Settlement Administration Agent User Requirements Specification

Synopsis	The Settlement Administration Agent is responsible for calculating payments resulting from trades in both the Balancing Mechanism and Imbalance Settlement processes. This document describes the detailed requirements of this service.
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Table of Contents

1 Management Summary 6
2 Introduction 7
3 Scope of Specification 7
4 Business and System Overview 8
4.1 Summary of Business Requirements 8
4.2 The Settlement Calendar 9
4.3 Service Context 10
4.4 Requirements Summary 11
4.6 Numbering Scheme for Requirement Definitions 12
4.7 Attributes of Individual Requirements 14
5 Functional Requirements 15
5.1 SAA-F001: Produce Settlement Calendar 15
5.2 SAA-F002: Validate settlement data 16
5.3 SAA-F003: Validate SVAA meter data 17
5.4 SAA-F004: Calculate Supplier BM Unit Metered Volumes 18
5.5 SAA-F005: Calculate balancing mechanism volumes 20
5.6 SAA-F006: Calculate BM unit transmission loss multipliers 25
5.7 SAA-F007: Calculate balancing mechanism cashflows 26
5.8 SAA-F008: Calculate credit energy volumes 28
5.9 SAA-F009: Calculate energy imbalance prices 29
5.10 SAA-F010: Calculate interconnector error 48
5.11 SAA-F011: Calculate energy imbalance cashflows 49
5.12 SAA-F012: Validate Adjustment Data 51
5.13 SAA-F013: Calculate information imbalance charges 51
5.14 SAA-F014: Calculate non-delivery volumes 53
5.15 SAA-F015: Calculate non-delivery charges 56
5.16 SAA-F016: Calculate system operator BM cashflow 57
5.17 SAA-F017: Calculate residual cashflows 58
5.18 SAA-F018: Allocate BSCCo Ltd Costs (Redundant) 59
5.19 SAA-F019: Aggregate charges and payments 60
5.20 SAA-F020: Validate Market Index Data 60
5.21 SAA-F021: Manage settlement disputes 62
5.22 SAA-F022: Provide settlement reports 63
5.23 SAA-F023: Process Market Index Data Provider Liquidity Thresholds 63
5.24 SAA-F024: Daily Check for Missing Settlement Calculation Data Flows 64
5.25 SAA-F025: Process Withdrawing Party Settlement Details 65
5.26 SAA-F026: Process Emergency Acceptance Data 66
5.27 SAA-F027: Calculate BM Unit Gross Demand for EMR 67
5.28 SAA-F028: Compare SBR Imbalance Price and System Buy Price 68
6 Interface Requirements 69
7 Non-functional Requirements 73
7.1 SAA-N001: Audit Requirements 73
7.2 SAA-N002: *Requirement not currently used* 73
7.3 SAA-N003: Operational Control 74
7.4 SAA-N004: *Requirement not currently used* 74
8 Service Requirements 75
9 User Roles and Activities 75
Appendix A Glossary 77
Appendix B Requirements Compliance Matrix 77
Appendix C Logical Data Model 82
Appendix D Business Process Model 83
Appendix E Price Derivation Code Definitions 84

1 Management Summary 5
2 Introduction 6
3 Scope of Specification 6
4 Business and System Overview 7
4.1 Summary of Business Requirements 7
4.2 The Settlement Calendar 8
4.3 Service Context 9
4.4 Requirements Summary 10
4.6 Numbering Scheme for Requirement Definitions 11
4.7 Attributes of Individual Requirements 13
5 Functional Requirements 14
5.1 SAA-F001: Produce Settlement Calendar 14
5.2 SAA-F002: Validate settlement data 15
5.3 SAA-F003: Validate SVAA meter data 16
5.4 SAA-F004: Calculate Supplier BM Unit Metered Volumes 17
5.5 SAA-F005: Calculate balancing mechanism volumes 19
5.6 SAA-F006: Calculate BM unit transmission loss multipliers 24
5.7 SAA-F007: Calculate balancing mechanism cashflows 25
5.8 SAA-F008: Calculate credit energy volumes 27
5.9 SAA-F009: Calculate energy imbalance prices 28
5.10 SAA-F010: Calculate interconnector error 47
5.11 SAA-F011: Calculate energy imbalance cashflows 48
5.12 SAA-F012: Validate Adjustment Data 50
5.13 SAA-F013: Calculate information imbalance charges 50
5.14 SAA-F014: Calculate non-delivery volumes 52
5.15 SAA-F015: Calculate non-delivery charges 55
5.16 SAA-F016: Calculate system operator BM cashflow 56
5.17 SAA-F017: Calculate residual cashflows 57
5.18 SAA-F018: Allocate BSCCo Ltd Costs (Redundant) 58
5.19 SAA-F019: Aggregate charges and payments 59
5.20 SAA-F020: Validate Market Index Data 59
5.21 SAA-F021: Manage settlement disputes 61
5.22 SAA-F022: Provide settlement reports 62
5.23 SAA-F023: Process Market Index Data Provider Liquidity Thresholds 62
5.24 SAA-F024: Daily Check for Missing Settlement Calculation Data Flows 63
5.25 SAA-F025: Process Withdrawing Party Settlement Details 64
5.26 SAA-F026: Process Emergency Acceptance Data 65
5.26 SAA-F027: Calculate BM Unit Gross Demand for EMR 66
5.28 SAA-F028: Compare SBR Imbalance Price and System Buy Price 67
6 Interface Requirements 68
7 Non-functional Requirements 72
7.1 SAA-N001: Audit Requirements 72
7.2 SAA-N002: *Requirement not currently used* 72
7.3 SAA-N003: Operational Control 73
7.4 SAA-N004: *Requirement not currently used* 73
8 Service Requirements 74
9 User Roles and Activities 74
Appendix A Glossary 76
Appendix B Requirements Compliance Matrix 76
Appendix C Logical Data Model 81
Appendix D Business Process Model 82
Appendix E Price Derivation Code Definitions 83
1 Management Summary 4
2 Introduction 5

3 Scope of Specification 5
4 Business and System Overview 6
4.1 Summary of Business Requirements 6
4.2 The Settlement Calendar 7
4.3 Service Context 8
4.4 Requirements Summary 9
4.6 Numbering Scheme for Requirement Definitions 10
4.7 Attributes of Individual Requirements 12
5 Functional Requirements 13
5.1 SAA-F001: Produce Settlement Calendar 13
5.2 SAA-F002: Validate settlement data 14
5.3 SAA-F003: Validate SVAA meter data 15
5.4 SAA-F004: Calculate Supplier BM Unit Metered Volumes 16
5.5 SAA-F005: Calculate balancing mechanism volumes 18
5.6 SAA-F006: Calculate BM unit transmission loss multipliers 23
5.7 SAA-F007: Calculate balancing mechanism cashflows 24
5.8 SAA-F008: Calculate credit energy volumes 26
5.9 SAA-F009: Calculate energy imbalance prices 27
5.10 SAA-F010: Calculate interconnector error 46
5.11 SAA-F011: Calculate energy imbalance cashflows 47
5.12 SAA-F012: Validate Adjustment Data 49
5.13 SAA-F013: Calculate information imbalance charges 49
5.14 SAA-F014: Calculate non-delivery volumes 51
5.15 SAA-F015: Calculate non-delivery charges 54
5.16 SAA-F016: Calculate system operator BM cashflow 55
5.17 SAA-F017: Calculate residual cashflows 56
5.18 SAA-F018: Allocate BSCCo Ltd Costs (Redundant) 57
5.19 SAA-F019: Aggregate charges and payments 58
5.20 SAA-F020: Validate Market Index Data 58
5.21 SAA-F021: Manage settlement disputes 60
5.22 SAA-F022: Provide settlement reports 61
5.23 SAA-F023: Process Market Index Data Provider Liquidity Thresholds 61
5.24 SAA-F024: Daily Check for Missing Settlement Calculation Data Flows 62
5.25 SAA-F025: Process Withdrawing Party Settlement Details 63
5.26 SAA-F026: Process Emergency Acceptance Data 64
5.25 SAA-F027: Calculate BM Unit Gross Demand for EMR 65
6 Interface Requirements 67
7 Non-functional Requirements 71
7.1 SAA-N001: Audit Requirements 71
7.2 SAA-N002: Requirement not currently used 71
7.3 SAA-N003: Operational Control 72
7.4 SAA-N004: Requirement not currently used 72
8 Service Requirements 73
9 User Roles and Activities 73
Appendix A – Glossary 75
Appendix B – Requirements Compliance Matrix 75
Appendix C – Logical Data Model 80
Appendix D – Business Process Model 81
Appendix E – Price Derivation Code Definitions 82

Amendment History

Date	Version	Description of Change	Mods /Panel/ Committee Refs
05/11/2009	13.0	P217, CP1283, CP1286	Change Implementation
03/11/2011	14.0	Document amended to remove details of interfaces included in the IDD Part 1 or Part 2, and to include changes for P253, as part of the November 2011 Release.	Change Implementation
29/11/2012	15.0	P278 for the November 2012 Release	ISG138/10
27/06/2013	16.0	P285 for the June 2013 Release	P206/07
01/08/14	17.0	ORD005	Directed by the Secretary of State
25/06/15	18.0	CP1435	ISG168/02

1 Management Summary

The Settlement Administration Agent (SAA) is one of the suite of seven services that support the operation of the Balancing and Settlement Code (BSC).The SAA role is critical to the successful operation of the BSC, as it calculates the credit and debit payments resulting both from trades made in the Balancing Mechanism (BM) and from imbalances between contracted and actual generation or consumption. The principal business processes involved may be summarised as:

- The capture of data relating to the operation of the BM and the settlement of imbalances in each half hour, from a range of sources;
- For each Settlement Day, execution of the BM and imbalance calculations as dictated by the Settlement Calendar, so that a minimum of six Settlement and Reconciliation runs are carried out for each day over a period of 14 months following the Settlement Date;
- Preparation and distribution of a series of Settlement reports to BSC Parties, the FAA and other parties, detailing the results of each day's Settlement calculations; and
- Support of the Disputes management process which enables BSC Parties to query the reported outcome of the Settlement and Reconciliation runs.

The purpose of this document is to provide a complete specification of the set of business requirements which the SAA 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 SAA itself 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 is of particular importance for the implementation of the SAA, CRA and CDCA services, which 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 SAA 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 detailed requirements for the exchange of data between the SAA, 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 service delivery requirements of the SAA service, including such as issues as performance, volumetrics, number of Settlement runs to be carried out.

These requirements are catalogued in sections 5 to 8 respectively.

2 Introduction

This document is the User Requirements Specification (URS) for the Settlement Administration Agent 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 system services. This document set comprises:

- BMRA URS;
- CRA URS;
- SAA URS;
- ECVAA URS;
- CDCA URS;
- FAA URS;
- SVAA URS;
- Interface Specification.

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

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

It should be noted that whereas this URS describes the requirements of the SAA *Service* in isolation, the computer system built to support these requirements will be a combined SAA, CRA and CDCA system.

3 Scope of Specification

This document provides a specification of the requirements for the Settlement Administration Agent (SAA) Service within the BSC Services Agreement. The requirements are described from the point of view of the SAA Service users.

The document is divided into the following chapters.

- Chapter 4, Business and System Overview - describes the business context of the SAA Service;
- Chapter 5, Functional Requirements - describes the functional requirements of the Service from the point of view of the Service users;
- Chapter 6, Interfaces Requirements - describes the interfaces with the external users of the Service;
- Chapter 7, Non-Functional Requirements - describes the non-functional requirements of the Service, such as auditing, security and resilience;
- 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;
- 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 Customer's Tender Invitation documents;
- Appendix C: Logical Data Model;
- Chapter 14, Appendix D: Business Process Model.

4 Business and System Overview

This section provides an overview of the Settlement Administration Agent (SAA) 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 SAA will receive the inbound data, provided by other BSC Services, and perform calculations based on the validated data such that the financial debits and credits determined under the BSC of each BSC Party can be determined. The Funds Administration Agent will then be advised of the required financial transfers. This operation will be performed in accordance with the Settlement Timetable. The SAA service will also produce reports for distribution to BSC Parties and others, such as BSCCo Ltd and the System Operator.

The information the SAA service will calculate will include:

- Balancing Mechanism accepted bid/offer volumes and prices,
- System Buy and System Sell price,

- BM Unit Transmission Loss Multipliers,
- Interconnector Error Administrator's energy volumes,
- Information Imbalance Charges,
- Credited energy volumes,
- Non-delivery volumes and charges,
- Energy imbalance charges,
- Other costs, including System Operator charge, BSCCo Ltd administration charge, and SAA administration charge and Residual cash-flow reallocation.

Services will be provided to support the Disputes Process, including re-runs of the Settlement calculations as required.

In addition, the SAA service will produce and publish the Settlement Calendar.

4.2 The Settlement Calendar

The settlement rules require the SAA to perform at least six standard settlement runs in respect of each settlement day, together with any dispute requested under the auspices of the BSC. The set of settlement runs to be carried out for each settlement day will consist of:

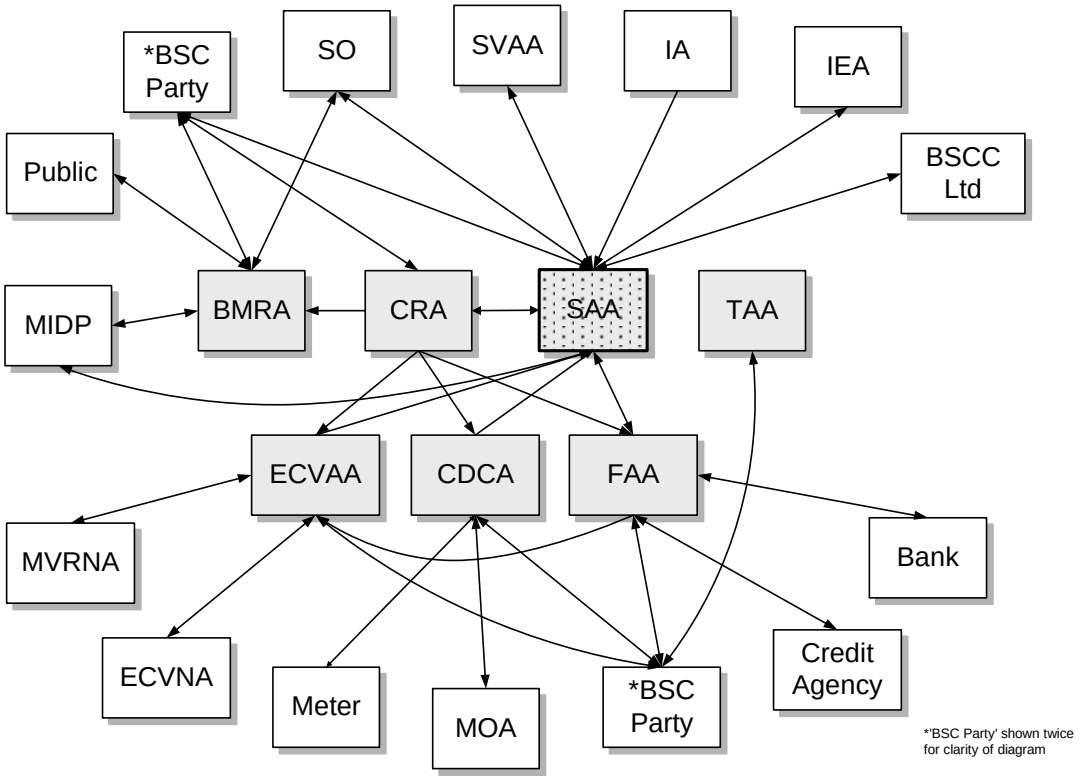
- Interim Initial Settlement;
- Initial Settlement;
- Reconciliation Settlement (3 runs)
- Final Reconciliation;
- Settlement Dispute (runs as necessary).

The Settlement Calendar will be constructed so as to smooth the processing of these settlement runs, as necessary, across available working days with the aim of reducing the necessity of running more than ten settlements runs on any given working day and to meet the payment timetable as produced by the FAA.

The CDCA is required to supply the ECVAA with aggregated BM Unit Meter Volume data for Credit Cover purposes. Although not part of Settlement this 'Credit Cover Volume Allocation Run' will be scheduled from and be part of the Settlement Calendar.

4.3 Service Context

The following diagram illustrates the context of the SAA 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 SAA 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	A signatory to the Balancing and Settlement Code
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 rating data on BSC Parties.
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.
MIDP	Market Index Data Provider
MVRNA	Metered Volume Reallocation Notification Agent
MOA	Meter Operation 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.

4.4 Requirements Summary

The following table summarises the requirements of the SAA service. These are then described in detail in section 5, including the source reference for each requirement.

Requirement ID.	User Requirement
Functional	
SAA-F001	Produce Settlement Calendar
SAA-F002	Validate settlement data
SAA-F003	Validate SVAA meter data
SAA-F004	Calculate Supplier BM Unit Metered Volumes
SAA-F005	Calculate balancing mechanism volumes
SAA-F006	Calculate BM unit transmission loss multipliers
SAA-F007	Calculate balancing mechanism cashflows
SAA-F008	Calculate credit energy volumes
SAA-F009	Calculate energy imbalance prices
SAA-F010	Calculate interconnector error
SAA-F011	Calculate energy imbalance cashflows
SAA-F012	Validate Adjustment Data
SAA-F013	Calculate information imbalance charges
SAA-F014	Calculate non-delivery volumes
SAA-F015	Calculate non-delivery charges
SAA-F016	Calculate system operator BM cashflow
SAA-F017	Calculate residual cashflows
SAA-F018	Allocate BSCCo Ltd Costs (Redundant)
SAA-F019	Aggregate charges and payments
SAA-F020	Validate Market Index Data
SAA-F021	Manage settlement disputes
SAA-F022	Provide settlement reports
SAA-F023	Process Market Index Data Provider Liquidity Thresholds

Requirement ID.	User Requirement
SAA-F024	Daily Check for Missing Settlement Calculation Data Flows
SAA-F025	Process Withdrawals Party Settlement Details
SAA-F026	Process Emergency Acceptance Data
SAA-F027	Calculate BM Unit Gross Demand for EMR
SAA-F028	Compare SBR Imbalance Price and System Buy Price
Interface	
SAA-I001	Receive Registration Data
SAA-I002	Receive Credit Assessment Load Factor
SAA-I003	Receive Balancing Mechanism Data
SAA-I004	Receive Period Meter Data
SAA-I005	*Requirement not currently used*
SAA-I006	Receive Interconnector User BM Unit Metered Volumes
SAA-I007	Receive BM Unit Allocated Demand Volume
SAA-I008	Receive Energy Contract Data
SAA-I009	Receive Transmission Loss Data
SAA-I010	Receive BSCCo Ltd Cost Data (Redundant)
SAA-I011	Receive Payment Calendar Data
SAA-I012	Receive Dispute Notification
SAA-I013	Issue Credit/Debit Reports (initial and revised)
SAA-I014	Issue Settlement Reports
SAA-I015	Issue BM Unit CAIC Data
SAA-I016	Publish Settlement Calendar
SAA-I017	Issue SAA Data Exception Reports
SAA-I018	Issue Dispute Reports
SAA-I019	Issue BSC Party Performance Reports (Redundant)
SAA-I020	Issue SAA Performance Reports
SAA-I021	Receive Acknowledgement of SAA Messages
SAA-I022	Issue SAA Acknowledgement of Messages
SAA-I023	Receive System Parameters
SAA-I025	SAA BSC Section D Charging Data
SAA-I026	Receive Balancing Services Adjustment Data
SAA-I027	Report pre-settlement run validation failure
SAA-I028	Receive settlement run decision
SAA-I029	Receive settlement run instructions
SAA-I030	Receive Market Index Data
SAA-I031	Receive Market Index Data Provider Thresholds
SAA-I032	Report Market Index Data Provider Thresholds
SAA-I033	Receive Request for Data Change
SAA-I034	Report Recommended Data Change
SAA-I035	Receive Instruction for Data Change
SAA-I036	Report Confirmation of Data Change
SAA-I037	Issue Withdrawing Party Settlement Details
SAA-I038	Receive Excluded Emergency Acceptance Pricing Information
SAA-I039	Send Excluded Emergency Acceptance Dry Run Results
SAA-I040	Receive Authorisation To Proceed With Full Settlement Run
Non-Functional	
SAA-N001	Audit Requirements
SAA-N002	Security Requirements
SAA-N003	Operational Control
SAA-N004	Euro Compliance

4.6 Numbering Scheme for Requirement Definitions

As described in section 2, the set of baseline requirement documents includes a User Requirements Specification for each of the services of the central BSC systems

(except FAA - see footnote 1). Within these documents each requirement across the set of services is uniquely identified to provide traceability of each individual requirement from URS to System Specification (functional specification) and then to Design Specification (technical specification).

In keeping with industry good practise, this 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. (TAA is typically excluded from the latter.) 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 would be two separately numbered requirements (which happen to be the same) in this example.

Each requirement is 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);
- TAA (Technical Assurance Agent);
- FAA (Funds Administration Agent);
- GEN (General).

2. Requirements are categorised into the following headings:

   - Functional (F), a specific business requirement of the service.
   - Interface (I), a requirement for data exchange between services or to external parties.
   - 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.

3. Within a service, each requirement has 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

4.7 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 SAA requirements will 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.

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. For interface requirements an additional mechanism of 'via shared database' may be specified indicating that combined computer system will be built for the SAA, CRA and CDCA services. This mechanism statement 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. Any outstanding issues relating to the requirement definition are also identified.

5 Functional Requirements

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

5.1 SAA-F001: Produce Settlement Calendar

Requirement ID: SAA-F001	**Status:** M	**Title:** Produce Settlement Calendar	**BSC reference:** SAA SD 5.2, SAA BPM 3.2, CP555, P215
Man/auto: Manual	Frequency: On demand.	Volumes:	

Functional Requirement:

The SAA shall produce a Settlement Calendar that is consistent with the Payment Calendar (published by the Funds Administration Agent) and defines when the Settlement runs should take place for each Settlement Day, taking account for bank holidays etc. (See NETA Clarification Note CR_99813_06b: 2.1)

The calendar shall also specify when data needs to be provided to the SAA from each party/agent providing data in order to enable the payment calendar to be complied with.

The calendar shall also specify when data needs to be provided to the ECVAA from each party/agent for the purposes of Credit Cover.

The Settlement Calendar shall be provided to all such parties/agents for comment and shall be approved by BSCCo Ltd.

Non Functional Requirement:

The Settlement Calendar shall cover the year starting 1st April.

FAA will issue a draft Payment Calendar to SAA by January 15th, and SAA shall respond with any comments to BSCCo Ltd within 5 working days of receipt. After resolution of any issues, FAA will issue the authorised Payment Calendar, by 31st January.

On receipt of the authorised Payment Calendar from FAA, SAA shall prepare and issue a draft Settlement Calendar to BSCCo Ltd, CDCA and SVAA within 10 working days. On receipt of approval of the Settlement Calendar from BSCCo Ltd, SAA shall issue the approved Settlement Calendar to CDCA, SVAA and BSC Parties within two working days.

Interfaces:

Issues:

5.2 SAA-F002: Validate settlement data

Requirement ID:	Status:	Title:	BSC reference:
SAA-F002	M	Validate settlement data	SAA SD 2, CP598, CP639, P78
Man/auto: Manual & Automatic	**Frequency:** Once, on each settlement run & on demand.	**Volumes:**	

Functional Requirement:

All received input data to the SAA shall be validated to confirm that it exists and is in the correct format to enable a settlement run to be executed.

If expected settlement data is not received or is invalid the SAA shall take remedial action to obtain complete and corrected data from the relevant service, e.g. CRA, CDCA, ECVAA, BMRA SVAA , SO or BSC party.

For all run types for the settlement day, the validation checks are:

- check FPN data has been loaded for all settlement periods for BM Units that have their FPN flag set, or for which BOD data has been loaded;
- check BSAD data has been loaded for all settlement periods;
- check Bid/Offer data has been loaded for all settlement periods in which any BM Unit has a Bid Offer Acceptance;
- check Interconnector User BM Unit metered volumes have been received for each Interconnector;
- check Account Bilateral Contract Volumes and Metered Volume Reallocation Data have been received from the ECVAA;
- check appropriate CDCA Aggregation Run has taken place;

For Interim Initial settlement runs for Settlement Dates prior to the P253 effective date, the following additional check is performed:

- check that no data relating to this settlement day has been loaded from the SVAA.

In addition to the checks outlined above, the SAA will, on D+3, check that the required Market Index Data has been received.

For Interim Initial settlement runs for Settlement Dates on or after the P253 effective date, and for all Initial Settlement and Reconciliation runs, the following additional check is performed:

- check that BM Unit Allocated Demand Volume data relating to this settlement day has been loaded from the SVAA.

The SAA will report any failures of the above checks to BSCCo through manual flow SAA-I027 and await instruction on how to proceed. BSCCo shall immediately respond to the SAA through SAA-I028 with an indication as to whether to proceed making use of default functionality in the system, or whether to suspend the run pending further instruction. Instruction on how to proceed other than by substituting system default data shall be received by SAA from BSCCo through SAA-I029.

Non Functional Requirement:

Interfaces:

See SAA-I027, SAA-I028, SAA-I029

Issues:

5.3 SAA-F003: Validate SVAA meter data

Requirement ID: SAA-F003	**Status:** M	**Title:** Validate SVAA meter data	**BSC reference:** SAA SD 2.5.1, CP639
Man/auto: Automatic	**Frequency:** Once, on each settlement run.	**Volumes:**	

Functional Requirement:

For Settlement Dates prior to the P253 effective date, the following validation shall be performed on receipt of BM Unit Allocated Demand Volume and BM Unit SVA Gross Demand data at the Loader:

- check that the Interim Initial Settlement Run has been performed for that settlement date.

If the above check fails, the entire flow shall be rejected and the SAA will report the failure of the above check to BSCCo through manual flow SAA-I027 but will not take any further action.

If the Interim Initial Settlement Run has been performed and/or the Settlement Date is on or after the P253 effective date, processing continues with the following:

- the CDCA Run Number & Settlement Date received from the SVAA matches the CDCA Run Number and Settlement Date received from the CDCA;
- the Aggregated Supplier Volume Allocation received from the SVAA matches the GSP Group Take provided by CDCA (accounting for tolerances);

The SAA will report the failure of the above check to BSCCo through manual flow SAA-I027 and await further instruction. BSCCo shall immediately respond to the SAA through SAA-I028 with an indication as to whether to proceed with the settlement run, or whether to suspend the run pending further instruction. Instruction on how to proceed shall be received by SAA from BSCCo through SAA-I029.

- all BM Unit identifiers reported in the BM Unit Allocated Demand Volume data shall be valid for the settlement day

Where this check fails, the metered volume shall be added into the Base BM Unit for the Supplier in the relevant GSP Group. The SAA will report the failure of the above check to BSCCo through manual flow SAA-I027 and await further instruction. The SAA shall notify BSCCo that it has undertaken the above defaulting in time for BSCCo to instruct the SAA otherwise, if deemed appropriate by BSCCo. BSCCo shall immediately respond to the SAA through SAA-I028 with an indication as to whether to proceed with the settlement run, or whether to suspend the run pending further instruction. Instruction on how to proceed shall be received by SAA from BSCCo through SAA-I029.

The following Pre-Run additional checks shall be performed:

- BM Unit Allocated Demand Volume data has been received from SVAA.
- the SVAA has supplied data for all supplier BM Units

The SAA will report any failure of the above checks to BSCCo through manual flow SAA-I027 and await instruction on how to proceed. BSCCo shall immediately respond to the SAA through SAA-I028 with an indication as to whether to proceed with the settlement run, or whether to suspend the run pending further instruction. Instruction on how to proceed shall be received by

SAA from BSCCo through SAA-I029.

- CDCA Run Number & Settlement Date received from SVAA matches that from CDCA.

If there is a discrepancy, the SAA will check with the SVAA and CDCA. If the discrepancy cannot be resolved, the SAA will report the failure of the above check to BSCCo through manual flow SAA-I027 and await instruction on how to proceed. BSCCo shall immediately respond to the SAA through SAA-I028 with an indication as to whether to proceed with the settlement run, or whether to suspend the run pending further instruction. Instruction on how to proceed shall be received by SAA from BSCCo through SAA-I029.

Note that where a volume is not specified for a Supplier BM Unit, no value is loaded. Where that volume is required in processing functions, a default value of zero is applied by the processing function.

Non Functional Requirement:

The SAA Service shall receive BM Unit Allocated Demand Volume and BM Unit SVA Gross Demand in accordance with the Settlement Calendar.

Interfaces:

See SAA-I007, SAA-I027, SAA-I028, SAA-I029, SAA-I041

Issues:

5.4 SAA-F004: Calculate Supplier BM Unit Metered Volumes

Requirement ID: SAA-F004	**Status:** M	**Title:** Calculate Supplier BM Unit Metered Volumes	**BSC reference:** Modification P2, CP632
Man/auto: Automatic	**Frequency:** Once on each Settlement Run	**Volumes:**	

Functional Requirement:

For Interim Initial settlement runs for Settlement Dates on or after the P253 effective date, and for all Initial Settlement and subsequent Settlement Runs, the SAA shall use the BM Unit Allocated Demand Volume received from SVAA via interface SAA-I007.

For Interim Initial Settlement Runs for Settlement Dates prior to the P253 effective date only, where this data is not available, the SAA shall calculate QM_{ij} for Supplier BM Units using data from previous Settlements Days and Periods, as follows.

1: Determine the previous Settlement Day d' to use in estimating the Supplier BM Unit Metered Volumes for Settlement Day d as follows:

Settlement Day d' shall be the most recent Settlement Day prior to d that is:

a) the same day of the week as day d,

b) not a clock change day, and

c) a day on which an Initial Settlement (SF) Run has taken place.

2: Determine the Settlement Period j' on Settlement Day d' to use in estimating the Supplier BM Unit Metered Volumes for Settlement Period j of Settlement Day d as follows:

a) If day d is not a clock change day, then j' = j

b) If day d is a short clock change day, then:

i) If $j \leq 2$ then $j' = j$

ii) If $j > 2$ then $j' = j + 2$

c) If day d is a long clock change day, then:

i) If $j \leq 4$ then $j' = j$

ii) If $j > 4$ then $j' = j - 2$

3: Finally, having determined the variables j' and d', the BM Unit Metered Volume for Supplier BM Units in the Interim Initial Run shall be calculated as:

$$QM_{ij} = GSPGT_{ij} * QM_{ij'} / GSPGT_{ij'}$$

Where:

$GSPGT_{ij}$ is the GSP Group Take for the GSP Group associated with BM Unit i in Settlement Period j on Settlement Day d

$QM_{ij'}$ is the BM Unit Metered Volume for BM Unit i in Settlement Period j' on Settlement Day d'

$GSPGT_{ij'}$ is the GSP Group Take for the GSP Group associated with BM Unit i in Settlement Period j' on Settlement Day d'

If there is no BM Unit Metered Volume for BM Unit i in Settlement Period j' on Settlement Day d' (for example, because the BM Unit was not effective on that Day), then QM_{ij} shall be set to 0.

Non Functional Requirement:

Interfaces:

Issues:

5.5 SAA-F005: Calculate balancing mechanism volumes

Requirement ID: SAA-F005	Status: M	Title: Calculate balancing mechanism volumes	**BSC reference**: SAA BPM 3.5 SAA SD 3.2.2-7, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12, 3.17.1, 3.18, 3.19, CP632, P71, CP754.
Man/auto: Automatic	Frequency: Once, on each settlement run.	Volumes:	

Functional Requirements:

A large number of intermediate calculations are required to produce the balancing mechanism volumes. All calculation steps in this requirement are included here.

Whilst all half-hourly integrated MWh energy quantities should be explicitly calculated as part of the settlement process, it is not intended that these continuous functions of time should actually be calculated or reported. The variables to which this applies are as follows:

Final Physical Notification ($FPN_{ij}(t)$)

Bid-Offer Volume ($qBO^{n}_{ij}(t)$)

Bid-Offer Upper Range ($BOUR^{n}_{ij}(t)$)

Bid-Offer Lower Range ($BOLR^{n}_{ij}(t)$)

Acceptance Volume ($qA^{k}_{ij}(t)$)

Accepted Bid-Offer Volume ($qABO^{kn}_{ij}(t)$)

Accepted Offer Volume ($qAO^{kn}_{ij}(t)$)

Accepted Bid Volume ($qAB^{kn}_{ij}(t)$)

1: The value of Final Physical Notification, $FPN_{ij}(t)$ shall be defined for times, t, falling within Settlement Period j by linear interpolation from the values of Point FPN ($^{f}FPN_{it}$), 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 time t shall be defined by linear interpolation from the values of Point Bid-Offer Volume ($^{f}qBO^{n}_{it}$) submitted for Settlement Period j for BM Unit i.

3: Define Bid-Offer Upper Range for Bid-Offer Pairs with positive Bid-Offer Pair Numbers, and define the Bid-Offer Lower Range for Bid-Offer Pairs with negative Bid-Offer Pair Numbers. The Bid-Offer Upper Range is defined as follows:

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

$BOUR^{0}_{ij}(t) = FPN_{ij}(t)$

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

For Bid-Offer Pairs for which the associated Bid-Offer Pair Number n<0, the Bid-Offer Lower Range $BOLR^n_{ij}(t)$ is defined for all times in Settlement Period j as:

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

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

On occasion, the SO may issue acceptances which exceed the Bid-Offer ranges:

In the following equations,

Σ^+ represents a sum over all positive Bid-Offer Pairs (zero if there are none)
Σ^- represents a sum over all negative Bid-Offer Pairs (zero if there are none)
$qA^k_{ij}(t)$ is the acceptance level for acceptance k

If, for any k, $qA^k_{ij}(t) > FPN_{ij}(t) + \Sigma^+ qBO^n_{ij}(t)$

then:

if $FPN_{ij}(t) >= 0$ and there is at least one positive bid-offer pair,

the highest numbered Bid-Offer pair is extended up to $Max^k(qA^k_{ij}(t))$

otherwise,

a new bid-offer pair is created with pair number one greater than the highest (or 1 if none exist) with:

$BOUR^n_{ij}(t) = Max\{ FPN_{ij}(t) + \Sigma^+ qBO^n_{ij}(t), Max^k(qA^k_{ij}(t)) \}$

If, for any k, $qA^k_{ij}(t) < FPN_{ij}(t) + \Sigma^- qBO^n_{ij}(t)$

then:

if $FPN_{ij}(t) <= 0$ and there is at least one negative bid-offer pair,

the lowest numbered Bid-Offer pair is extended down to $Min^k(qA^k_{ij}(t))$

otherwise,

a new bid-offer pair is created with pair number one lower than the lowest (or -1 if none exist) with:

$BOLR^n_{ij}(t) = Min\{ FPN_{ij}(t) + \Sigma^- qBO^n_{ij}(t), Min^k(qA^k_{ij}(t)) \}$

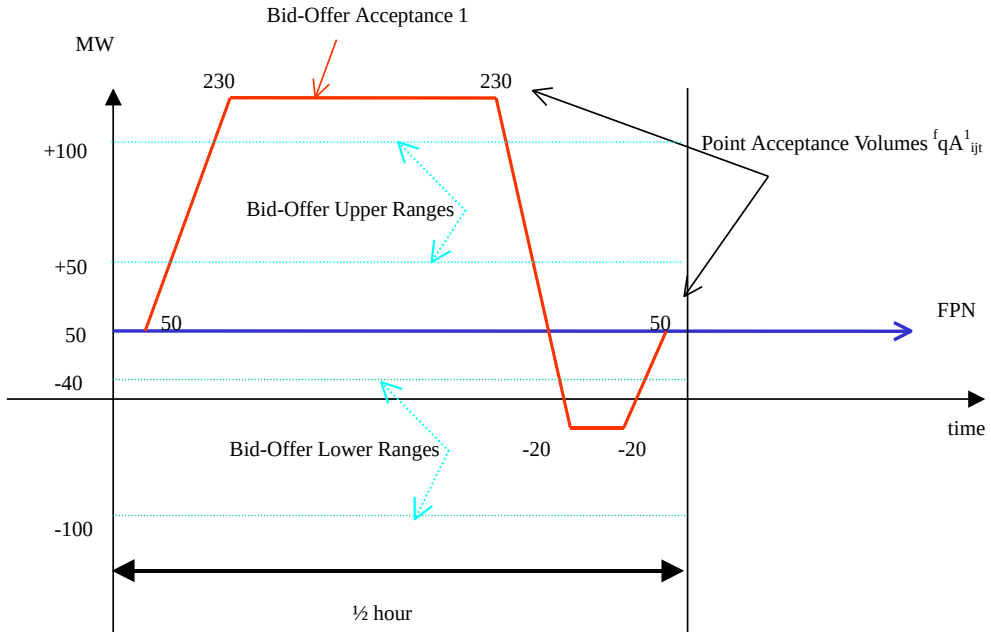
4: The Acceptance Volume ($qA^k_{ij}(t)$) attributable to each Bid-Offer Acceptance shall be defined. This is undertaken through processing the Point Acceptance Volumes that define the MW output levels that the System Operator requested the BM Unit to operate for certain times within the Balancing Mechanism 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 times within the Balancing Mechanism Window Period prior to the first value Point Acceptance Volume for Bid-Offer Acceptance k, or after the last value, the value of the Acceptance Volume is set to the last calculated value of Acceptance Volume for those 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,

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

For n<0,

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

Where, from all Bid-Offer Acceptances for which an Acceptance Volume has been determined for Settlement Period j, k- represents the last Bid-Offer Acceptance preceding k which covers time t.

If there is no such Bid-Offer Acceptance, 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.

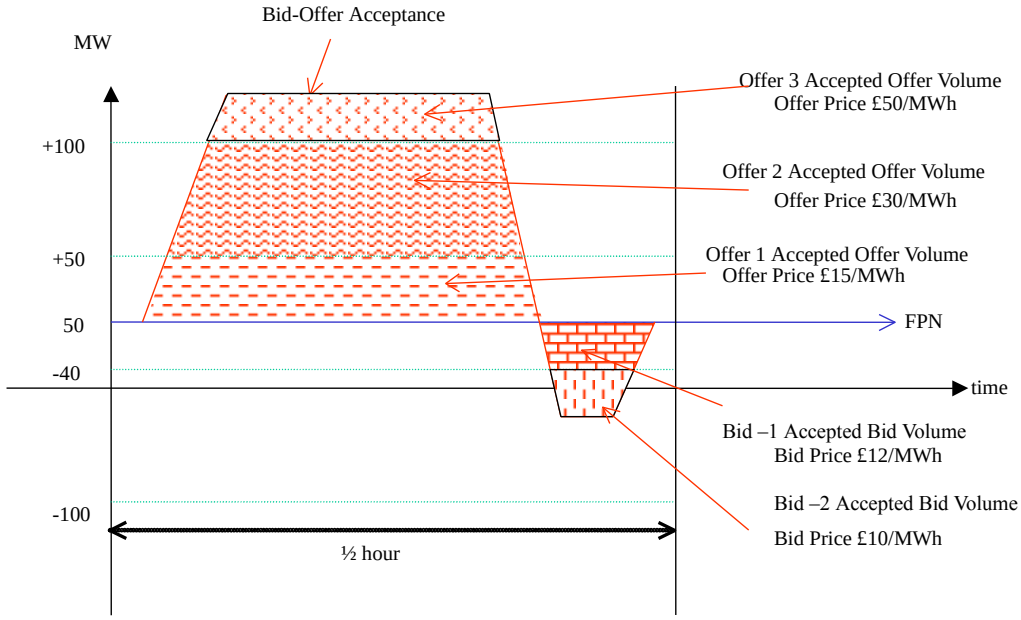
The Accepted Offer Volume ($qAO^{kn}_{ij}(t)$) represents the volume (in MW) of Offer n accepted as a result of Bid-Offer Acceptance k from BM Unit i at times t within Settlement Period j. It is the positive part of the Bid-Offer Acceptance Volume, defined by:

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

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 times t within Settlement Period j. It is the negative part of the Bid-Offer Acceptance Volume, defined 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 times in the Settlement Period.

The Period Accepted Offer Volume (QAO^{kn}_{ij}) is determined by integrating the Accepted

Offer Volume over all 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 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.

8: 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.

Where either of QAO^{n}_{ij} or QAB^{n}_{ij} is non-zero, a flag (NZ^{n}_{i}) is set to record that a non-zero value has been calculated for the Settlement Period [see SAA-I014 sub flow 2 in IDD part 2].

9: The Period BM Unit Balancing Services Volume shall be calculated as follows:

$QBS_{ij} = \Sigma^{n} (QAO^{n}_{ij} + QAB^{n}_{ij}) + QAS_{ij}$

where

Σ^{n} represents the sum over all Bid-Offer Pair numbers for the BM Unit

QAS_{ij} is the BM Unit Applicable Balancing Services Volume

This represents the net volume of Balancing Services accepted in Settlement Period j for BM Unit i

10: The Period FPN (FPN_{ij}) shall be calculated for each BM Unit i, by integrating the value of Final Physical Notification $FPN_{ij}(t)$ across all times t, falling within Settlement Period j. The Period FPN is quoted in MWh.

Non-Functional Requirement:

Interfaces:

Issues:

5.6 SAA-F006: Calculate BM unit transmission loss multipliers

Requirement ID: SAA-F006	**Status:** M	**Title:** Calculate BM unit transmission loss multipliers	**BSC reference:** SAA SD 3.1, SAA BPM 3.6, SAA WS1 Action 24 CP1222, P278
Man/auto: Automatic	**Frequency:** Once, on each settlement run.	**Volumes:**	

Functional Requirements:

A number of intermediate calculations are required to produce the transmission loss multipliers.

All calculation steps in this requirement are included here.

1: All BM unit metered volumes shall be summed over their associated Trading Units to determine the net Import or Export meter volumes for each Trading Unit. Where the total Trading Unit meter volume is positive, all BM Units associated with this Trading Unit shall be classified as delivering to the Total System. Where the total Trading Unit meter volume is negative, all BM Units associated with this Trading Unit shall be classified as offtaking from the Total System.

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 "delivering" and "offtaking" status of such a Trading Unit shall therefore be determined using the metered volume of the single BM Unit comprising that Trading Unit.

This calculation takes place in each Settlement Period.

2: The Transmission Loss Multipliers ($TLMO^{+}_{j}$ and $TLMO^{-}_{j}$) shall be calculated for the Settlement Period j. These are calculated as follows:

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

$$TLMO^{-}_{j} = \{(\alpha-1)(\Sigma^{+}QM_{ij} + \Sigma^{-}QM_{ij}) - \Sigma^{-}_{(non\text{-}I)}(QM_{ij} * TLF_{ij})\} / \Sigma^{-}_{(non\text{-}I)} QM_{ij};$$

Where:

Σ^{+} represents a sum over all BM Units in Trading Units that are net deliverers of energy in Settlement Period j;

Σ^{-} represents a sum over all BM Units in Trading Units that are net offtakers of energy in Settlement Period j;

$\Sigma^{+}_{(non\text{-}I)}$ represents a sum over all BM Units other than Interconnector BM Units in Trading Units that are net deliverers of energy in Settlement Period j; and

$\Sigma^{-}_{(non\text{-}I)}$ represents a sum over all BM Units other than Interconnector BM Units in Trading Units that are net offtakers of energy in Settlement Period j.

3: The BM Unit Transmission Loss Multiplier shall be calculated for each BM Unit in each settlement period. This shall be calculated as:

$TLM_{ij} = 1 + TLF_{ij} + TLMO^{+}_{j}$ for all non-Interconnector BM Units that are in Trading

Units that are net deliverers of energy in Settlement Period j,

$TLM_{ij} = 1 + TLF_{ij} + TLMO^{-}_{j}$ for all non-Interconnector BM Units that are in Trading Units that are net offtakers of energy in Settlement Period j,

$TLM_{ij} = 1$ for all Interconnector BM Units irrespective of whether they are in Trading Units that are net deliverers or offtakers of energy in Settlement Period j.

Where TLF_{ij} is the Transmission Loss Factor assigned to each BM Unit. This will allow imports and exports volumes to be scaled by location, as well as for adjusting the relative contributions to the total cost of losses from imports and exports. The values of α and TLF_{ij} will, in general be determined by the BSC. Initially the value of α will be set to 0.45 and TLF_{ij} be set to zero. It should be noted that TLMs and TLFs are BM Unit specific variables.

Non-Functional Requirement:

Interfaces:

Issues:

5.7 SAA-F007: Calculate balancing mechanism cashflows

Requirement ID: SAA-F007	**Status:** M	**Title:** Calculate balancing mechanism cashflows	**BSC reference:** SAA SD 3.13, 3.14, 3.15, 3.16, 3.2.1, 3.2.8, SAA BPM 3.7
Man/auto: Automatic	**Frequency:** Once, on each settlement run.	**Volumes:**	

Functional Requirements:

A number of intermediate calculations are required to produce the balancing mechanism cashflows. All calculation steps in this requirement are included here.

1: The Period Acceptance Offer Cashflow CAO^{kn}_{ij} shall be calculated as:
$CAO^{kn}_{ij} = QAO^{kn}_{ij} * PO^{n}_{ij} * TLM_{ij.}$

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

$CAB^{kn}_{ij} = QAB^{kn}_{ij} * PB^{n}_{ij} * TLM_{ij}$

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 TLM_{ij} is the Transmission Loss Multiplier for BM Unit i and Settlement Period j.

The Period Acceptance Bid Cashflow (CAB^{kn}_{ij}) and Period Acceptance Offer Cashflow (CAO^{kn}_{ij}) represent the 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.
2: The Period BM Unit Offer Cashflow (CO^{n}_{ij}) shall be calculated as: $CO^{n}_{ij} = QAO^{n}_{ij} * PO^{n}_{ij} * TLM_{ij}$ ($=\Sigma^{k}CAO^{kn}_{ij}$) The Period BM Unit Bid Cashflow (CB^{n}_{ij}) shall be calculated as: $CB^{n}_{ij} = QAB^{n}_{ij} * PB^{n}_{ij} * TLM_{ij}$ ($=\Sigma^{k}CAB^{kn}_{ij}$) These represent the 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.
3: The Period BM Unit Cashflow (CBM_{ij}).shall be calculated as: $CBM_{ij} = \Sigma^{n}CO^{n}_{ij} + \Sigma^{n} CB^{n}_{ij}$ This represents the total payment to BM Unit i as a result of accepted Balancing Mechanism action in Settlement Period j
4: The Total System BM Cashflow ($TCBM_{j}$) shall be calculated as: $TCBM_{j} = \Sigma_{i} CBM_{ij}$ This represents the total payments and charges in respect of Balancing Mechanism action for all BM Units (excluding any non-delivery adjustments) in Settlement Period j.
Non-Functional Requirement:
Interfaces:
Issues:

5.8 SAA-F008: Calculate credit energy volumes

Requirement ID: SAA-F008	Status: M	Title: Calculate credit energy volumes	**BSC reference**: RETA CR 005, RETA ERR 1, SAA SD 3.31, 3.32.1, SAA BPM 3.8, P71
Man/auto: Automatic	Frequency: Once, on each settlement run.	Volumes:	

Functional Requirements:

A number of intermediate calculations are required to produce the credit energy volumes. All calculation steps in this requirement are included here.

1: The Credited Energy Volume QCE_{iaj} from each BM Unit i, shall be allocated to each Energy Account a of each Subsidiary Energy Account for each Settlement Period j, as follows:

$QCE_{iaj} = \{(QM_{ij} - QBS_{ij})*(QMPR_{iaj}/100) + QMFR_{iaj}\}*TLM_{ij}$,

Where

$a \neq A$, and A is the Lead Energy Account for BM Unit i;

$QMFR_{iaj}$ is the Metered Volume Fixed Reallocation, a fixed volume in MWh, assigned to Energy Account a from BM Unit i in Settlement Period j;

$QMPR_{iaj}$ is the Metered Volume Percentage Reallocation, the percentage of the BM Unit Metered Volume that remains after Balancing Actions have been deducted, which is allocated to Energy Account a from BM Unit i in Settlement Period j; and

QM_{ij} is the BM Unit Metered Volume."

QCE_{iaj} are rounded down to the nearest kWh.

2: The Lead Party Credited Energy Volume shall be calculated for the Lead Energy Account, for each BM Unit i, in each Settlement Period j, as follows:

$QCE_{iAj} = (QM_{ij} * TLM_{ij}) - \Sigma_{a \neq A} QCE_{iaj}$

Where $\Sigma_{a \neq A}$ represents a sum over all Energy Accounts, other than the Lead Energy Account.

This allocates any residual metered volume, including any Balancing Mechanism action to the Lead Energy Account. This ensures that all the BM Unit Metered Volume flow is always allocated in full.

3: The Account Credited Energy Volume ($QACE_{aj}$).shall be calculated for each Energy Account a, as follows: $QACE_{aj} = \Sigma_i QCE_{iaj}$
Non-Functional Requirement:
Interfaces:
Issues:

5.9 SAA-F009: Calculate energy imbalance prices

Requirement ID: SAA-F009	Status: M	Title: Calculate energy imbalance prices	**BSC reference**: SAA SD 3.24.1, 3.24.2, 3.26, 3.27, 3.28, 3.29, SAA BPM 3.9, CR003, P8, P10, P18A, CP598, P71, P72, P78, P194, P217
Man/auto: Automatic	Frequency: Once, on each Settlement Run.	Volumes:	
Functional Requirements:			
A number of intermediate calculations are required to produce the energy imbalance prices. All calculation steps in this requirement are included here. (Note: In order that Energy Imbalance Prices may be calculated as soon as possible after a particular Settlement Period has ended, Energy Imbalance Prices will not be adjusted in order to account for volumes of non-delivered Bids and/or Offers.)			
For Settlement Days before the P217 effective date apply PAR Tagging in addition to NIV Tagging, as defined in SAA-F009a. For Settlement Days after, and including, the P217 effective date apply Replacement Price Classification, as defined in SAA-F009b.			
Non-Functional Requirement:			

5.9.1 SAA-F009a: Apply Net Imbalance Volume and Price Averaging Reference Tagging

Requirement ID: SAA-F009a	Status: M	Title: Apply Net Imbalance Volume and Price Averaging Reference Tagging	**BSC reference**: P194, P217
Man/auto: Automatic	Frequency: Once, on each Settlement Run.	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.

e. Total Period Applicable Balancing Services Volume

$TQAS_j = \Sigma_i QAS_{ij}$

Σ_i represents the sum over all BM Units.

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

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.

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

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

Tagged Status	Offer Type	Price	Vol
NT	$TQUAO_j$	-	10
NT	$SBVA_j$	-	0
NT	$QAPO_j$	25	5
NT	$QAPO_j$	20	20
NT	$EBVA_j$	15	5
NT	$QAPO_j$	10	30

Bid Stack

Tagged Status	Bid Type	Price	Vol
U	$ESVA_j$	15	15
U	$QAPB_j$	10	15
NT	$QAPB_j$	10	29
NT	$QAPB_j$	5	5
NT	$QAPB_j$	-10	7
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 (PAR_d) 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 PAR_d 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

Tagged Status	Offer Type	Price	Vol
NT	$TQUAO_j$	-	10
NT	$SBVA_j$	-	0

Bid Stack

Tagged Status	Bid Type	Price	Vol
PT	$ESVA_j$	15	10
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 PAR_d 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 $SBVA_j$ ($TTQUAB_j$, $TESVA_j$, $NTESVA_j$, $PTESVA_j$, $TSSVA_j$, $TTQUAO_j$, $TEBVA_j$, $NTEBVA_j$, $PTEBVA_j$, $TSBVA_j$ 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:

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

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 System Buy Price (SBP_j) as follows:

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

$$SBP_j = \frac{\{\Sigma_i \Sigma^n \{QAPO^n_{ij} * PO^n_{ij} * TLM_{ij}\} + UEBCA_j\} + \{BPA_j\}}{\{\Sigma_i \Sigma^n \{QAPO^n_{ij} * TLM_{ij}\} + UEBVA_j\}}$$ [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.

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

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

[1] Price derivation codes A, B, C

[2] Price derivation codes F, I

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 $\{\Sigma_i\Sigma^n \{QAPO^n_{ij} * TLM_{ij}\} + UEBVA_j\}$ is zero [6], then the System Buy Price will be determined as:

$$SBP_j = \Sigma_s\{PXP_{sj} * QXP_{sj}\} / \Sigma_s QXP_{sj}$$ [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 System Sell Price (SSP_j) as follows:

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

$$SSP_j = \frac{\{\Sigma_i\Sigma^n\{QAPB^n_{ij} * PB^n_{ij} * TLM_{ij}\} + UESCA_j\} + \{SPA_j\}}{\{\Sigma_i\Sigma^n \{QAPB^n_{ij} * TLM_{ij}\} + UESVA_j\}}$$ [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.

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

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

where

[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

[10] Price derivation codes A, D

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 $\{\Sigma_i\Sigma^n \{QAPB^n_{ij} * TLM_{ij}\} + UESVA_j\}$ is zero [14], then the 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 NIV Tagged Bids;

15. The price adjustment parameters shall be set through the automatic interface SAA-I026, 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 SAA-I023.

Market Index Data is received from Market Index Data Providers through the automatic flow SAA-I030.

The SAA 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 are used for a Settlement Period, for the purposes of the Initial Interim Settlement Calculation

[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

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 Initial Interim Settlement 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 SBP and SSP were calculated. The possible values for the code, and their associated meaning, are defined in Appendix E.
Non-Functional Requirement:

5.9.2 SAA-F009b: Apply Replacement Price Classification

Requirement ID: SAA-F009b	Status: M	Title: Apply Replacement Price Classification	**BSC reference**: P217
Man/auto: Automatic	Frequency: Once, on each Settlement Run.	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" (De Minimis Tagging).

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 System 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.

A First-Stage Unflagged System Action is one which is not a First-Stage Flagged System Action.

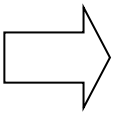
Then, for the Buy Stack, all First-Stage Flagged System Actions with a price which is higher than the most expensive First-Stage Unflagged System Action are classified as Second-Stage Flagged System Actions. And, for the Sell Stack, all First-Stage Flagged System Actions with a price which is lower than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

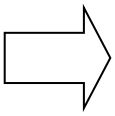
First-Stage Flag	Price
T	-
T	-
T	25
-	20
T	25
-	10



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		
Tagged Status	Price	Vol
Tagged	-	10
Tagged	-	0
Tagged	25	5
Tagged	20	20
Tagged	15	5
Tagged	10	30

Sell Stack		
Tagged Status	Price	Vol
Untagged	15	15
Untagged	10	15
Tagged	10	29
Tagged	5	5
Tagged	-10	7
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 Total NIV Tagged Volume for a Settlement Period can now be calculated as:

$$TCQ_j = \{\Sigma_w QSB^{w}_{j} - \Sigma_w QSS^{w}_{j}\} / 2$$

where

Σ_w represents the sum over all System Actions which are NIV Tagged.

14. The actual 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 Tagged System Actions, and not Arbitrage Tagged System Actions.

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

In respect of each Settlement Period, if the Net Imbalance Volume is **positive** then the 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 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 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.

[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

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

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

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

$$SSP_j = \frac{\{\Sigma_i\Sigma^n\Sigma^k \{QAB^{kn}_{ij} * PB^n_{ij} * TLM_{ij}\} + \Sigma^m \{QBSAS^m_j * BSAP^m_j\}\} \quad + \{SPA_j\}}{\{\Sigma_i\Sigma^n\Sigma^k \{QAB^{kn}_{ij} * TLM_{ij}\} + \Sigma^m QBSAS^m_j\}}$$ [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 System Sell Price will be determined as follows:

$$SSP_j = \Sigma_s\{PXP_{sj} * QXP_{sj}\} / \Sigma_s QXP_{sj}$$ [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 Σ_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 System Sell Price will be determined as:

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

where

[23] Price derivation codes L

[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

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 Σ_s QXP_{sj} is equal to zero, then $SSP_j = 0$ [30].
17. The Price Adjustment parameters shall be set through the automatic interface SAA-I026, 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 both of the Price Adjustment parameters. The system parameters like $RPAR_d$, PAR_d, Arbitrage Flag, $DMAT_d$, and $CADL_d$ are received from BSCCo Ltd through the manual flow SAA-I023. Market Index Data is received from Market Index Data Providers through the automatic flow SAA-I030. The SAA 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 are used for a Settlement Period, for the purposes of the Initial Interim Settlement 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 Initial Interim Settlement 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 SBP and SSP were calculated. The possible values for the code, and their associated meaning, are defined in Appendix E.
18. SAA receive BSCCo price in accordance with SAA-I047 Before publishing SBP, for an affected SP, compare with SAA SBP – to ensure that SAA SBP = BSCCo Prices within 2dp. Report discrepancies to BSCCo. using SAA-I048.
Non-Functional Requirement:

[30] Price derivation codes L

5.10 SAA-F010: Calculate interconnector error

Requirement ID: SAA-F010	**Status:** M	**Title:** Calculate interconnector error	**BSC reference:** SAA BPM 3.10, RETA ERR 3, CP555, CP632
Man/auto: Automatic	**Frequency:** Once, on each settlement run.	**Volumes:**	

Functional Requirements:

A number of intermediate calculations are required to produce the interconnector error. All calculation steps in this requirement are included here.

1: The BM Unit Metered Volumes for Interconnector Users (QM_{ij}) shall be summed by Interconnector. These values are received from the Interconnector Administrator.

Note that where a volume is not specified for an Interconnector User BM Unit, no value is loaded. Where that volume is required in processing functions, a default value of zero is applied by the processing function.

Where a revised, or late, flow is received from an External Interconnector Administrator after the Interim Information Settlement Run has been issued for the relevant Settlement Day (s), then the flow shall not be automatically loaded, but instead the SAA should contact BSCCo Ltd and ask what action should be taken. BSCCo Ltd will then indicate to SAA whether or not to load the data. The SAA must be able to manually load the data if instructed to do so by BSCCo Ltd.

2: The aggregated BM Unit Metered Volumes for Interconnector Users (ΣQM_{ij}) (obtained above) shall be compared with the aggregated meter reading (IMV_j) (obtained from the Interconnector Metered Flow from the CDCA). The difference is the Interconnector Error Administrator Volume ($ErrorVol_j$) which shall be allocated to the Interconnector Error Administrator BM Unit (or IEA BM unit).

A positive (or zero) Error Volume is assigned to the production IEA BM Unit with zero assigned to the consumption IEA BM Unit; a negative Error Volume is assigned to the consumption IEA BM Unit with zero is assigned to the production IEA BM Unit.
Formally:

$$ErrorVol_j = IMV_j - \Sigma_i QM_{ij}$$

where $ErrorVol_j$ is the error volume for the Interconnector in period j
and Σ_i is the sum over all Interconnector User BM Units for the Interconnector

For the production IEA BM Unit for the Interconnector

$$QM_{ij} = Max\ (ErrorVol_j, 0)$$

For the consumption IEA BM Unit for the Interconnector

$$QM_{ij} = Min\ (ErrorVol_j, 0)$$

Note: All Interconnector Users will have 2 BMU Units i.e. One for Production and Consumption respectively.

Non-Functional Requirement:
Interfaces:
Issues:

5.11 SAA-F011: Calculate energy imbalance cashflows

Requirement ID: SAA-F011	**Status:** M	**Title:** Calculate energy imbalance cashflows	**BSC reference:** SAA SD 3.24.3, 3.30.1, 3.33, 3.34, 3.35, 3.36, 3.37, SAA BPM 3.11, CR028, P71
Man/auto: Automatic	**Frequency:** Once, on each settlement run.	**Volumes:**	

Functional Requirements:

A number of intermediate calculations are required to produce the energy imbalance cashflows. All calculation steps in this requirement are included here.

The SAA shall exclude the System Operator Production and Consumption Imbalance Volumes from the calculations in steps 3, 4, and 5 below.

The System Operator Production Imbalance and System Operator Consumption Imbalance shall be reported to all parties on a Settlement Period basis.

1: The Account Period Balancing Services Volume, $QABS_{aj}$, shall be calculated as follows:

$$QABS_{aj} = \Sigma_{i \in a} QBS_{ij} * TLM_{ij}$$

Where

$\Sigma_{i \in a}$ represents a sum over all BM Units i for which Energy Account a is the Lead Energy Account;

QBS_{ij} is the Period BM Unit Balancing Services Volume and

TLM_{ij} is the Transmission Loss Multiplier for BM Unit i in Settlement Period j.

The Account Period Bid-Offer Volume represents the net volume of accepted Balancing Mechanism Bids and Offers attributable to each Energy Account a, in Settlement Period j.

2: The Account Energy Imbalance, $QAEI_{aj}$, attributable to each Energy Account a in Settlement Period j, shall be calculated. This shall be determined by subtracting the Total Energy Contract Volume ($QABC_{aj}$) and Account Period Balancing Services Volume ($QABS_{ij}$) from the Account Credited Energy Volume ($QACE_{aj}$), as follows:

$$QAEI_{aj} = QACE_{aj} - QABS_{aj} - QABC_{aj}$$

Where the Total Energy Contract Volumes for each Energy Account is obtained from the Energy Contract Volume Aggregation Agent.

3: The Total System Energy Imbalance Volume $TQEI_j$ (summed across all Energy Accounts a) shall be calculated as follows:

$TQEI_j = \Sigma_a \, QAEI_{aj}$

Where Σ_a is the sum of all Energy Accounts for Settlement Period j and a ≠ SO Energy Account(s).

4: The Energy Imbalance Cashflow ($CAEI_{aj}$).shall be calculated for each Energy Account a, in Settlement Period j as follows:

If $QAEI_{aj} > 0$, then

$CAEI_{aj} = -QAEI_{aj} * SSP_j$,

Otherwise,
$CAEI_{aj} = -QAEI_{aj} * SBP_j$,

Where SSP_j is the System Sell Price and SBP_j is the System Buy Price for Settlement Period j and a ≠ SO Energy Account(s).

Thus, the price that applies to the Energy Imbalance Volume of a particular Energy Account shall depend on the net Energy Imbalance Position of that that Energy Account.

5: The Total System Energy Imbalance Cashflow, $TCEI_j$ shall be calculated as:

$TCEI_j = \Sigma_a \, CAEI_{aj}$

Where a ≠ SO Energy Account(s)
This represents the total cashflow relating to settlement of energy imbalances in Settlement Period j.

Non-Functional Requirement:

Interfaces:

Issues:

5.12 SAA-F012: Validate Adjustment Data

Requirement ID: SAA-F012	**Status:** M	**Title:** Validate Adjustment Data	**BSC reference:** P78
Man/auto: Automatic	Frequency: On demand	Volumes:	
Functional Requirements:			
The SAA 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 SAA will generate an exception to the Transmission Company (via the SAA-I017) detailing the reason for the exception.			
Non-Functional Requirement:			
This function only applies to BSAD data for Settlement Days after, and including the P78 effective date.			
Interfaces:			
SAA-I026, SAA-I017			

5.13 SAA-F013: Calculate information imbalance charges

Requirement ID: SAA-F013	**Status:** M	**Title:** Calculate information imbalance charges	**BSC reference:** SAA SD 3.17.2, 3.20, 3.21, 3.22, 3.23, SAA BPM 3.13, CP596, P71
Man/auto: Automatic	**Frequency:** Once, on each settlement run.	**Volumes:**	
Functional Requirements:			
A number of intermediate calculations are required to produce the information imbalance charges. All calculation steps in this requirement are included here.			
1: The Period Expected Meter Volume shall be calculated for each BM Unit in each Settlement Period as follows: $QME_{ij} = FPN_{ij} + QBS_{ij}$ Where FPN_{ij} is the Period FPN and QBS_{ij} is the Period BM Unit Balancing Services Volume. This is the volume of energy that a particular BM Unit is expected to produce or consume in Settlement Period j.			

2: The Period Information Imbalance Volume (QII_{ij}) shall be calculated for each BM Unit in each Settlement Period as follows:

$QII_{ij} = |QM_{ij} - QME_{ij}|$

This is the modulus of the difference between the Period Metered Volume (QM_{ij}) and the Period Expected Metered Volume QME_{ij}

3: The Information Imbalance Charge (CII_{ij}) shall be calculated for each BM Unit in each Settlement Period. CII_{ij} is calculated by multiplying the Information Imbalance Volume, QII_{ij}, by the appropriate Information Imbalance Price, ($IIP1_{ij}$ or $IIP2_{ij}$).

FPN flags apply to BM Units, the Lead Party will identify BM Units for which the flag will be set to 'N', the default value will be 'Y'. This flag will be used to indicate whether a Party is required to submit an accurate FPN for a particular BM Unit or not. The Lead Party will set these FPN flags through the CRA Interfaces.

The Information Imbalance Charge will be calculated as follows:

If FPN Flag is set to 'Y' then
$CII_{ij} = QII_{ij} * IIP1_{ij}$
Else
$CII_{ij} = QII_{ij} * IIP2_{ij}$
Endif

where
$IIP1_{ij}$ is the Information Imbalance Price 1 and
$IIP2_{ij}$ is the Information Imbalance Price 2.
These are both half-hourly variables, SAA will be notified by BSCCo Ltd. Both variables will initially be set to zero for all Settlement Periods.

4: The Total System Information Imbalance Charge, $TCII_j$. shall be calculated for each settlement period as:

$TCII_j = \Sigma_i CII_{ij}$

Where Σ_i is the sum over all values of BM Unit i.

Non-Functional Requirement:

Interfaces:

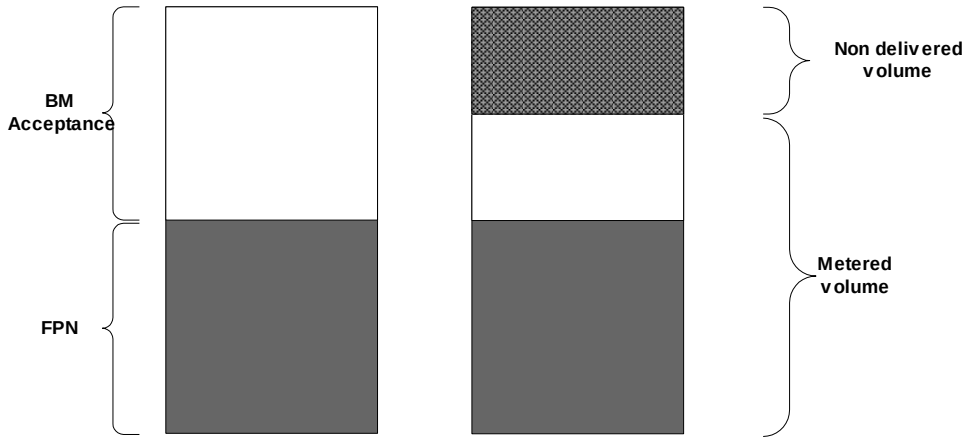
Issues:

5.14 SAA-F014: Calculate non-delivery volumes

Requirement ID: SAA-F014	Status: M	Title: Calculate non-delivery volumes	**BSC reference**: SAA SD 3.38, 3.39, 3.40, 3.41, 3.42, SAA BPM 3.14
Man/auto: Automatic	Frequency: Once, on each settlement run.	Volumes:	

Functional Requirement:

Non-delivery arises when there is a BM Unit imbalance in the opposite direction to the volume of accepted Offers and Bids, integrated over the Settlement Period. The following diagram illustrates a non-delivered volume.



A large number of intermediate calculations are required to produce the non delivery volumes. All calculation steps in this requirement are included here.

1: The Period BM Unit Non-Delivered Offer Volume ($QNDO_{ij}$) shall be calculated for each BM Unit i in each Settlement Period j by processing the Period Expected Metered Volume (QME_{ij}), Period Meter Volume (QM_{ij}), and Period Accepted Offer Volume ($\Sigma^n QAO^n_{ij}$) as follows:

$$QNDO_{ij} = \text{Min}\{\text{Max}\{QME_{ij} - QM_{ij}, 0\}, \Sigma^n QAO^n_{ij}\}$$

2: The Period BM Unit Non-Delivered Bid Volume ($QNDB_{ij}$) shall be calculated for each BM Unit I in each Settlement Period j by processing the Expected Period Meter Volume (QME_{ij}), Period Meter Volume (QM_{ij}), and Period Accepted Bid Volume ($\Sigma^n QAB^n_{ij}$) as follows:

$$QNDB_{ij} = \text{Max}\ \{\text{Min}\{QME_{ij} - QM_{ij},0\}, \Sigma^n QAB^n_{ij}\ \}$$

Note that Bid volumes are negative, and so is the non-delivered Bid volume by this definition.

3: The Offer Non-Delivery Volume ($QNDO^{n}_{ij}$) shall be calculated as follows.
If QNDOij > 0, then the Period BM Unit Non-Delivered Offer Volume is apportioned across accepted Offers to determine values of Offer Non-Delivery Volume.

In each Settlement Period, the set of all accepted Offers (i.e. Offers for which QAO^{n}_{ij} >0) is considered. This set of Offers is then ranked from highest price to lowest price. The Non-Delivery Order Number u is used for this purpose. The Offer with the highest price is allocated a Non-Delivery Order Number of u=1, the next highest priced Offer is allocated a Non-Delivery Order Number u=2 and so on until all Offers in the Settlement Period is allocated a Non-Delivery Order Number.

The set of Offers {QAO^{n1}_{ij}, QAO^{n2}_{ij}, …….. QAO^{nu}_{ij}} is therefore the ranked set of Offers. The Offer Non-Delivery Volume is allocated to the highest priced Offers first. The apportionment continues until the Period BM Unit Non-Delivered Offer Volume is fully apportioned or all available Offer Volumes have been used up.

Thus, the Offer Non Delivery Volume for Offer n, is:
$QNDO^{n}_{ij} = Min(QAO^{nu}_{ij}, RQNDO^{u-1}_{ij})$

Where $RQNDO^{u-1}_{ij}$ is the Remaining Period BM Unit Non-Delivered Offer Volume determined as:
$RQNDO^{u}_{ij} = RQNDO^{u-1}_{ij} - QNDO^{nu-1}_{ij}$
and $RQNDO^{0}_{ij} = QNDO_{ij}$,
and $QNDO^{n0}_{ij} = 0$

4: The Bid Non-Delivery Volume ($QNDB^{n}_{ij}$) shall be calculated as follows
If QNDBij < 0, then the Period BM Unit Non-Delivered Bid Volume is apportioned across accepted Bids to determine values of Bid Non-Delivery Volume.

In each Settlement Period, the set of all accepted Bids (i.e. Bids for which QAB^{n}_{ij} <0) is considered. This set of Bids is then ranked from lowest price to highest price. The Non-Delivery Order Number, u is used for this purpose. The Bid with the lowest price is allocated a Non-Delivery Order Number of u=1, the next lowest priced Offer is allocated a Non-Delivery Order Number u=2 and so on until all Bids in the Settlement Period are allocated a Non-Delivery Order Number.

The set of Bids {QAB^{n1}_{ij}, QAB^{n2}_{ij}, …….. QAB^{nu}_{ij}, } is therefore the ranked set of Bids.

The Bid Non-Delivery Volume is allocated to the lowest priced Bids first. The apportionment continues until the Period BM Unit Non-Delivered Bid Volume is fully apportioned or all available Bid Volumes have been used up.

Thus, the Bid Non Delivery Volume for Bid n, is:

$QNDB^{n}_{ij} = Max(QAB^{nu}_{ij}, RQNDB^{u-1}_{ij})$

Where $RQNDB^{u-1}_{ij}$ is the Remaining Period BM Unit Non-Delivered Bid Volume determined as:

$RQNDB^{u}_{ij} = RQNDB^{u-1}_{ij} - QNDB^{nu-1}_{ij}$ and $RQNDB^{0}_{ij} = QNDB_{ij}$ and $QNDB^{no}_{jj} = 0$
Non-Functional Requirement:
Interfaces:
Issues:

5.15 SAA-F015: Calculate non-delivery charges

Requirement ID: SAA-F015	Status: M	Title: Calculate non-delivery charges	BSC reference: SAA SD 3.43, 3.44, 3.45, 3.46, SAA BPM 3.14, SAA WK1 Action 30
Man/auto: Automatic	**Frequency:** Once, on each settlement run.	**Volumes:**	

Functional Requirement:

A number of intermediate calculations are required to produce the non delivery charges. All calculation steps in this requirement are included here.

1: The Non-Delivered Offer Charge ($CNDO^n_{ij}$) shall be calculated for the non-delivery of Offer n in Settlement Period j from BM Unit i, as follows:

$$CNDO^n_{ij} = QNDO^n_{ij} * Max \{(PO^n_{ij} – SBP_j), 0\} * TLM_{ij}$$

Where SBP_j is the System Buy Price, PO^n_{ij} is the Offer Price and TLM_{ij} is the Transmission Loss Multiplier for that BM Unit and Settlement Period.

1: The Non-Delivered Offer Charge ($CNDO^n_{ij}$) shall be calculated for the non-delivery of Offer n in Settlement Period j from BM Unit i, as follows:

$$CNDO^n_{ij} = QNDO^n_{ij} * Max \{(PO^n_{ij} – SBP_j), 0\} * TLM_{ij}$$

Where SBP_j is the System Buy Price, PO^n_{ij} is the Offer Price and TLM_{ij} is the Transmission Loss Multiplier for that BM Unit and Settlement Period.

2: The Non-Delivered Bid Charge ($CNDB^n_{ij}$) shall be calculated for the non-delivery of Bid n in Settlement Period j from BM Unit i, as follows:

$$CNDB^n_{ij} = QNDB^n_{ij} * Min \{(PB^n_{ij} – SSP_j), 0\} * TLM_{ij}$$

Where SSP_j is the System Sell Price, PB^n_{ij} is the Bid Price and TLM_{ij} is the Transmission Loss Multiplier for that BM Unit and Settlement Period.

Note that this is a product of two negative numbers that results in a positive charge (or zero).

2: The Non-Delivered Bid Charge ($CNDB^n_{ij}$) shall be calculated for the non-delivery of Bid n in Settlement Period j from BM Unit i, as follows:

$$CNDB^n_{ij} = QNDB^n_{ij} * Min \{(PB^n_{ij} – SSP_j), 0\} * TLM_{ij}$$

Where SSP_j is the System Sell Price, PB^n_{ij} is the Bid Price and TLM_{ij} is the Transmission Loss Multiplier for that BM Unit and Settlement Period.

Note that this is a product of two negative numbers that results in a positive charge (or zero).
3: The BM Unit Period Non-Delivery Charge (CND_{ij}).shall be calculated for the non-delivery of Bids and Offers in Settlement Period j from BM Unit i, as follows: $CND_{ij} = \Sigma^{n} (CNDO^{n}_{ij} + CNDB^{n}_{ij})$
4: The Total System Non-Delivery Charge ($TCND_j$) shall be calculated for the non-delivery of Bids and Offers in Settlement Period j, summed across all BM Units, as follows: $TCND_j = \Sigma_i CND_{ij}$
Non-Functional Requirement:
Interfaces:
Issues:

5.16 SAA-F016: Calculate system operator BM cashflow

Requirement ID: SAA-F016	**Status:** M	**Title:** Calculate system operator BM cashflow	**BSC reference:** SAA SD 3.48, SAA BPM 3.15, CP632
Man/auto: Automatic	**Frequency:** Once, on each settlement run.	**Volumes:**	
Functional Requirement:			
The System Operator BM cashflow ($CSOBM_j$) shall be calculated by subtracting the Total System Non-Delivery Charge ($TCND_j$) from the Total System BM Cashflow ($TCBM_j$) for each Settlement Period. Specifically: $CSOBM_j = TCBM_j – TCND_j$			
Non-Functional Requirement:			
Interfaces:			
Issues:			

5.17 SAA-F017: Calculate residual cashflows

Requirement ID:	Status:	Title:	BSC reference:
SAA-F017	M	Calculate residual cashflows	SAA SD 3.49.1, 3.50, 3.51, 3.52, SAA BPM 3.16, CR016, CP632, CP532, CP1222, P285
Man/auto: Automatic	**Frequency:** Once, on each settlement run.	**Volumes:**	

Functional Requirement:

A number of intermediate calculations are required to produce the residual cashflows. All calculation steps in this requirement are included here.

1: The Total System Residual Cashflow (TRC_j) shall be calculated as follows:

$TRC_j = TCII_j + CSOBM_j + TCND_j – TCBM_j + TCEI_j$

This represents any net difference between total payments and receipts to and from BSC Parties for a particular Settlement Period. It therefore considers the Total System Information Imbalance Charge ($TCII_j$), Total System Non-Delivery Charge ($TCND_{j)}$, System Operator BM Cashflow ($CSOBM_j$), Total System BM Cashflow ($TCBM_j$) and Total System Energy Imbalance Cashflow ($TCEI_j$).

2: The Residual Cashflow Reallocation Proportion ($RCRP_{aj}$) to be allocated to each Energy Account (excluding the SO's account) in each Settlement Period shall be calculated as follows:

$$RCRP_{aj} = \{\Sigma^{+}_{(non\text{-}I)} (QCE_{aij}) + \Sigma^{-}_{(non\text{-}I)} (-QCE_{aij})\} / \Sigma_a \{\Sigma^{+}_{(non\text{-}I)} (QCE_{aij}) + \Sigma^{-}_{(non\text{-}I)} (–QCE_{aij})\}$$

where $\Sigma^{+}_{(non\text{-}I)}$ is, for each Account a in Settlement Period j, the sum over all BM Units other than Interconnector BM Units that are in delivering Trading Units (i.e. every Trading Unit t where $\Sigma_{i \in t} QM_{ij} >= 0$) , and

$\Sigma^{-}_{(non\text{-}I)}$ is, for each Account a in Settlement Period j, the sum over all BM Units other than Interconnector BM Units that are in offtaking Trading Units (i.e. every Trading Unit t where $\Sigma_{i \in t} QM_{ij} < 0$) is a Consumption Account.

Note that $\Sigma_a RCRP_{aj}$ should be equal to one.

This represents the proportion of the Credited Energy Volume attributed to each Energy Account a for all BM Units i in each Settlement Period j divided by the Total Credited Energy across all Energy Accounts and all BM Units in that Settlement Period.

3: The Residual Cashflow Reallocation Denominator ($RCRD_j$) in each Settlement Period shall be defined as the denominator in the expression for $RCRP_{aj}$ above.

4: The Residual Cashflow Reallocation Cashflow ($RCRC_{aj.}$) shall be calculated by multiplying the Residual Cashflow Reallocation Proportion with the Total System Residual Cashflow, as follows:

$RCRC_{aj} = RCRP_{aj} * TRC_j$

This represents the proportion of the Total System Residual Cashflow allocated to the Energy Account a.

Non-Functional Requirement:
Interfaces:
Issues:

5.18 SAA-F018: Allocate BSCCo Ltd Costs (Redundant)

Requirement ID: SAA-F018	**Status:** M	**Title:** Allocate BSCCo Ltd Costs	**BSC reference:** SAA SD 3.47, SAA BPM 3.16, CR016, CR028
Man/auto: Automatic	**Frequency:** Once, on each settlement run.	**Volumes:**	

Functional Requirement:

A number of intermediate calculations are required to produce the allocation of BSCCo Ltd costs. All calculation steps in this requirement are included here.

1: The Balancing and Settlement Code Company (BSCCo Ltd) Costs shall be notified to the SAA by BSCCo Ltd.

2: A proportion of these BSC Co costs be charged out pro-rata as explained below, and the remaining proportion be charged out pro-rata on the modulus of all notified Energy Contract volumes (ECQ_{zbaj}). The System Operators' (SO) Energy Contract Volumes and Credited Energy Volumes will be excluded from these calculations.

(i) $\Sigma^{+(}QCE_{aij},)$ where Σ^{+} is, for each Account a in Settlement Period j, the sum over all BM Units i that are in delivering Trading Units (i.e. each Trading Unit t where $\Sigma_{i \in t}\, QM_{ij} >= 0$); and

(ii) $\Sigma^{-}(-QCE_{aij})$, where Σ^{-} is, for each Account a in Settlement Period j, the sum over all BM Units i that are in offtaking Trading Units (i.e. each Trading Unit t where $\Sigma_{i \in t}\, QM_{ij} < 0$)

3: BSCCo Ltd costs shall be recovered monthly, based on a cost forecast, and will reconcile this at year end to total actual costs.

Non-Functional Requirement:
Interfaces:
Issues:

5.19 SAA-F019: Aggregate charges and payments

Requirement ID: SAA-F019	Status: M	Title: Aggregate charges and payments	BSC reference: SAA 3.53, SAA BPM 3.17, CP632
Man/auto: Automatic	**Frequency:** Once, on each settlement run.	**Volumes:**	
Functional Requirement:			
A number of intermediate calculations are required to produce the aggregated charges and payments. All calculation steps in this requirement are included here.			
1: All separate charges and payments shall be aggregated by BSC Party, Settlement Day and charge type, including the following: Balancing Mechanism Cashflows; Residual Cashflow Reallocation Cashflows; Non-Delivery Charges; Information Imbalance Charges; Energy Imbalance Cashflows; System Operator BM Cashflow; BSCCo Ltd Charges. NB: These seven individual charges are calculated separately for each individual BSC Party for each Settlement Day.			
2: In addition, the Total Account Charge/Payment shall be calculated by aggregating all the net cashflows for each charge type calculated above to produce a net charge/payment by BSC Party per Settlement Day. (This shall be calculated for reporting purposes only.)			
Non-Functional Requirement:			
Interfaces:			
Issues:			

5.20 SAA-F020: Validate Market Index Data

Requirement ID: SAA-F020	Status: M	Title: Validate Market Index Data	BSC reference: P78
Man/auto: Automatic	**Frequency:** On demand	**Volumes:**	
Functional Requirement:			
The SAA shall validate Market Index Data, on receipt, to ensure that the Market Index			

Volume is either zero, or it equals or exceeds the Liquidity Threshold for the relevant Market Index Data Provider, Settlement Day, and Settlement Period. If a non-zero Market Index Volume is below the defined threshold, then the SAA will default the invalid Market Index Volume and its associated Price to zero, for that Settlement Period.

The occurrence of below threshold, non-zero Market Index Volume is recorded by the SAA for the purposes of performance reporting.

Unless a specific clock change day Liquidity Threshold has been submitted, then, where an 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 Requirement:

Interfaces:

SAA-I030

Issues:

5.21 SAA-F021: Manage settlement disputes

Requirement ID:	Status:	Title:	BSC reference:
SAA-F021	M	Manage settlement disputes	SAA SD 5.1, SAA BPM 3.18
Man/auto:	**Frequency:**	**Volumes:**	
Manual & auto	On demand.		
Functional Requirement:			
1: The SAA shall perform settlement runs in support of disputes, on instruction from BSCCo Ltd.			
2: It shall be possible for SAA system operators to create new data or amend existing data for input to a dispute settlement run.			
3: The dispute run shall invoke the required calculations for a specific Settlement Period to be re-run.			
4: The output from any dispute run, shall be forwarded to the Funds Administration Agent for processing and funds transfer. The SAA provides only the new calculated values to the FAA; the SAA is not required to provide the difference between the new values and the original values.			
5: Where the FPN is disputed, an Amended FPN shall be determined. The dispute run (and any future runs pertaining to the disputed Settlement Period) shall be performed against the amended FPN.			
Non-Functional Requirement:			
A Dispute may be raised by a BSC Party, the System Operator or by BSCCo Ltd if they object to the results of a Settlement when they believe that the calculation has been undertaken using the wrong data or the calculation does not follow the rules. The Settlement Administration Agent may raise a dispute on behalf of BSC Parties if errors in calculations or data are detected or suspected. The Settlement Administration Agent shall be able to receive individual Dispute notifications from BSC Parties and shall take appropriate action to process the dispute. All dispute notifications shall be logged. The Settlement Administration Agent shall, when requested by the Customer, undertake evaluation, or analysis if requested, of a dispute to determine the facts and its materiality. The Settlement Administration Agent shall, when requested by the Balancing and Settlement Code Company or Panel submit written evidence concerning a particular Dispute, to the Balancing and Settlement Code Panel. The Settlement Administration Agent shall carry out actions in support of disputes within timescales agreed with BSCCo Ltd.			
Interfaces:			
The interface requirements SAA-I012 and SAA-I018 describe the Dispute Notifications received by SAA from external parties, and the Dispute Reports produced by the SAA.			
Issues:			

5.22 SAA-F022: Provide settlement reports

Requirement ID: SAA-F022	**Status:** M	**Title:** Provide settlement reports	**BSC reference:** SAA SD, SAA BPM 3.19
Man/auto: Manual & auto	**Frequency:** Once following each settlement run & on demand.	**Volumes:**	
Functional Requirement:			
1: The SAA shall produce all settlement reports in accordance with the Settlement Calendar, listed as external interfaces in section 6.			
2: Reports shall be provided to all BSC Parties for general market information, and only to authorised BSC Parties where the information is party specific. The reporting requirements and access rights of each BSC party will be maintained to ensure that reports are only distributed to interested and authorised BSC parties.			
3: The SAA shall support an interface to enable changes to reporting requirements and access rights to be administered.			
4: Ad-hoc reports shall be supplied to the Customer or BSC Parties, as requested.			
Non-Functional Requirement:			
Interfaces:			
The data requirements for settlement reports are described in SAA-I014. The physical format of externally distributed files is described in the NETA Central Systems Interface Specification.			
Issues:			

5.23 SAA-F023: Process Market Index Data Provider Liquidity Thresholds

Requirement ID: SAA-F023	**Status:** M	**Title:** Process Market Index Data Provider Liquidity Thresholds	**BSC reference:** P78
Man/auto: Manual/ Automatic	**Frequency:** On demand	**Volumes:**	
Functional Requirement:			
The SAA shall carry out the following validation on MIDP Liquidity Thresholds: (a) 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; (b) 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;			

(c) 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. In cases where a change in MIDP Liquidity Threshold would be retrospective, the SAA will confirm correctness with BSCCo before applying the update. If a retrospective change to MIDP Liquidity Thresholds requires Market Index Data to be resubmitted (in order to be revalidated), then a check will be made by SAA to confirm that this does occur. BSCCo will communicate the details of what files will be resubmitted, from which Market Index Data Providers, along with details of the timeframe in which this should occur. Where files are not re-submitted within the expected timeframe, then this will be escalated to BSCCo. Changes to Liquidity Thresholds, retrospective or otherwise, will not be applied to existing Market Index Data. 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 SAA-I032 flow.
Non-Functional Requirement:
Interfaces:
SAA-I031, SAA-I032
Issues:

5.24 SAA-F024: Daily Check for Missing Settlement Calculation Data Flows

Requirement ID: SAA-F024	**Status:** N/a	**Title:** Daily Check for Missing Settlement Calculation Data Flows	**BSC reference:** SAA SD 2.1.1, CP639, P71
Man/auto: Manual & Automatic	**Frequency:** Daily (not related to specific run types)	**Volumes:**	
Functional Requirement:			
The SAA shall validate certain incoming data flows to check for potential out of sequence files, which would indicate missing Settlement Calculation data. This check will be carried			

out for the following types of data: • Bid Offer Acceptance data; • BM Unit Applicable Balancing Services Volume data. The SAA will report a failure of the above check to BSCCo through manual flow SAA-I027 and await further instruction. BSCCo shall immediately respond to the SAA through SAA-I028 with an indication as to whether to proceed with the settlement run, or whether to suspend the run pending further instruction. Instruction on how to proceed shall be received by SAA from BSCCo through SAA-I029.Missing data should be provided within 2 days, otherwise the matter will be escalated.
Non Functional Requirement:
Interfaces:
See SAA-I027, SAA-I028, SAA-I029
Issues:

5.25 SAA-F025: Process Withdrawing Party Settlement Details

Requirement ID: SAA-F025	**Status:** Mandatory	**Title:** Process Withdrawing Party Settlement Details	**BSC reference:** CP974
Man/auto: Manual	**Frequency:** On request	**Volumes:** Low	
Functional Requirement:			
The SAA shall provide the information specified by Interface Requirement SAA-I037 to CRA, on request. Settlement details shall be matched to the request by means of the participant name and / or participant id registered in SAA.			
Non Functional Requirement:			
Interfaces:			
SAA-I037: Issue Withdrawing Party Settlement Details.			

5.26 SAA-F026: Process Emergency Acceptance Data

Requirement ID:	Status:	Title:	BSC reference:
SAA-F026	Mandatory	Process Emergency Acceptance Data	P172
Man/auto:	**Frequency:**	**Volumes:**	
Manual	On request	Low	

Functional Requirement:

The SAA shall receive from the SO requests for data changes from time to time via the manual interface SAA-I033, which is then agreed between the SAA and BSCCo via the manual interfaces SAA-I034 and SAA-I035, and then reported to the SO via the manual interface SAA-I036. These requests may relate to Emergency Instructions, and if so, will be clearly marked 'EMERGENCY INSTRUCTION'. In addition, where the Emergency Instruction is to be treated as an 'Excluded Emergency Acceptance', the request will also include the words 'EXCLUDED EMERGENCY ACCEPTANCE'. Where it is not to be treated as an 'Excluded Emergency Acceptance' the words 'EMERGENCY ACCEPTANCE' will be included in the request.

The SAA shall enter this data manually and perform the next Settlement Run (usually the II Run).

If the Instruction has been determined by the SO to be treated as an Excluded Emergency Acceptance, the following steps should also be performed:

The SAA shall receive recalculated Energy Imbalance Prices to be achieved in the next run from BSCCo via manual interface SAA-I038.

SAA shall calculate and apply any adjustments required:

$$\text{Adjusted } BPA_j = \text{existing } BPA_j + \text{BPA adjustment}_j$$

$$\text{Adjusted } SPA_j = \text{existing } SPA_j + \text{SPA adjustment}_j$$

SAA shall carry out an additional settlement 'dry run' and send confirmation to BSCCo, via manual interface SAA-I039, that the adjustments to BSAD have given the required Energy Imbalance Prices. The SAA will liaise with BSCCo until such time as it is able to confirm that the adjustments to BSAD have generated the required Energy Imbalance Prices. The 'dry run' will only be carried out once the associated CDCA Aggregation Run has been completed. In order to allow sufficient lead time between the 'dry run' and the 'live run' the SAA will not wait for receipt of the relevant data from SVAA (via SAA-I007) but instead use SVAA data from the most recent Settlement Run for the purposes of carrying out the 'dry run'.

The SAA will not conduct the actual live Settlement Run without prior authorisation to do so from BSCCo via manual interface SAA-I040.

The SAA will check and confirm that the amended BSAD has not been overwritten by any other subsequently submitted BSAD data, and that, consequently, the amended BSAD data is used in the live Settlement Run.

Note: Subsequent adjustments for later runs will be processed by iterations of the above manual processing.
Non Functional Requirement:
Interfaces:
SAA-I033: Receive Request for Data Change. SAA-I034: Report Recommended Data Change SAA-I035: Receive Instruction for Data Change SAA-I036: Report Confirmation of Data Change SAA-I038: Receive Excluded Emergency Acceptance Pricing Information SAA-I039: Send Excluded Emergency Acceptance Dry Run Results. SAA-I040: Receive Confirmation of Additional Run Results.

5.2~~7~~5 SAA-F027: Calculate BM Unit Gross Demand for EMR

Requirement ID: SAA-F026	**Status:** Mandatory	**Title:** Calculate BM Unit Gross Demand	**BSC reference:** EMR
Man/auto: Automatic	**Frequency:** Once, on each Settlement Run	**Volumes:**	

Functional Requirement:

The SAA shall determine the TLM-Adjusted BM Unit Gross Demand for registered BM Units, for use by a CFD Settlement Services Provider.

1. For Supplier BM Units the TLM-Adjusted BM Unit Gross Demand is defined as:

   TLM-Adjusted BM Unit Gross Demand = $– TLM_{ij}$ * BM Unit SVA Gross Demand

   where BM Unit SVA Gross Demand is the value received from the SVAA for that BM Unit and Settlement Period, and will be deemed to be zero if no such value has been received.

2. For BM Units other than Supplier BM Units and Interconnector BM Units) the TLM-Adjusted BM Unit Gross Demand is defined as:

   TLM-Adjusted BM Unit Gross Demand = TLM_{ij} * min (QM_{ij}, 0)

3. For all other BM Units, TLM-Adjusted BM Unit Gross Demand is not defined (and the SAA will not provide a value for that BM Unit and Settlement Period to a CFD Settlement Services Provider).

4. The SAA shall report TLM-Adjusted BM Unit Gross Demand values to a CFD Settlement Services Provider for each relevant BM Unit and Settlement Period in the Settlement Day via SAA-I042.

Non Functional Requirement:
Interfaces:
SAA-I041: BM Unit SVA Gross Demand Data File SAA-I042: BM Unit Gross Demand Report

5.28 SAA-F028: Compare SBR Imbalance Price and System Buy Price

Requirement ID:	**Status:**	**Title:**	**BSC reference:**
SAA-F028	Mandatory	Compare SBR Imbalance Price and System Buy Price	P323
Man/auto:	**Frequency:**	**Volumes:**	
Manual	On demand		

Functional Requirement:
The SAA shall compare the BSCCo Calculated SBR Imbalance Price with the System Buy Price(s) for relevant Settlement Period(s). Before publishing the SBP the SAA shall confirm to the BSCCo that the prices were, or were not, equal. Where not equal and the difference is after the second decimal place the SAA shall not report this as a discrepancy. Where there is a discrepancy, if the discrepancy is £10 per MWh or more different then the SAA shall **not** publish the price and shall await further instructions. And where the discrepancy is less than £10 per MWh the SAA shall publish the price and await further instructions.
Non Functional Requirement:
Interfaces:
SAA-I047: BSCCo Calculated SBR Imbalance Price SAA-I048: SBR Imbalance Price Discrepancy Notice

6 Interface Requirements

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

Other Service Providers:

- Central Registration Agent (CRA)
- Central Data Collection Agent (CDCA)
- Funds Administration Agent (FAA)
- Balancing Mechanism Reporting Agent (BMRA)
- Energy Contract Volume Aggregation Agent (ECVAA)
- Supplier Volume Allocation Agent (SVAA)

Other external parties:

- BSC Party
- BSCCo Ltd
- System Operator (SO)
- Interconnector Administrator (IA)
- Interconnector Error Administrator (IEA)

The SAA Service shall provide inbound and outbound interfaces as summarised in the following table. Each interface requirement is described in detail below.

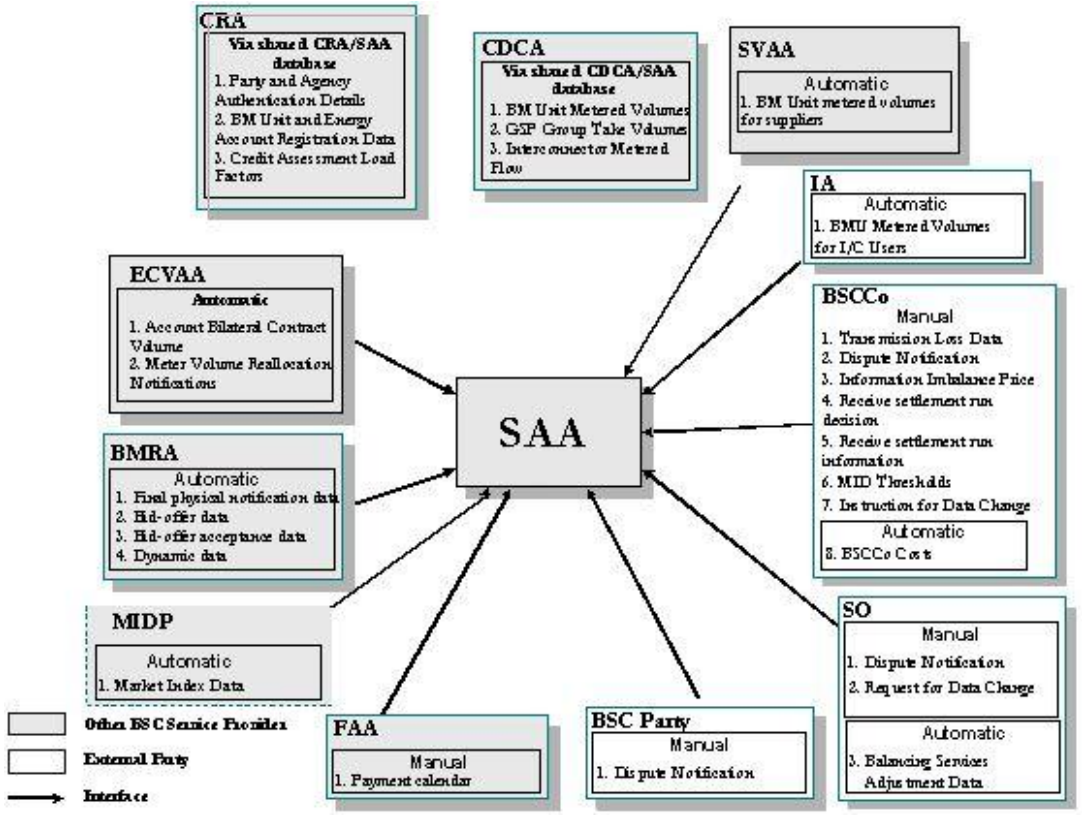
It is the intention that the SAA URS and the IDD should be fully consistent. However, in the event that some inconsistency is found, the definition in the IDD should be assumed to take precedence until such time as the inconsistency can be corrected at the next release of the document.

It is anticipated that the SAA Service will acquire correct and complete operational data from market participants on an ongoing basis. The SAA Service will not be migrating bulk data from any source.

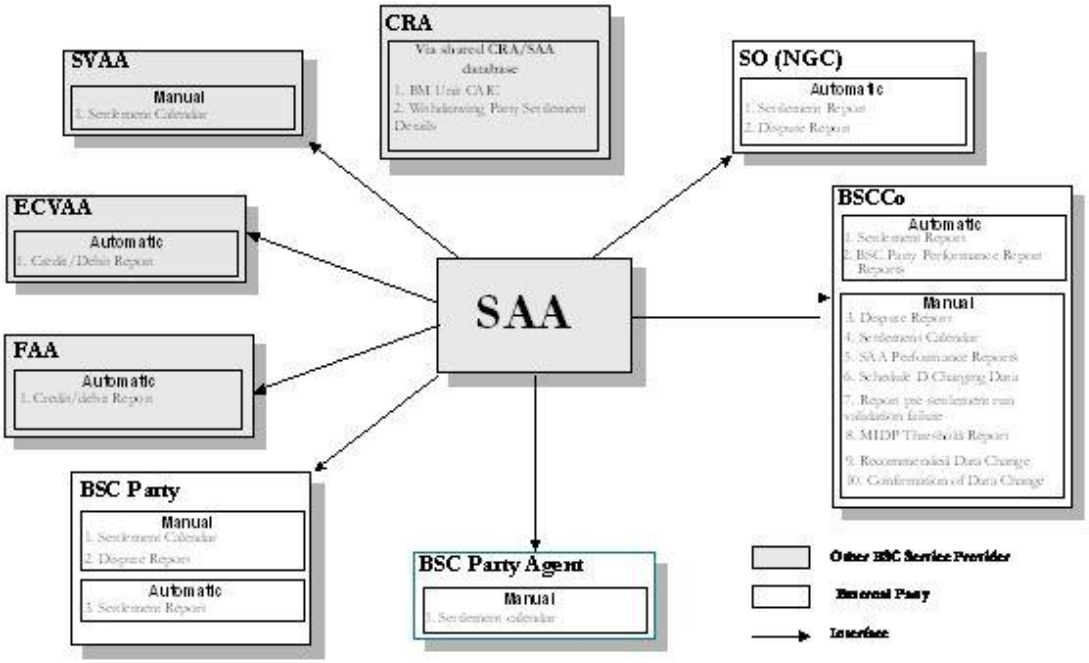
Reqt No.	Interface Requirement	Inbound/ Outbound	Interface User (IU)	Mechanism
SAA-I001	Receive Registration Data	Inbound	CRA	Via shared database
SAA-I002	Receive Credit Assessment Load Factor	Inbound	CRA	Via shared database
SAA-I003	Receive Balancing Mechanism Data	Inbound	BMRA	Automatic
SAA-I004	Receive Period Meter Data	Inbound	CDCA	Via shared database
SAA-I005	*Requirement not currently used*			
SAA-I006	Receive BM Unit Metered Volumes for Interconnector Users	Inbound	IA	Automatic
SAA-I007	Receive BM Unit Allocated Demand Volume	Inbound	SVAA	Automatic
SAA-I008	Receive Energy Contract Data	Inbound	ECVAA	Automatic
SAA-I009	Receive Transmission Loss Data	Inbound	BSCCo Ltd	Manual
SAA-I010	Receive BSCCo Ltd Costs (Redundant)	Inbound	BSCCo Ltd	Automatic
SAA-I011	Receive Payment Calendar Data	Inbound	FAA	Manual
SAA-I012	Receive Dispute Notification	Inbound	BSC Party, BSCCo Ltd, SO	Manual
SAA-I013	Issue Credit/Debit Reports	Outbound	FAA, ECVAA	Automatic
SAA-I014	Issue Settlement Reports	Outbound	BSC Party, BSCCo Ltd, SO	Automatic
SAA-I015	Issue BM Unit Credit Assessment Import Capability Data	Outbound	CRA	Via shared database
SAA-I016	Publish Settlement Calendar	Outbound	BSC Party, BSC Party Agent, SVAA, BSCCo Ltd	Manual
SAA-I017	Issue SAA Data Exception Reports	Outbound	ECVAA, SO, SVAA, IA, MIDP	Automatic
SAA-I018	Issue Dispute Reports	Outbound	BSC Party, BSCCo Ltd, SO	Manual
SAA-I019	Issue BSC Party Performance Reports (Redundant)	Outbound	BSCCo Ltd	Automatic
SAA-I020	Issue SAA Performance Reports	Outbound	BSCCo Ltd	Manual
SAA-I021	Receive Acknowledgement of SAA Messages	Inbound	All automatic outbound IU	Automatic
SAA-I022	Issue SAA Acknowledgement of Messages	Outbound	All automatic inbound IU	Automatic
SAA-I023	Receive System Parameters	Inbound	BSCCo Ltd	Manual
SAA-I025	SAA BSC Section D Charging Data	Outbound	BSCCo Ltd	Manual
SAA-I026	Receive Balancing Services Adjustment Date	Inbound	SO	Automatic
SAA-I027	Report pre-settlement run validation failure	Outbound	BSCCo Ltd	Manual
SAA-I028	Receive settlement run decision	Inbound	BSCCo Ltd	Manual
SAA-I029	Receive settlement run instructions	Inbound	BSCCo Ltd	Manual
SAA-I030	Receive Market Index Data	Inbound	MIDP	Automatic
SAA-I031	Receive Market Index Data Provider Thresholds	Inbound	BSCCo Ltd	Manual
SAA-I032	Report Market Index Data Provider Thresholds	Outbound	BSCCo Ltd	Manual
SAA-I033	Receive Request for Data Change	Inbound	SO	Manual
SAA-I034	Report Recommended Data Change	Outbound	BSCCo Ltd	Manual
SAA-I035	Receive Instruction for Data Change	Inbound	BSCCo Ltd	Manual
SAA-I036	Report Confirmation of Data Change	Outbound	BSCCo Ltd, SO	Manual

Reqt No.	Interface Requirement	Inbound/ Outbound	Interface User (IU)	Mechanism
SAA-I037	Issue Withdrawals Checklist - Settlement Data	Outbound	CRA	Via shared database
SAA-I038	Receive Excluded Emergency Accepted Pricing Information	Inbound	BSCCo Ltd	Manual
SAA-I039	Send Excluded Emergency Acceptance Dry Run Results	Outbound	BSCCo Ltd	Manual
SAA-I040	Receive Authorisation To Proceed With Full Settlement Run	Inbound	BSCCo Ltd	Manual
~~SAA-I047~~	BSCCo Calculated SBR Imbalance Price	Inbound	BSCCo Ltd	Manual
~~SAA-I048~~	SBR Imbalance Price Discrepancy Notice	Outbound	BSCCo Ltd	Manual

The following diagrams illustrate these interface requirements.



SAA Service: Inbound Interface Requirements[32]



SAA Service: Outbound Interface Requirements[31]

[32] Note that details of SAA-I047 (BSCCo Calculated SBR Imbalance Price) flow has not been included in this diagram in order to avoid excessive clutter

[31] Note that details of the SAA-I017 (Data Exception Report) and SAA I048 (SBR Imbalance Price Discrepancy Notice) flows have not been included in this diagram, in order to avoid excessive clutter.

7 Non-functional Requirements

This section specifies the specific non-functional requirements of the SAA Services. Common non-functional requirements are described in CRA URS - Appendix D.

7.1 SAA-N001: Audit Requirements

Requirement ID: SAA-N001	Status: M	Title: Audit Requirements	**BSC reference**: SAA SD: 5.3.2
Man/auto: Automatic	Frequency: All business transactions	Volumes: Audit information shall be associated with each set of data created by any business transaction. Volumes will be established during detailed design	
Non Functional Requirement:			
1. Sufficient information shall be stored such that the service provider shall be able to demonstrate how the results of any individual settlement calculations were derived. 2. It shall be possible to re-run any individual settlement process to recreate the results exactly as originally generated, as a historic report. This shall include the facility to exclude later versions of business data, for instance meter readings, which were received after the settlement process was originally run. Standard reconciliation runs shall include the current version of all current business data relevant to the trading day of the run, including any data received after the settlement process was originally run. 3. It shall be possible to maintain separate settlement calculation rules applicable to individual trading days, since these rules may change over time. In performing subsequent reconciliations of individual trading days, it shall be possible to apply either the calculation rule which was in force at the date on which the trading day was first settled, or alternatively to apply retrospectively an amended calculation rule if deemed necessary. This application of alternative calculation rules shall also be possible for a historic report which uses the same business data as the original settlement run. 4. Should any settlement run or other report process generate informational, warning or error logs as part of its processing, these logs should be available for inspection by an operator. 5. The Service Provider shall facilitate the following specific requirements of the BSCCo Ltd appointed Auditor. The Service Provider shall facilitate any reasonable audit requirements to ensure: a) Data quality is of the required standards for settlement. b) Settlement issues/disputes can be investigated.			

7.2 SAA-N002: *Requirement not currently used*

Requirement ID: SAA-N002	Status:	Title: Requirement not currently used	**BSC reference**:
Man/auto:	Frequency:	Volumes:	
Non Functional Requirement:			

7.3 SAA-N003: Operational Control

Requirement ID: SAA-N003	Status: M	Title: Operational Control	**BSC reference**:
Man/auto: Manual & Automatic	Frequency: As required	Volumes:	
Non Functional Requirement: The SAA Service operational procedures will be fully defined in the Operational Services Manual. Procedures are likely to include, but not be limited to, the following.			
1. It shall be possible to perform settlement runs to satisfy "what if" scenarios, especially in order to gauge materiality in the event of disputes. The results of such "what if" calculations should not be available to subsequent reconciliation runs for the relevant trading day unless so confirmed by a suitably authorised operator. 2. The system shall be sized to support the provision of at least ten settlement runs over the course of each working day in order to comply with the requirements of the Settlement Calendar. 3. It shall be possible to run settlement calculations associated with balancing mechanism requirements prior to, and separately from, calculations associated with imbalancing mechanism settlement. 4. Settlement reports associated with a particular settlement run shall be made available for release to all relevant recipients at approximately the same time. Note that the time of receipt of a given report by a particular BSC Party after release by the central system will be dependent on the type and grade of communications service which that BSC Party has chosen to purchase.			

7.4 SAA-N004: *Requirement not currently used*

Requirement ID: SAA-N004	Status:	Title: Requirement not currently used	**BSC reference**:
Man/auto:	Frequency:	Volumes:	
Non Functional Requirement:			

8 Service Requirements

There are no specific service requirements for the SAA Services. All common service requirements including indicative volumetrics and performance criteria are described in CRA URS - Appendix.

9 User Roles and Activities

The following table describes the user roles which will support the day to day operation of the SAA service.

Role	Activities
System Administrator	Database management Specific aspects of system configuration User account and security management
Supervisor	Management of operators Management of standing data updates Co-ordination of creation of the Settlement Calendar Management of planned operational activities to meet Settlement Calendar timescales and service level requirements Creation of management information reports Support for communication with external parties
Operator	Performance of procedures to monitor receipt and processing of information from external parties. Performance of procedures to initiate and monitor settlement runs and reports. Second level support for ad hoc queries raised by external parties
Help Desk Operator	First level support for ad hoc queries raised by external parties. Note that the Help Desk facility shall be shared by more than one service provision.
Auditor	There shall be a specific user security configuration which allows an external auditor to review data within the system, but prevents the initiation of batch processes or logical edits to business data.

These roles and activities will be refined and developed in more detail during detailed business process definition.

The following parties are associated with the SAA business processes in the wider context, and may thus be considered as "users" of the service. The detailed functional requirements and data interfaces necessary to support these parties are described earlier in this chapter.

Role	Summary of Activities related to SAA
BSCCo Ltd	Receives summary settlement reports from SAA at periodic intervals (daily, weekly, monthly).
Balancing Mechanism Operator	Transmits balancing mechanism data (via the BMRA service) to be settled by the SAA service according to Settlement Calendar timescales.
BSC Party	Receives detailed settlement reports daily from SAA.
CRA	Provides registration data to the SAA which defines the set of items such as the BM Units relevant to each trading period.
ECVAA	Provides total energy contract volume associated with each energy account and settlement period.
CDCA	Provides metered volumes for BM Units, Interconnectors and GSP Groups as input to the settlement process performed by SAA.
SVAA	Provides Supplier Take Energy volumes as input to the settlement process performed by SAA.
Interconnector Administrator	Provides BM Unit Metered Volumes for Interconnector Users as input to the settlement process performed by SAA.
Funds Administration Agent (FAA)	Receives debit/credit instructions from SAA in order to perform funds clearance. Provides payment calendar annually.

Appendix A Glossary

A standard NETA glossary is included in the Appendix of the CRA URS.

Appendix B Requirements Compliance Matrix

The following tables show the mapping of requirements defined in this URS document to the requirements set out in the Service Description for Settlement Administration, Change Notices and Clarification Notes.

Service Description Requirement Number	URS Requirement Reference Number	Notes
1		Overview section therefore no mapping of requirements
2.1.1	SAA-I003 SAA-F002	Balancing Mechanism data received from BMRA not SO
2.1.2	SAA-I026	
2.2.1	SAA-I004 SAA-F002	
2.3.1	SAA-I008 SAA-F002	
2.3.2	SAA-I008 SAA-F002	
2.4.1	SAA-I006 SAA-F002	
2.5.1	SAA-I007 SAA-F002 SAA-F003	
2.6.1	SAA-I001 SAA-F002	
2.6.2	SAA-I010 SAA-F002	
2.6.3	SAA-I023	
2.6.4	SAA-I023	
2.7.1	SAA-I001 SAA-I002 SAA-F002	
2.8.1	SAA-I011 SAA-F002	
2.9.1	SAA-I012 SAA-F002	
3.1.1	SAA-F006	
3.1.2	SAA-F006	
3.1.3	SAA-F006	
3.2.1	SAA-F007	
3.2.2	SAA-F005	
3.2.3	SAA-F005	
3.2.4	SAA-F005	
3.2.5	SAA-F005	
3.2.6	SAA-F005	
3.2.7	SAA-F005	
3.2.8	SAA-F007	
3.3.1	SAA-F005	
3.3.2	SAA-F005	
3.4.1	SAA-F005	
3.4.2	SAA-F005	

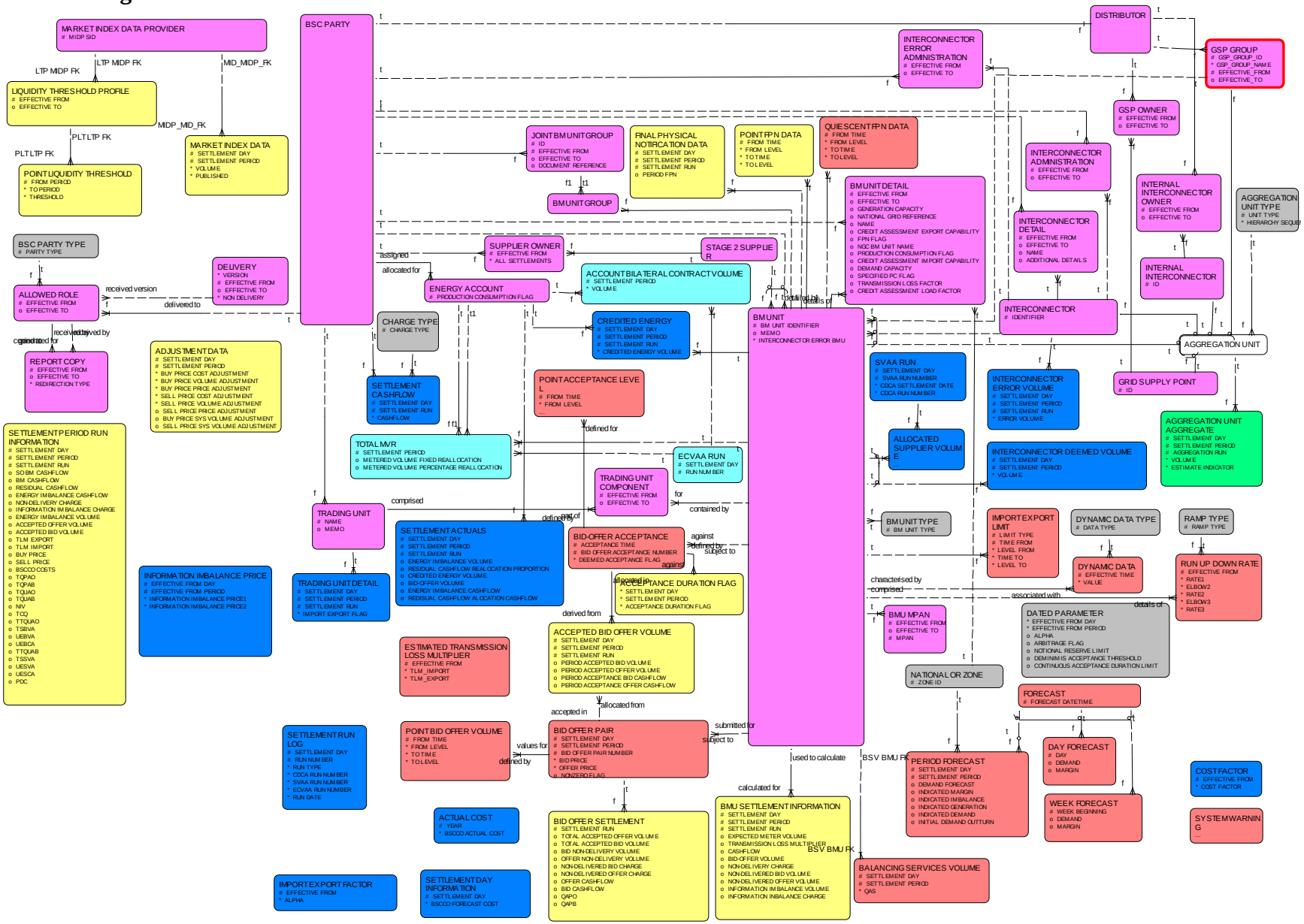
Service Description Requirement Number	URS Requirement Reference Number	Notes
3.5.1	SAA-F005	
3.5.2	SAA-F005	
3.5.3	SAA-F005	
3.5.4	SAA-F005	
3.6.1	SAA-F005	
3.7.1	SAA-F005	
3.8.1	SAA-F005	
3.9.1	SAA-F005	
3.9.2	SAA-F005	
3.9.3	SAA-F005	
3.10.1	SAA-F005	
3.11.1	SAA-F005 SAA-F010	
3.11.2	SAA-F010	
3.12.1	SAA-F005	
3.12.2	SAA-F005	
3.13.1	SAA-F005	
3.13.2	SAA-F005	
3.14.1	SAA-F005	
3.15.1	SAA-F007	
3.15.2	SAA-F007	
3.16.1	SAA-F007	
3.16.2	SAA-F007	
3.17.1	SAA-F007	
3.18.1	SAA-F007	
3.19.1	SAA-F005	
3.19.2	SAA-F013	
3.19.3	SAA-F013	
3.20.1	SAA-F005	
3.21.1	SAA-F005	
3.22.1	SAA-F013	
3.22.2	SAA-F013	
3.23.1	SAA-F013	
3.24.1	SAA-F013	
3.25.1	SAA-F013	
3.26.1	SAA-F009	
3.27	SAA-F009	
3.28	SAA-F009	
3.29	SAA-F005	
3.30	SAA-F005	
3.31.1	SAA-F009	
3.31.2	SAA-F009	
3.32.1	SAA-F009	
3.32.2	SAA-F009	
3.33.1	SAA-F011	
3.34.1	SAA-F008	
3.34.2	SAA-F008	
3.34.3	SAA-F008	
3.35.1	SAA-F008	
3.36.1	SAA-F011	
3.37.1	SAA-F011	
3.38.1	SAA-F011	
3.39.1	SAA-F011	
3.40.1	SAA-F011	

Service Description Requirement Number	URS Requirement Reference Number	Notes
3.41.1	SAA-F014	
3.41.2	SAA-F014	
3.41.3	SAA-F014	
3.42.1	SAA-F014	
3.43.1	SAA-F014	
3.44.1	SAA-F014	
3.44.2	SAA-F014	
3.44.3	SAA-F014	
3.45.1	SAA-F014	
3.45.2	SAA-F014	
3.45.3	SAA-F014	
3.46.1	SAA-F015	
3.47.1	SAA-F015	
3.48.1	SAA-F015	
3.49.1	SAA-F015	
3.50.1	SAA-F018	
3.50.2	SAA-F018	
3.51.1	SAA-F016	
3.52.1	SAA-F017	
3.53.1	SAA-F017	
3.54.1	SAA-F017	
3.55.1	SAA-F017	
3.56.1	SAA-F019	
3.56.2	SAA-F019 SAA-I013	
3.56.3	SAA-F019	
3.57.1	SAA-I013 SAA-I014	
4.1.1	SAA-I013 SAA-I014	
4.1.2	SAA-I013 SAA-I014	
4.1.3	SAA-I013 SAA-I014	
4.1.4	SAA-I013 SAA-I014	
4.2.1	SAA-I013 SAA-I014	
4.2.2	SAA-I013 SAA-I014	
4.2.3	SAA-I013 SAA-I014	
5.1.1	SAA-F021	
5.1.2	SAA-F021	
5.1.3	SAA-F021	
5.1.4	SAA-F021 SAA-I018	
5.1.5	SAA-F021	
5.1.6	SAA-F021	
5.2.1	SAA-F001 SAA-I016	
5.2.2	SAA-F001	
5.3.1	SAA-I001	
5.3.2	SAA-N001	
5.3.3	SAA-I001	

Change Notice or Clarification Note	URS Requirement Reference Number	Notes
CR002	SAA-F010	
CR003	SAA-F006 SAA-F009	
CR004		not applicable to SAA
CR005	SAA-F008 SAA-I008	
CR006	SAA-F005	
CR007	SAA-F018	
CR008		not applicable to SAA
CR009	SAA-F005	
CR_18_990909		not applicable to SAA
CR_990813_06a		not applicable to SAA
CR_990813_06b	SAA-F022 SAA-I014 SAA-N003	
CR_990813_07		not applicable to SAA
CR_991027_06a	SAA-I014	
CR_991027_06b		not applicable to SAA
CR065	SAA-I025	
CP555	SAA-F001	
	SAA-F010	
	SAA-I006	
	SAA-I011	
	SAA-I016	
	SAA-I024	
CP598	SAA-F002	
CP595	SAA-I017	
CP596	SAA-F013	
P8	SAA-I014	
P18A	SAA-I014	
P2	SAA-F004	
	SAA-I013	
P71	SAA-F005	
	SAA-F024	
	SAA-I003	
	SAA-I014	SAA-I014 changes for P71 are documented in the IDD, however they are included in this cross reference for completeness
P78	SAA-F002	
	SAA-F009	
	SAA-F009a	
	SAA-F009b	
	SAA-F012	
	SAA-F020	
	SAA-F023	
	SAA-I014	The SAA-I014 changes for P78 are documented in the IDD, however they are included in this cross reference for completeness
	SAA-I017	
	SAA-I020	
	SAA-I026	
	SAA-I030	

Change Notice or Clarification Note	URS Requirement Reference Number	Notes
	SAA-I031	
	SAA-I032	
CP754	SAA-I014	The SAA-I014 changes for CP754 are documented in the IDD, however they are included in this cross reference for completeness
CP797	SAA-I014	The SAA-I014 changes for CP797 are documented in the IDD, however they are included in this cross reference for completeness
CP915	SAA-I006	
CP975	SAA-I001	
CP995	SAA-I003 SAA-I033 SAA-I034 SAA-I035 SAA-I036	
CP974	SAA-F025 SAA-I037	
P215	SAA-F001	
CP1283	SAA-I034 SAA-I035 SAA-I036	
CP1286	SAA-I003	
P217	SAA-F009 SAA-I003 SAA-I014 SAA-I023 SAA-I026	
P285	SAA-F017	
P323	SAA-F028	

Appendix C Logical Data Model



The diagram above illustrates the logical data model as it affects the SAA User Requirements Specification. It does not describe the entire system data model and it is included for indicative purposes only.

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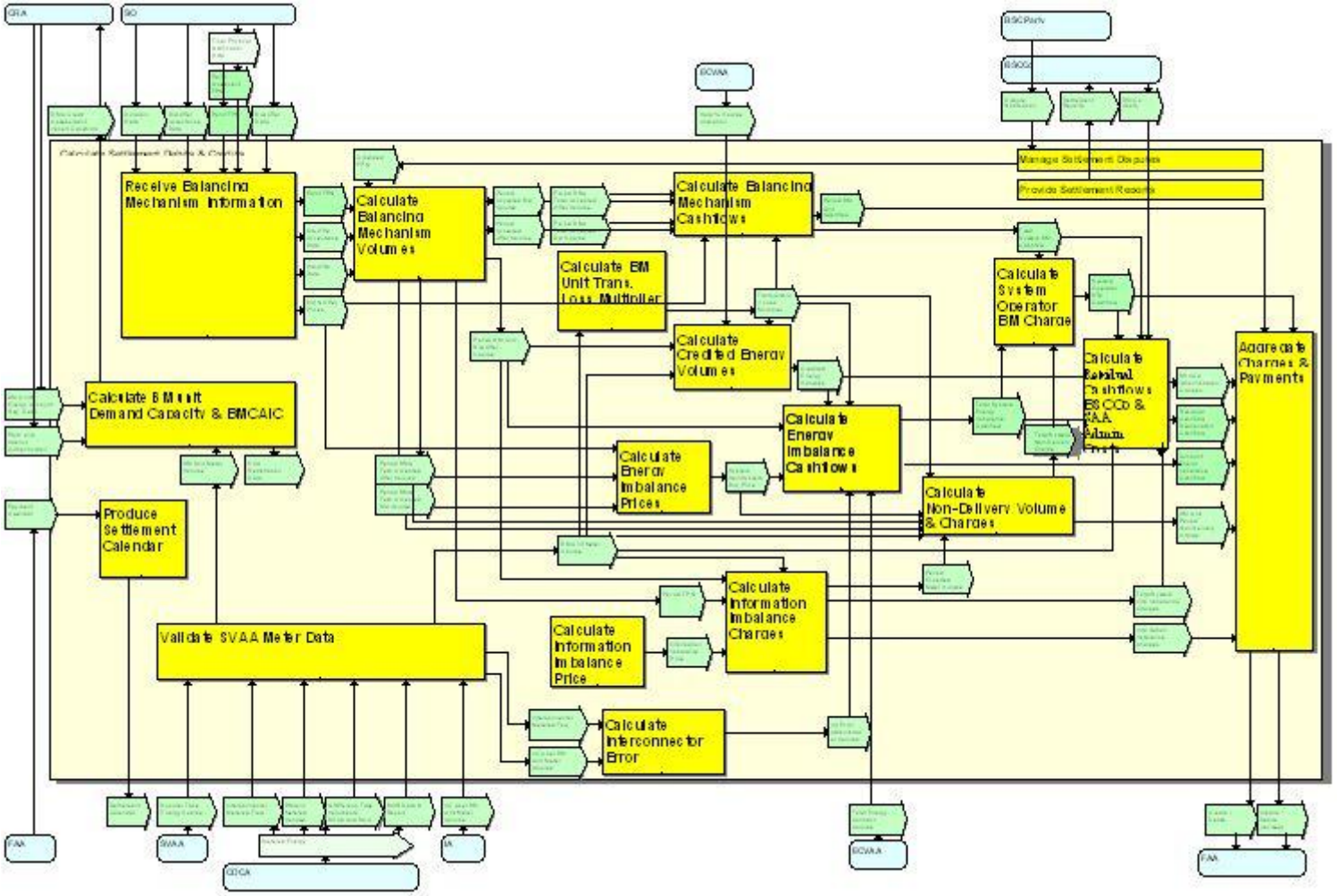
Appendix D Business Process Model

The Business Process Model diagram(s) for the SAA Service will be found in the NETA PROGRAMME shared folder (Reference 07-5505). The diagram below is included for indicative purposes only.



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Appendix E 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 System Buy Price and 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 ∑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 ∑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 ∑QXP is zero SBP = NIV; SSP = NIV; QAPO + UEBVA is not zero
D	SBP & SSP Defaulted to Market Price	NIV is positive ∑QXP is non zero SBP = PXP; SSP = PXP; QAPO + UEBVA is zero
E	SSP & SBP Defaulted to Zero	NIV is positive ∑QXP is zero SBP = 0; SSP = 0; QAPO + UEBVA is zero
F	SSP = Main Price; SBP = Reverse Price	NIV is negative ∑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 ∑QXP is non zero SBP = NIV; SSP = NIV; QAPB + UESVA is not zero; SSP is greater than SBP

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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

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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;

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