

TECHNICAL GUIDE TO THE WESTERN AUSTRALIAN GAS RETAIL MARKET

PREPARED BY: AEMO / Markets / Market Management

VERSION: 3.0

EFFECTIVE DATE: 30 April 2018

STATUS: FINAL

VERSION RELEASE HISTORY

Version	Effective Date	Summary of Changes
1.0	31 Oct 2016	First Issue
2.0	1 July 2017	Minor change to section 9.2.
3.0	30 April 2018	Updated per change IN002/17W which involved changes to the Procedure Change Committee (PCC) terms of reference and chapter 9 of the procedures.

CONTENTS

1.	INTRODUCTION	7
2.	OVERVIEW	7
3.	GAS RETAIL MARKET OBLIGATIONS SUMMARY	8
3.1.	The WA Gas Retail Market Agreement	8
3.2.	The Procedures	9
3.3.	AEMO Specification Pack	9
3.4.	The Hub T&Cs	10
4.	INFORMATION SYSTEMS	11
4.1.	FRC Hub	12
4.2.	Gas Retail Market Systems (“GRMS”)	12
4.3.	Technical Certification	15
5.	DELIVERY POINT MANAGEMENT	17
5.1.	Precursors to a Transfer	17
5.2.	Lodging a Transfer Request	17
5.3.	Objection to a Transfer Request	18
5.4.	Completion of a Transfer Request	18
6.	METER DATA MANAGEMENT	19
6.1.	Different Types of Meters	19
6.2.	Measuring and Converting Gas to Energy	20
7.	SERVICE ORDER MANAGEMENT	22
7.1.	What is a Service Order?	22
7.2.	Service Connection Request	22
7.3.	User Service Orders	22
7.4.	Network Operator Service Orders	23
8.	BALANCING, ALLOCATION AND RECONCILIATION MANAGEMENT	23
8.1.	User Obligations	24
8.2.	Before the Gas Day	24
8.3.	During the Gas Day	25
9.	SWING SERVICE	27
9.1.	What is Swing Service?	27
9.2.	Calculating Swing Service	27
9.3.	Example of a Swing Service Calculation	29
9.4.	Allocating Swing Service	30
9.5.	How to Pay for Swing Service	32
10.	APPENDIX 1: GAS RETAIL MARKET PARTICIPANT TRAINING	34
11.	APPENDIX 2: GAS RETAIL MARKET REFERENCE DOCUMENTS	34

TABLES

Table 1	Obligations in the WA Gas Retail Market Agreement	8
Table 2	Content of the Retail Market Procedures	9
Table 3	Content of the AEMO Specification Pack	9
Table 4	Content of the Information Pack	11
Table 5	Reference Documentation from the AEMO Specification Pack for the LVI.....	15
Table 6	Key Calculations to Determine Allocation Quantities	26
Table 7	Key Reconciliation Calculations	26
Table 8	Participant Training Resources	34

FIGURES

Figure 1	Schematic of the AEMO Retail Market Scheme.....	8
Figure 2	Diagram of the FRC Hub	12
Figure 3	Diagram of the GRMS	13
Figure 4	aseXML message sent to GRMS (DPR) (e.g. a Transfer Request).....	14
Figure 5	aseXML message sent to GRMS (BAR) (e.g. User Allocation Instructions)	14
Figure 6	Example of the Customer Transfer Process	19
Figure 7	Example of Calculating Swing Service	29
Figure 8	Example of a Swing Service Bid Stack	33

PURPOSE

AEMO has prepared this document to provide information about the operation of the principal aspects of the gas retail market operated by AEMO in Western Australia.

Disclaimer

This document is intended as a guide only. The information in it may be subsequently updated or amended. This document does not constitute legal or business advice, and should not be relied on as a substitute for obtaining detailed advice about the regulatory instruments governing the WA retail gas market, including (without limitation), the:

- Energy Coordination Act 1994 (WA)
- Retail Market Procedures (WA)
- WA Retail Gas Market Agreement

AEMO has made every effort to ensure the quality of the information in this document but cannot guarantee its accuracy or completeness. Accordingly, to the maximum extent permitted by law, AEMO and its officers, employees and consultants involved in the preparation of this document:

- make no representation or warranty, express or implied, as to the currency, accuracy, reliability or completeness of the information in this document; and

are not liable (whether by reason of negligence or otherwise) for any statements or representations in this document, or any omissions from it, or for any use or reliance on the information in it.

LIST OF ABBREVIATIONS

Term	Description
AEMO	Australian Energy Market Operator
AML	Apply Meter Lock
ASWG	aseXML Standards Working Group
B2B	Business-to-Business
B2M	Business-to-Market
BAR	Balancing, Allocation and Reconciliation
CSV	Comma Separated Values
DBNGP	Dampier to Bunbury Natural Gas Pipeline
DEE	Data Estimation Entity
DPR	Delivery Point Registry
ERA	Economic Regulation Authority
FRC	Full Retail Contestability
GBOid	Gas Business Operator Identifier
GRMS	Gas Retail Market System
Hub T&Cs	FRC Hub Operational Terms and Conditions
ICD	Interface Control Document
ITDF	Information Technology Development Forum
LVI	Low Volume Interface
MDA	Meter Data Agent
MIRN	Meter Indicator Reference Number
MSH	Message Server Handler
NEM	National Electricity Market
PCC	Procedure Change Committee
PCF	Pressure Correction Factor
REMCo	Retail Energy Market Operator Limited
SA	South Australia
SSPOLR	Swing Service Provider of Last Resort
TWG	Technical Working Group
WA	Western Australia

1. INTRODUCTION

This guide provides a technical overview of the principal operational aspects of the Western Australian (“WA”) gas retail market and supplements the “Overview Guide to the WA Gas Retail Market.”

This technical guide is intended to help gas retail market participants, customers, and other stakeholders understand the more detailed and technical concepts and workings of the market. Please refer to the Overview Guide for further information about the background and development of the market, and more detailed summaries of the regulatory framework, compliance requirements, and roles and responsibilities for market operation and administration.

This document is a guide only – the Retail Market Procedures (WA) (the “Procedures”) and the *Energy Coordination Act 1994* prevail in any case of inaccuracy or omission.

2. OVERVIEW

AEMO operates the only approved retail market scheme in WA under the *Energy Coordination Act 1994*. The AEMO Retail Market Scheme covers the gas distribution systems operated by ATCO Gas Australia Pty Ltd (i.e. the Mid-West/South-West, Kalgoorlie-Boulder and Albany systems).

In accordance with the *Energy Coordination Act 1994*, the principal scheme documentation comprises:

- (a) the WA Gas Retail Market Agreement (the “Agreement”), as the agreement between AEMO (as the gas retail market operator) and Gas Market Participants (being Users, i.e. retailers, and Network Operators); and
- (b) the Procedures, as the retail market rules that govern the requirements and process for practical gas full retail contestability (“FRC”) in the distribution systems covered by the scheme.

The Procedures require all Gas Market Participants to comply with the following documents, which are also part of the AEMO Retail Market Scheme:

- (c) AEMO Specification Pack; and
- (d) FRC Hub Operational Terms and Conditions (“Hub T&Cs”).

All of the AEMO Retail Market Scheme documents and related publications, including guides, process documentation and training material, are available on the AEMO website at www.aemo.com.au.

The *Energy Coordination Act 1994* also provides that Pipeline Operators and Prescribed Persons (i.e. Self-Contracting Users, Shippers, and Swing Service Providers) must comply with relevant parts of the Procedures, although they are not required to sign the Agreement. The Pipeline Operators whose transmission pipelines transport gas to the scheme distribution systems are:

- DBP Transmission operates the Dampier to Bunbury Natural Gas Pipeline (“DBNGP”), a pressure controlled pipeline transporting gas from the North West Shelf to the Mid-West/South-West Distribution System
- APA Group operates the Parmelia Pipeline, a flow controlled pipeline transporting gas from the Perth basin to the Mid-West/South-West Distribution System; and the Goldfields Gas Pipeline, transporting gas from the North West Shelf to the Kalgoorlie/Boulder Distribution System.

The WA gas retail market is made up of several systems and processes, primarily including:

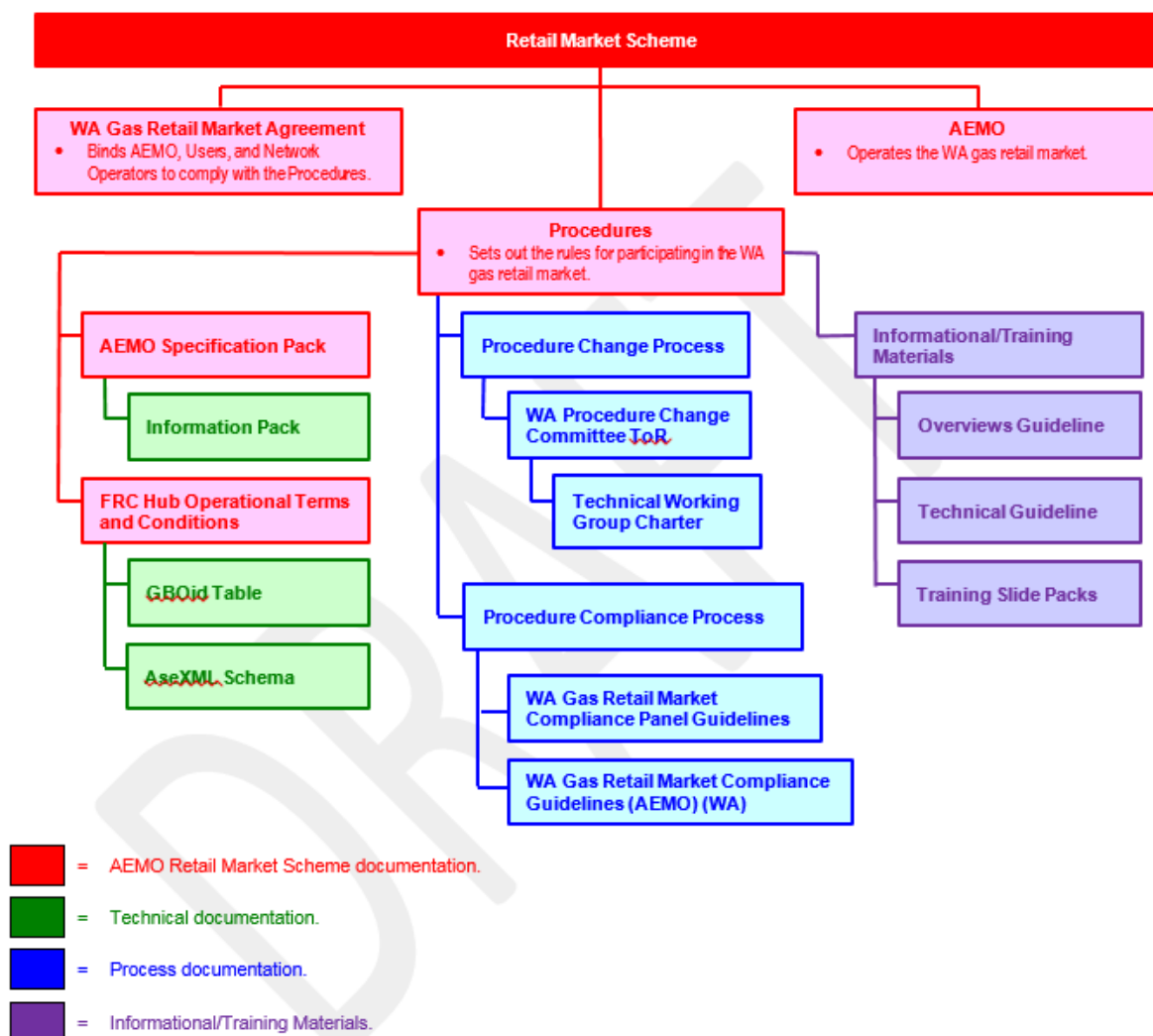
- **Delivery Point Management** – managing the transfer of gas delivery points (i.e. customers) between Users, and providing a mechanism for Users to retrieve data from the Network Operator about particular customers;
- **Meter Data Management** – managing the transfer of meter data from the Network Operator to the Users and AEMO, such as the consumed energy used by the customers;
- **Service Order Management** – managing Service Order requests and completion notices between Users and the Network Operator, which pertain to metering works undertaken at customers’ premises; and
- **Balancing, Allocation and Reconciliation Management** – managing the daily allocation of gas usage to Users to enable settlement of gas supply and gas transmission contracts.

These systems and processes allow gas retail market participants to conduct their business electronically in an efficient and uniform manner, and are described in more detail in this document.

3. GAS RETAIL MARKET OBLIGATIONS SUMMARY

Figure 1 provides a schematic of the AEMO Retail Market Scheme and related documentation.

Figure 1 Schematic of the AEMO Retail Market Scheme



3.1. The WA Gas Retail Market Agreement

The WA Gas Retail Market Agreement is the agreement required under section 11ZOF(a) of the *Energy Coordination Act 1994* for the AEMO Retail Market Scheme between Gas Market Participants and AEMO.

AEMO uses the same AEMO Specification Table 1 lists the key obligations imposed by the WA Gas Retail Market Agreement.

Table 1 Obligations in the WA Gas Retail Market Agreement

Party	Obligations
AEMO	<ul style="list-style-type: none"> Is bound by and operate the WA gas retail market in accordance with the Procedures. Has the primary aim to develop and operate cost efficient and effective retail market arrangements, which are fair and equitable, to facilitate competition in the WA gas retail market. Must act in a manner that treats all Scheme Participants fairly and equitably, and does not unfairly discriminate between the interests of Scheme Participants.

Party	Obligations
Scheme Participants	<ul style="list-style-type: none"> • Are bound by and must observe the terms of the Procedures, including any changes to the Procedure from time-to-time. • Must abide by any determination made by the Compliance Panel established under the Procedures.

3.2. The Procedures

The Procedures provide an efficient means of managing the gas retail market by regulating the activities of parties involved in the market. Table 2 provides a summary of the content of the Procedures.

Table 2 Content of the Retail Market Procedures

Chapter	Content
1. Interpretation and administration of the Procedures	Deals with legal clarity, including: defining terms used in the Procedures; and identifying who the Procedures apply to.
2. The databases	Deals with management of databases, including: the "AEMO registry", which is maintained by AEMO, and links Users (i.e. Retailers) with their customers; and the "MIRN database", which is maintained by the Network Operator, and contains the meter information for all customers.
3. MIRN transactions	Deals with the transfer of customers between Users.
4. Metering	Sets out the requirements for metering equipment, meter reading, and management of metering data.
5. Allocation, reconciliation and swing	Sets out the processes for managing the daily allocation of gas usage to Users to enable settlement of gas supply and transmission contracts. Participants are urged to ensure that they have a detailed understanding of Chapter 5, which is the most complex part of market operations, and therefore represents the most risk to Participants.
6. Compliance and interpretation	Deals with Procedure breaches and interpretation of the Procedures, and with establishment of the Compliance Panel.
7. Reporting and audits	Details the requirements for AEMO, Users, and Network Operators to audit and report on their compliance with the Procedures.
8. Administration	Sets out administrative processes, including setting AEMO's fees.
9. Procedure change process	Sets out the process to amend the Procedures, and deals with establishing the Procedure Change Committee ("PCC").
10. General provisions	Deals with the interaction between the Procedures, laws, and the relevant Access Arrangements.

3.3. AEMO Specification Pack

Clause 14 of the Procedures stipulates that AEMO, Participants, Pipeline Operators and Prescribed Persons are required to comply with the AEMO Specification Pack.

The AEMO Specification Pack provides the technical specifications for how AEMO and the Participants, Pipeline Operators or Prescribed Persons are to implement the Procedures.

The AEMO Specification Pack is made up of agreed technical standards and business processes that enable AEMO, Participants, Pipeline Operators and Prescribed Persons to transfer information between each others' systems in the WA and SA gas retail market.¹ This includes customer meter readings, Service Orders and customer transfer transactions.

Table 3 provides an overview of the content of the AEMO Specification Pack.

Table 3 Content of the AEMO Specification Pack

¹ AEMO uses the same AEMO Specification Pack, Hub T&Cs, and GBOid Table for the WA and SA gas retail market operations. This approach promotes interchangeability in these documents for the benefit of stakeholders from both states.

Document	Description
AEMO Specification Pack Usage Guidelines	Provides an overview of the various documents that form the AEMO Specification Pack and the purpose of each of these documents.
SAWA Interface Control Document (“ICD”)	Describes in detail the physical transactions transferred between AEMO’s IT system – the Gas Retail Market System (“GRMS”) – and the market participants of the WA and SA gas retail markets.
FRC Business-to-Business (“B2B”) System Interface Definitions	Defines the behaviour of the WA and SA market business and IT systems. The definitions identify the manner in which the participants in the WA and SA gas market will communicate with each other to manage their day-to-day business.
FRC Business-to-Market (“B2M”)-B2B Hub System Architecture	Provides a comprehensive architectural overview of the FRC transaction and messaging system based on the use of the FRC Hub.
FRC B2M-B2B Hub System Specifications	Provides the configuration and control settings that apply to the transaction and messaging system.
FRC CSV Data Format Specification	Defines format of Comma-Separated Values (“CSV”) files for transactions that are to be exchanged between gas retail market participants.
Connectivity Testing and Technical Certification	Describes the processes through which organisations wishing to participate in the WA and SA gas retail markets can achieve technical certification from the relevant Market Operator.
Readiness Criteria	Sets out the criteria for AEMO’s assessment of participants’ market readiness, pursuant to the issuance of a GBOid in accordance with clause 21B of the Procedures.
B2B Service Order Specifications, Parts 1 and Part 2	Define the detailed usage of Job Enquiry Codes and Job Completion Codes.
aseXML Schemas	Transactions are conducted on the basis of a set of industry Procedures encapsulated in the aseXML schema and expressed in aseXML documents.

3.4. The Hub T&Cs

The FRC Hub is a communication infrastructure operated by AEMO, and is the gateway through which gas retail market participants can deliver and receive structured B2B and B2M messages using defined protocols and formats.

The Hub T&Cs contains information for Participants who are connected to and use the FRC Hub infrastructure, which is administered by AEMO for the gas retail markets.¹

The Hub T&Cs provide an overview of the FRC Hub and specific information for gas retail market participants who wish connect to the FRC Hub to operate in the relevant markets. The Hub T&Cs contain a number of appendices with detailed instructions on the use of certain features of the FRC system.

3.4.1. Technical Documentation

A number of technical documents that support the AEMO Retail Market Scheme, including:

- the Gas Business Operator Identification (“GBOid”) Table;
- the Information Pack; and
- the aseXML Schema.

3.4.2. The GBOid Table

The GBOid Table lists all the identifiers and their status in the GRMS for the WA and SA gas retail market participants. AEMO publishes the GBOid Table on its website, in accordance with clause 22(2) of the Procedures, and any changes are published by AEMO in a new version of document.¹

The GBOid Table contains the following information:

- the name of each person (or Company);
- the capacity in which the person operates;
- the status of the GBOid; being “active”, “suspended” or “deregistered”;
- the person’s nominated contact details; and

- the effective date of any changes to the GBOid Table.

3.4.3. Information Pack

The Information Pack is a set of documents designed to help Participants interpret the content of the AEMO Specification Pack and the Hub T&Cs. The Information Pack provides guidance to AEMO, Participants, Pipeline Operators and Prescribed persons in relation to B2M and B2B systems and processes in the WA and SA gas retail markets.

Table 4 provides an overview of the content of the Information Pack, including a description of each document.

Table 4 Content of the Information Pack

Document	Description
Information Pack Usage Guidelines	Provides an overview of the various documents that form the Information Pack and the purpose of each of these documents
SAWA Business Specification	The Business Specification provides a baseline definition of CGI's scope of work for the delivery of the GRMS for WA and SA, in accordance with the Procedures and the Retail Market Procedures (SA).
FRC B2M Process Flow and Sequence Diagrams	Identifies the work processes and data flows in the FRC environment for B2M transactions. The B2B processes reference the FRC B2B Process Flows, where applicable, and detail each logical step in the process required to deliver various gas services in the FRC environment.
FRC B2B Process Flow Diagrams	Identifies the work processes and data flows in the FRC environment for B2B transactions. The B2B processes detail each logical step in the process required to deliver various gas services in the FRC environment, and identify data flows between businesses that will have to occur for FRC to operate successfully.
GRMS FTP User Guide	Provides an overall guide for participants using the AEMO FTP Server, with a description of how the FTP service has been implemented with some required settings that participants will need to configure in their own FTP client.
GRMS FTP Procedure Guide	Outlines the processes for issuing and maintaining the Usernames and passwords required by participants to connect to the GRMS FTP Server.
GRMS FTP Registration Form	The template that needs to be completed by businesses wishing to register and connect to the GRMS FTP Server.
FRC Gas Hub Participant User Guide	Provides an overall guide for the use of the Certification Responders based on the FRC Hub.
Non-IT RMR Communications	Lists a number of obligations from the WA and SA Procedures that AEMO will perform manually, as described under the Business Specification.
WA Profile Nominations Guideline	Details the principles for the creation, selection and management of daily nomination profiles as required under clause 200.
New Entrant GRMS Deliverables Information Sheet	Provided information on what reports AEMO published, when they are published, and the purpose of the reports.
Changing your Password on the Participant Server	Market participants are required to change their password for the market systems on a quarterly basis, and this document provides information on how to do so.

3.4.4. The aseXML Schema

The aseXML schema is an external standard referred to in the AEMO Specification Pack and mandates that certain transactions are conducted on the basis of a set of industry rules encapsulated in the aseXML schema, and expressed in aseXML documents.

4. INFORMATION SYSTEMS

There are two main information systems that underpin the gas retail market in WA:

- the FRC Hub – AEMO's communications IT system, which is provided by AEMO under contract; and
- the Gas Market Retail System ("GRMS") – AEMO's IT system that implements the Procedures, and is provided by CGI under contract.

4.1. FRC Hub

4.1.1. Overview

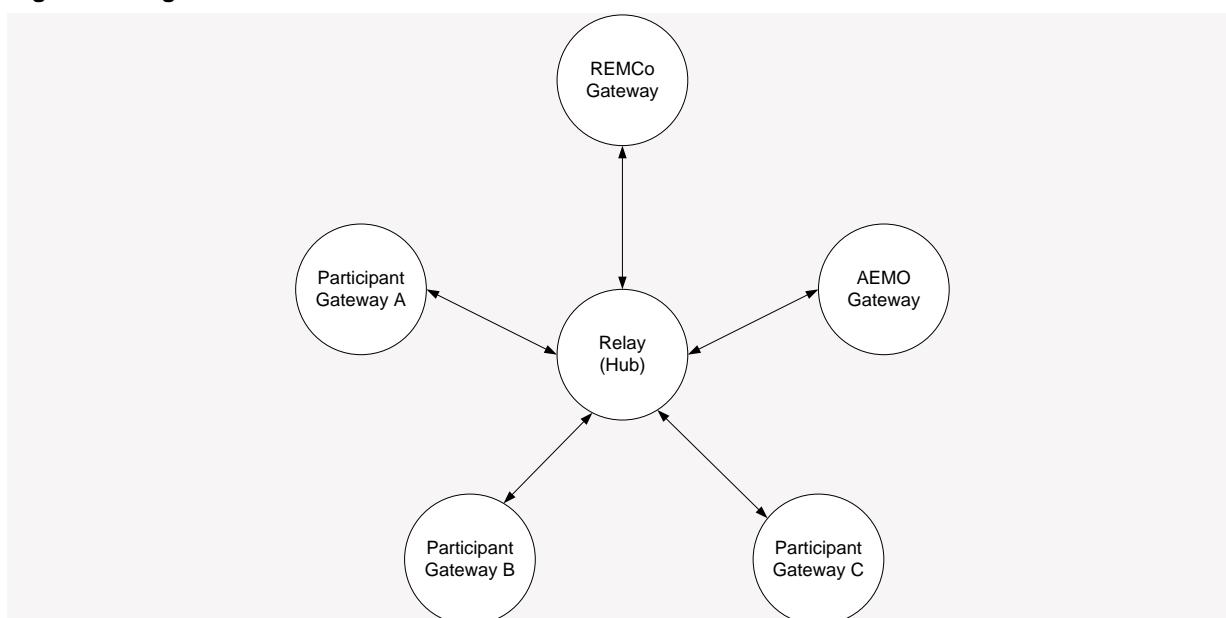
The FRC Hub is the network facility through which AEMO, Users, and the Network Operator can deliver and receive structured B2B and B2M transactions utilising the protocols and formats as defined in the AEMO Specification Pack. These transactions are sent to and from Participants' interface gateways via the FRC Hub, which routes the transaction to the intended recipient within the gas retail market.

For example, when a User wants the Network Operator to conduct a special meter read on its behalf:

- the User creates a Service Order transaction requesting a meter read and sends it to the FRC Hub, which in turn delivers it to the Network Operator for action; and
- when the meter has been read, the Network Operator creates a transaction with the meter reading and sends it to the FRC Hub, which then delivers that message to the relevant User for processing.

Not all B2M transactions are routed via the FRC Hub, only those related to customer transfers. Other B2M transactions such as User allocation instructions are routed directly via the GRMS.

Figure 2 Diagram of the FRC Hub



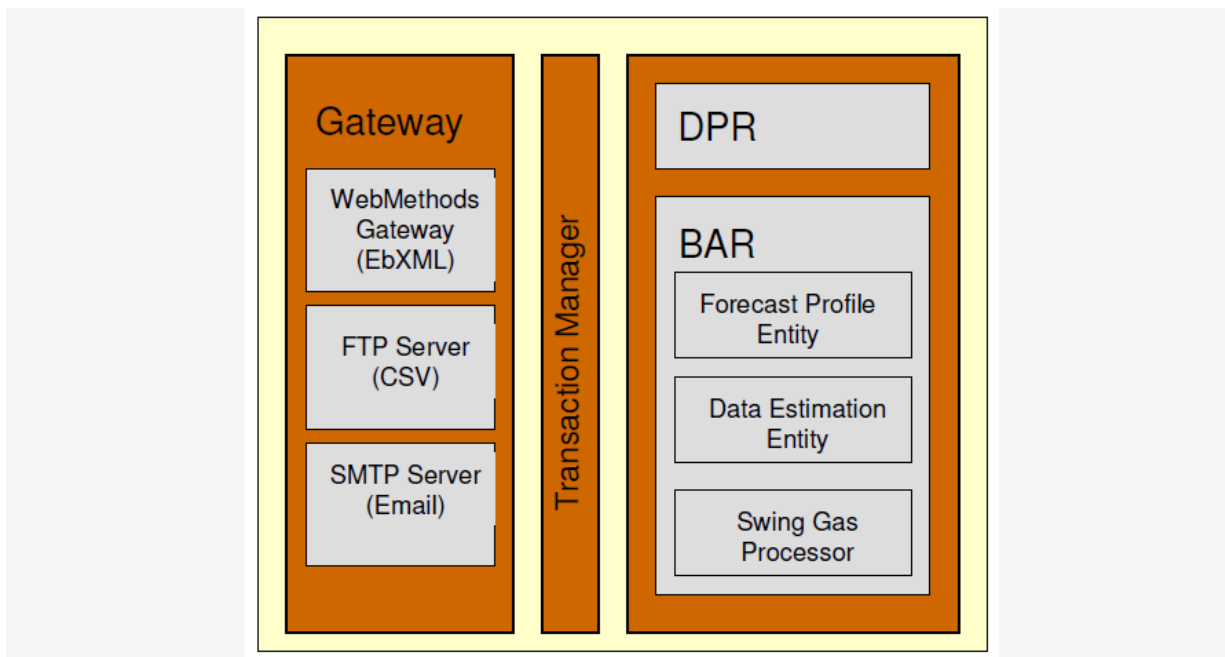
As shown in Figure 2, the FRC Hub operates in a spoke topology. Each participant needs to know the GBOid of all other participants in the market, but only set up a connection to the FRC Hub to be able to communicate with other participants. The FRC Hub routes messages to the desired recipients based on the applicable architectural documents for the market.

4.2. Gas Retail Market Systems (“GRMS”)

The GRMS provides the IT systems necessary to facilitate the competitive gas retail market in WA. The system was built on the foundation of the Procedures, and consists of the following three sub-systems:

- Delivery Point Registry (“DPR”) entity;
- Balancing, Allocation and Reconciliation (“BAR”); and
- Gateways (CSV, ebXML, e-mail).

Figure 3 provides a diagrammatical representation of the GRMS and its various entities.

Figure 3 Diagram of the GRMS

4.2.1. Delivery Point Registry (“DPR”)

Referred to in the Procedures as the “AEMO registry” this subsystem is a repository for all Meter Indicator Reference Numbers (“MIRNs”), which are the unique indicator for each meter, associated with each customer. The DPR stores the Standing Data and information on all business process transactions (e.g. new connections, Transfers, etc.) initiated for each MIRN. Transactions are initiated either by aseXML or e-mail depending on the business process (the mechanisms are defined in the ICD).

4.2.2. Balancing, Allocation and Reconciliation (“BAR”)

The BAR subsystem is responsible for forecasting and profiling consumption, balancing, estimation, reconciliation and swing service calculations. Transactions are initiated either by aseXML, CSV, or e-mail depending on the business process (the mechanisms are defined in the ICD).

The BAR comprises three processes:

- Forecast Profiling Entity (“FPE”):
 - Maintains information on profiles, sub-networks, pipelines, Users and Shippers.
 - Prepares profiled forecasts for each gas day for each sub-network and allocates consumption values across Shippers and Pipelines.
- Data Estimation Entity (“DEE”):
 - Runs settlement and reconciliation calculations on a User and sub-network level for all delivery points, and therefore determines how much the Users’ withdraw from each sub-network, and settles any retrospective revisions.
 - The DEE stores a subset of AEMO standing data, received internally from DPR, as required for BAR calculations. The DEE also stores historic basic and interval meter reading data for all MIRN, including gate point data and unaccounted for gas.
 - DEE also provides information to the other two sub-systems – the FPE (e.g. total sub-network withdrawal for allocation to Shippers, Swing Service Providers and to Pipeline Operators) and the SGP (e.g. pipeline injection amounts).
- Swing Gas Processor (“SGP”):
 - SGP calculates all swing service amounts, and allocates swing service across the Users.

- SGP maintains the Swing Service Provider register, including the Swing Service Provider of Last Resort (“SSPOLR”) register, and all off-market trade and bid-stack information.
- Information required for the swing service calculations are provided to SGP internally from both the FPE and DEE sub-systems, and externally from market participant transactions.

4.2.3. Gateway

As shown in Figure 3, the GRMS is comprised of three separate gateways:

- webMethods Gateways (EbXML) – the gateway to the FRC Hub that is used to send and receive ebXML messages;
- FTP Server (CSV) – allows participants and the GRMS to exchange messages in non-aseXML/ebXML format (i.e. CSV format files); and
- SMTP Server (e-mail) – stores all incoming and outgoing email messages.

The GRMS Transactions Manager database provides the integration between the webMethods Gateway, the FTP Server and the SMTP Server and is used to store all incoming and outgoing messages and transactions.

Figures 4 and 5 show two gateway examples relating to aseXML messages routed via the WebMethods Gateway, and to messages routed via the FTP Server.

Figure 4 aseXML message sent to GRMS (DPR) (e.g. a Transfer Request)

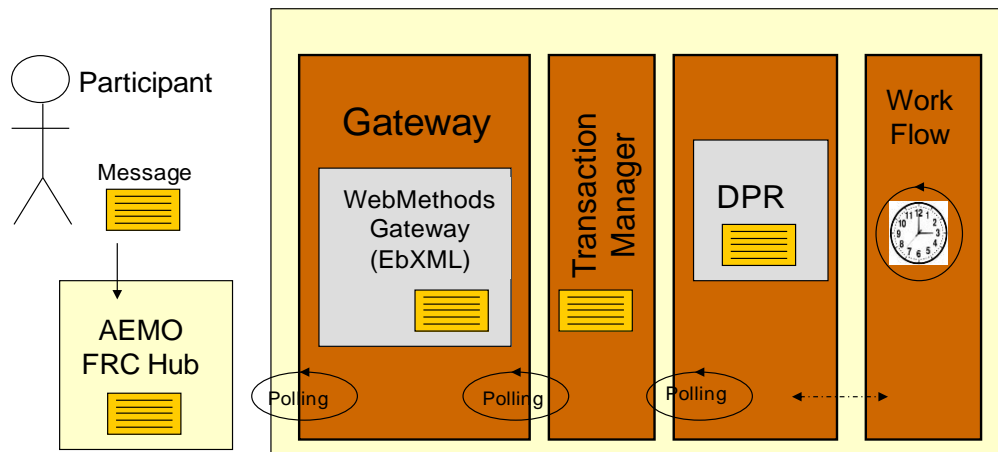
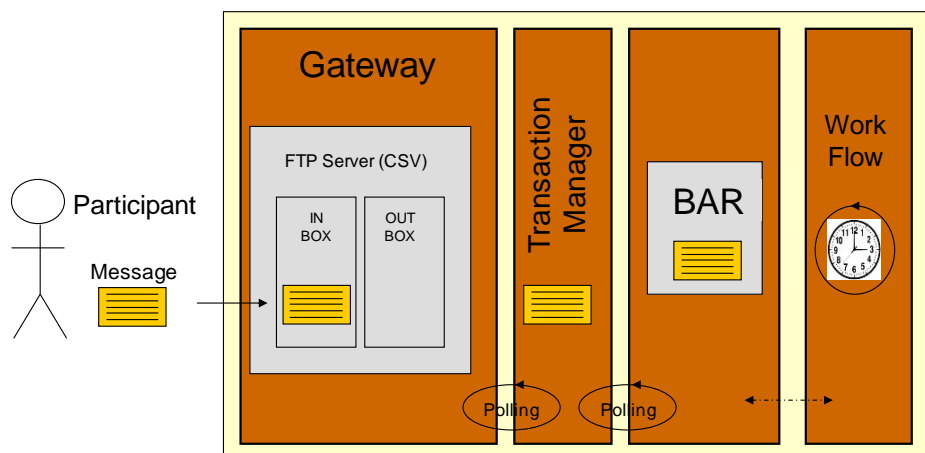


Figure 5 aseXML message sent to GRMS (BAR) (e.g. User Allocation Instructions)



4.2.4. Low Volume Interface

The Low Volume Interface (“LVI”) provides Users who have a relatively low number customers with an alternative mechanism for sending B2M and B2B transactions. By using this interface, the LVI Users do

not need to incur the costs associated with implementing an ebXML gateway. The solution leverages the existing infrastructure and hardware in place for the GRMS.

Use of the LVI is only suitable for organisations that are focused on commercial and industrial customers, although the User may have some residential accounts and some customers with basic meters. So long as the Users market share does not exceed 500 MIRNs, AEMO will continue to provide the LVI service to the User.

Table 5 details the key reference documents that Users need to consider when choosing whether to use the LVI. These documents are available on the AEMO website (www.aemo.com.au).

Table 5 Reference Documentation from the AEMO Specification Pack for the LVI

Document Name	Section And Summary
FRC B2M-B2B Hub System Specifications	Appendix D – provides a general overview of the LVI, including examples and a list of restrictions.
Interface Control Document	Section 3.6 – describes the transport layer, directory structure, and the process to send and receive transactions for the LVI.
Connectivity Testing and Technical Certification	Section 2.4 – sets out the certification process that needs to be completed during internal testing and before any market testing of the LVI.

4.3. Technical Certification

To be eligible to participate in the WA gas retail market, a Participant must achieve Technical Certification from AEMO to prove its operating systems can:

- meet the connectivity and technical certification requirements for use of the FRC Hub and the GRMS FTP gateway;
- where relevant, send/receive correctly structured and valid ebXML and aseXML messages/transactions;
- send/receive aseXML documents that conform to the transaction definitions set out in the AEMO Specification Pack; and
- where relevant, send/receive correctly structured 'csv' files that meet the definitions set out in the AEMO Specification Pack.

The remainder of section 4.3 provides a brief description of the various types of Technical Certification that need to be completed by Participants.

4.3.1. New Participant Certification

Upon joining the WA gas retail market, a Participant must achieve New Participant Certification. To be eligible, an applicant must certify that they have completed the following steps, as outlined under section 1.3.1 of the *Connectivity Testing and Technical Certification* document, as contained in the AEMO Specification Pack:

- obtained copies of the AEMO Specification Pack, the Information Pack, FRC Gas Hub Participant User Guide and the GRMS FTP Registration Form;
- connected their test gateway to the FRC Test Hub. The FRC Hub Operator (i.e. AEMO) will make available a 'Sandpit' environment for preliminary testing prior to formal certification on the Certification Responder;
- successfully completed the two stages of formal testing. These stages are described as Window 1 (messaging capability) and Window 2 (transaction capability). An applicant will need to have successfully completed Window 1 before commencing Window 2; and
- notify the FRC Hub Operator of the time at which the applicant plans to undertake certification.

Once the applicant has completed either of the Windows, it must notify the FRC Hub Operator of the time at which it started and stopped sending transactions for certification. The FRC Hub Operator will then analyse the results of the process and will issue a report to the applicant and to AEMO.

4.3.2. Self-Certification

New Participants and Self-Contracting Users must complete Self Certification prior to becoming operational in the WA gas retail market. To be eligible, an applicant must certify that they have completed the following steps, as outlined in section 2.2 of the *Readiness Criteria* document, as contained in the AEMO Specification Pack:

- the systems, processes and staff have passed reasonable and prudent internal testing by the participant;
- the participant's test data and results are produced from its 'acceptance' test environment;
- the participant's test environment used for the Connectivity Testing and Technical Certification Process is representative of its production environment (i.e. the test environment is effectively a mirror of the production environment, but may not be specified to production standards);
- the resources necessary to participate in the market are available, including the systems, processes, software and personnel (sufficiently trained for the market processes and systems);
- business processes and systems are ready for normal and exception management operations in the WA gas retail market (i.e. in addition to having in place processes, procedures, and systems for compliance with the Procedures and any technical protocols);
- the participant has appropriate contractual arrangements in place for entry into the WA gas retail market (including for access to the relevant gas distribution networks);
- the participant has a transition plan in place for data migration and other activities required to move from the test environment to the production environment; and
- the participant has in place disaster recovery and business continuity planning procedures applicable to WA market activities.

Importantly, once the Self Certification process has been completed, the applicant must sign the Readiness Criteria Self Certification Checklist Form to verify that the applicant has successfully completed the Self Certification Process. A signed copy of this form must then be sent to AEMO.

On receipt of the signed Readiness Criteria Self Certification Checklist form, AEMO will notify all Participants of the pending activation of the new Participants GBOid and that the activation of this GBOid is required on the day specified on the notice, which must be at least 10 business days from the date of the notice being issued.

4.3.3. Re-certification

If any of the following occurs, an applicant must certify that they have completed the re-certification process, as outlined under section 1.3.2 of the *Connectivity Testing and Technical Certification* document:

- relocation of the applicant's gateway message sever handler ("MSH");
- a change to the hardware or software platform on which the applicant's gateway MSH is deployed;
- any major changes that need to be made to application services behind the gateway; and
- any other changes that might reasonably be considered to render the applicant's current certification invalid.

It is up to each certified Participant and Self-Contracting User to ensure that its certification remains valid after any configuration changes.

AEMO may request re-certification on any part of the certification process by participants in the event of:

- FRC Hub changes;
- FRC B2B-B2M Hub System Specification changes;
- aseXML schema changes; and
- a participant reconnecting to the FRC Hub after its connection has been 'blocked' by AEMO.

If a Participant or Self-Contracting User is required to re-certify for any reason, an application will need to be made to AEMO that outlines the basis for re-certification. If a Participant considers that it should be exempt from part of the re-certification process, details of the basis for this claim, including the

impact of these changes on the Participant's messaging and transaction capabilities, must be provided to the AEMO for consideration and approval.

Re-certification must be successfully completed prior to the release of any changes to the production environment. The release of changes to a Participants production environment should be notified to the market at least one week prior to their release.

5. DELIVERY POINT MANAGEMENT

5.1. Precursors to a Transfer

Customer transfers are facilitated through the FRC Hub, whereby a customer can transfer from one User to another. To lodge a transfer request, the User must obtain the customer's consent and identify the delivery point identifier (i.e. MIRN) utilising the processes defined in the Procedures. Unless otherwise specified, references to 'clause' followed by a number are to a clause in the Procedures.

5.1.1. Obtaining Customer Consent

A User can only lodge a customer transfer request if it has received "Explicit Informed Consent" from the prospective customer. Explicit Informed Consent, as covered in clause 349 and Appendix 6 of the Procedures, means that the prospective customer has authorised a User to obtain confidential meter and address information for that customer's meter from the relevant Network Operator; and to transfer that customer.

Users must ensure that the Explicit Informed Consent received from their prospective customer is expressly provided either in writing or orally, that the User has in plain language appropriate to that customer disclosed all matters materially relevant to the giving by the customer of the consent, including each specific purpose for which the consent will be used.

5.1.2. Identifying the MIRN (MIRN Discovery)

Under Part 3.2 of the Procedures, a User with Explicit Informed Consent is able to lodge a MIRN discovery request from the Network Operator. The Network Operator is obligated to provide the User with the following information immediately, and no later than the next business day, under clause 75 of the Procedures:

- MIRN and MIRN checksum;
- MIRN standing data; and
- Next schedule read date.

The MIRN Discovery process is only for prospective Users who have agreed to offer supply at an existing site. A MIRN Discovery cannot be completed on a greenfield site because there will be no information to obtain. Additionally, this process is not available to Self-Contracting Users.

5.2. Lodging a Transfer Request

In general, there are two scenarios in which transfer requests are lodged:

1. where a customer moves into a new premise with an existing connection, the Procedures allow the customer to transfer (known as a 'move-in transfer' as defined in clause 78); or
2. if the customer was not previously supplied by their gas supplier of choice, opt to change their gas supplier (known as an 'in situ transfer'). It is expected that the incoming User has access to haulage when a transfer is lodged.

Additionally, the Procedures allow for a transfer to amend an incorrect User that is recorded in the AEMO registry, which can be completed by lodging either an error correction notice, as per clause 32(2), or by lodging a new transfer request. In the case of lodging a new transfer request, in accordance with clause 77, all affected participants must provide AEMO with information that they agree in order to facilitate this type of transfer to correct the error.

Transfers are lodged through the FRC Hub, and the ICD specifies the 'CATSChangeRequest' as the transaction that is used for all types of transfers that occur. The transaction has the following information contained within it:

- change reason (prospective in situ, prospective move-in, or correction of transfer);
- proposed change date; and
- MIRN and MIRN checksum.

The proposed change date for an in situ transfer takes place on the next scheduled read date, which is usually obtained from the MIRN Discovery data. However, a User can nominate a proposed change date for an in situ transfer provided that they have agreed this with the customer and have requested the Network Operator to undertake a special meter read. For a move in transfer, the proposed change date could be on a date agreed by the User and customer. In this situation, the lodgement of a transfer is deemed to create a Service Order for the Network Operator to complete an actual read on the proposed change date (see section 7 for more information on service orders).

Upon lodgement of a transfer, the system goes through statuses of 'Request', 'Pending' and 'Completed', whereby system notifications advise relevant participants that the transfer is to occur on the proposed change date. The system allows for objections to be lodged, between the statuses of 'Pending' and 'Completed'. Additionally, the incoming User is able to withdraw the request, and in this circumstance, the transfer is 'Cancelled'. This is shown diagrammatically in Figure 7.

5.3. Objection to a Transfer Request

Once a transfer has been lodged, a Network Operator may object to a transfer that is not a move in, within 2 business days of the transfer being processed. The objection can only be lodged on the basis that the incoming User does not have haulage arrangement in place, and is only valid if it corresponds to an open transfer request and is lodged within the applicable timeframe. If the objection is not valid, AEMO will reject the objection.

A Network Operator may also withdraw their objection notice, within 3 business days of the transfer being processed. In this scenario, the transfer continues to occur.

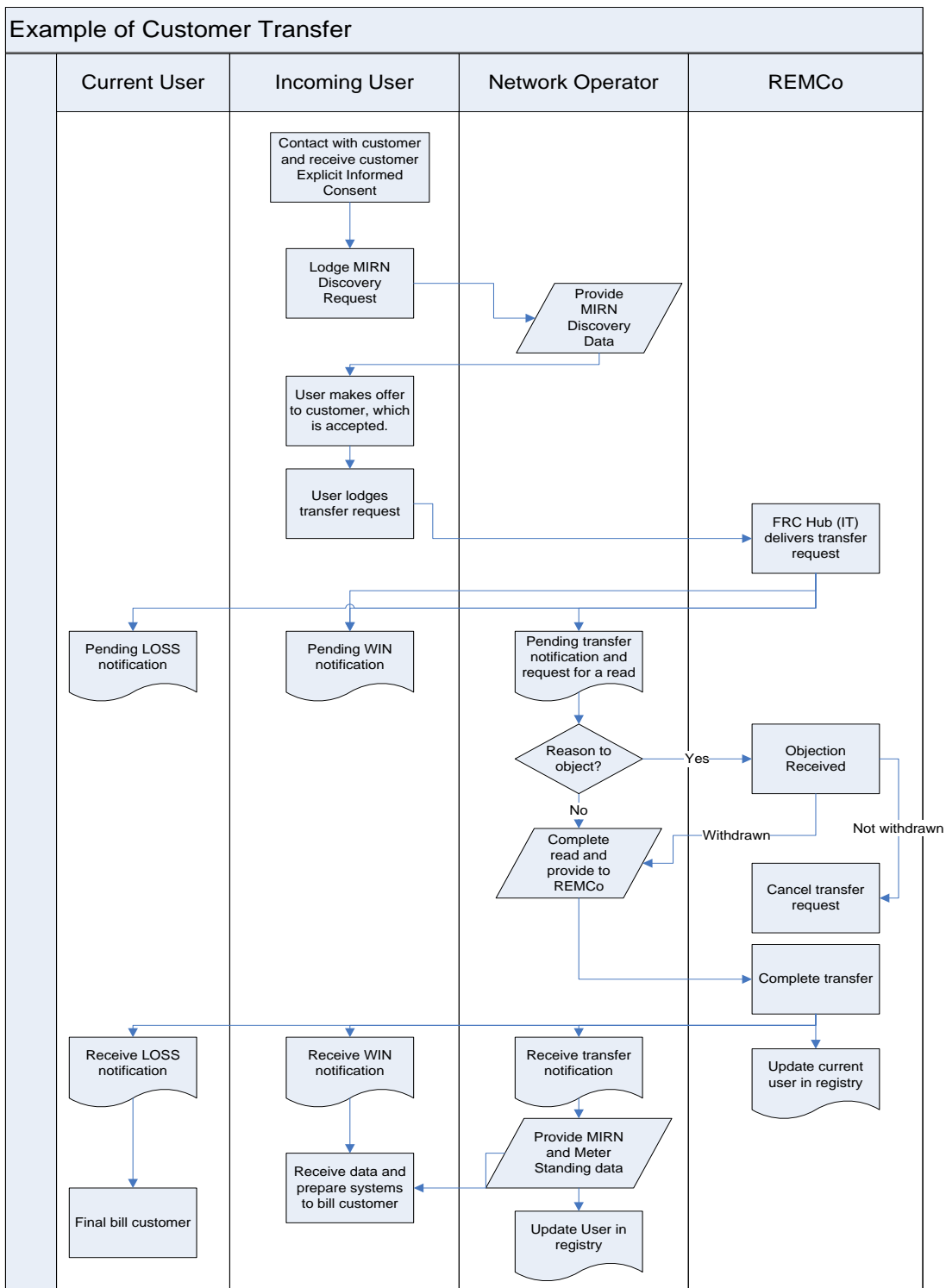
5.4. Completion of a Transfer Request

To complete a transfer request, the Network Operator must provide an actual meter read, or in the case of a move in, a deemed meter reading under clause 148, for the earliest transfer day. On the basis that AEMO receives the metering data and there have been no objections made, the transfer will take effect on the transfer date.

AEMO will then provide confirmation to the incoming User that they are now the current User, to the Network Operator who has the obligation of changing the current User in their registry, and to the current User (who becomes the previous User) who are provided with the final read data to enable to final bill to be sent to the customer.

Additionally, within 24 hours of the completion of the transfer, the Network Operator must provide the incoming User with the MIRN standing data and meter standing data, and the index meter reading that was used to facilitate the transfer.

Figure 6 Example of the Customer Transfer Process



6. METER DATA MANAGEMENT

6.1. Different Types of Meters

There are three types of meters used in the gas retail market:

- interval meters;
- basic meters; and

- gate point meters.

6.1.1. Interval Meters

Interval meters calculate and record gas flows for each hour, and are installed at sites with large industrial gas customers that consume more than 10,000 gigajoules per annum. Interval meters have a data logger or flow computer that records or calculates information such as gas volumes, temperature, and gas pressure for each hour of each day.

Network Operators are assigned the role of Meter Data Agent (“MDA”) and are responsible for reading interval meters, converting the meter readings to energy, and providing interval metering data to AEMO and Users for network and retail billing purposes.

AEMO uses the interval meter data collected by the Network Operator from each site to perform its balancing, allocation and reconciliation functions for the retail market.

6.1.2. Basic Meters

Basic meters record the accumulated gas flows between two dates, are manually read, and are installed at sites with small to medium sized gas customers. This includes all residential customers as well as small commercial and industrial customers.

Network Operators are responsible for reading basic meters according to a meter reading schedule (mostly quarterly), converting the meter readings to energy, and providing the relevant data to AEMO and the appropriate User.

6.1.3. Gate Point Meters

Gate point meters are located at gate stations where a gas transmission pipeline interconnects with the gas distribution system. Pipeline Operators are responsible for reading gate point meters, including the provision of any physical gate point meter data (including Heating Value) which is supplied to the Network Operator.

6.2. Measuring and Converting Gas to Energy

Measuring gas volume and converting the volume measurement to an energy measure involves:

- using meters to measure the flow of gas;
- converting the flow of gas to a standardised volume (which is dependent upon the pressure, temperature and composition of the gas); and
- converting the standardised volume of gas to energy using the applicable heating value, which describes the amount of energy in a standard volume of gas.

In simple terms:

Energy (Joules) = Flow (F) x Pressure Correction Factor (PCF) x Heating Value (HV)

6.2.1. Converting Gas Flow to a Standard Volume

Flow information collected from meters must be converted to volume. This is done by multiplying the flow of gas measured by the meter by an appropriate Pressure Correct Factor (“PCF”) to calculate the standardised volume of gas for that period.

That is: Standard Volume (V) = Flow (F) x Pressure Correction Factor (PCF)

6.2.2. Pressure Correction Factor (“PCF”)

The PCF is a factor that defines the representative pressure, elevation, and temperature of the gas at the meter so that a difference between index readings can be converted to a consumption value at standard conditions (Standard Cubic Metres).

Basic meters have a set outlet pressure and the volume measured is corrected for environmental conditions, using a uniform PCF.

For interval meters, the PCF can be calculated dynamically using the information from the meter’s sensors. If there are no sensors, then a standardised PCF is used that relates to the outlet pressure of the meter.

The standard conditions currently prescribed in the Procedures are 101.325 kPa (15 degrees Celsius). However, the PCF seeks to correct globally for all respective meters in each gas zone for these standard conditions.

The pressure at the meter changes the higher it is from sea level (101.325 kPa) and is also affected by barometric pressure. As each meter is in a different location, this factor becomes difficult to calculate and therefore some generalisations are made.

The network operator currently uses algorithms established in 2004 to correct the measured gas volume for the following environmental conditions:

- atmospheric pressure;
- elevation; and
- temperature.

Each of the above environmental conditions were assessed for each gas zone and then correlated to customer numbers and network throughput that prevailed in 2004.

The PCF also incorporates a correction to standard conditions for the delivered pressure at a meter. For example, where an end-use customer receives gas at 2.75 kPa or 1.25 kPa, this pressure is also used in deriving a PCF for each basic meter.

The end result is a set of parameters that have been used to determine the applicable PCF allocated to each basic meter on the distribution network.

This process was established by the Network Operator, and is subject to revisions for current market data and new technologies, where possible, to preserve the accuracy of the underlying estimations.

6.2.3. Converting a Standard Volume to Energy

Once the standard volume has been calculated, it is possible to convert that standard volume to energy (joules) using a factor called Heating Value (“HV”).

The HV represents the energy per unit of volume of gas. The energy value of gas is calculated by multiplying the HV of gas by the standard volume.

That is: Energy = Heating Value (HV) x Standard Volume (V)

6.2.4. Heating Value (“HV”)

The HV is a factor that describes the energy contained in a standard volume of gas and can therefore be used to convert the standard volume to energy.

Natural gas is not a pure gas, and is made up of various components, the majority of which is methane gas. Because the various components can alter the quality and therefore the amount of energy a given volume of gas can produce, the gas must be analysed to determine the energy content. The energy, HV, is expressed as mega joules per metre cubed (MJ/m³).

The HV content of the gas is supplied to the Network Operator by the Pipeline Operators, who supply the energy from point of measurement (physical gate point).

6.2.5. Unaccounted for Gas

Unaccounted for Gas (“UAFG”) represents the amount of gas that is not accounted for within the gas distribution system at each sub-network due to the differences between the gate point metering (inflows), the aggregation of all meters on the distribution network, operational gas losses and physical loss of gas due to third party damage. The differences between the inflows and outflows are most significantly influenced by the inherent differences of the various meters within the network.

In WA, the Network Operator has an obligation to replace any gas that is deemed to be ‘lost’.

UAFG is determined by the subtraction of all network (interval and basic) meter readings from the gate point meter readings.

Metering factors that contribute to UAFG are:

- the accuracy of the physical meter (+/-% at various flows);

- the pressure control at the meter (the contracted over the actual at various flows); and
- environmental conditions at the meter (temperature, height above sea level and barometric conditions)

Other factors that contribute to UAFG are:

- operational losses (mains gassing, network maintenance);
- network pipeline breaks and leaks (third parties breaking of mains etc.); and
- allocation errors in UAFG calculation method (as not all meters can be read at once).

7. SERVICE ORDER MANAGEMENT

7.1. What is a Service Order?

Service orders and their management are a primary function of a Market. Service orders are requests and completion notices between a User and Network Operator that pertain to metering works undertaken at a customer's premises. In the WA gas retail market, service orders are facilitated through the FRC Hub and the specification for the types and contents of service orders is outlined in the AEMO Specification Pack.

Service orders are predominately initiated by Users, but Network Operators are also able to initiate a notification in the case of faults and emergencies. Service orders are initiated for a variety of reasons including:

- meter connection (service connection request);
- decommissioning, recommissioning or disconnection of meters;
- meter reading;
- meter service, faults or upgrade; and
- emergency situations, including gas leaks.

Unless otherwise specified, references to 'clause' followed by a number are to a clause in the Procedures.

7.2. Service Connection Request

A new connection, as defined in Part 3.1 of the Procedures, is known as a "service connection request" or "meter fix". These are considered a special type of service order, as an incorrect initiation of a new connection will create gas allocation issues and inconsistencies between the Network Operator and AEMO registries.

Each Network Operator is provided a range of MIRNs by AEMO, and each connection is allocated a MIRN. Each MIRN can only be used once, even after the site has been deregistered, and is considered a specific identifier for the connection.

A service connection request takes place when a customer requests a new connection with a User, who submits a service connection request to the Network Operator. Once the connection has been established and installed, and a MIRN has been allocated, the transaction is sent to AEMO to register that delivery point in the DPR (see section 4.2.1), from the commission date with a current User. This type of service order also includes the Network Operator providing AEMO with the standing data for that delivery point or MIRN.

The specific requirements for service connection request transactions are specified in the AEMO Specification Pack and the ICD. These documents outline the specific data elements that are required and the timeframes for the transaction.

7.3. User Service Orders

Users raise service orders to have metering works undertaken at a customer's premise. Service orders are predominately considered to be B2B transactions, but AEMO is occasionally advised of a service order completion.

7.3.1. Standard User Service Orders

A User will raise a service order in the instances where a customer requests work to be undertaken, or where Part 3.5 of the Procedures allows Users to disconnect or reconnect a MIRN. All of the available jobs that can be raised are listed in the AEMO Specification Pack, specifically in B2B service order specifications. Some of the service orders available for Users include:

- Service Connection Request (“SCR”) – as described in section 7.2 above, an SCR takes place when connecting a new gas customer.
- Dissatisfied Customer (“DFC”) – a User will raise this as a complaint with the service that does not relate to the User. This type of service order will result in the Network Operator investigating the customer complaint.

7.3.2. Deemed User Service Orders

There are certain service orders that are deemed to have occurred, as specified in clause 82, particularly when a transfer has been requested. This process of deeming a service order was developed to lessen the administrative burden and speed up the process. Therefore, a service order is deemed to have been requested by the User in the following circumstances:

- if the MIRN proposed for transfer is a decommissioned site, the commissioning is deemed to have been requested;
- if the transfer is cancelled after a reconnection, the disconnection is deemed to have been requested; and
- if the transfer request is a move in, the undertaking of a special meter read is deemed to have been requested.

7.4. Network Operator Service Orders

Customers may alert Network Operators in cases of an emergency or gas fault. In these instances the Network Operator will complete the field work as soon as possible, and then send a service order completion to the User. In these cases, Users can expect the following responses:

- Meter Change (“MCH”) completed, where a meter has been changed and has the same commissioned or decommissioned status as previous;
- Apply Meter Lock (“AML”), where the meter has been decommissioned for safety reasons;
- Meter Regulator Removal (“MRM”), which is where the regulator has been removed for safety reasons; and
- Disconnect service in street (“DSD”), which is used when the field staff may be in safety danger or the access to the meter is not possible.

8. BALANCING, ALLOCATION AND RECONCILIATION MANAGEMENT

AEMO performs the balancing, allocation and reconciliation (“BAR”) functions for the WA gas retail market; and calculates the gas injection and withdrawal quantities for each sub-network for each day. The BAR functions are performed in accordance with Chapter 5 of the Procedures, and the calculations are made by the GRMS.

- **Balancing:** these processes are designed so that the gas injection and withdrawal quantities across each sub-network for each day are always in balance (i.e. total injections equal total withdrawals each day).
- **Allocation:** means allocating the gas injections into a sub-network for a gas day to the various withdrawals from each of the User’s operating in the sub-network. Allocations are undertaken by calculating the User’s estimated total withdrawals (“UETW”) which are reconciled to account for data changes from the past 425 days.
- **Reconciliation:** these processes are done on a forward basis (i.e. today’s errors are fixed the day after tomorrow). Estimations or errors used for today’s allocations are fixed over the 28 days commencing the day after tomorrow.

This section of the technical guide summarises the key concepts in Chapter 5 of the Procedures. Unless otherwise specified, references to ‘clause’ followed by a number are to a clause in the Procedures.

8.1. User Obligations

In accordance with Part 5.2 of the Procedures, there are a number of User obligations in relation to balancing, allocation and reconciliation. Users must:

- procure gas injections to match their likely swing service repayment quantities and User’s required withdrawals (clause 178);
- endeavour to minimise their contribution to the causation of swing service, as well as the contribution of the User’s related Shipper or Swing Service Provider (clause 181);
- collectively keep the sub-network pressurised and not act in a manner that may jeopardise gas injections into a sub-network or impede the Network Operators ability maintain system pressure (clause 182);
- notify AEMO, in the form of a revised User’s pipeline nomination amount (“UPNA”), of any renominations or changes in right to inject gas into a sub-network (clause 184); and
- procure Shipper’s nominations within the timeframes required by the related Shipper’s or Swing Service Provider’s transmission contract to satisfy the User’s obligations (clause 186).

8.1.1. User Allocation Instructions

In accordance with Part 5.3 of the Procedures, at least two business days before the start of a gas day, a User must give AEMO a valid User allocation instruction (“UAI”) which specifies the amount of gas that a User is likely to withdraw from a sub-network.

Users may submit their UAI’s for a gas day at any time up to 18 hours before the start of the gas day. The allocation instruction must be capable of allocating all of the User’s withdrawals, other than its swing service repayment quantities.

A UAI is typically expressed as a standing instruction that specifies the following information:

- percentages (e.g. 20% to Shipper A + 80% to Shipper B);
- quantities, including an allocation of residual quantity (e.g. 15TJ to Shipper A + 5TJ to Shipper B + balance to Shipper A); or
- a combination of the above options (e.g. 15TJ to Shipper A + 40% of the balance to Shipper A + 60% of the balance to Shipper B).

8.2. Before the Gas Day

The requirements for balancing, allocation and reconciliation before the gas day are detailed in Part 5.4 of the Procedures. Unless otherwise specified, references to ‘clause’ followed by a number are to a clause in the Procedures.

8.2.1. Users to Procure Standing Nominations

In accordance with clause 195, a User must procure a “standing nomination” from a Shipper for the delivery of gas to a gate point by a Pipeline Operator. Standing nominations are typically detailed in a transmission contract between the User’s related Shipper and the nominated Pipeline Operator.

Based upon its standing nomination, a User should be able to determine the:

- **User’s amount** of gas to be delivered to a gate point by the User’s Shipper. The User’s amount is agreed to between the User and the Shipper, and is reflected in the Shipper’s nomination amount.
- **User’s pipeline nomination amount**, which is the sum of the User’s amounts across all Shippers for the gate point, plus the User’s Swing Service repayment quantities. In accordance with clause 197(2), a User must notify AEMO of its User’s pipeline nomination amount for each gate point at least 18 hours before the start of a gas day.
- **User’s total nomination amount**, which is the sum of the User’s pipeline nomination amounts across all gate points for the gas day.

8.2.2. Shipper's Nominations

In accordance with clause 194, Shipper's nominations apply only to the "accepted part" or the amount of a Shipper's or Swing Service Provider's nomination or renomination in accordance with the relevant transmission contract.

8.2.3. AEMO publishes profiled daily nominations

In accordance with clause 199, AEMO must publish the following information at least two hours before the start of the gas day (as applicable) for Users, Shippers, Swing Service Providers, the Network Operator, and the Pipeline Operators:

- **Profiled pipeline nominations** for each sub-network, being the aggregate of User's total nomination amounts for each gas day; and
- **Profiled sub-network nominations** for each sub-network, being the aggregate of all Users' total nomination amounts for the gas day.

AEMO must publish guidelines which set out the principles used in the selection of a profile for a gas day, including AEMO's policy on the retention and management a profile library.

8.3. During the Gas Day

The requirements for balancing, allocation and reconciliation during the gas day are detailed in Part 5.5 of the Procedures.

8.3.1. Pipeline Operators to Provide Hourly Data

In accordance with clause 210, within 30 minutes after the end of each hour, Pipeline Operators must provide AEMO with as-retrieved energy inflow data for the gate point for the hour. AEMO uses this data in its intra-day reporting processes to publish the following information for Users and Pipeline Operators:

- As-retrieved energy inflow data for each gate point for the hour;
- As-retrieved energy inflow data aggregated across all gate points; and
- Profiled sub-network nominations.

8.3.2. Allocation

In accordance with Part 5.6 of the Procedures, AEMO performs the allocations for gas injections and gas withdrawals for each gas day over the relevant historical period, which is the 425 day period between 426 gas days before gas day D, and one gas day before gas day D.

These allocations are performed by the GRMS and are applied to each User, Shipper, Swing Service Provider, or Pipeline Operator to determine their relevant gas injection and withdrawal quantities for each gas day.

AEMO is required under the Procedures to perform these calculations within 4.5 hours after the end of the gas day and to notify each User, Shipper, Swing Service Providers, the Network Operator, and Pipeline Operator of their relevant allocation quantities.

In summary, AEMO performs allocations for each of the following different types of meters:

- **Gate point meters** – for each gate point, allocations are based upon the pipeline injections or the physical gate point energy quantities as provided to AEMO by the Network Operator under clause 152;
- **Interval meters** – for each interval-metered delivery point, allocations are based upon the interval-metered withdrawals ("IW") for each of the User's interval-metered delivery points, as provided to AEMO by the Network Operator under clause 158(1)(c); and
- **Basic-meters** – for each basic-metered delivery point, allocations are based upon the estimated basic-metered withdrawals ("EBW") for each of the User's basic-metered delivery points, as provided to AEMO by the Network Operator under clause 158(1)(a).

Table 6 outlines some of the key calculations which are performed by AEMO to determine the allocation quantities for each gas day.

Table 6 Key Calculations to Determine Allocation Quantities

Concept	Description
Pipeline injections (“PI”)	For each gate point, the gate point energy quantity for each gas day as provided by the Network Operator to AEMO under clause 152.
Pipeline corrected injections (“PCI”)	For each gate point for each gas day, equals the sum of pipeline injections (“PI”), minus the gate point adjustment amount (“GAA”), as calculated under clause 220(2).
Total corrected injections (“TCI”)	For each sub-network for each gas day, equals the pipeline corrected injections (“PCI”), minus the sum of each swing service repayment quantity (“SRQ”), minus the sum of the User’s reconciliation adjustment amount (“URAA”), as calculated under clause 221.
Net system load (“NSL”)	For each sub-network for each gas day, equals the total corrected injections (“TCI”), minus the sum of the User’s interval metered withdrawals (“UIW”), minus the estimate of unaccounted for gas (EUAFG), as calculated under clause 223.
User’s estimated basic-metered withdrawals (“UEBW”)	For each User for each sub-network, equals the sum of the estimated basic-metered withdrawals (“EBW”) for each of the User’s basic-metered delivery points, as calculated under clause 227.
User’s estimated total withdrawals (“UETW”)	For each User for each sub-network, equals the User’s interval-metered withdrawals (“UIW”), plus the User’s estimated basic-metered withdrawals (“UEBW”), plus the User’s UAFG plus the User’s reconciliation amount (“URAA”) plus the User’s swing service repayment quantities (“SRQ”), as calculated under clause 228.
User’s interval-metered withdrawals (“UIW”)	For each User for each sub-network, equals the sum of interval-metered withdrawals for each of User’s interval-metered delivery points in the sub-network as provided to AEMO by the network operator under clause 158(1)(c).
Estimate of unaccounted for gas (“EUAFG”)	For each sub-network for each gas day, is the estimate of UAFG as provided by the Network Operator to AEMO under clause 229(1).
User’s unaccounted for gas (“UUAFG”)	For each sub-network for each gas day, is the User’s UAFG as provided by the Network Operator to AEMO under clause 229(2).
User’s basic-metered withdrawals (“UBW”)	For each User for each sub-network for the historical UAFG day, equals the sum of distributed actual basic-metered withdrawals (“DABW”), plus the sum of the User’s basic-metered delivery points (“EBW”), as calculated under clause 230(1).
Actual unaccounted for gas (“UAFG”)	For each sub-network for each gas day, AEMO calculates the actual UAFG for gas day D-1 to gas day D-425, as required under clause 230.

8.3.3. Reconciliation

In accordance with Part 5.7 of the Procedures, AEMO reconciles allocated gas withdrawal quantities for each gas day using a forward reconciliation approach which corrects any past metering errors through future adjustments.

In summary, the forward reconciliation can be described as follows:

- any estimated meter readings or errors in metering data in today’s allocations (i.e. for gas day D) are adjusted over the following 28 days to reduce spikes;
- for each gas day, the UETW contains an adjustment amount which takes account for any changes in basic or interval meter readings over the past 425 days; and
- this adjustment amount, known as the User’s reconciliation adjustment amount (“URAA”), is the total reconciliation amount (“TRA”), divided over the next 28 days, following the gas day after tomorrow (i.e. gas day D+2).

Table 7 outlines the some of the key reconciliation calculations performed by AEMO.

Table 7 Key Reconciliation Calculations

Concept	Description
User’s reconciliation adjustment amount (“URAA”)	For each User, for each sub-network for gas day D, equals the sum of the User’s total reconciliation amount (“TRA”), divided by 28, as calculated under clause 243.

Concept	Description
Total Reconciliation Amount ("TRA")	For each User, for each sub-network for gas day D, equals the sum of the User's total basic-meter reconciliation amount ("TBRA"), the User's total interval-meter reconciliation amount ("TIRA"), the User's total basic-meter withdrawal reconciliation amount ("TBRWA"), the User's unaccounted for gas reconciliation amount ("UUAFGRA"), and User miscellaneous reconciliation amount ("MRA"), as calculated under clause 242.
Total basic-meter reconciliation amount ("TBRA")	For each User, for each sub-network for gas day D, equals the sum of the User's delta summed basic-meter reconciliation ("ΔSBRA"), in the range of gas day D-1 to gas day D-425, as calculated under clause 235.
Total interval-meter reconciliation amount ("TIRA")	For each User, for each sub-network for gas day D, equals the sum of the User's interval-meter withdrawals ("UIW") for gas day D, minus the sum of the UIW for gas day D-1 to gas day D-425, as calculated under clause 236.
Total basic-meter withdrawal reconciliation amount ("TBWRA")	For each User, for each sub-network for gas day D, equals the sum of the User's delta basic-meter withdrawal reconciliation amount ("ΔBWRA") for gas day D, in the range gas day D-1 to gas day D-425, as calculated under clause 237.
User's unaccounted for gas reconciliation amount ("UUAFGRA")	For each User, for each sub-network for gas day D, equals the sum of the User's daily unaccounted for gas reconciliation ("UDURA"), in the range of gas day D-1 to gas day D-425, as calculated under clause 241.
Miscellaneous Reconciliation Amount ("MRA")	As calculated under clause 239.

9. SWING SERVICE

In accordance with Part 5.10 of the Procedures, AEMO calculates the daily swing service quantities for the WA gas retail market. This section of the technical guide describes what swing service is, how it is calculated, how it is allocated, and how it is purchased. Unless otherwise specified, references to 'clause' followed by a number are to a clause in the Procedures.

9.1. What is Swing Service?

Typically, a User does not know exactly what their withdrawals will be on a gas day. As a result, there is usually a mismatch between the contracts they make with Shippers before the gas day for gas injections, and the amount of gas their customers withdraw from a sub-network on the gas day.

Balancing this mismatch between injections and withdrawals is relatively straightforward when one pipeline is injecting gas into a sub-network. However, balancing this mismatch is more complex when two pipelines inject gas into the sub-network, in which case the balancing is done using the swing service mechanism.

When there are two pipelines injecting gas into a sub-network:

- one pipeline is deemed to be a "pressure control pipeline" – it injects gas at a rate to maintain the pressure on the sub-network; and
- the other is deemed to be a "flow controlled pipeline" – it injects gas according to Shipper nominations.

On the gas day, any shortfall or excess between the contracted injections and the withdrawals is physically met by the pressure controlled pipeline which is set to maintain pressure within the sub-network and will inject an amount of gas that meet required withdrawals.

Swing service is a contractual mechanism that retrospectively balances this mismatch between the Users' contractual gas injections and customer withdrawals.

Currently, swing service applies in the Metro North and Metro South sub-network in the Mid-West/South-West Distribution System.

9.2. Calculating Swing Service

In simple terms, swing service is the difference between what was ordered by a User on one pipeline and what was delivered to the User's customers from the other pipeline. The amount of swing service on the pipeline is calculated using the following formula:

$$SS=|UDW(OP)-PCI(OP)|$$

Where:

- SS = the swing service for the gate point for the gas day.
- UDW(OP) = each User's deemed withdrawals for the other gate point for the sub-network for the gas day calculated under clause 248.
- PCI(OP) = the pipeline corrected injections for the other gate point for the sub-network for the gas day calculated under clause 220(2).

A positive number indicates 'loan' swing service, while a negative number indicates 'park' swing service.

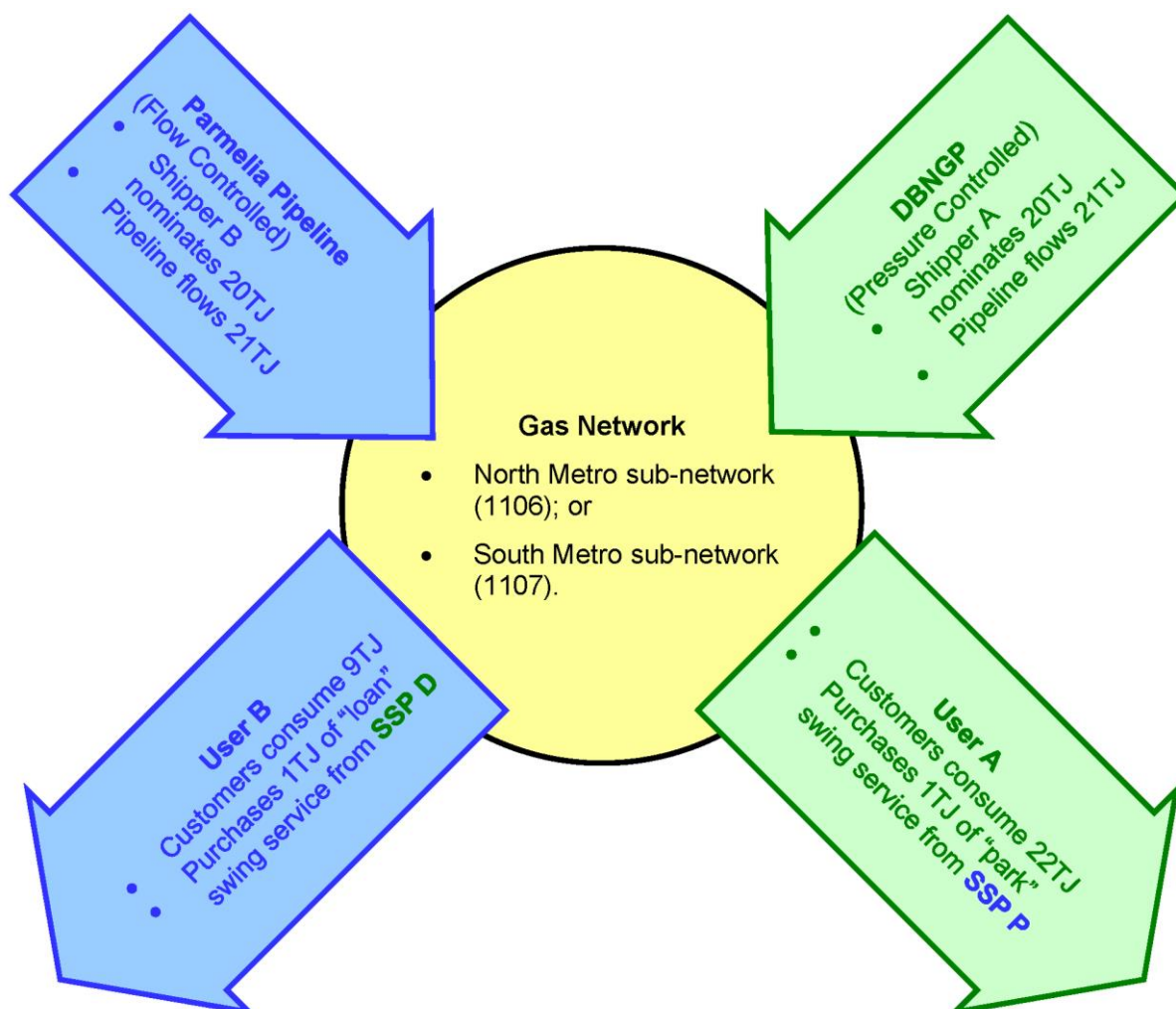
A User who incurs swing service can be thought of as having contracted for too much gas from one pipeline and not enough from the other. This results in a 'loan' of gas on one pipeline and a 'park' of gas on the other. After the end of the gas day:

- If the sum of the User's deemed withdrawals ("UDW") for one pipeline exceed pipeline corrected injections ("PCI") for that pipeline, then the gas relating to those excess withdrawals must have been provided by the other pipeline. The Users are therefore considered to have borrowed gas on that day from the other pipeline, known as "loan" swing service.
- If the sum of all UDW's for one pipeline is less than the PCI's for that pipeline, then the Users on that pipeline have contracted for pipeline injections in the sub-network that exceed their requirements. This gas is considered to be stored by the other pipeline for that gas day, known as "park" swing service.

A swing service transaction does not involve the sale or purchase of gas as a commodity. Instead, swing service is the provision of a loan or park of gas; and the Users pay Swing Service Providers for this service by repaying the loan or taking back the park on gas day + 2, plus payment for having provided the loan/park.

9.3. Example of a Swing Service Calculation

Figure 7 Example of Calculating Swing Service



Explanation:

- The parties involved:
 - **DBNGP** is the pressure controlled pipeline (the DBNGP);
 - **Shipper A** ships gas for User A on the DBNGP;
 - **SSP D** is the Swing Service Provider on the DBNGP;
 - **The Parmelia Pipeline** is the flow controlled pipeline;
 - **Shipper B** ships gas for User B on the Parmelia Pipeline; and
 - **SSP P** is the Swing Service Provider on Parmelia Pipeline.
- Gas day D injections and withdrawals:
 - **User A** contracts to inject 20TJ, but its customers withdraw 22TJ;
 - **User B** contracts to inject 10TJ, but its customers withdraw 9TJ; and
 - The **Parmelia Pipeline** (the flow control pipeline) injects 10TJ, as per nominations; and
 - since 31TJ is withdrawn, the **DBNGP** (the pressure control pipeline) injects 21TJ.
- Swing service results:
 - **SSP D** provides a "loan" swing service of 1TJ to **User B**; and

- **SSP P** provides a “park” swing service of 1TJ to **User A**.

9.4. Allocating Swing Service

Swing service is broken down into two components when allocated to individual Users:

- **Non-User specific** – non-User specific swing service is the “blame free” swing service that is deemed to be acceptable and is socialised across all Users. Non-User specific swing service is allocated by market share.
- **User specific** – User specific swing service is allocated where a “User’s swing error” exceeds the acceptable amount. This is the swing services that a User is deemed to have caused, and so the User is required to repay all of the User specific swing service.

There are seven steps for calculating User specific and non-User specific amounts of swing service for a gate point on a gas day.

9.4.1. User Specific Swing Service

Step 1 – Calculate each User’s swing service error (“SE”) for each gate point.

The SE is used as an input for calculating the User specific and non-User specific swing service components. This is done by taking the absolute value of the interval metered data associated with the User’s customers subtracted from the User’s forecast interval load:

$$SE = | IF - UIW |$$

Where:

IF = the User’s forecast of its interval metered load; and

UIW = the User’s actual interval metered load.

Step 2 – Calculate the User’s specific swing error (“USSE”) for each gate point.

The USSE arises if a SE falls outside the acceptable range, which is currently set at 20%, and is calculated for each User by finding the maximum of:

$$USSE = \text{Zero or } \{SE - (A \times IF)\}$$

Where:

SE = the interval swing error as calculated in Step 1;

IF = the User’s Interval metered Forecast load; and

A = a percentage value of 20% as defined under clause 261(2)

Step 3 – Calculate the User’s total (pre-procurement) swing service (“USS”) for each gate point:

The USS is the notional amount of swing service that a User would have on a gas day if there is no User specific swing service. The USS for a User is simply the total swing service for the gate point multiplied by the User’s market share (i.e. the proportion of total UETW attributed to that User):

$$USS = \frac{|UETW|}{\sum |UETW|} \times SS$$

Where:

| UETW | = the absolute value of the User’s Estimated Total Withdrawals;

$\sum |UETW|$ = the sum of the absolute value of the UETW; and

SS = the Swing Service for the gate point.

Step 4 – Calculate the User specific swing service amount (“USA”) for each gate point:

The USA is determined by multiplying the USS by the proportion of all swing errors for the sub-network attributable to that User’s User specific swing service error:

$$USA = \frac{|USSE|}{|SE|} \times USS$$

Where:

$\Sigma|USSE|$ = the sum of absolute values of the User specific swing error;

$\Sigma|SE|$ = the sum of the absolute value of the User's interval meter swing error for each gate point in the sub-net; and

USS = the User's total swing service as calculated in Step 3.

Step 5 – Calculate the total of all Users' specific swing service amounts ("TUSA") for each gate point:

To determine the total amount of non-User specific swing service, it is first necessary to calculate the TUSA which is calculated by summarising all the USA values:

$$TUSA = \Sigma USA$$

Where:

ΣUSA = the sum of all the User's specific swing amounts as calculated in Step 4.

9.4.2. Non-User Specific Swing Service

Step 6 – Calculate the total of all Users' non-User specific swing service amounts ("TUNUSA") for each gate point:

TUNUSA is calculated by subtracting the total of all Users' specific swing service amounts from the total swing service amount:

$$TUNUSA = SS - TUSA$$

Where:

TUSA = the total User specific swing amount as calculated in Step 5;

SS = the total swing service amount for each gate point.

Step 7 – Calculate each User's non-User specific swing service amount ("NUSA") for each gate point:

The NUSA is calculated by subtracting the User specific swing service amount from the User's total swing service:

$$NUSA = USS - USA$$

Where:

USS = the User's total swing service as calculated in Step 3;

USA = the User specific swing service amount as calculated in Step 4.

In summary, the total swing service amount allocated to a User on a gas day is the NUSA plus the USA.

9.4.3. Worked Example: Allocating Swing Service

Assume for gas day D that two Users are supplied with gas, with a total swing service amount of 6TJ for the gate point:

- User 1: UETW = 30TJ USS = 4TJ absolute value of the USSE = 2;
- User 2 UETW = 15TJ USS = 2TJ absolute value of USSE = 4; and
- the sum of the absolute value of the SE for each gate point in the sub-network = 5.

The User's specific swing service amounts ("USA") for Users 1 and 2 are calculated as follows:

$$USA = \frac{|USSE|}{|SE|} \times USS$$

$$USA1 = 2/5 \times 4 = 1.6$$

$$USA2 = 4/5 \times 2 = 1.6$$

This results in a total User specific swing service amount (“TUSA”) = 3.2TJ.

The non-User specific swing service amounts (“NUSA”) for Users 1 and 2 are calculated as follows:

$$\text{NUSA} = \text{USS} - \text{USA}$$

$$\text{NUSA1} = 4 - 1.6 = 2.4$$

$$\text{NUSA2} = 2 - 1.6 = 0.4$$

This results in a total non-User specific swing service amount (“TNUSA”) of 2.8TJ.

As a result, the total swing service amount allocated to User 1 for the gate point is 4TJ (i.e. 2.4TJ + 1.6TJ) and the total swing service amount allocated to User 2 is 2TJ (i.e. 0.4TJ + 1.6TJ).

9.5. How to Pay for Swing Service

In general, there are three ways in which a User can pay for swing service:

- **Off-market procurement** – this is a bilateral, off-market contractual arrangement between a User and a Swing Service Provider. From a User’s perspective, off-market procurement has the advantages of a known supplier and a known price.
- **Bid Stack** – AEMO operates two ‘bid stacks’ for each gate point. These bid stacks allow Swing Service Providers to place bids to provide a quantity of swing service for a certain price. AEMO then determines the market clearing price (“MCP”) which sets the price of park or loan swing service for that gate point.
- **Swing Service Provider of Last Resort (“SSPOLR”)** – a SSPOLR provides a fall back if all other bids in a bid stack are exhausted. The SSPOLR is a Swing Service Provider that has contracted with AEMO to provide an unlimited last resort bid. Because the SSPOLR faces additional risk in providing the unlimited bid, the SSPOLR bid is generally higher than other swing service bids in the bid stack.

9.5.1. Swing Service Bid Stack

Once the calculations for off-market procurement have been completed, AEMO then calculates the on-market swing service exposure via the swing service bid stack. AEMO operates:

- one bid stack for ‘park’ swing service for each gate point; and
- one bid stack for ‘loan’ swing service for each gate point.

Swing Service Providers are required to provide AEMO with a Bid Book up to 1 year in advance and no later than 30 minutes before the start of the gas day (see Procedures 281 and 282).

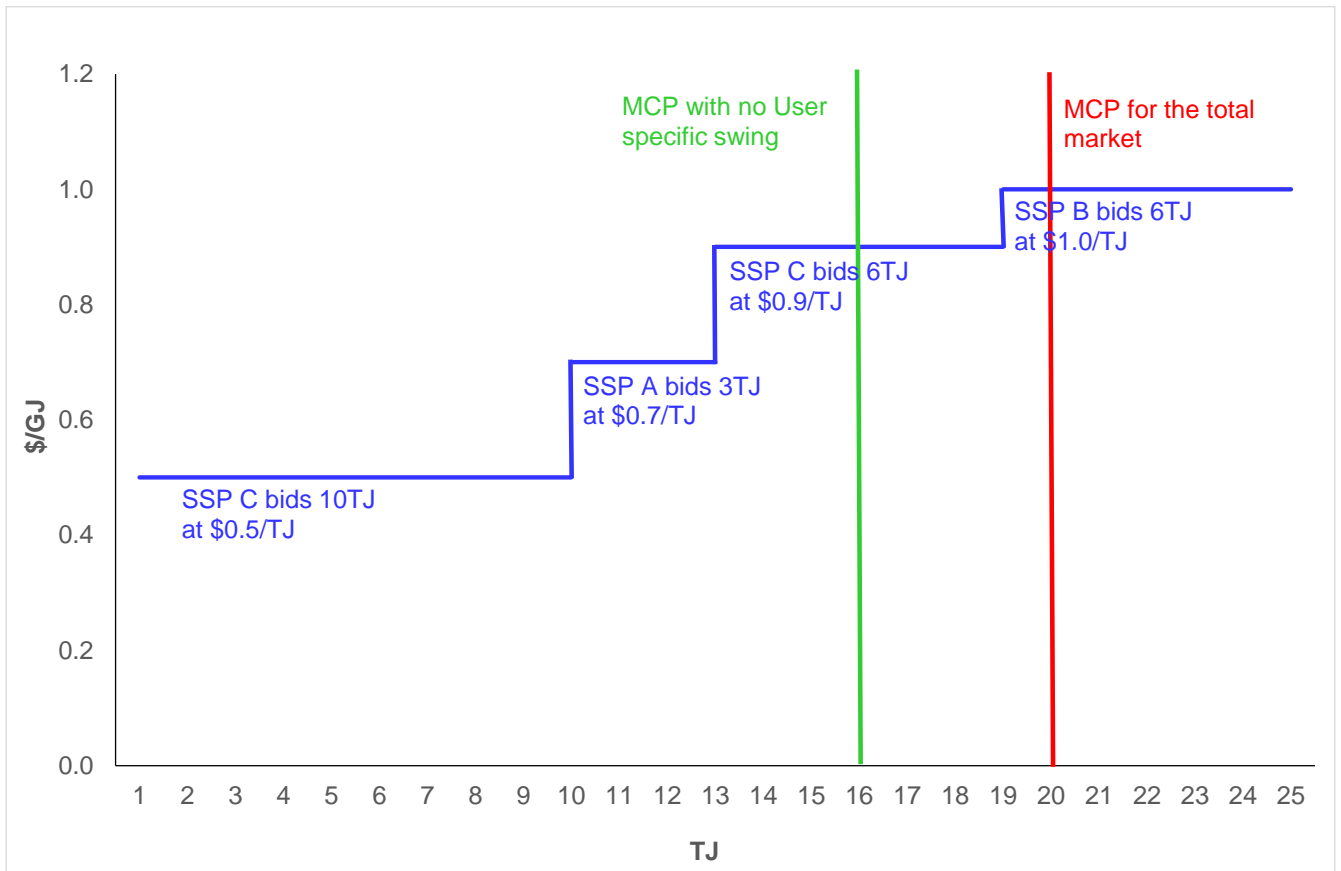
AEMO calculates the bid stack based on valid swing service bids from Swing Service Providers. Only ‘surplus’ swing service goes into the bid stack and off-market procurement instructions are applied first to the socialised swing amounts (i.e. the non-User specific amounts) and then to the User-specific amounts. Only after all of a User’s off-market provisions have been used up does the ‘surplus’ go into the bid stack (see Procedures 270 and 276).

Once the bid stack has been calculated, AEMO determines the market clearing price (“MCP”) for total amount of swing service to be procured through applicable bid-stack. The MCP is the intersect point between the total amount of swing service to be procured on market and the price path.

Costs and swing service amounts are then allocated to the Users and Swing Service Providers in proportion to the User’s contribution and the bid stack outcome. AEMO publishes the bid stack no later than five hours after the end of the gas day.

9.5.2. Example of a Swing Service Bid Stack

Figure 8 Example of a Swing Service Bid Stack



Explanation:

- Volume:
 - total swing service amount = 20TJ;
 - non-User specific swing service = 16TJ; and
 - User specific swing service = 4TJ.
- Price:
 - The MCP that clears all of the non-User specific swing service = \$0.90/GJ; and
 - the MCP that clears all of the remaining User specific swing service is \$1.00/GJ.
- Allocation:
 - SSP A 3 GJ at \$0.90/GJ = \$2.70;
 - SSP B 4 GJ at \$1.00/GJ = \$4.00;
 - SSP C 10 GJ at \$0.90/GJ = \$9.00; and
 - SSP D 3 GJ at \$0.90/GJ = \$2.70
- Cost:
 - total swing service cost = \$18.40;
 - total non-User specific swing service cost = \$14.40; and
 - total User specific swing service cost = \$4.00 (\$18.40 – \$14.40).

10. APPENDIX 1: GAS RETAIL MARKET PARTICIPANT TRAINING

AEMO provides a number of resources to aid the gas industry in participating in the gas retail market. Table 8 lists the participant training resources and their purpose.

Table 8 Participant Training Resources

Document	Purpose
Overview of AEMO and the Procedures	This slide pack provides a general overview of the AEMO arrangements and the content of the Procedures.
The Basics of Swing Service	This slide pack provides a high-level overview of how Swing Service works as a practical guide for Users.
The Details of Swing Service	This slide pack provides detailed information on how Chapter 5 of the Procedures works.
Overview Guide to the WA Gas Retail Market	This guide: <ul style="list-style-type: none"> • provides a high-level overview of the WA gas retail market, and complements AEMO's "WA Gas Retail Market Technical Guide"; and • is intended to assist Participants, customers, and other stakeholders to understand the broad concepts and workings of the market.
Technical Guide to the WA Gas Retail Market.	This document, which provides a technical overview of the operational aspects of the WA gas retail market, and complements the "Overview Guide to the WA Gas Retail Market".

Copies of the above documents are available from the AEMO website (www.aemo.com.au).

AEMO will also make workshops available to gas industry and other interested parties upon request, at cost to workshop participants.

11. APPENDIX 2: GAS RETAIL MARKET REFERENCE DOCUMENTS

The following is a list of reference documents relevant to the AEMO Scheme that Participants should be familiar with. Copies of these documents are available from the AEMO website (www.aemo.com.au).

- The WA Gas Retail Market Agreement.
- The Retail Market Procedures (WA).
- The AEMO Specification Pack, which is comprised of the following documents:
 - AEMO Specification Pack Usage Guidelines;
 - Interface Control Document;
 - FRC B2B System Interface Definition;
 - FRC B2M-B2B HUB System Specifications;
 - FRC B2M-B2B Hub System Architecture;
 - FRC CSV Data Format Specification;
 - Connectivity Testing and Technical Certification;
 - Readiness Criteria;
 - B2B Service Order Specification Part 1;
 - B2B Service Order Specification Part 2; and
 - The complete set of aseXML schemas and examples.
- The FRC Hub Operational Terms and Conditions.
- The Information Pack, which is comprised of the following documents:
 - Information Pack Usage Guidelines;
 - SAWA Business Specification;
 - FRC B2M Process Flow and Sequence Diagrams;
 - FRC B2B Process Flow Diagrams;
 - GRMS FTP User Guide;

- GRMS FTP Procedure Guide;
- GRMS FTP Registration Form;
- FRC Gas Hub Participant User Guide;
- Non-IT RMR communications;
- WA Profile Nominations Guideline;
- New Entrant GRMS Deliverables Information Sheet; and
- Changing your Password on the Participant Server.
- Documents relating to the Retail Market Procedure (WA) change process, including:
 - The WA Procedure Change Committee Terms of Reference;
 - The Technical Working Group Charter;
 - Gas Market Issue Template (used to raise new issues for consideration by the PCC);
 - Proposed Procedure Change Template (used to formally propose Procedure changes); and
 - Impact and Implementation Report Template (used to submit an Impact and Implementation Report to AEMO).
- Documents relating to the compliance process, including the:
 - WA Gas Retail Market Compliance Guidelines (AEMO);
 - WA Gas Retail Market Compliance Panel Guidelines;
 - Procedure Breach Interpretation Notice Template (used to submit a notice to AEMO to commence a formal compliance process); and
 - Pipeline Operator Informing of Special Circumstances Template (used to submit a notice to AEMO under clause 255 of the Procedures).
- Documents to assist with gas retail market participant training, including:
 - Three slide packs (available in presentation or handout format), including:
 - Overview of AEMO and the Procedures;
 - The Basics of Swing Service; and
 - The Details of Swing Service.
 - Two Guides:
 - Overview Guide to the Western Australian Gas Retail Market (this document); and
 - Technical Guide to the Western Australian Gas Retail Market.
- Documents to assist with Self Certification, including:
 - Readiness Criteria;
 - Readiness Criteria Self Certification Checklist form; and
 - Connectivity Testing and Technical Certification.