids	
BM unit	Vol($QAPO^n_{ij}$)	Price(PO^n_{ij})	BM unit	Vol($QAPB^n_{ij}$)	Price(PB^n_{ij})
1	12	50	6	10	25
2	24	45	7	15	8
3	15	43	8	5	7
4	50	40	9	5	4
5	20	10	10	10	2

5: Starting from the most expensive bid and least expensive offer, each offer and bid is inspected for arbitrage, i.e. where the bid price exceeds or is equal to the offer price. Any arbitrage volume (whole or part) is removed, with the following changes to the example:

	Offers			Bids	
BM unit	Vol($QAPO^n_{ij}$)	Price(PO^n_{ij})	BM unit	Vol($QAPB^n_{ij}$)	Price (PB^n_{ij})
1	12	50	~~6~~	~~10~~	~~25~~
2	24	45	7	15	8
3	15	43	8	5	7
4	50	40	9	5	4
5	~~20~~10	10	10	10	2

The removal (or not) of arbitrage offer and bid volumes shall be controlled by the Arbitrage Flag, a system parameter.

If, for a particular price, only a subset of the entire set of Bids (or Offers) can be matched, then every Bid (or Offer) in that price is tagged to the same degree (a fraction equal to amount matched, for that price, over the total volume available, for that price), rather than tagging some of the Bids (or Offers) entirely, and others not at all.

6: For each Settlement Period, the offer and bid stacks for all BM units are then updated by applying the following algorithms:

The Offer (and purchase) stack:

1. The non-zero (net) Buy Price Volume Adjustment (Energy) ($EBVA_j$) is Inserted into the Offer stack in order of price (derived from $EBCA_j/EBVA_j$, i.e. a £/MWh price).

2. The non-zero Total System Un-priced Accepted Offer Volume ($TQUAO_j$) is placed at the top of the Offer stack.

3. The non-zero (net) Buy Price Adjustment (System)($SBVA_j$) is then inserted into the Offer stack below the Total System Un-priced Accepted Offer Volume.

For example:
Offer Stack

Offer Type	Price(£/MWh)	Volume (MWh)
$TQUAO_j$	-	10
$SBVA_j$	-	0
$QAPO_j$	25	5
$QAPO_j$	20	20
$EBVA_j$	15	5
$QAPO_j$	10	30

The Bid (and sale) stack:

1. The non-zero (net) Sell Price Volume Adjustment (Energy) ($ESVA_j$) is Inserted into the Offer stack in order of price (derived from $ESCA_j/ESVA_j$, i.e. a £/MWh price).
2. The non-zero Total System Un-priced Accepted Bid Volume ($TQUAB_j$) is placed at the bottom of the Bid stack.
3. The non-zero (net) Sell Price Adjustment (System)($SSVA_j$) is then inserted into the Bid stack above the Total System Un-priced Accepted Bid Volume.

For example:
Bid Stack

Bid Type	Price(£/MWh)	Volume (MWh)
$ESVA_j$	15	15
$QAPB_j$	10	44
$QAPB_j$	5	5
$QAPB_j$	-10	7
$SSVA_j$	-	25
$TQUAB_j$	-	4

7: Referencing the remaining offers and bids, and starting from the least expensive bid and most expensive offer, bids and offers are matched and tagged until the smaller (in total volume) of the two stacks is completely tagged.

If, for a particular price, only a subset of the entire set of Bids (or Offers) can be matched, then every Bid (or Offer) in that price is tagged to the same degree (a fraction equal to amount matched, for that price, over the total volume available, for that price), rather than tagging some of the Bids (or Offers) entirely, and others not at all. If the Energy Volume Adjustment is at the same price, then this is treated as if it were another Bid (or Offer) at that same price - i.e. it is partially tagged in the same proportion.

In the example from above the Offer stack is the smaller (having only 70 MWh of total volume, as opposed to 100 MWh on the Bid Stack).The result of this process is that there will be, across the two stacks, a mixture of Tagged and Untagged NIV volumes. Continuing the example:

	Offer Stack				**Bid Stack**		
Tagged Status	**Offer Type**	**Price**	**Vol**	**Tagged Status**	**Bid Type**	**Price**	**Vol**
NT	$TQUAO_j$	-	10	U	$ESVA_j$	15	15
NT	$SBVA_j$	-	0	U	$QAPB_j$	10	15
NT	$QAPO_j$	25	5	NT	$QAPB_j$	10	29
NT	$QAPO_j$	20	20	NT	$QAPB_j$	5	5
NT	$EBVA_j$	15	5	NT	$QAPB_j$	-10	7
NT	$QAPO_j$	10	30	NT	$SSVA_j$	-	25
				NT	$TQUAB_j$	-	4

Note that for the £10 price range only 29 out of the 44 available MWh of Bids at that price can be tagged. Therefore each Bid in that price range would have tagged by an amount equal to 29/44 of their entire volumes. Expanding the example, and assuming that there are three Bids that make up the 44 MWh:

Bid Item	Volume	Tagged Volume	Untagged Volume
1	20	20 x 29/44 = 13.182	20 x 15/44 = 6.818
2	10	10 x 29/44 = 6.591	10 x 15/44 = 3.409
3	14	14 x 29/44 = 9.227	14 x 15/44 = 4.773

8. Referencing the remaining offer or Bid Stack (depending on whichever stack has items remaining after NIV tagging), and starting from the most expensive Bid priced item or least expensive Offer priced item, Bids or Offers are tagged until the total remaining priced volume in the stack is not more than the Price Average Reference Volume (PARd) for the target Settlement Date.

   If, for a particular price, only a subset of the entire set of Bids (or Offers) at that price are to be tagged, then every Bid (or Offer) at that price is tagged to the same degree (a fraction equal to amount matched, for that price, over the total volume available, for that price), rather than tagging some of the Bids (or Offers) entirely, and others not at all. If the Energy Volume Adjustment is at the same price, then this is treated as if it were another Bid (or Offer) at that same price - i.e. it is partially tagged in the same proportion. For an example which demonstrates the principle of this mechanism see the section describing NIV tagging above.

   Continuing the example from above: All items in the Offer stack are NIV Tagged, and only two items remain untagged in the Bid Stack, leaving a total of 30 MWh untagged volume. Assuming a PARd value of 20 MWh, this would mean that 10 of the remaining 30 MWh should be PAR Tagged (to leave us with the required 20 MWh), leaving the stacks as follows:

Offer Stack				**Bid Stack**			
Tagged Status	**Offer Type**	**Price**	**Vol**	**Tagged Status**	**Bid Type**	**Price**	**Vol**
NT	$TQUAO_j$	-	10	PT	$ESVA_j$	15	10
NT	$SBVA_j$	-	0	U	$ESVA_j$	15	5
NT	$QAPO_j$	25	5	U	$QAPB_j$	10	15
NT	$QAPO_j$	20	20	NT	$QAPB_j$	10	29
NT	$EBVA_j$	15	5	NT	$QAPB_j$	5	5
NT	$QAPO_j$	10	30	NT	$QAPB_j$	-10	7
				NT	$SSVA_j$	-	25
				NT	$TQUAB_j$	-	4

   Note that where, after NIV Tagging, the remaining volume is less than or equal to the PARd then no items will be PAR Tagged.

9. It is now possible to calculate tagged elements of $TQUAB_j$, $ESVA_j$, $SSVA_j$, $TQUAO_j$, $EBVA_j$, and $SBVA_j$ ($TTQUAB_j$, $TESVA_j$, $TSSVA_j$, $TTQUAO_j$, $TEBVA_j$, $TSBVA_j$ respectively), as well as the untagged elements of $EBCA_j$ and $ESCA_j$ ($UEBCA_j$ and $UESCA_j$ respectively).

   System BSAD (System Buy Price Volume Adjustment ($SBVA_j$) and System Sell Price Volume Adjustment ($SSVA_j$)):

   Where none of the system BSAD volume is tagged out by the NIV Tagging, then the NIV Tagged volume is equal to zero (i.e. $TSBVA_j = 0$ or $TSSVA_j = 0$).
   Where all of the system BSAD volume is tagged out by the NIV Tagging, then the NIV Tagged volume is equal to the original notified volume (i.e. $TSBVA_j = SBVA_j$ or $TSSVA_j = SSVA_j$).

   System (un-priced) Bid – Offer Acceptances (Total System Un-priced Bid Acceptance Volume ($TQUAB_j$) and Total System Un-priced Offer Acceptance Volume ($TQUOB_j$)):

   Where none of the (CADL'ed) Un-priced Acceptance volume is tagged out by the NIV Tagging, then the NIV Tagged volume is equal to zero (i.e. $TTQUAB_j = 0$ or $TTQUAO_j = 0$).
   Where all of the (CADL'ed) Un-priced Acceptance volume is tagged out by the NIV Tagging, then the NIV Tagged volume is equal to the original calculated volume (i.e. $TTQUAB_j = TQUAB_j$ or $TTQUAO_j = TQUAO_j$).

   Energy BSAD (Energy Buy Price Volume Adjustment ($EBVA_j$) and Energy Sell Price Volume Adjustment ($ESVA_j$)):

   NIV Tagged Energy Volumes ($NTESVA_j$ and $NTEBVA_j$) will be the volume of Energy BSAD removed by the NIV Tagging.

   PAR Tagged Energy Volumes ($PTESVA_j$ and $PTEBVA_j$) will be the volume of Energy BSAD removed by the PAR Tagging.

   The total tagged and untagged Energy BSAD Volumes can then be calculated as follows:

   $TEBVA_j = NTEBVA_j + PTEBVA_j;$
   $TESVA_j = NTESVA_j + PTESVA_j;$

$UEBVA_j = EBVA_j - TEBVA_j;$
$UESVA_j = ESVA_j - TESVA_j;$

Where all of the energy BSAD volume is tagged out by the combined NIV and PAR Tagging, then the Untagged volume is equal to zero (i.e. $UEBVA_j = 0$ or $UESVA_j = 0$). The Untagged price (i.e. $UEBCA_j$ and $UESCA_j$) is also equal to zero.

Where none of the energy BSAD volume is tagged out by the combined NIV and PAR Tagging, then the Untagged volume is equal to the original notified volume (i.e. $UEBVA_j = EBVA_j$ or $UESVA_j = ESVA_j$). The Untagged price (i.e. $UEBCA_j$ and $UESCA_j$) is also equal to the originally notified price.

Where a part of the volume is tagged out by the combined NIV and PAR Tagging, then the price associated with the untagged volume is to be derived as follows:

$UEBCA_j = (EBCA_j / EBVA_j) * UEBVA_j;$
$UESCA_j = (ESCA_j / ESVA_j) * UESVA_j.$

If for that Settlement Period $EBVA_j$ is zero, then $UEBCA_j = 0;$
If for that Settlement Period $ESVA_j$ is zero, then $UESCA_j = 0.$

---

10. The Total NIV Tagged Volume for a Settlement Period can now be calculated as:

$$TCQ_j = \{\{(\Sigma_i \Sigma^{n'} QAPB^n_{ij}) + TTQUAB_j + NTESVA_j + TSSVA_j\} - \{(\Sigma_i \Sigma^{n*} QAPO^n_{ij}) + TTQUAO_j + NTEBVA_j + TSBVA_j\}\} / 2$$

where
Σ_i represents the sum over all BM Units;
$\Sigma^{n'}$ represents the sum over all Priced Acceptance Bids which are NIV Tagged Bids;
Σ^{n*} represents the sum over all Priced Acceptance Offers which are NIV Tagged Offers;
$TTQUAB_j$ is the NIV Tagged $TQUAB_j$;
$NTESVA_j$ is the NIV Tagged $ESVA_j$;
$TSSVA_j$ is the NIV Tagged $SSVA_j$;
$TTQUAO_j$ is the NIV Tagged $TQUAO_j$;
$NTEBVA_j$ is the NIV Tagged $EBVA_j$, and;
$TSBVA_j$ is the NIV Tagged $SBVA_j$.

---

11. The actual Net Imbalance Volume (NIV) for each Settlement Period can then be calculated as follows:

$$NIV_j = \{ \Sigma_i \Sigma^n QAPO^n_{ij} \quad + EBVA_j \quad + SBVA_j \quad + TQUAO_j\}$$
$$\quad - \{ \Sigma_i \Sigma^n (-QAPB^n_{ij}) \quad + (-ESVA_j) \quad + (-SSVA_j) \quad + (-TQUAB_j)\}$$

where
Σ_i represents the sum over all BM Units, and;
Σ^n represents the sum over all Bid-Offer Pair Numbers for the BM Unit, that are not De Minimis Accepted Bid-Offer Pairs, and not Arbitrage Accepted Bid-Offer Pairs.

---

12. The remaining offers and bid volumes shall be used in the calculation of the Indicative System Buy Price (SBP_j) as follows:

In respect of each Settlement Period, if the Net Imbalance Volume is **positive**, and the value of $\{\Sigma_i \Sigma^n \{QAPO^n_{ij} * ETLM_{ij}\} + UEBVA_j\}$ is non-zero, then the Indicative System Buy Price will be determined as follows:

$$SBP_j = \frac{\{\Sigma_i \Sigma^n \{QAPO^n_{ij} * PO^n_{ij} * ETLM_{ij}\} + UEBCA_j\} + \{BPA_j\}}{\{\Sigma_i \Sigma^n \{QAPO^n_{ij} * ETLM_{ij}\} + UEBVA_j\}} \quad [1]$$

where
Σ_i represents the sum over all BM Units;
Σ^n represents the sum over those accepted Priced Accepted Offers, that are not De Minimis Acceptance volumes and not Arbitrage Accepted Offers and not NIV Tagged Offers, and not PAR Tagged Offers;
PO^n_{ij} is the Offer Price for the Offer acceptance n, BM Unit i and Settlement Period j;
$UEBCA_j$ is the Untagged Buy-Price Cost Adjustment (Energy);
$UEBVA_j$ is the Untagged Buy-Price Volume Adjustment (Energy); and
BPA_j is the Buy-Price Price Adjustment.

---

[1] Price derivation codes A, B, C

If, for any Settlement Period, the Net Imbalance Volume is **negative**, then the Indicative System Buy Price will be determined as:

$$SBP_j = \Sigma_s\{PXP_{sj} * QXP_{sj}\} / \Sigma_s \, QXP_{sj} \quad [2]$$

where
Σ_s represents the sum over all Index Providers;
PXP_{sj} is the Market Index Price for Index Provider s and Settlement Period j;
QXP_{sj} is the Market Index Volume for Index Provider s and Settlement Period j.

(a) If for that Settlement Period $\Sigma_s \, QXP_{sj}$ is equal to zero, then $SBP_j = SSP_j$ [3];

(b) If for that Settlement Period SBP < SSP, i.e. there is a negative spread, then $SBP_j = SSP_j$ [4].

If, for any Settlement Period, the Net Imbalance Volume is **zero**[5], or the value of $\{\Sigma_i\Sigma^n \{QAPO^n_{ij} * ETLM_{ij}\} + UEBVA_j\}$ is zero[6], then the Indicative System Buy Price will be determined as:

$$SBP_j = \Sigma_s\{PXP_{sj} * QXP_{sj}\} / \Sigma_s \, QXP_{sj} \quad [7]$$

where
Σ_s represents the sum over all Index Providers;
PXP_{sj} is the Market Index Price for Index Provider s and Settlement Period j;
QXP_{sj} is the Market Index Volume for Index Provider s and Settlement Period j.

If for that Settlement Period $\Sigma_s \, QXP_{sj}$ is equal to zero, then $SBP_j = 0$ [8].

---

13. The remaining offers and bid volumes shall be used in the calculation of the Indicative System Sell Price (SSP_j) as follows:

In respect of each Settlement Period, if the Net Imbalance Volume is **negative**, and the value of $\{\Sigma_i\Sigma^n \{QAPB^n_{ij} * ETLM_{ij}\} + UESVA_j\}$ is non-zero, then the Indicative System Sell Price will be determined as follows:

$$SSP_j = \frac{\{\Sigma_i\Sigma^n\{QAPB^n_{ij} * PB^n_{ij} * ETLM_{ij}\} + UESCA_j\} + \{SPA_j\}}{\{\Sigma_i\Sigma^n \{QAPB^n_{ij} * ETLM_{ij}\} + UESVA_j\}} \quad [9]$$

where
Σ_i represents the sum over all BM Units;
Σ^n represents the sum over those accepted Priced Accepted Bids, that are not De Minimis Acceptance volumes and not Arbitrage Accepted Bids and not NIV Tagged Bids, and not PAR Tagged Bids;
PB^n_{ij} is the Bid Price for the Bid acceptance n, BM Unit i and Settlement Period j:
$UESCA_j$ is the Untagged Sell-Price Cost Adjustment (Energy):
$UESVA_j$ is the Untagged Sell-Price Volume Adjustment (Energy); and
SPA_j is the Sell-Price Price Adjustment.

---

[2] Price derivation codes F, I
[3] Price derivation codes H, J
[4] Price derivation codes G
[5] Price derivation codes K, L
[6] Price derivation codes D, E
[7] Price derivation codes D, K
[8] Price derivation codes E, L
[9] Price derivation codes F, G, H

If for any Settlement Period the Net Imbalance Volume is **positive**, then the Indicative System Sell Price will be determined as follows:

$SSP_j = \Sigma_s\{PXP_{sj} * QXP_{sj}\} / \Sigma_s QXP_{sj}$ [10]

where
Σ_s represents the sum over all Index Providers;
PXP_{sj} is the Market Index Price for Index Provider s and Settlement Period j;
QXP_{sj} is the Market Index Volume for Index Provider s and Settlement Period j.

(a)   If for that Settlement Period $\Sigma_s QXP_{sj}$ is equal to zero, then $SSP_j = SBP_j$ [11].

(b)   If for that Settlement Period SSP > SBP, i.e. there is a negative spread, then $SSP_j = SBP_j$ [12].

If for any Settlement Period the Net Imbalance Volume is **zero**[13], or the value of $\{\Sigma_i\Sigma^n \{QAPB^n_{ij} * ETLM_{ij}\} + UESVA_j\}$ is zero[14], then the Indicative System Sell Price will be determined as:
$SSP_j = \Sigma_s\{PXP_{sj} * QXP_{sj}\} / \Sigma_s QXP_{sj}$ [15]
where
Σ_s represents the sum over all Index Providers;
PXP_{sj} is the Market Index Price for Index Provider s and Settlement Period j;
QXP_{sj} is the Market Index Volume for Index Provider s and Settlement Period j.

If for that Settlement Period $\Sigma_s QXP_{sj}$ is equal to zero, then $SSP_j = 0$ [16].

14: In respect of each Settlement Period, the Total Priced Volume of Offers will be determined as follows:

$TQPAO_j = \Sigma_i\Sigma^n QAPO^n_{ij}$

where
Σ_i represents the sum over all BM Units;
Σ^n represents the sum over those accepted Offers that are not De Minimis Acceptance volumes and not Arbitrage Accepted Offers and not NIV Tagged Offers;

In respect of each Settlement Period then the Total Priced Volume of Bids will be determined as follows:

$TQPAB_j = \Sigma_i\Sigma^n QAPB^n_{ij}$

where
Σ_i represents the sum over all BM Units;
Σ^n represents the sum over those accepted Bids that are not De Minimis Acceptance volumes and not Arbitrage Accepted Bids and not Trade Tagged Bids;

---

[10] Price derivation codes A, D
[11] Price derivation codes C, E
[12] Price derivation codes B
[13] Price derivation codes K, L
[14] Price derivation codes I, J
[15] Price derivation codes I, K
[16] Price derivation codes J, L

---

15. The price adjustment parameters shall be set through the automatic interface BMRA-I014, as directed by SO. Note that if no adjustment data has been provided for Settlement Period j then a value of zero will be used for all eight parameters.

The system parameters like PAR_d, Arbitrage Flag, $DMAT_d$, and $CADL_d$ are received from BSCCo Ltd through the manual flow BMRA-I012.

Market Index Data is received from Market Index Data Providers through the automatic flow BMRA-I015.

Where no Market Index Data has been provided by a Market Index Data Provider, at the point where the Indicative Calculation is carried out, for a given Settlement Period, then the BMRA will generate a warning message (see BMRA-F007).

The BMRA shall, for the purposes of performance reporting, record details of those cases where:

1. A value of zero was used for Market Index Price and Volume for a Settlement Period, for the purposes of the Indicative Calculation
2. A Market Index Provider has failed to supply Market Index Data for any given Settlement Period, such that a default price and volume of zero are used for that Settlement Period, for the purposes of the Indicative Calculation.

The SAA shall for the purposes of reporting, record a Price Derivation Code (PDC_j) for each Settlement Period. This code will describe how the Indicative SBP and SSP were calculated. The possible values for the code, and their associated meaning, are defined in Appendix G.

Non-Functional Requirement:

Interfaces:
BMRA-I001, BMRA-I002, BMRA-I006, BMRA-I012, BMRA-I014, BMRA-I015.

5.4.2   BMRA-F004b: Calculate Estimated System Buy and Sell Prices using the P217 methodology

Requirement ID: BMRA-F004b	**Status:** M	**Title:** Calculate Estimated System Buy and Sell Prices using the P217 methodology	**BSC reference:** P217
Man/auto: Automatic	**Frequency:** Once, for each Settlement Period.	**Volumes:**	

Functional Requirements:

1: Identify Short-Duration Acceptances.

The rules for identifying Short-Duration Acceptances are:

a. Acceptances for each BM Unit are grouped into sets of overlapping acceptances (for the avoidance of doubt, if two acceptances are contiguous, i.e. the last spot time of one acceptance matches the first of another, then the two are considered to overlap).

b. The overall duration of the group is computed (earliest spot time of any acceptance in a group to latest spot time of any acceptance in a group).

c. If the overall duration is less than the Continuous Acceptance Duration Limit, $CADL_d$ then the Short Duration Acceptance flag for each acceptance in the group is set to show that it is a Short-Duration Acceptance. If $CADL_d = 0$ then no acceptances are "Short-Duration Acceptances". $CADL_d$ will be an integer number of minutes from 0 to 30.

Short-Duration Acceptances will be considered to be "CADL Flagged" for the purposes of the System Price Calculation process.

2: Compute Total Volumes:

a.   Total Volume of Offers

$TQAO_j = \Sigma_i \Sigma^n QAO^n_{ij}$

where: Σ_i represents the sum over all BM Units;
                Σ^n represents the sum over **all** accepted Offers

b.   Total Volume of Bids

$TQAB_j = \Sigma_i \Sigma^n QAB^n_{ij}$

where: Σ_i represents the sum over all BM Units;
                Σ^n represents the sum over **all** accepted Bids

c.   Total Period Applicable Balancing Services Volume

$TQAS_j = \Sigma_i QAS_{ij}$

where: Σ_i represents the sum over all BM Units;

d.   Total Balancing Services Adjustment Buy Volume

$TBVA_j = \Sigma^m QBSAB^m_j$

where: Σ^m represents the sum over all Balancing Services Adjustment Buy Actions.

e.   Total Balancing Services Adjustment Sell Volume

$TSVA_j = \Sigma^m QBSAS^m_j$

where: Σ^m represents the sum over all Balancing Services Adjustment Sell Actions.

3: Identify "De Minimis Acceptance Volumes".

Acceptances with a Total Accepted Volume less than the De Minimis Acceptance Threshold (i.e. where values of $|QAO^n_{ij}| < DMAT_d$ or $|QAB^n_{ij}| < DMAT_d$) are identified as "De Minimis Acceptance Volumes" and are therefore considered to be De Minimis Tagged.

Balancing Services Adjustment Actions with a Volume less than the De Minimis Acceptance Threshold (i.e. where values of $|QBSAB^m_j| < DMAT_d$ or $|QBSAS^m_j| < DMAT_d$) are identified as "De Minimis Acceptance Volumes" and are therefore considered to be De Minimis Tagged.

De Minimis Tagged System Actions are excluded from the price calculations as they may distort the results.

If $DMAT_d$ is set to 0, then no volumes will be tagged in this way. $DMAT_d$ will always be a positive number or 0.

4: Build Buy and Sell Stacks.

Buy System Actions (QSB^w_j) are considered to be:
i.   All those Accepted Offers (QAO^{kn}_{ij}) which are not "De Minimis Acceptance Volumes"; and
ii.   All Balancing Services Adjustment Buy Actions ($QBSAB^m_j$) which are not "De Minimis Acceptance Volumes".

Sell System Actions (QSS^w_j) are considered to be:
i.   All those Accepted Bids (QAB^{kn}_{ij}) which are not "De Minimis Acceptance Volumes"; and
ii.   All Balancing Services Adjustment Sell Actions ($QBSAS^m_j$) which are not "De Minimis Acceptance Volumes".

The price of a System Action is considered to be (SAP^w_j):
i.   In the case of an accepted Offer, the Offer Price PO^n_{ij};
ii.   In the case of an accepted Bid, the Bid Price PB^n_{ij};

iii.   In the case of Balancing Services Adjustment Actions, Balancing Services Adjustment Price $BSAP^m_j$ (derived from Cost/Volume, i.e. a £/MWh price);

For each Settlement Period, all System Actions are listed in descending order of price, within the relevant Stack. Unpriced Balancing Services Adjustment Actions are placed at the top of the Buy Stack (as if most expensive) or the bottom of the Sell Stack (as if least expensive), as appropriate. For example:

Buy Stack		Sell Stack	
Vol(QSB^w_j)	Price(SAP^w_j)	Vol(QSS^w_j)	Price(SAP^w_j)
12	-	7	25
24	45	15	8
15	40	5	7
50	10	5	4
20	10	10	-

5: Apply Arbitrage Tagging.

Starting from the most expensive Sell Action and least expensive Buy Action, each System Action is inspected for arbitrage, i.e. where the Sell Action's price exceeds or is equal to the Buy Action's price. Where arbitrage exists then equivalent amounts of volume are tagged out from both stacks until arbitrage no longer exists.

Actions with the same price which are on the same stack are combined into a single item for the purpose of Arbitrage inspection. If, for a particular price, only a subset of the combined Buy (or Sell) Actions can be matched, then every Buy (or Sell) Action at that price is tagged to the same degree (a fraction equal to amount matched, for that price, over the total volume available, for that price), rather than tagging some of the individual Actions entirely, and others not at all.

Extending the example from above:

Buy Stack		Sell Stack	
Vol(QSB^w_j)	Price(SAP^w_j)	Vol(QSS^w_j)	Price(SAP^w_j)
12	-	~~7~~	~~25~~
24	45	15	8
15	40	5	7
~~50~~ 45	10	5	4
~~20~~ 18	10	10	-

In this example there are two Buy Actions (total volume = 70 MWh, price = £10) matched to a single Sell Action (volume = 7 MWh, price = £25). The two Buy Actions therefore have an amount tagged equal to 7/70 times their volume (5 and 2 MWh respectively, for a total of 7 MWh tagged volume)

Unpriced Balancing Services Adjustment Actions are ignored for the purposes of Arbitrage – i.e. once all Priced Actions on a Stack have been Arbitrage tagged then no further Arbitrage tagging can occur.

The process of Arbitrage Tagging will only be carried out for Settlement Dates where the Arbitrage Flag (a dated system parameter) is set.

6: Determine Action Classification

For each Settlement Period, the Buy and Sell Stacks are then updated by applying the following algorithm:

All the First-Stage Flagged and Unflagged System Actions are identified on each Stack. A First-Stage Flagged System Action is one which is either:

a) A Short-Duration (CADL Flagged) Acceptance;
b) A SO-Flagged Acceptance; or
c) A SO-Flagged Balancing Services Adjustment Action.
d)
A First-Stage Unflagged System Action is one which is not a First-Stage Flagged System Action.

Then, for the Buy Stack, all First-Stage Flagged System Actions with a price which is higher than the most expensive First-Stage Unflagged System Action are classified as Second-Stage Flagged System Actions. And, for the Sell Stack, all First-Stage Flagged System Actions with a price which is lower than the least expensive First-Stage Unflagged System Action are classified as Second-Stage Flagged System Actions.

All Second-Stage Flagged System Actions are considered to be unpriced.

For example:

Buy Stack

First-Stage Flag	Price
T	-
T	-
T	25
-	20
T	25
-	10

Second-Stage Flag	Price
T	-
T	-
T	-
-	20
-	25
-	10

Sell Stack

First-Stage Flag	Price
-	15
T	10
T	5
-	-10
T	-
T	-

Second-Stage Flag	Price
-	15
-	10
-	5
-	-10
T	-
T	-

Note that unpriced Balancing Services Adjustment Actions are always classified as Second-Stage Flagged System Actions and therefore always remain unpriced.

7: Apply NIV Tagging

Starting from the least expensive Sell Action and most expensive Buy Action, Actions from the two stacks are matched and tagged until the smaller (in total volume) of the two stacks is completely tagged. Unpriced Actions are included in NIV Tagging. Unpriced Sell Actions are considered to be the least expensive Sell Actions and Unpriced Buy Actions are considered to be the most expensive Buy Action – i.e. where present they are the first Actions to be considered during the NIV Tagging process.

Actions with the same price which are on the same stack are combined into a single item for the purpose of matching. If, for a particular price, only a subset of the combined Buy (or Sell) Actions can be matched, then every Buy (or Sell) Action at that price is tagged to the same degree (a fraction equal to amount matched, for that price, over the total volume available, for that price), rather than tagging some of the individual Actions entirely, and others not at all. Unpriced items are considered to be at the same price for the purpose of NIV Tagging.

In the example from above the Buy Stack is the smaller (having only 70 MWh of total volume, as opposed to 100 MWh on the Sell Stack). The result of this process is that there will be, across the two stacks, a mixture of NIV Tagged and NIV Untagged stack items. Continuing the example from before:

Buy Stack				**Sell Stack**		
Tagged Status	Price	Vol		Tagged Status	Price	Vol
Tagged	-	10		Untagged	15	15
Tagged	-	0		Untagged	10	15
Tagged	25	5		Tagged	10	29
Tagged	20	20		Tagged	5	5
Tagged	15	5		Tagged	-10	7
Tagged	10	30		Tagged	-	25
				Tagged	-	4

Note that for the £10 price range only 29 out of the 44 available MWh of Sell Actions at that price can be tagged. Therefore each Sell Action in that price range would be tagged by an amount equal to 29/44 of their entire volumes. Expanding the example, and assuming that there are three Sell Actions that make up the 44 MWh:

Sell Action	**Volume**	**Tagged Volume**	**Untagged Volume**
1	20	20 x 29/44 = 13.182	20 x 15/44 = 6.818
2	10	10 x 29/44 = 6.591	10 x 15/44 = 3.409
3	14	14 x 29/44 = 9.227	14 x 15/44 = 4.773

8: Calculate and Apply Replacement Price

The Replacement Price is calculated from a selection of those untagged items remaining after the NIV Tagging process which are priced System Actions (i.e. Unflagged Second-Stage System Actions). This selection is determined by the Replacement Price Average Reference (RPAR) Volume, and is defined as that volume of the most expensive priced System Action items remaining after NIV Tagging which is equivalent to the RPAR Volume (where necessary only part of an item's volume will be considered selected in order that the total selected volume is equal to the RPAR Volume). Where the total remaining volume of untagged, priced System Action items is less than the RPAR Volume then all untagged, priced System Action items are selected.

The Replacement Price is calculated as the volume weighed average price of the selected items.

If NIV is positive then:

$$RP_j = \Sigma^{w'} (QSB^{w'}_j * SAP^{w'}_j) / \Sigma^{w'} QSB^{w'}_j$$

and if NIV is negative then:

$$RP_j = \Sigma^{w'} (QSS^{w'}_j * SAP^{w'}_j) / \Sigma^{w'} QSS^{w'}_j$$

Where $\Sigma^{w'}$ is the sum over all RPAR Volume selected untagged, priced System Actions.

Where no priced System Action items remain after NIV Tagging then the Replacement Price is the Market Price. If the Market Price is undefined then the Replacement Price is zero.

The actual volume of Actions used to calculate the Replacement Price is defined as the Replacement Price Calculation Volume. If the Replacement Price is derived from the Market Price then Replacement Price Calculation Volume will be considered to be zero.

Once calculated the Replacement Price is assigned to those remaining untagged stack items which are classified as Second-Stage Flagged System Actions, All such affected System Actions are considered to be "Repriced" System Actions.

9: Apply PAR Tagging

Referencing the remaining Buy or Sell Stack (depending on whichever stack has untagged items remaining after NIV tagging), and starting from the most expensive Sell Stack item or least expensive Buy Stack item, Buy or Sell Stack items are tagged until the total remaining priced volume in the stack is not more than the Price Average Reference Volume (PAR_d).

Actions with the same price which are on the same stack are combined into a single item for the purpose of matching. If, for a particular price, only a subset of the entire set of combined Sell Actions (or Buy Actions) can be matched, then every Sell Action (or Buy Action) at that price is tagged to the same degree (a fraction equal to amount matched, for that price, over the total volume available, for that price), rather than tagging some of the individual Sell Actions (or Buy Actions) entirely, and others not at all. For an example which demonstrates the principle of this mechanism see the section describing NIV tagging above.

Continuing the example from above: All items in the Buy Stack are NIV Tagged, and only two items remain untagged in the Sell Stack, leaving a total of 30 MWh untagged volume. For example, if PAR_d was defined to have a value of 20 MWh, this would mean that 10 of the remaining 30 MWh should be PAR Tagged (to leave us with the required 20 MWh), leaving the stacks as follows:

Buy Stack			Sell Stack		
Tagged Status	Price	Vol	Tagged Status	Price	Vol
NIV Tagged	-	10	PAR Tagged	15	10
NIV Tagged	-	0	Untagged	15	5
NIV Tagged	25	5	Untagged	10	15
NIV Tagged	20	20	NIV Tagged	10	29
NIV Tagged	15	5	NIV Tagged	5	5
NIV Tagged	10	30	NIV Tagged	-10	7
			NIV Tagged	-	25
			NIV Tagged	-	4

Note that where, after NIV Tagging, the remaining volume is less than or equal to the PAR_d then no items will be PAR Tagged.

10: Calculate Reported Period BM Unit Volumes

It is now possible to calculate the following reported derived values:

a. Period BM Unit Tagged Volume of Offers ($QTAO^n_{ij}$) and Bids ($QTAB^n_{ij}$) are the amounts of QAO^n_{ij} and QAB^n_{ij} respectively which were excluded from the System Price Stacks by De Minimis Tagging, Arbitrage Tagging, NIV Tagging and/or PAR Tagging.

b. Period BM Unit Repriced Accepted Volume of Offers ($QRAO^n_{ij}$) and Bids ($QRAB^n_{ij}$) are the amounts of QAO^n_{ij} and QAB^n_{ij} respectively which were not NIV tagged (i.e. remain on the System Price Stacks after NIV Tagging) but which were Classified as Second-Stage Flagged and therefore subject to the Replacement Price.

c. Period BM Unit Originally-priced Accepted Volume of Offers ($QOAO^n_{ij}$) and Bids ($QOAB^n_{ij}$) are the amounts of QAO^n_{ij} and QAB^n_{ij} respectively which were not NIV tagged (i.e. remain on the System Price Stacks after NIV Tagging) and were not Classified as Second-Stage Flagged and therefore not subject to the Replacement Price.

11: Calculate Reported Acceptance Volumes

It is now possible to calculate the following reported derived values:

a. The System Total Priced Accepted Volume of Offers ($TQPAO_j$) and Bids ($TQPAB_j$) are the sum of QAO^n_{ij} and QAB^n_{ij} respectively which were not Classified as Second-Stage Flagged.

b. System Total Tagged Accepted Volume of Offers ($TQTAO_j$) and Bids ($TQTAB_j$) are the sum of QAO^n_{ij} and QAB^n_{ij} respectively which were excluded from the System Price Stacks by De Minimis Tagging, Arbitrage Tagging, NIV Tagging and/or PAR Tagging.

c. System Total Repriced Accepted Volume of Offers ($TQRAO_j$) and Bids ($TQRAB_j$) are the sum of QAO^n_{ij} and QAB^n_{ij} respectively which were not NIV tagged (i.e. remain on the System Price Stacks after NIV Tagging) but which were Classified as Second-Stage Flagged and therefore subject to the Replacement Price.

d. System Total Originally-priced Accepted Volume of Offers ($TQOAO_j$) and Bids ($TQOAB_j$) are the sum of QAO^n_{ij} and QAB^n_{ij} respectively which were not NIV tagged (i.e. remain on the System Price Stacks after NIV Tagging) and were not Classified as Second-Stage Flagged and therefore not subject to the Replacement Price.

12: Calculate Reported Adjustment Volumes

It is now possible to calculate the following reported derived values:

a. Total System Adjustment Volume of Buy Items ($TSVA_j$) and Sell Items ($TBVA_j$) are the sum of $QBSAB^m_j$ and $QBSAS^m_i$ respectively.

b. Total System Tagged Adjustment Volume of Buy Items ($TSTVA_j$) and Sell Items ($TBSVA_j$) are the sum of $QBSAB^m_j$ and $QBSAS^m_i$ respectively which were excluded from the System Price Stacks by De Minimis Tagging, Arbitrage Tagging, NIV Tagging and/or PAR Tagging.

c. Total System Repriced Adjustment Volume of Buy Items ($TSRVA_j$) and Sell Items ($TBRVA_j$) are the sum of $QBSAB^m_j$ and $QBSAS^m_i$ respectively which were not NIV tagged (i.e. remain on the System Price Stacks after NIV Tagging) but which were Classified as Second-Stage Flagged and therefore subject to the Replacement Price.

d. Total System Originally-priced Adjustment Volume of Buy Items ($TSOVA_j$) and Sell Items ($TBOVA_j$) are the sum of $QBSAB^m_j$ and $QBSAS^m_i$ respectively which were not NIV tagged (i.e. remain on the System Price Stacks after NIV Tagging) and were not Classified as Second-Stage Flagged and therefore not subject to the Replacement Price.

13: The actual Indicative Net Imbalance Volume (NIV) for each Settlement Period can then be calculated as follows:

$$NIV_j = \Sigma_w\ QSB^w_j - \Sigma_w\ (-QSS^w_j)$$

where

Σ_w represents the sum over all System Actions that are not De Minimis System Actions, and not Arbitrage Tagged System

Actions.

14: The remaining offers and bid volumes shall be used in the calculation of the Indicative System Buy Price (SBP_j) as follows:

In respect of each Settlement Period, if the Net Imbalance Volume is **positive** then the Indicative System Buy Price will be determined as follows:

$$SBP_j = \frac{\{\Sigma_i\Sigma^n\Sigma^k \{QAO^{kn}_{ij} * PO^n_{ij} * TLM_{ij}\} + \Sigma^m \{QBSAB^m_j * BSAP^m_j\}\} + \{BPA_j\}}{\{\Sigma_i\Sigma^n\Sigma^k \{QAO^{kn}_{ij} * TLM_{ij}\} + \Sigma^m QBSAB^m_j\}}$$ [17]

where
Σ_i represents the sum over all BM Units;
Σ^k represents the sum over all Acceptances;
Σ^n represents the sum over those Accepted Offers that are not De Minimis Tagged and not Arbitrage Tagged Offers and not NIV Tagged Offers and not PAR Tagged Offers;
PO^n_{ij} is the Price for the Offer acceptance n, for BM Unit i and Settlement Period j (which may be the Replacement Price);
Σ^m represents the sum over those Balancing Services Adjustment Buy Actions that are not De Minimis Tagged and not Arbitrage Tagged Actions and not NIV Tagged Actions and not PAR Tagged Actions;
$BSAP^m_j$ is the Price for the Balancing Services Adjustment Buy Action m for Settlement Period j (which may be the Replacement Price); and
BPA_j is the Buy-Price Price Adjustment.

If, for any Settlement Period, the Net Imbalance Volume is **negative**, then the Indicative System Buy Price will be determined as:
$$SBP_j = \Sigma_s\{PXP_{sj} * QXP_{sj}\} / \Sigma_s QXP_{sj}$$ [18]

where
Σ_s represents the sum over all Index Providers;
PXP_{sj} is the Market Index Price for Index Provider s and Settlement Period j;
QXP_{sj} is the Market Index Volume for Index Provider s and Settlement Period j.

(a)   If for that Settlement Period $\Sigma_s QXP_{sj}$ is equal to zero, then $SBP_j = SSP_j$ [19];

(b)   If for that Settlement Period SBP < SSP, i.e. there is a negative spread, then $SBP_j = SSP_j$ [20].

If, for any Settlement Period, the Net Imbalance Volume is **zero**[21] then the Indicative System Buy Price will be determined as:

$$SBP_j = \Sigma_s\{PXP_{sj} * QXP_{sj}\} / \Sigma_s QXP_{sj}$$ [22]

where
Σ_s represents the sum over all Index Providers;
PXP_{sj} is the Market Index Price for Index Provider s and Settlement Period j;
QXP_{sj} is the Market Index Volume for Index Provider s and Settlement Period j.

If for that Settlement Period $\Sigma_s QXP_{sj}$ is equal to zero, then $SBP_j = 0$ [23].

---

[17] Price derivation codes A, B, C
[18] Price derivation codes F
[19] Price derivation codes H
[20] Price derivation codes G
[21] Price derivation codes K, L
[22] Price derivation codes K
[23] Price derivation codes L

15: The remaining offers and bid volumes shall be used in the calculation of the Indicative System Sell Price (SSP_j) as follows:

In respect of each Settlement Period, if the Net Imbalance Volume is **negative** then the Indicative System Sell Price will be determined as follows:

$$SSP_j = \frac{\{\Sigma_i \Sigma^n \Sigma^k \{QAB^{kn}_{ij} * PB^n_{ij} * TLM_{ij}\} + \Sigma^m \{QBSAS^m_j * BSAP^m_j\}\}}{\{\Sigma_i \Sigma^n \Sigma^k \{QAB^{kn}_{ij} * TLM_{ij}\} + \Sigma^m QBSAS^m_j\}} + \{SPA_j\} \quad [24]$$

where
Σ_i represents the sum over all BM Units;
Σ^k represents the sum over all Acceptances;
Σ^n represents the sum over those Accepted Bids that are not De Minimis Tagged and not Arbitrage Tagged Bids and not NIV Tagged Bids and not PAR Tagged Bids;
PB^n_{ij} is the Price for the Bid acceptance n, for BM Unit i and Settlement Period j (which may be the Replacement Price):
Σ^m represents the sum over those Balancing Services Adjustment Sell Actions that are not De Minimis Tagged and not Arbitrage Tagged Actions and not NIV Tagged Actions and not PAR Tagged Actions;
$BSAP^m_j$ is the Price for the Balancing Services Adjustment Buy Action m for Settlement Period j (which may be the Replacement Price); and
SPA_j is the Sell-Price Price Adjustment.

If for any Settlement Period the Net Imbalance Volume is **positive**, then the Indicative System Sell Price will be determined as follows:

$$SSP_j = \Sigma_s\{PXP_{sj} * QXP_{sj}\} / \Sigma_s QXP_{sj} \quad [25]$$

where
Σ_s represents the sum over all Index Providers;
PXP_{sj} is the Market Index Price for Index Provider s and Settlement Period j;
QXP_{sj} is the Market Index Volume for Index Provider s and Settlement Period j.

(a)   If for that Settlement Period $\Sigma_s QXP_{sj}$ is equal to zero, then $SSP_j = SBP_j$ [26].

(b)   If for that Settlement Period SSP > SBP, i.e. there is a negative spread, then $SSP_j = SBP_j$ [27].

If for any Settlement Period the Net Imbalance Volume is **zero**[28] then the Indicative System Sell Price will be determined as:

$$SSP_j = \Sigma_s\{PXP_{sj} * QXP_{sj}\} / \Sigma_s QXP_{sj} \quad [29]$$

where
Σ_s represents the sum over all Index Providers;
PXP_{sj} is the Market Index Price for Index Provider s and Settlement Period j;
QXP_{sj} is the Market Index Volume for Index Provider s and Settlement Period j.

If for that Settlement Period $\Sigma_s QXP_{sj}$ is equal to zero, then $SSP_j = 0$ [30].

---

[24] Price derivation codes F, G, H
[25] Price derivation codes A
[26] Price derivation codes C
[27] Price derivation codes B
[28] Price derivation codes K, L
[29] Price derivation codes K
[30] Price derivation codes L

16: The price adjustment parameters shall be set through the automatic interface BMRA-I014, as directed by SO. Note that if no adjustment data has been provided for Settlement Period j then a value of zero will be used for SPA and BPA.

The system parameters like $RPAR_d$, PAR_d, Arbitrage Flag, $DMAT_d$, and $CADL_d$ are received from BSCCo Ltd through the manual flow BMRA-I012.

Market Index Data is received from Market Index Data Providers through the automatic flow BMRA-I015.

Where no Market Index Data has been provided by a Market Index Data Provider, at the point where the Indicative Calculation is carried out, for a given Settlement Period, then the BMRA will generate a warning message (see BMRA-F007).

The BMRA shall, for the purposes of performance reporting, record details of those cases where:

1. A value of zero was used for Market Index Price and Volume for a Settlement Period, for the purposes of the Indicative Calculation
2. A Market Index Provider has failed to supply Market Index Data for any given Settlement Period, such that a default price and volume of zero are used for that Settlement Period, for the purposes of the Indicative Calculation.

The BMRA shall for the purposes of reporting, record a Price Derivation Code (PDC_j) for each Settlement Period. This code will describe how the Indicative SBP and SSP were calculated. The possible values for the code, and their associated meaning, are defined in Appendix G.

Non-Functional Requirement:

Interfaces:

BMRA-I001, BMRA-I002, BMRA-I006, BMRA-I012, BMRA-I014, BMRA-I015, BMRA-I031.[P295]

5.5   BMRA-F005: Postponement of Calculations

Requirement ID: BMRA-F005	Status: Mandatory	Title: Postponement of calculations	BSC reference: CP560
Man/auto: Manual	Frequency: Ad hoc	Volumes: N/a	

Functional Requirements:

1. When the BMRA is advised of an Outage by the SO it shall carry out the following procedures in order to avoid publishing erroneous Settlement data:
   a)   If an Outage is planned, the BMRA shall receive a prior warning from the SO detailing the expected date and time of the Outage. For those unplanned Outages, the BMRA will be informed of the date and time as soon as possible after the Outage has commenced.
   b)   The BMRA shall inform BSCCo that Settlement calculations shall be suspended during the planned Outage.
   c)   From the time at which the Outage commenced (if it was planned), or as soon as possible after it commenced (if the Outage was unplanned) the BMRA shall disable its automatic calculation processes. In the case of an unplanned Outage the BMRA shall also send confirmation to BSCCo that calculations have been suspended.
   d)   During the Outage, the BMRA shall load and report any Bid-Offer and Physical Notification data received from the SO as normal.
   e)   When the Outage has ceased, the BMRA shall receive and load the backlog of Bid-Offer Data issued by the SO. Once the backlog has been received and loaded, the automatic calculation processes shall be re-enabled to operate on the first Settlement Period affected by the Outage.
   f)   The BMRA will then inform BSCCo that calculations have resumed, and confirm the Settlement Periods that have been affected.

2. During an Outage the BMRA reporting service shall continue to operate as normal.

3. In cases where an unplanned Outage has led to the calculation processes being disabled after the first Settlement Period of the Outage (and therefore incorrect data has been published), the BMRA is not required to re-calculate and correct the data on the BMRS once the Outage has ceased. For the avoidance of doubt, note that the BMRA may, at its discretion, re-calculate and correct the data.

4. In the event that the date and time of an Outage changes from that already notified by the SO, a further warning shall be issued to the BMRA containing the revised date and time.

Non-Functional Requirements:

Interfaces:

No interfaces are defined for the interactions with the SO and BSCCo. These will take the form of email or telephone calls.

Issues:

5.6   BMRA-F006: Validate Market Index Data

Requirement ID: BMRA-F006	Status: Mandatory	Title: Validate Market Index Data	BSC reference: P78
Man/auto: Automatic	Frequency: On demand.	Volumes:	

Functional Requirements:

The BMRA shall validate Market Index Data, on receipt, to ensure that the Market Index Volume equals, or exceeds the Liquidity Threshold for the relevant Market Index Data Provider, Settlement Day, and Settlement Period. If the Market Index Volume is non-zero and below the defined threshold, then the BMRA will default the invalid Market Index Volume, and its associated Market Index Price, to zero for that Settlement Period.
The occurrence of below threshold, non-zero Market Index Data is recorded by the BMRA for the purposes of performance reporting.

Unless a specific clock change day Liquidity Threshold has been submitted, then, where a Liquidity Threshold is defined for a range of days that spans a 'long' or 'short' day, the following rules will be applied:

For a 'short' day, having 46 Settlement Periods (i.e. the spring clock change when 1am GMT changes to 2am BST):
- Settlement Periods 1 to 2 (00:00 to 01:00 GMT) of the 'short' day take the values of Settlement Periods 1 to 2 (00:00 to 01:00 local time) of the 'normal' day data;
- Settlement Periods 3 to 46 (02:00 to 24:00 BST) of the 'short' day take the values of Settlement Periods 5 to 48 (02:00 to 24:00 local time) of the 'normal' day data;
- Settlement Periods 3 and 4 of the 'normal' day data are not used on a short day.

For a 'long' day, having 50 Settlement Periods (i.e. the autumn clock change when 2am BST changes to 1am GMT):
- Settlement Periods 1 to 4 (00:00 to 02:00 BST) of the 'long' day take the values of Settlement Periods 1 to 4 (00:00 to 02:00 local time) of the 'normal' day data;
- Settlement Periods 5 to 6 (01:00 to 02:00 GMT) of the 'long' day take the values of Settlement Periods 3 to 4 (01:00 to 02:00 local time) of the 'normal' day data;
- Settlement Periods 7 to 50 (02:00 to 24:00 GMT) of the 'long' day take the values of Settlement Periods 5 to 48 (02:00 to 24:00 local time) of the 'normal' day data.

Non-Functional Requirements:

Interfaces:
BMRA-I011, BMRA-I015

5.7   BMRA-F007: Generate Missing Market Index Data Messages

Requirement ID: BMRA-F007	Status: Mandatory	Title: Generate Missing Market Index Data Messages	BSC reference: P78
Man/auto: Automatic	Frequency: Once, for each settlement period.	Volumes:	

Functional Requirements:

The BMRA shall, for each Settlement Period, identify those Market Index Data Providers which are active for that Settlement Period, but have not submitted Market Index Data by the time that BMRA commences calculating the Indicative System Buy and Sell Prices – i.e. those cases where the calculation will use default values.
A warning message will be generated for each Market Index Data Provider so identified.

The Warning message will include:

Settlement Day
Settlement Period
Market Index Data Provider Identifier
Market Index Data Provider Name
Message detailing that the MIDP has not submitted Market Index Data in time for the Indicative Calculation, and therefore the Market Index Price and Market Index Volume have been defaulted to zero for that MIDP and Settlement Period

Non-Functional Requirements:

Interfaces:

BMRA-I005

5.8 BMRA-F008: Process Market Index Data Provider Liquidity Thresholds

Requirement ID: BMRA-F008	Status: M	Title: Process Market Index Data Provider Liquidity Thresholds	BSC reference: P78
Man/auto: Manual/Automatic	**Frequency:** On demand.	**Volumes:**	

Functional Requirements:

The BMRA shall carry out the following validation on MIDP Liquidity Thresholds:

    (a)   That there is no impact on retrospective dates;
    (b)   Where the Action is 'Insert', then the effective date range of the Liquidity Threshold record must not overlap with any existing record for that MIDP;
    (c)   Where the Action is 'Update', then the 'Effective From Settlement Date' must match the Effective From Settlement Date of an existing Liquidity Threshold record for that MIDP;
    (d)   Where the Action is 'Delete', then the 'Effective From Settlement Date' must match the Effective From Settlement Date of an existing Liquidity Threshold record for that MIDP.

Where a Liquidity Threshold record fails validation then it is rejected, and the details of the rejection are reported back to BSCCo.

After applying an update, or set of updates, for a given MIDP, the Liquidity Threshold data for current and future dates is reported back to BSCCo, using the BMRA-I017 flow.

Amendments to Liquidity Thresholds will not be applied to existing Market Index Data.

Non-Functional Requirement:

Interfaces:

BMRA-I016, BMRA-I017

5.9 BMRA-F009: Validate Adjustment Data

Requirement ID: BMRA-F009	Status: M	Title: Validate Adjustment Data	BSC reference: P78, P217
Man/auto: Automatic	Frequency: On demand.	Volumes:	

Functional Requirements:

For Settlement Dates prior to the P217 effective date the BMRA shall validate Adjustment Data, on receipt, to ensure that:
1. One of Energy SVA and Energy BVA must be zero;
2. One of System SVA and System BVA must be zero.

Where this is not the case, then the BMRA will generate an exception to the Transmission Company (via the BMRA-I010) detailing the reason for the exception, and will not load data for the offending Settlement Period.

For Settlement Dates on or after the P217 effective date the BMRA shall validate the following Adjustment Data items:

Net Energy Buy Price Cost Adjustment (EBCA) (£)
Net Energy Buy Price Volume Adjustment (EBVA) (MWh)
Net System Buy Price Volume Adjustment (SBVA) (MWh)
Net Energy Sell Price Cost Adjustment (ESCA) (£)
Net Energy Sell Price Volume Adjustment (ESVA) (MWh)
Net System Sell Price Volume Adjustment (SSVA) (MWh)

Where they are found to be non-zero, the BMRA will set the values to zero and pass the details of the validation failure to BSCCo.

Non-Functional Requirement:

Interfaces:

BMRA-I014, BMRA-I010

5.10 BMRA-F010: Produce ETSOVista Report[STF1] [P295]

Requirement ID: BMRA-F010	Status: M	Title: ETSOVista Data	BSC reference: CR129 (TAI2321)
Man/auto: Automatic by email	Frequency: Half hourly.	Volumes: Medium	

Functional Requirements:

For each half hour. the BMRA shall report to ETSOVista:

- A Balancing Mechanism Trend flag. This flag can have three different values, corresponding to the cases $NIV_j>0$, $NIV_j<0$ and $NIV_j=0$.

- The Global Imbalance i.e. the value (in MWh) of NIV_j.

- The System Sell Price (SSP_j) and System Buy Price (SBP_j) for the Settlement Period, converted from sterling to euros using the relevant exchange rate for the Settlement Day in question.

Non-Functional Requirement:

Interfaces:

A physical structure is defined by ETSOVista for this interface because it is sent as an electronic data file attached to an email. For details of this file structure please refer to [ETSO-BPRM].

~~5.11~~5.10   **BMRA-F011: Process SO-SO Trades**

Requirement ID: BMRA-F011	Status: M	Title: Process SO-SO Trades	BSC reference: CP1333
Man/auto: Automatic	Frequency: Continuously	Volumes: Up to 20 prices per Interconnector per hour (received as one file per Interconnector per hour) plus occasional resends and corrections of data (up to an extra 10% volume)	

Functional Requirements:

The BMRA shall carry out the following activities to process and prepare for publication information relating to SO-SO Trades:

1. The BMRA shall use the Resource Provider, Acquiring Area, Connecting Area and Resolution Codes to identify the SO-SO Trade Type to which the SO-SO price in each interval element of BMRA-I025 relates.

2. The effective date and time of each SO-SO price shall be determined from the Time Interval element of BMRA-I025, this time being the start time of the block to which the price relates. For example, a price that relates to 04:00 – 05:00 on 26 June 2011 would be notified with a time of 2001-06-24 04:00:00.

3. Individual Bids and Offers shall be identified using the Contract Identification and Direction elements, with a stack of multiple prices being built up for each block.

4. The currency in which each price is provided shall be determined from the currency element in BMRA-I025, validated against the expected of currencies for that price received in BMRA-I026.

5. The energy price value and quantity associated with each SO-SO trade shall be determined from the Energy Price and Qty elements in BMRA-I025. The quantity shall represent a MWh level while energy price shall represent a price value in the currency relevant for that SO-SO Trade Type (i.e. £/MWh or €/MWh).

6. The previous steps shall result in a set of Bids and Offers each comprising the following data items:

   - SO-SO Trade Type
   - Effective date and time
   - Direction
   - Contract Identification
   - Quantity
   - Energy Price

7. Following successful processing the information shall be published on the BMRS in accordance with BMRA-I005.

Non-Functional Requirement:

Interfaces:

BMRA-I025, BMRA-I026, BMRA-I005

6   External interfaces

Details of the contents of interfaces relevant to the BMRA are contained in the Interface Definition and Design (IDD). Part 1 of the IDD is limited to the definition and design of interfaces between the BSC central systems and the BSC Parties and their Agents, while Part 2 details the interfaces between the BSC central systems and other BSC service providers.

The interface document is based from and references to the Transmission Company BMRA & SAA Interface Specification:

6.1   Overview

The BMRA Service shall provide an interface to the following external parties.

Other Service Providers:

- Central Registration Agent (CRA)

- Settlement Administration Agent (SAA)

Other external parties:

- System Operator (SO)

- BMRS User

The BMRS shall provide inbound and outbound interfaces as summarised in the following table. Each interface requirement is listed below.

Reqt. No.	Interface Requirement	I/O	Interface User	Mechanism
BMRA-I001	Receive Registration Data	I	CRA	Automatic
BMRA-I002	Receive Balancing Mechanism Data	I	SO	Automatic
BMRA-I003	Receive System Related Data	I	SO	Automatic
BMRA-I004	Publish Balancing Mechanism Data	O	BMR Service User	Automatic
BMRA-I005	Publish System Related Data	O	BMR Service User	Automatic
BMRA-I006	Publish Derived Data	O	BMR Service User	Automatic
BMRA-I007	SAA/ECVAA Balancing Mechanism Data	O	SAA, ECVAA	Automatic
BMRA-I010	Data Exception Reports	O	SO, CRA, BSCCo Ltd, MIDP	Automatic
BMRA-I011	Performance Reports	O	BSCCo Ltd	Manual
BMRA-I012	Receive System Parameters	I	BSCCo Ltd	Manual
BMRA-I013	BMRA BSC Section D Charging Data	O	BSCCo Ltd	Manual
BMRA-I014	Receive Adjustment Data	I	SO	Automatic
BMRA-I015	Receive Market Index Data	I	MIDP	Automatic
BMRA-I016	Receive Market Index Data Provider Thresholds	I	BSCCo Ltd	Manual
BMRA-I017	Report Market Index Data Provider Thresholds	O	BSCCo Ltd	Manual
BMRA-I018	Receive Credit Default Notices	I	ECVAA	Automatic
BMRA-I019	Publish Credit Default Notices	O	BMR Service User	Automatic
BMRA-I020	Receive BM Unit Fuel Type List	I	SO	Manual
BMRA-I021	Receive Temperature Reference Data	I	SO	Manual
BMRA-I022	Receive Daily Energy Volume Reference Data	I	SO	Manual
BMRA-I023	Receive Wind Generation Registered Capacities	I	SO	Manual
BMRA-I024	Large Combustion Plant Directive	I	BSCCo Ltd	Manual

	Spreadsheet				
BMRA-I025	SO-SO Prices	I	SO	Automatic	
BMRA-I026	SO-SO Standing Data	I	SO	Manual	
BMRA-I027	Settlement Report	I	SAA	Automatic	
BMRA-I028	REMIT Data	I	BMR Service User SO	Automatic	
BMRA-I029	Transparency Regulation Data	I	SO	Automatic	
BMRA-I030	Publish REMIT Data	O	BMR Service User	Automatic	
BMRA-I031	Publish Transparency Regulation Data	O	BMR Service User ENTSO-E	Automatic	

~~BMRA I004, BMRA I005 and BMRA I006~~BMRA-I004, I005, I006, I030 and I031 are outbound interfaces that comprise of the following formats: [P291, P295]

- screen based (on both high and low grade services);

- programmatic (on high grade service);

- file download (on both high and low grade services).

6.2   Inbound Interface Requirements
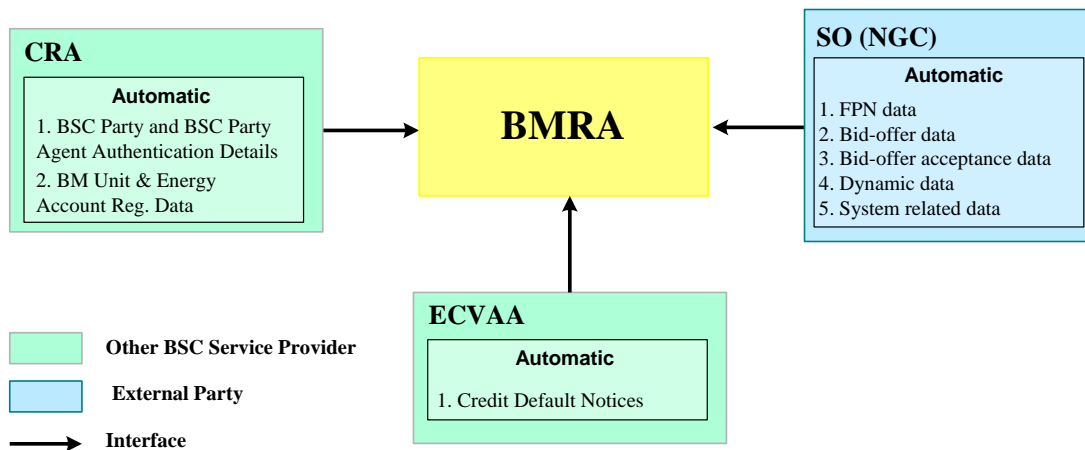
6.3   Outbound Interface Requirements
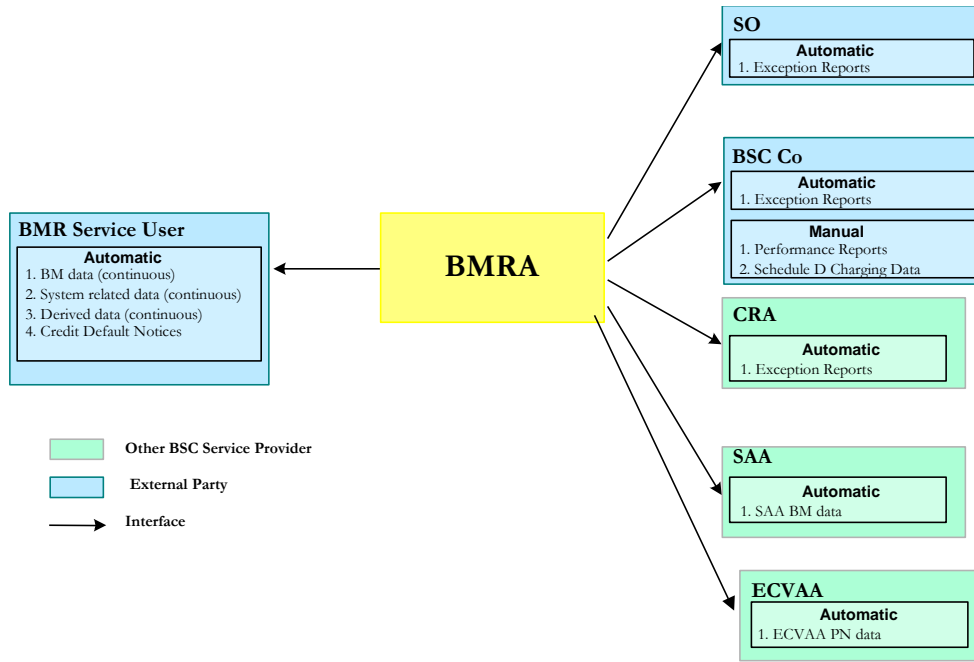
7 Non-Functional Requirements

Please refer to the document CRA URS for a complete specification of the non-functional requirements which are generic to all NETA central systems.

The generic non-functional requirements include:

- GEN-N001: Audit Requirements;

- GEN-N002: Security Requirements;

- GEN-N003: Operational Control;

- GEN-N004: Euro Compliance;

- GEN-N005: Help Desk Queries;

- GEN N006: Help Desk SLA Reporting.

7.1 BMRA-N001: Security for BMRA Service

Requirement ID: BMRA-N001	Status: Mandatory	Title: Security for BMRA Service	BSC reference: GEN SCH 3.B.4
Man/auto: As required	**Frequency:** As required.	**Volumes:** As required	
Non Functional Requirement:			
1: A secure site shall be provided for the systems required to support the Internet web based access of the BMRA Service. The systems and data shall be protected against unauthorised access and corruption of data. Note: Refer to GEN-N002 for common security requirements			
Interfaces:			
Issues:			

8 Service Requirements

Please refer to the document CRA URS for a complete specification of the service requirements which are generic to all NETA central systems.

The generic service requirements include:

- GEN-S001: Volumetric Requirements;

- GEN-S003: Backup and Recovery Requirements;

- GEN-S004: Archiving Requirements;

- GEN-S005: Synchronise System Time;

- GEN-S006: Query Resolution

(GEN-S002: Resilience Requirements is superseded by BMRA-S008: Resilience Requirements.)

8.1   BMRA-S001: High Grade BMRA Service Availability

Requirement ID: BMRA-S001	Status: Mandatory	Title: High Grade BMRA Service Availability	BSC reference: BMRA SD 1.4, 1.5, 1.6, 3.1, 4.2, B5, B6, B7. BMRA SCH 4 Part B section 2.2.3., CP703, P291, P295
Man/auto: Automatic	**Frequency:** See below.	**Volumes:** See below.	

Non Functional Requirement:

1: The BMRA central system shall receive, store and publish data on the high grade service continually as it is submitted by the SO, ~~or by~~ ECVAA or BMR service users.

2: Published data shall be "pushed" in near to real-time to interested BMR service users over high performance private lines in accordance to service level delivery times.

3: Published data shall be made available to all interested BMR service users at the same time.

4: Published data shall be presented to BMR Service Users as continuous real-time parameterised BM reports/screens, screen trading reports and BM data reports. Published data shall be received by interested BMR service users as a real-time feed and automatically update the relevant screen(s) displaying the data (if it is open). The visual representation of the data (i.e. graph, text) will automatically update to reflect the newly received data values.

5: Published data shall be identifiable at a component level (i.e. bid-offer data) so that BMR service users can select which data component to subscribe and display.

6: Published data shall be available to BMR Service Users:

- Forecast data: forecasts relating to future dates and periods will be available
- System Warnings: warnings will be available for 7 days from receipt
- Credit Default Notices: Level 1 and Level 2 Default Notices will be available as long as the default is in force, or until the associated BSC Party is withdrawn from the BSC. Cleared Notices will be available for 30 days (parameterised) from receipt
- REMIT data   messaged will be available for a period of 3 years after the calendar day to which it relates
- Transparency data   data will be available for a period of 5 years after its initial receipt
- All other data: data will be available for one year after the Settlement Date to which it relates

7: Drill-down facilities and intuitive on-screen cues shall be used to ensure that all information in the rolling seven day/1 year period can be readily accessed.

8: Published data shall be published on a near real-time message (or programmatic) interface, which may be used for integration with BMR service user proprietary systems.

9:	The BMR Service User main screen shall load within 10 seconds (subject to client PC hardware and LAN satisfying minimum specification).
10:	If the BMR Service User requests to view a different screen, the requested screen shall display within 1 second of request (subject to client PC hardware satisfying minimum specification).
11:	If the BMR Service User requests to subscribe to different data, the requested data shall begin to download within 1 minute of request
12:	High grade users will retrieve historical data through the web interface, they shall also have the ability to download BMRA data.
13:	Credit Default Notices will be removed from the BMRA Screens when instructed by ELEXON (e.g. when a party is removed from the BSC or when a dispute is upheld). When Credit Default Notices are removed in this way, no explicit message will be sent to BMR Service Users to indicate removal of the notice.
Interfaces:	
Issues:	
	The requirement for pictorial data has been discussed, but a specific requirement has not been agreed. Section 1.4 of the BMRA SD states that short term forecasts may be presented in a graphical **or** pictorial format. In the absence of an agreed format for pictorial data, short term forecasts shall be presented graphically.

8.2   BMRA-S002: Low Grade BMRA Service Availability

Requirement ID: BMRA-S002	**Status:** Mandatory	**Title:** Low Grade BMRA Service Availability	**BSC reference:** BMRA SD 1.5, 1.6, 3.1, 5.1, CP703, P291, P295
Man/auto: Automatic/ Manual	**Frequency:** See below.	**Volumes:** See below.	

Non Functional Requirement:	
1:	Published data shall be made available on a publicly available Internet web site. The availability and performance of this service shall be commensurate with standard Internet web sites.
2	Published data shall be refreshed on the source web page. The BMR Service User shall refresh the screen by manually re-loading the web page.

3: Published data shall be available:
- Forecast data: forecasts relating to future dates and periods will be available
- System Warnings: warnings will be available for 7 days from receipt
- Credit Default Notices: Level 1 and Level 2 Default Notices will be available as long as the default is in force, or until the associated BSC Party is withdrawn from the BSC. Cleared Notices will be available for 30 days (parameterised) from receipt.
- REMIT data   data will be available for a period of 3 years after the calendar day t which it relates
- Transparency data   data will be available for a period of 5 years after its initial receipt
- All other data: data will be available for one year after the Settlement Date to which it relates

All received and derived data shall be downloadable in a standard format (e.g. comma delimited ASCII file)

4:	Low grade users will have the ability to download data and retrieve historical data through the web interface.
5:	Credit Default Notices will be removed from the BMRA Screens when instructed by ELEXON (e.g. when a party is removed from the BSC or when a dispute is upheld). When Credit Default Notices are removed in this

Requirement ID: BMRA-S002	Status: Mandatory	Title: Low Grade BMRA Service Availability	BSC reference: BMRA SD 1.5, 1.6, 3.1, 5.1, CP703, P291, P295
way, no explicit message will be sent to BMR Service Users to indicate removal of the notice.			
Interfaces:			
Issues:			

8.3   BMRA-S003: Data Storage

Requirement ID: BMRA-S003	Status: Mandatory	Title: Data Storage	BSC reference: BMRA SD 4.1, 4.2, 5.1, CP703 P291, P295
Man/auto: Automatic	**Frequency:** As required.	**Volumes:** See below.	

Non Functional Requirement:

Both the High Grade BMRA Service and the Low Grade BMRA Service shall store all received and derived data on a rolling basis:

- Forecast data: all forecasts relating to future dates and periods will be stored
- System Warnings: warnings will be stored for 7 days from receipt
- Credit Default Notices: Level 1 and Level 2 Default Notices will be stored as long as the default is in force, or until the associated BSC Party is withdrawn from the BSC. Cleared Notices will be stored for 30 days (parameterised) from receipt.
- REMIT data   data will be stored for at least 3 years after the calendar day to which it relates
- Transparency data   data will be stored for at least 5 years after its initial receipt
- All other data: data will be stored for one year after the Settlement Date to which it relates

Interfaces:
Issues:

8.4   BMRA-S005: Data Access and Display

Requirement ID: BMRA-S005	Status: Mandatory	Title: Data Access and Display	BSC reference: BMRA SD 5.2, CP589 part 2 P295
Man/auto: Automatic	**Frequency:** As required.	**Volumes:** As required	

Non Functional Requirement:

1: BMR service ~~user~~ software shall be used to provide selective data reports, through on-line screens, to enable BMR Service Users to select, display and download a range of Balancing Mechanism information. Historic access to BM Unit related data shall allow BMR Service Users to retrieve Settlement Period related data relating to multiple BM Units in a single query. A single Settlement Period's data shall be provided for up to 50 BM Units or up to a whole Settlement Day's data may be provided for a single BM Unit.

2: The BMRA shall provide an authenticated access facility to allow BMR Service Users to submit REMIT data, ensuring that only users with appropriate permissions are able to do so.

Requirement ID: BMRA-S005	Status: Mandatory	Title: Data Access and Display	BSC reference: BMRA SD 5.2, CP589 part 2 P295
32: BMR Service ~~User~~ software shall make use of the most appropriate format, i.e. text, graphical or pictorial, for display of data. (See appendix C for more information.)			
Interfaces:			
Issues:			

8.5   BMRA-S006: Volumetric Requirements

Requirement ID: BMRA-S006	Status: Mandatory	Title: Volumetric Requirements	BSC reference: RETA BSC A3
Man/auto: Manual & Automatic	**Frequency:** As required	**Volumes:** As below.	

Non Functional Requirement:

The BMRA shall be sized in accordance with the following volumetric requirements. Required traffic volumes are unknown at present; these will be agreed when the current performance modelling work is completed.

	Low	Volumes Average	High
BSC Service Users*	100	200	300
Other users*	50	100	150
Connections (1.5 x BSC Service Users)*	225	450	675

*Concurrent users/connections supported

Interfaces:

Issues:

8.6   BMRA-S007: Resilience Requirements

Requirement ID: BMRA-S007	Status: Mandatory	Title: Resilience Requirements	BSC reference: BMRA SD B1
Man/auto: Automatic	**Frequency:** As required	**Volumes:** As below.	

Non Functional Requirement:

1: The BMRA central system shall provide a continuous unmanned 24x7 service, to enable support of the high grade BMRA service's near real-time reporting requirements. All software components of the high grade BMRA service shall run on a very high availability and resilient dual processor architecture which support an automatic fail over capability if either processor node was to fail.

The very high availability architecture shall support no single point of failure, with transparent fail-over of applications, storage and files.

2: The health of all application processes (in the high grade BMRA service) and system resources shall be continuously monitored. On detection of error, a pre-determined set of actions shall be performed. Examples of actions taken can include restarting a failed process and warning of critical resource shortages (disk, memory, CPU).

3: The continuous receipt of inbound data from the SO must not be lost or duplicated in the event of a failure.

Interfaces:

Issues:

9 User Roles and Activities

Please refer to the document CRA URS for description of the user roles which will support the day to day operation of the NETA central system services.

10 Future Enhancements

The BMRA shall be designed with a requirement to be flexible and accommodate change to specification with the minimum impact to program code re-work. Future enhancements may include:

- significant changes to display charts and graphs, according to the requirements of BMR service users.

Appendix A Glossary

Please refer to the document CRA URS for a complete reference of the NETA glossary of acronyms.

Appendix B   Requirement Summary Matrix

The following table shows the mapping of requirements defined in this URS document to the requirements set out in the Service Description for Balancing Mechanism Reporting [BMRA SD].

Service Description Requirement Number or CR number	URS Requirement Reference Number	Notes
1.1 - 1.3		Overview sections, therefore no mapping of requirements
1.4	BMRA-S001	
1.5	BMRA-S001	
1.6	BMRA-S001 BMRA-S002	
1.7	GEN-S007	
2		Overview section, therefore no mapping of requirements
3.1	BMRA-I002 BMRA-S001 BMRA-S002	
4.1	BMRA-S003	
4.2	BMRA-S001 BMRA-S003	
5.1	BMRA-S002 BMRA-S003	
5.2	BMRA-S005	
6.1	BMRA-I001	
6.2	BMRA-I010	
7.1	BMRA-I003 BMRA-I005 BMRA-I010	
7.2	BMRA-I014	
7.3	BMRA-I012	
7.4	BMRA-I004	
7.5	BMRA-I002	
7.6	BMRA-I002	
8.1	BMRA-I012	
8.2	BMRA-I012	
8.3	BMRA-I012	
8.4	BMRA-I012	
9.1	BMRA-I006	
9.2	BMRA-F001	
9.3	BMRA-F001	
9.4	BMRA-F001	
9.5	BMRA-F001	
9.6	BMRA-F001	
9.7	BMRA-F001	
9.8	BMRA-F001 BMRA-F002 BMRA-F003 BMRA-F004	
9.9	BMRA-F004	
9.10	BMRA-F001	
9.11	BMRA-F001	
9.12	BMRA-F001	
9.13	BMRA-F004	
9.14	BMRA-F001	
9.15	BMRA-F001	
9.16	BMRA-F001	
9.17	BMRA-F002	
9.18	BMRA-F004	
9.19	BMRA-F004	
9.20	BMRA-F004	

Service Description Requirement Number or CR number	URS Requirement Reference Number	Notes
9.21	BMRA-F004	
10.1	GEN-S005	
B1	BMRA-S007	
B2	BMRA-I001	
B3	BMRA-I003	
B4	BMRA-I002	
B5	BMRA-S001	
B6	BMRA-S001	
B7	BMRA-S001	
B8-15	GEN-N005 GEN-N006	
CR 65	BMRA-I013	
P8	BMRA-I005	
P18A	BMRA-I006	
P71	BMRA-I002 BMRA-I004 BMRA-I007	
P78	BMRA-F004 BMRA-F004a BMRA-F004b BMRA-F006 BMRA-F007 BMRA-F008 BMRA-F009 BMRA-I001 BMRA-I005 BMRA-I006 BMRA-I010 BMRA-I011 BMRA-I014 BMRA-I015 BMRA-I016 BMRA-I017	
CP703	BMRA-I018 BMRA-I019 BMRA-S001 BMRA-S002 BMRA-S003	
CP736	BMRA-I006 BMRA-I011	
CP975	BMRA-I001	
P219	BMRA-I003 BMRA-I005	
P220	BMRA-I003 BMRA-I005	
P226	BMRA-I024	
P243	BMRA-I003 BMRA-I005	
CP1333	BMRA-F011 BMRA-I025 BMRA-I026	
P291	BMRA-I028 BMRA-I030 BMRA-S001 BMRA-S002 BMRA-S003	
P295	BMRA-F010 BMRA-I029 BMRA-I031 BMRA-S001 BMRA-S002	

Service Description Requirement Number or CR number	URS Requirement Reference Number	Notes
	BMRS-S003	

Appendix C   BMRA external data flow timings and formats

C.1   System Operator System Related Data (BMRA-I003 and BMRA-I005 (partial))

DATA ITEM	[NGC IS] Reference and Flow Acronym	BSC Section Q Ref	TIMING (when issued by SO)	COVERAGE	FORMAT
2-14 days ahead (TSDFD) Transmission System demand forecast	5.1.3 TSDFD	6.1.3	By 1500hrs each day	Data for D+2 to D+14	Tabular and graphic (½ hour average MW value for the peak of the day)
2-14 days ahead (NDFD) National demand forecast	5.1.2 NDFD	6.1.3	By 1500hrs each day	Data for D+2 to D+14	Tabular and graphic (½ hour average MW value for the peak of the day)
2-52 weeks ahead (TSDFW) Transmission System demand forecast	5.1.3 TSDFW	6.1.2(b)	By 1500hrs each Thursday	Data for Week+2 to Week+52	Tabular and graphic (½ hour average MW value for the peak of the week)
2-52 weeks ahead (NDFW) National demand forecast	5.1.2 NDFW	6.1.2(a)	By 1500hrs each Thursday	Data for Week+2 to Week+52	Tabular and graphic (½ hour average MW value for the peak of the week)
2-14 days ahead (SPLD) National surplus forecast	5.1.1 OCNMFD	6.1.4	By 1600hrs each Business Day	Data for D+2 to D+14	Tabular and graphic (½ hour average MW value for the peak of the day)
2-52 weeks ahead (SPLW) National surplus forecast	5.1.1 OCNMFW	6.1.2(b)	By 1700hrs each Friday	Data for Week+2 to Week+52	Tabular and graphic (½ hour average MW value for the peak of the week)
2-14 days ahead National Generating Plant Demand Margin	16.2.1 OCNMFD2	6.1.4	By 1600hrs each Business Day	Data for D+2 to D+14	Tabular and graphic (½ hour average MW value for the peak of the day)
2-52 weeks ahead National Generating Plant Demand Margin	16.2.1 OCNMFW2	6.1.2	By 1700hrs each Friday	Data for Week+2 to Week+52	Tabular and graphic (½ hour average MW value for the peak of the week)

DATA ITEM	[NGC IS] Reference and Flow Acronym	BSC Section Q Ref	TIMING (when issued by SO)	COVERAGE	FORMAT
Output Usable Data	National 16.1.2				
	NOU2T14D	6.1.4A(a)	By 1600hrs each Business Day	Data for D+2 to D+14	Download (½ hour average MW value for the peak of the day)
	NOU2T49D	6.1.2B(a)	Once every month	Data for D+2 to D+49	
	NOU2T52W	6.1.2A(a)	By 1700hrs each Friday	Data for Week+2 to Week+52	
	NOUY1	6.1.4B(a)	Every 6 months	Data for Year+1	Download (½ hour average MW value for the peak of the week)
	NOUY2	6.1.4B(a)	Every 6 months	Data for Year+2	
	NOUY3	6.1.4B(a)	Every 6 months	Data for Year+3	
	NOUY4	6.1.4B(a)	Every 6 months	Data for Year+4	
	NOUY5	6.1.4B(a)	Every 6 months	Data for Year+5	
	Zonal 16.1.1				
	ZOU2T14D	6.1.4A(d)	By 1600hrs each Business Day	Data for D+2 to D+14	Download (½ hour average MW value for the peak of the day)
	ZOU2T49D	6.1.2B(b)	Once every month	Data for D+2 to D+49	
	ZOU2T52W	6.1.2A(d)	By 1700hrs each Friday	Data for Week+2 to Week+52	
	ZOUY1	6.1.4B(b)	Every 6 months	Data for Year+1	Download (½ hour average MW value for the peak of the week)
	ZOUY2	6.1.4B(b)	Every 6 months	Data for Year+2	
	ZOUY3	6.1.4B(b)	Every 6 months	Data for Year+3	
	ZOUY4	6.1.4B(b)	Every 6 months	Data for Year+4	
	ZOUY5	6.1.4B(b)	Every 6 months	Data for Year+5	

DATA ITEM	[NGC IS] Reference and Flow Acronym	BSC Section Q Ref	TIMING (when issued by SO)		COVERAGE	FORMAT
	By Fuel Type 16.1.3					
	FOU2T14D	6.1.4A(b)	By 1600hrs each Business Day	Data for D+2 to D+14		Graphic and download (½ hour average MW value for the peak of the day)
	FOU2T52W	6.1.2A(b)	By 1700hrs each Friday	Data for Week+2 to Week+52		Graphic and download (½ hour average MW value for the peak of the week)
	By Fuel Type and BM Unit 16.1.4					
	UOU2T14D	6.1.4A(c)	By 1600hrs each Business Day	Data for D+2 to D+14		Download (½ hour average MW value for the peak of the day)
	UOU2T52W	6.1.2A(c)	By 1700hrs each Friday	Data for Week+2 to Week+52		Download (½ hour average MW value for the peak of the week)
Initial Day ahead National demand forecast (NDF)	5.2 NDF	6.1.5(a)	By 0900hrs each day		Data for the following Operational Day (D+1)	Tabular and graphic (½ hour average MW values).
Initial Day ahead transmission system demand forecast (TSDF)	5.2 TSDF	6.1.5(b)	By 0900hrs each day		Data for the following Operational Day (D+1)	Tabular and graphic (½ hour average MW values).
Initial Day ahead Zonal transmission system demand forecast (TSDF)	5.2 TSDF	6.1.5(c)	By 0900hrs each day		Data for the following Operational Day (D+1)	Tabular, graphic and pictorial (½ hour average MW values).
Initial National Day ahead Indicated Margin (MELNGC)	5.3 MELNGC	6.1.6(a)	By 1200hrs each day		Data for the following Operational Day (D+1)	Tabular or graphic (½ hour average MW values).
Initial National Day ahead Indicated Imbalance (IMBALNGC)	5.3 IMBALNGC	6.1.6(b)	By 1200hrs each day		Data for the following Operational Day (D+1)	Tabular or graphic (½ hour average MW values).

DATA ITEM	[NGC IS] Reference and Flow Acronym	BSC Section Q Ref	TIMING (when issued by SO)	COVERAGE	FORMAT
Initial National Day ahead Indicated Generation (INDGEN)	5.3 INDGEN	6.1.6(c)	By 1200hrs each day.	Data for the following Operational Day (D+1)	Tabular or graphic (½ hour average MW values).
Initial National Day ahead Indicated Demand (INDDEM)	5.3 INDDEM	6.1.6(d)	By 1200hrs each day.	Data for the following Operational Day (D+1)	Tabular or graphic (½ hour average MW values).
Updated Day ahead National demand forecast (NDF)	5.3.1 NDF	6.1.6(e)	By 1200hrs each day	Data for the following Operational Day (D+1)	Tabular or graphic (½ hour average MW values).
Updated National Grid Transmission System Demand Forecast (TSDF)	5.3.1 TSDF	6.1.6(f)	By 1200hrs each day	Data for the following Operational Day (D+1)	Tabular or graphic (½ hour average MW values).
Current Day and Day Ahead Updated Market Information (MELNGC, IMBALNGC, INDGEN, INDDEM, NDF and TSDF)	National 5.3.1 NDF 6.1.8(a) MELNGC .... 6.1.8(b) IMBALNGC .... 6.1.8(c) INDDEM .... 6.1.8(d) INDGEN .... 6.1.8(e) TSDF 6.1.8(k)		By 0200hrsData for 0200D to 0500D+1 By 1000hrsData for 1000D to 0500D+1 By 1600hrsData for 0500D+1 to 0500D+2 By 1630hrsData for 1630D to 0500D+1 By 2200hrsData for 2200D to 0500D+2		Tabular, graphic and pictorial (½ hour average MW values).
Current Day and Day Ahead Updated Market Information (MELNGC, IMBALNGC, INDGEN, INDDEM and TSDF)	Zonal 5.3.2 TSDF 6.1.8(f) MELNGC.................. 6.1.8(g) IMBALNGC .... 6.1.8(h) INDDEM .... 6.1.8(i) INDGEN .... 6.1.8(j)		By 0200hrsData for 0200D to 0500D+1 By 1000hrsData for 1000D to 0500D+1 By 1600hrsData for 0500D+1 to 0500D+2 By 1630hrsData for 1630D to 0500D+1 By 2200hrsData for 2200D to 0500D+2		Tabular, graphic and pictorial (½ hour average MW values).
Initial National Demand Out-turn (INDO)	7.0 INDO	6.1.13	Within 15 minutes of the end of the settlement period	Data for previous Settlement Period	Tabular and graphic
Initial Transmission System Demand Out-turn (ITSDO)	7.0 ITSDO	6.1.13	Within 15 minutes of the end of the settlement period	Data for previous Settlement Period	Tabular and graphic
System warnings (SYS_WARN)	SYSWARN	n/a	Within 15 minutes of issue to MCUSA signatories	n/a	Textual
SO-SO Prices	SOSO	n/a	By 15 minutes before the start of each hour	Data for next hour	Tabular

DATA ITEM	[NGC IS] Reference and Flow Acronym	BSC Section Q Ref	TIMING (when issued by SO)	COVERAGE	FORMAT
Temperature (TEMP)	14.0 TEMP	6.1.15	By 1700hrs each day	Data for the previous Operational Day (D-1)	Tabular and graphic
Reference Temperature (REFTEMP)	N/A	6.1.16	By 1700hrs each day	Data for the previous Operational Day (D-1)	Tabular and graphic
Wind Generation Forecast (WINDFOR)	15 WINDFOR	6.1.17	By 1700hrs each day	Data for D to D+2	Tabular and graphic
Instantaneous Generation by Fuel Type (FUELINST)	12 FUELINST	6.1.18	Every 5 minutes	Data for previous 5 minutes	Tabular and graphic
Half Hourly Generation by Fuel Type (FUELHH)	12.FUELHH	6.1.19	Within 15 minutes of the end of the settlement period	Data for previous Settlement Period	Tabular and graphic
Non-BM STOR (NONBM)	16 NONBM	6.1.22	Within 15 minutes of the end of the settlement period	Data for previous Settlement Period	Tabular and graphic
System Frequency (FREQ)	13 FREQ	6.1.23	Every 2 minutes	Data for previous 2 minutes	Tabular and graphic
Initial National Demand Out-Turn Daily (INDOD)	7 INDOD	6.1.21	By 1700hrs each day	Data for the previous Operational Day (D-1)	Tabular and graphic
Reference Initial National Demand Out-Turn Daily (REFINDOD)	N/A	6.1.21	By 1700hrs each day	Data for the previous Operational Day (D-1)	Tabular and graphic

Notes: All forecast data is sourced from the System Operator.

In the event that a forecast update is not received from the System Operator, the BMRA shall display the most recent forecast value for that time.

If an initial forecast is not received from the System Operator, the BMRA shall display nothing.

All data is published within 5 minutes of receipt by BMRA

Where data is scheduled to be issued on a Friday and this is a non-working day, it will be published on the Thursday instead

C.2 BM Data (BMRA-I002, BMRA-I014, BMRA-I004 and BMRA-I005 (partial))

DATA ITEM	SOURCE	FORMAT	DEFAULT	COMMENTS
FPN per BM Unit (PN, QPN)	SO (Grid Code)	Tabular and graphic.	None	
Bids and Offers per BM Unit (BOD)	SO (Grid Code)	Tabular.	None	Prices and volumes to be displayed
Total Bid Volume	BMRA	Tabular and graphic.	None	Calculated from BOD data.
Total Offer Volume	BMRA	Tabular and graphic.	None	Calculated from BOD data.
Dynamics per BM Unit (MEL, MIL, RURE, RURI, RDRE, RDRI, NDZ, NTO, NTB, MZT, MNZT, SEL, SIL, MDV, MDP)	SO (Grid Code)	Tabular.	Previously submitted dynamics	
Acceptances per BM Unit (BOAL)	SO (Grid Code)	Tabular and graphic.	None	
Balancing Services Adjustment Data (BSAD): ESCA ESVA SSVA SPA EBCA EBVA SBVA BPA	SO	Tabular	None	Include BSAD as used in derivation of estimated SSP and SBP (published alongside derived estimated SSP/SBP) Also list of most recent version of BSAD data.
Disaggregated Balancing Services Adjustment Data (DBSAD)	SO	Tabular	None	

Notes: All BM data is sourced from the System Operator.

All data is published within 5 minutes of receipt by BMRA and retained for 12 months.

Total Bid/Offer volumes are computed when Bid-Offer data is processed

C.3   BMRA Derived Data (BMRA-I005 (partial) and BMRA-I006)

DATA ITEM	SOURCE	FORMAT	DEFAULT	COMMENTS
Estimated System Buy Price (SBP_i)	BMRA	Tabular and graphic	None	Derived within BMRA for initial numbers.
Estimated System Sell Price (SSP_j)	BMRA	Tabular and graphic	None	Derived within BMRA for initial numbers.
Period BM Unit Total Accepted Bid and Offer Volumes (QAB^n_{ij} and QAO^n_{ij})	BMRA	Tabular	None	Derived within BMRA for initial numbers.
Total Accepted Bid Volume	BMRA	Tabular and graphic	None	Derived within BMRA for initial numbers.
Total Accepted Offer Volume	BMRA	Tabular and graphic	None	Derived within BMRA for initial numbers.
Estimated Period Balancing Mechanism Bid and Offer Cashflows (CB^n_{ij} and CO^n_{ij})	BMRA	Tabular	None	Derived within BMRA for initial numbers.
Total Unpriced Accepted Bid Volume	BMRA	Tabular and graphic	None	Derived within BMRA for initial numbers.
Total Unpriced Accepted Offer Volume	BMRA	Tabular and graphic	None	Derived within BMRA for initial numbers.
Total Priced Accepted Bid Volume	BMRA	Tabular and graphic	None	Derived within BMRA for initial numbers.
Total Priced Accepted Offer Volume	BMRA	Tabular and graphic	None	Derived within BMRA for initial numbers.
Indicative System Price Stacks	BMRA	Tabular and graphic	None	Derived within BMRA for initial numbers.
System messages	BMRA	Textual	None	Reports missing Market Index Data

Notes: All data is published within <CADL> + 15 (parameterised) minutes of the end of relevant ½ hour and retained for 12 months.

C.4   Market Index Data (BMRA-I005 (partial))

DATA ITEM	SOURCE	TIMING	FORMAT	DEFAULT	COMMENTS
Market Index Data	MIDP	Within 15 minutes of end of related Settlement Period, or within 15 minutes of receipt, whichever is later.	Tabular	None	Data arriving after the related calculation has begun will be rejected, and therefore not published.

C.5 Credit Default Notices (BMRA-I019)

DATA ITEM	SOURCE	TIMING	FORMAT	DEFAULT	COMMENTS
Credit Default Notices	ECVAA	Within 5 minutes of receipt, then 2 (parameterised) additional times at 20 minute (parameterised) intervals	Tabular	None	Level 1 and Level 2 notices displayed continuously while BSC Party is still effective. Cleared notices displayed for 30 (parameterised) days.

C.6 REMIT Data (BMRA-I028) [P291]

REMIT Data may be received from either the SO or from BMR Service Users via the ELEXON Portal.

DATA ITEM	TIMING	FORMAT	DEFAULT	COMMENTS
REMIT Data	Within 5 minutes of receipt,	Tabular	None	

C.7 Transparency Regulation Data (BMRA-I029) [P295]

Transparency Regulation Data is sourced from the System Operator or generated by BMRA and is provided in a tabular format along with options to download the information. All data is published within 5 minutes of receipt or generation by BMRA.

DATA ITEM	ARTICLE REF	TIMING	COVERAGE
Actual Total Load per Bidding Zone	6.1.(a)	No later than one hour after the Settlement Period	Data per Settlement Period over the previous day
Day Ahead Total Load per Biding Zone	6.1.(b)	Two hours after gate closure	Data per Settlement Period over the day ahead

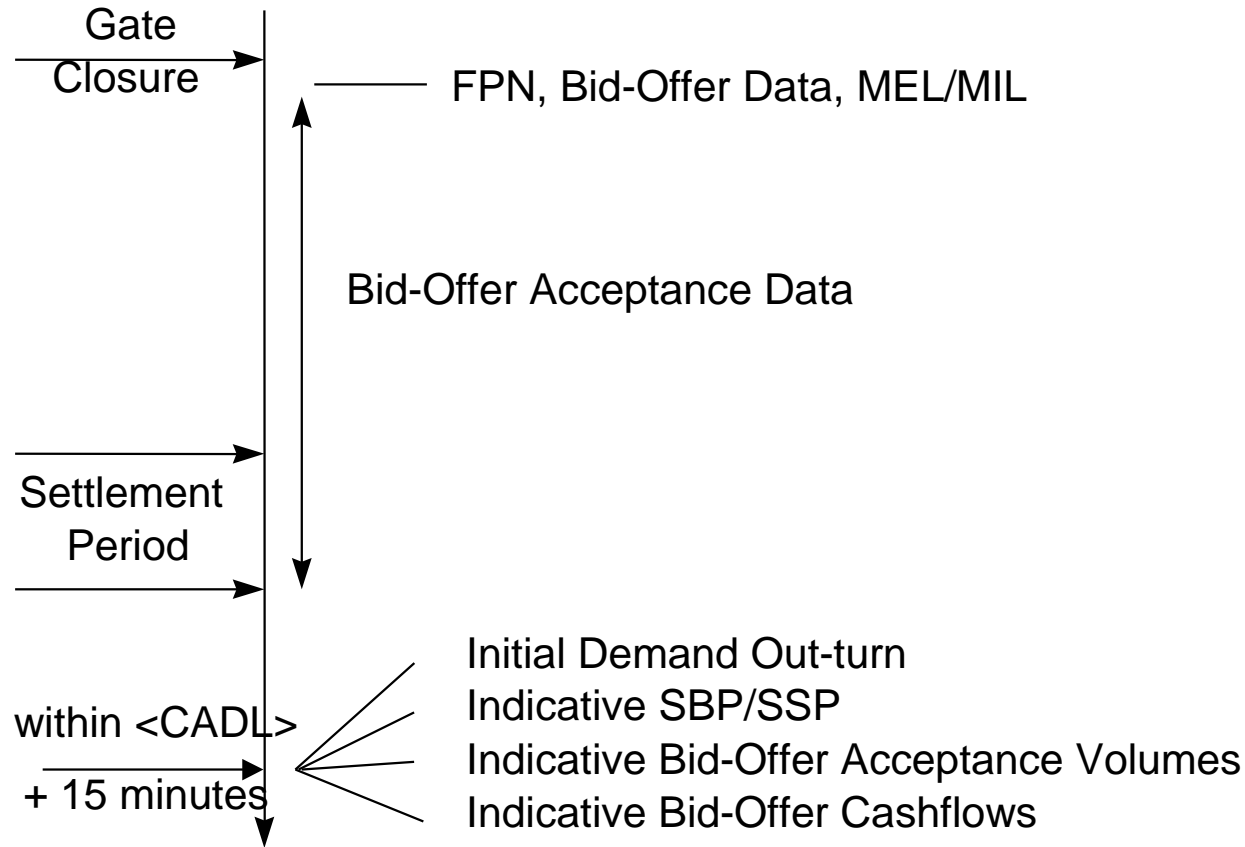|			
Week Ahead Total Load Forecast per Bidding Zone	6.1.(c)	Each Friday, two hours before gate closure	Data per day for the week ahead
Month Ahead Total Load Forecast per Bidding Zone	6.1.(d)	One week before the delivery month	Data per week for the month ahead
Year Ahead Total Load Forecast per Bidding Zone	6.1.(e)	15th day of the month before year to which the data refers to	Data per month for the year ahead
Planned Unavailability of Consumption Units (>=100MW)	7.1.(a)	One hour after decision regarding planned unavailability	Any details of planned unavailability
Changes in Actual Availability of Consumption Units (>=100MW)	7.1.(b)	One hour after decision regarding planned unavailability	Any details of planned unavailability
Year Ahead Forecast Margin	8.1	15th day of the month before year to which the data refers to	Data for the year ahead
Expansion and Dismantling Projects (≥100MW)	9.1	One week before the yearly capacity auction, but no later than December 15th at 2400 local time	Data for the year ahead
Planned Unavailability in the Transmission Grid (≥100MW)	10.1.(a)	An any time	Any details of planned unavailability
Changes in Actual Availability in the Transmission Grid (≥100MW)	10.1.(b)	At any time	Any details of actual unavailability
Changes in Actual Availability of Off-Shore Grid Infrastructure	10.1.(c)	One hour after the change in actual availability	Any details of wind unavailability
Countertrading	13 (b)	No later than one hour after the settlement period	Any details of countertrading
Costs of Congestion Management	13 (c)	Before the last working day of the following month	Details of cost incurred in a given month

Installed Generation Capacity Aggregated (>1MW)	14.1.(a)	One week before the beginning of the forecast year	Data for the next year
Installed Generation Capacity per Unit (>100MW)	14.1.(b)	One week before the beginning of the first forecast year	Data for the next 3 years
Day-Ahead Aggregated Generation	14.1.(c)	By 18:00 hours (Brussels time, UTC+01:00), one day before actual delivery	Data per Settlement Period for the day ahead
Day-Ahead Generation Forecasts for Wind and Solar (MWh)	14.1.(d)	18:00 hours (Brussels time, UTC+01:00), one day before actual delivery	Data per Settlement Period for the day ahead
Planned Unavailability of Generation Units (>100MW)	15.1.(a)	No Later than one hour after the decision regarding the planned unavailability	Data for up to 3 years ahead
Changes in Actual Availability of Generation Units (>100MW)	15.1.(b)	No Later than one hour after the change in actual availability	Data for up to 3 years ahead
Planned Unavailability of Production Units (≥200 MW including changes of 100 MW or more)	15.1.(c)	No later than one hour after the decision regarding the planned unavailability	Data for up to 3 years ahead
Changes in Actual Availability of Production Units (≥200 MW)	15.1.(d)	One hour after the decision regarding the planned unavailability	Data for up to 3 years ahead
Actual Generation Output Per Generation Unit	16.1.(a)	Five days after the Settlement Period	Data per Settlement Period
Aggregated Generation per Type (units >100MW installed capacity)	16.1.(b)	No later than one hour after the Settlement Period	Data for the previous Settlement Period
Actual or Estimated Wind and Solar Power Generation	16.1.(c)	No later than one hour after the operational period	Data for the previous Settlement Period
Rules on Balancing	17.1.(a)	At any time	N/A

Amount of Balancing Reserves under Contract	17.1.(b)	Two hours before the next procurement	Coverage dependent on by contract type (yearly monthly, etc.)
Prices of Procured Balancing Reserves	17.1.(c)	No later than one hour after the procurement process ends	Coverage dependent on by contract type (yearly monthly, etc.)
Accepted Aggregated Offers	17.1.(d)	No Later than one hour after the Settlement Period	Data for the previous Settlement Period
Activated Balancing Energy	17.1.(e)	No later than 30 minutes after the end of the Settlement Period	Data for the previous Settlement Period
Prices of Activated Balancing Energy	17.1.(f)	No Later than one hour after the Settlement Period	Data for the previous Settlement Period
Market Imbalance Prices	17.1.(g)	Two hours after the end of the Settlement Period	Data for the previous Settlement Period
Aggregated Imbalance Volumes	17.1.(h)	No later than 30 minutes after the end of the Settlement Period	Data for the previous Settlement Period
Financial Expenses And Income For Balancing	17.1.(i)	No later than three months after the operating month	Data for the previous month
Cross-Border Balancing • Volumes of Exchanged Bids and Offers. • Prices • Energy Activated	17.1.(j)	No later than one hour after the Settlement Period	Data for the previous Settlement Period

Appendix D   BMRA forecast data time-line

00:00

0200: Updated Generation, Demand, Margin

06:00

0900: Day+1 Demand Forecast

1000: Updated Generation, Demand, Margin

12:00   1200: Natl Day+1 Generation, Demand, Margin

1600: Day+1 Generation, Demand, Margin

18:00   1630: Updated Generation, Demand, Margin

2200: Updated Generation, Demand, Margin

24:00

(long-term forecasts not shown)

Appendix E   **BMRA settlement period time-line**

Gate Closure

FPN, Bid-Offer Data, MEL/MIL

Bid-Offer Acceptance Data

Settlement Period

within <CADL>

+ 15 minutes

Initial Demand Out-turn
Indicative SBP/SSP
Indicative Bid-Offer Acceptance Volumes
Indicative Bid-Offer Cashflows

Appendix F Logical Data Model

The following logical data model diagram is for indicative purposes only.
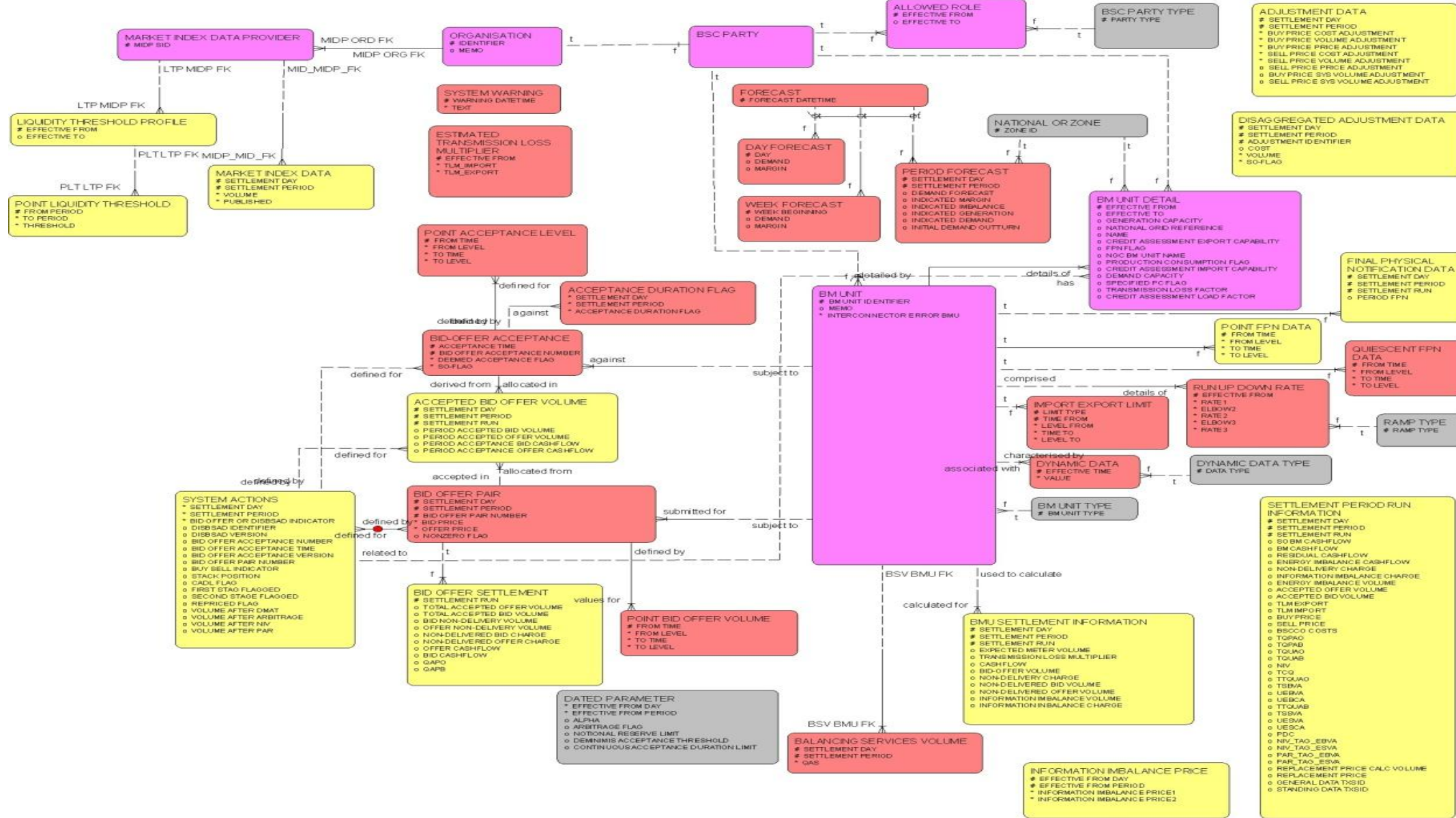
Appendix G Price Derivation Code Definitions

The possible values of the Price Derivation Code are defined in the table below. The description gives a brief summary of what the code represents, and the condition detail defines the relevant conditions that cause this related code to be true. Refer to the description of how the Indicative System Buy Price and Indicative System Sell Price are calculated for further understanding of what these conditions mean.

For Settlement Dates prior to the P217 effective date:

Code	Description	Condition Detail
A	SBP = Main price; SSP = Reverse Price	NIV is positive $\sum$QXP is non zero SBP = NIV; SSP = PXP; QAPO + UEBVA is not zero; SSP is not greater than SBP
B	SSP Capped to SBP	NIV is positive $\sum$QXP is non zero SBP = NIV; SSP = NIV; QAPO + UEBVA is not zero; SSP is greater than SBP
C	SSP Defaulted to SBP	NIV is positive $\sum$QXP is zero SBP = NIV; SSP = NIV; QAPO + UEBVA is not zero
D	SBP & SSP Defaulted to Market Price	NIV is positive $\sum$QXP is non zero SBP = PXP; SSP = PXP; QAPO + UEBVA is zero
E	SSP & SBP Defaulted to Zero	NIV is positive $\sum$QXP is zero SBP = 0; SSP = 0; QAPO + UEBVA is zero
F	SSP = Main Price; SBP = Reverse Price	NIV is negative $\sum$QXP is non zero SBP = PXP; SSP = NIV; QAPB + UESVA is not zero; SSP is not greater than SBP
G	SBP Capped to SSP	NIV is negative $\sum$QXP is non zero SBP = NIV; SSP = NIV; QAPB + UESVA is not zero; SSP is greater than SBP

Code	Description	Condition Detail
H	SBP Defaulted to SSP	NIV is negative ∑QXP is zero SBP = NIV; SSP = NIV; QAPB + UESVA is not zero
I	SBP & SSP Defaulted to Market Price	NIV is negative ∑QXP is non zero SBP = PXP; SSP = PXP; QAPB + UESVA is zero
J	SSP & SBP Defaulted to Zero	NIV is negative ∑QXP is zero SBP = 0; SSP = 0; QAPB + UESVA is zero
K	SSP & SBP Defaulted to Market Price	NIV is zero ∑QXP is non zero SBP = PXP; SSP = PXP;
L	SSP & SBP Defaulted to Zero	NIV is zero ∑QXP is zero SBP = 0; SSP = 0;

For Settlement Dates on or after the P217 effective date (note: Price Derivation Codes D, E, I, and J are not applicable for P217 effective dates):

Code	Description	Condition Detail
A	SBP = Main price; SSP = Reverse Price	NIV is positive ∑QXP is non zero SBP = NIV; SSP = PXP; SSP is not greater than SBP
B	SSP Capped to SBP	NIV is positive ∑QXP is non zero SBP = NIV; SSP = NIV; SSP is greater than SBP
C	SSP Defaulted to SBP	NIV is positive ∑QXP is zero SBP = NIV; SSP = NIV;
F	SSP = Main Price; SBP = Reverse Price	NIV is negative ∑QXP is non zero SBP = PXP; SSP = NIV; SSP is not greater than SBP

Code	Description	Condition Detail
G	SBP Capped to SSP	NIV is negative ∑QXP is non zero SBP = NIV; SSP = NIV; SSP is greater than SBP
H	SBP Defaulted to SSP	NIV is negative ∑QXP is zero SBP = NIV; SSP = NIV;
K	SSP & SBP Defaulted to Market Price	NIV is zero ∑QXP is non zero SBP = PXP; SSP = PXP;
L	SSP & SBP Defaulted to Zero	NIV is zero ∑QXP is zero SBP = 0; SSP = 0;