



TRADING & SETTLEMENT CODE – HELICOPTER GUIDE

16 October 2007

AIP/SEM/07/507

TABLE OF CONTENTS

1.	INTRODUCTION	1
1.1	Purpose	1
1.2	Disclaimer	1
1.3	The TSC	1
1.4	Timing conventions	2
2.	PARTIES AND PARTICIPANTS	3
2.1	Introduction	3
2.2	Roles and obligations of original signatories	3
2.3	Accession and Registration	4
2.4	Unit types	5
2.5	Trading Sites	7
3.	MARKET OVERVIEW	9
3.1	Introduction	9
3.2	Mandatory gross pool	9
3.3	Day ahead complex bidding	10
3.4	SMP Pricing	12
3.5	Central dispatch	15
3.6	Capacity Payments Mechanism	15
3.7	Transmission losses	17
3.8	Firm and Non-Firm Access	17
4.	PAYMENTS, CHARGES AND SETTLEMENT	18
4.1	Introduction	18
4.2	Payments and Charges	18
4.3	Settlement	24
4.4	Credit Cover	26
4.5	Settlement reallocation	27
4.6	Unsecured Bad Debt	27
4.7	Default, Suspension and Termination	27
4.8	Currency Costs	28
5.	OPERATION OF THE MARKET – DAY IN THE LIFE	29
5.1	Introduction	29
5.2	Before the Trading Day	29
5.3	During the Trading Day	30
5.4	After the Trading Day	30
5.5	Settlement	30

1. INTRODUCTION

1.1 Purpose

This Helicopter Guide is intended to provide a high-level summary of the Single Electricity Market (SEM) arrangements, which are set out in full in the Trading and Settlement Code (TSC), including the Appendices and Agreed Procedures (collectively referred to as the TSC in this Helicopter Guide. This guide is written based upon version 2.0 of the TSC.

1.2 Disclaimer

This guide is only intended to give an overview of the SEM arrangements, as defined within the TSC, but does not form part of the TSC. It is not, and is not meant to be, a comprehensive description of the TSC and/or a substitute for the detailed provisions of the TSC and no person is entitled to rely on this Helicopter Guide for any purpose. It is intended as a guide to assist the reader in understanding the TSC and should be read in conjunction with the TSC. Any person that is or is considering becoming a Party to the TSC must refer to the TSC itself in order to understand the SEM arrangements.

While great care has been taken to ensure that this Helicopter Guide provides an accurate reflection of the rules, readers should be aware that in the event of any discrepancies between this guide and the TSC, then the TSC will prevail.

1.3 The TSC

The TSC sets out the trading and settlement rules and procedures for participation in the SEM. The TSC consists of the sections briefly described below:

- **Section 1 “Introduction and Interpretation”**: sets out interpretations to be applied throughout the TSC.
- **Section 2 “Legal and Governance”**: sets out the legal basis for and requirements of the TSC and also includes TSC accession and registration processes, obligations on Parties to the TSC and TSC modification governance.
- **Section 3 “Data and Information Systems”**: sets out rules relating to the systems and procedures for data transactions and storage.
- **Section 4 “Pricing”**: sets out pricing rules for participants, which apply for all units unless specific rules to the contrary are outlined in Section 5.
- **Section 5 “Categorisation of Units and Rules for Special Units”**: sets out specific pricing rules which apply to some specific Generator Units in addition to or instead of those specified in Section 4.
- **Section 6 “Financial and Settlement”**: sets out rules for the settlement of payments/charges under the TSC and for financial arrangements including credit cover.
- **Section 7 “Interim Arrangements”¹**: sets out provisions which suspend, amend or replace the provisions of other parts of the TSC, and which apply for the first 12 months of SEM operation only.

¹ The provisions within this Section are not reflected in this guide.

- **Section 8 “Transitional Arrangements”²:** sets out provisions which suspend, amend or replace the provisions of other parts of the TSC to apply in the run up to SEM go-live and during the early operation of the SEM, particularly the first Trading Day.
- **Appendices:** set out details of data transactions and specific calculations or processes required under the TSC, such as the pricing algorithm.
- **Glossary:** sets out definitions for terms and variables used in the TSC.
- **Agreed Procedures:** set out detailed procedures to be followed in performing obligations and functions under the TSC.

1.4 Timing conventions

The TSC uses the following main timing conventions:

- **Trading Period:** means a thirty minute period beginning on each hour or half-hour.
- **Trading Day:** means the period commencing at 06:00 each day and ending at 06:00 the next day.
- **Settlement Day:** means a period starting from 00:00 and ending at 24:00 each day.
- **Billing Period:** means one Week commencing at 00:00 on Sunday.
- **Capacity Period:** means one Month commencing at 00:00 on the first day of the Month.

² The provisions within this Section are not reflected in this guide.

2. PARTIES AND PARTICIPANTS

2.1 Introduction

This section outlines the roles and obligations of the original signatories to the TSC and the registration process for Participants.

2.2 Roles and obligations of original signatories

Parties who undertake the following roles were the original signatories to the Framework Agreement and so are bound by the TSC:

- Market Operator;
- System Operators;
- Distribution System Operators;
- Transmission Asset Owners; and
- Meter Data Providers.

2.2.1 Market Operator

The Market Operator is responsible for the administration and operation of the TSC. EirGrid plc (EirGrid) and SONI Ltd (SONI) jointly carry out the Single Market Operator (SMO) function for the SEM under licence.

2.2.2 System Operators

SONI is the System Operator (SO) for Northern Ireland while EirGrid is the SO in Ireland.³ SONI and EirGrid take joint responsibility for the role of System Operator in the SEM and so are collectively responsible for coordination, direction and flow of electricity on the transmission network. SONI and EirGrid each retain responsibility for dispatching generation connected to their own transmission system and for fulfilling System Operator obligations under the TSC within their own jurisdiction.

2.2.3 Distribution System Operators

Distribution System Operators refer to the operators of the distribution networks. The operator of the distribution network in Northern Ireland is Northern Ireland Electricity, a unit of Viridian Group while the Ireland DSO is ESB Networks, a ringfenced unit within ESB.

2.2.4 Transmission Asset Owners

The Transmission Asset Owner is the entity owning the transmission network. ESB Networks owns the transmission assets in Ireland. In Northern Ireland, the transmission network is owned by Northern Ireland Electricity.

³ SONI Ltd is the licensed TSO for Northern Ireland under Article 10(1) (b) of the Electricity (Northern Ireland) Order 1992. EirGrid plc is the independent TSO in Ireland licensed under Section 14 (1) (e) of the Electricity Regulation Act 1999.

2.2.5 Meter Data Providers

The relevant distribution system operators are the Meter Data Providers, which are obliged to submit meter data to the Market Operator. In Ireland, the distribution system operator, ESB Networks, also has responsibility for the metering code and equipment. In Northern Ireland, Northern Ireland Electricity is in charge of metering data provision to the market operator. Separately, both System Operators (SONI and EirGrid) have metering responsibilities and are Meter Data Providers.

2.3 Accession and Registration

2.3.1 Accession

Persons other than the original signatories who wish to be Parties to the TSC must follow the accession process. This entails the completion of an application form, payment of an Accession Fee, demonstration of compliance with the eligibility criteria and, when provided, execution of the Accession Deed. When the MO receives an executed Accession Deed, the applicant becomes a Party to the TSC.

2.3.2 Registration

In order to participate in the market, a Party (or an applicant to become a Party) must become a Participant by registering Unit(s). This entails the completion of a Participation Notice, exchange of information (including validation by the MO), and the payment of a Participation Fee. As part of the registration process, the MO requires evidence that valid connection agreements, use of system agreements and generation or supply licences are in place. The detailed requirements are set out on the application form.

2.3.3 De-minimis threshold

The TSC sets mandatory participation for Generators with a Maximum Export Capacity of 10MW or greater. Any generator(s) with a capacity greater than or equal to the de-minimis threshold and which is covered by a single connection agreement is obliged to participate in the pool. Generators with capacities less than the threshold are not obliged and may choose whether or not to participate as Generator Units under the TSC, and may instead participate within a Supplier Unit as negative demand. There is no threshold for mandatory participation by Demand Side Units.

2.3.4 Intermediary arrangements

The Intermediary arrangements permit the owner of a generator to appoint an Intermediary to fulfil all of its obligations under the TSC. In order that the Generator Unit may be registered by the Intermediary, both regulatory approval⁴ and formal authorisation from the unit owner must be given. In these circumstances, the unit owner has no direct obligations under the Code relating to that generator.

⁴ The Regulatory Authorities have determined that the Intermediary arrangements are permitted for a maximum of 12 months after market start, except for certain PSO-related contracts, such as AER or REFIT renewable support contracts in Ireland, or the NIE PPB generator contracts in Northern Ireland.

2.3.5 Data Processing Entity arrangements

The TSC makes formal provision for Parties to appoint a Data Processing Entity who may submit data, raise queries and view settlement statements on its behalf. In these circumstances, the Party remains liable for fulfilling all TSC obligations.

2.4 Unit types

There are two generic Unit types used for settlement within the Code; Generator Units and Supplier Units. Generator Units predominantly cover those entities which are capable of delivering energy to the SEM, including all units relating to interconnectors (whether in either import or export mode), and including Demand Side Units which offer demand reduction. Supplier Units predominantly cover those settlement entities that typically consume energy (excluding interconnectors), but may include (as negative demand) generators that are below the 10MW de minimis threshold.

2.4.1 Generator Units

The TSC recognises several distinct types of Generator Units for the purposes of participation. These are grouped into several generic settlement classes, plus some special cases. Table 1 below presents the five generic settlement classes for Generator Units and the distinctions between them. Each Generator Unit must be registered as belonging to one of these generic settlement classes, except where the TSC makes specific provisions to the contrary. The relevant generic settlement class for a Generator Unit is based on the answers to the following questions:

1. Is the Generator Unit dispatchable by the relevant System Operator?
 - if the Generator Unit is not dispatchable it is classed as Autonomous, then proceed directly to Decision 3
 - if the Generator Unit is dispatchable, then proceed to Decision 2
2. Is the availability of the Generator Unit's fuel source variable (limited to wind or run-of-river hydro) in the short-term?
 - if the Generator Unit's fuel source is variable in the short term, and the fuel in question is wind or run-of-river hydro, it is classed as a Variable Generator Unit
 - if the Generator Unit's fuel source is not variable in the short term, and/or the fuel in question is not wind or run-of-river hydro, it is classed as a Predictable Generator Unit
 - in both cases, then proceed to Decision 3
3. Is the Generator Unit to be included in the price setting process?
 - if the Generator Unit is Autonomous, it must be registered as a Price Taker
 - if the Generator Unit does not have Priority Dispatch status, it must register as a Price Maker
 - if the Generator Unit does have Priority Dispatch status, it can choose to register as a Price Maker or as a Price Taker (and can change status between the two with 29 days notice)

Table 1 – Generator Units – generic settlement classes

Decision 1		Decision 2		Decision 3	Price Setting?	
					Yes	No
Dispatchable?	Yes	Variable?	No	Predictable	<ul style="list-style-type: none"> ▪ Predictable Price Maker ▪ Default 	<ul style="list-style-type: none"> ▪ Predictable Price Taker (Priority Dispatch only)
			Yes		<ul style="list-style-type: none"> ▪ Variable Price Maker 	<ul style="list-style-type: none"> ▪ Variable Price Taker (Priority Dispatch only)
	No		n/a	Autonomous Not dispatchable	<ul style="list-style-type: none"> ▪ N/A 	<ul style="list-style-type: none"> ▪ Autonomous

2.4.1.1 Special Units

Special provisions exist for certain types of Generator Unit. Table 2 outlines these Special Units, alongside a summary of their role in the market and their settlement class.

Table 2 – Special Units – roles and settlement classes

Unit	Role	Settlement Class
Demand Side Unit	Demand site which offers an ability to deliver demand reduction in response to dispatch instructions	Predictable Price Maker Generator Unit
Energy Limited Generator Unit	Hydro-electric generator which has a physical energy limit	Predictable Price Maker Generator Unit
Interconnector Unit	Unit which allows Interconnector users to trade between SEM and BETTA	Predictable Price Maker Generator Unit
Interconnector Error Unit	Unit to which imbalance on an Interconnector is allocated for settlement	Autonomous Generator Unit
Interconnector Residual Capacity Unit	Unit which allows SO to utilise/trade spare interconnector capacity	Predictable Generator Unit, but neither a Price Maker or a Price Taker
Pumped Storage Unit	Generator Unit within a pumped storage plant	Predictable Price Maker Generator Unit

2.4.1.2 Netting Generator Units

A Netting Generator Unit must be registered by the Market Operator as part of each Trading Site (see Section 2.5 for more details regarding Trading Sites). A Netting

Generator Unit is a notional Generator Unit registered to facilitate settlement of a Trading Site. Netting Generator Units do not physically exist, have no meter associated with them and are treated as Autonomous Generator Units for most purposes.

2.4.2 Supplier Units

Supplier Units are a collection of demand sites (and, potentially, generators which are below the de-minimis limit and which are not classed as Generator Units) for which metered consumption (which can be positive or negative) is aggregated. The following specific variations of Supplier Units are highlighted in the TSC:

- Error Supplier Unit – each jurisdiction has an Error Supplier Unit for which loss-adjusted net demand in that jurisdiction, allowing for net transfers between jurisdictions, is calculated.
- Trading Site Supplier Unit – a Supplier Unit that contains only the demand within a Trading Site and is settled on a net basis against the Generator Units on that Trading Site.
- Associated Supplier Unit – a Supplier Unit which is recorded to a Trading Site but may also contain demand outside that Trading Site and has its demand settled on a gross basis with the Generator Unit(s) on that Trading Site.

2.5 Trading Sites

All Generator Units must be registered as part of a Trading Site. A Trading Site refers to one or more Generator Units and either a Trading Site Supplier Unit (covered by a single connection agreement or located collectively on a contiguous site) or an Associated Supplier Unit.

There are two types of Trading Site. The first, illustrated in Figure 1, incorporates an Associated Supplier Unit, which has no physical link to the Trading Site. Generation and demand linked to the Units within this type of Trading Site are settled on a gross basis. The intention behind these arrangements is to ensure that if a generator site is importing, it is settled as demand (within the Associated Supplier Unit) rather than as generation.

The second, illustrated in Figure 2, incorporates a Trading Site Supplier Unit, which is located within the Trading Site, which must be a contiguous site or covered by a single connection agreement. Generation and demand linked to the Units within this type of Trading Site are settled on a net basis. The intention behind these arrangements is to facilitate net settlement at qualifying sites with both generation and demand.

Figure 1 – Trading Site with Associated Supplier Unit

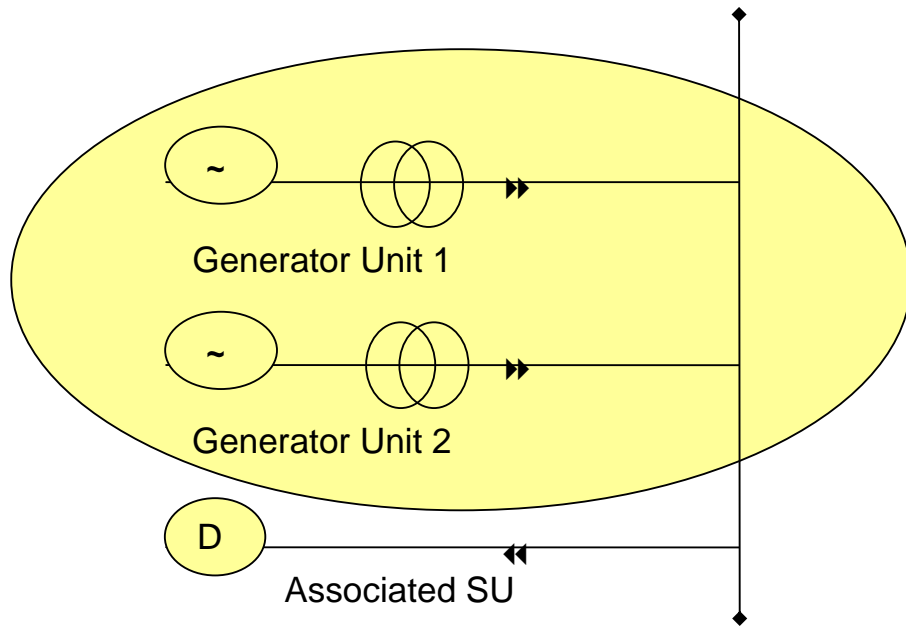
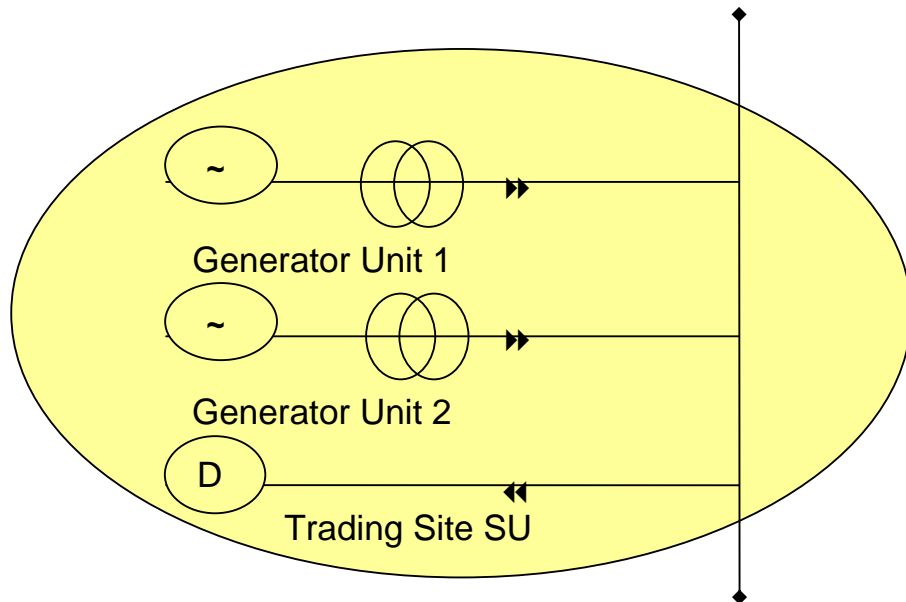


Figure 2 – Trading Site with Trading Site Supplier Unit



Each Unit within a Trading Site is registered to the same Participant, except for Associated Supplier Units which may contain demand from other participants outside the Trading Site. On registration of a Trading Site, the Market Operator registers a Netting Generator Unit for that site, as highlighted in Section 2.4.1.2.

3. MARKET OVERVIEW

3.1 Introduction

This section provides a high-level overview of the key features of the SEM:

- mandatory gross Pool;
- day-ahead complex bidding;
- ex-post System Marginal Price (SMP) pricing (which excludes transmission, reserve and other constraints), with a single island-wide price for each Trading Period;
- central dispatch;
- separate Capacity Payments Mechanism; and
- locational transmission losses.

Section 5 builds on this to provide a day-in-the-life example of the operation of the market.

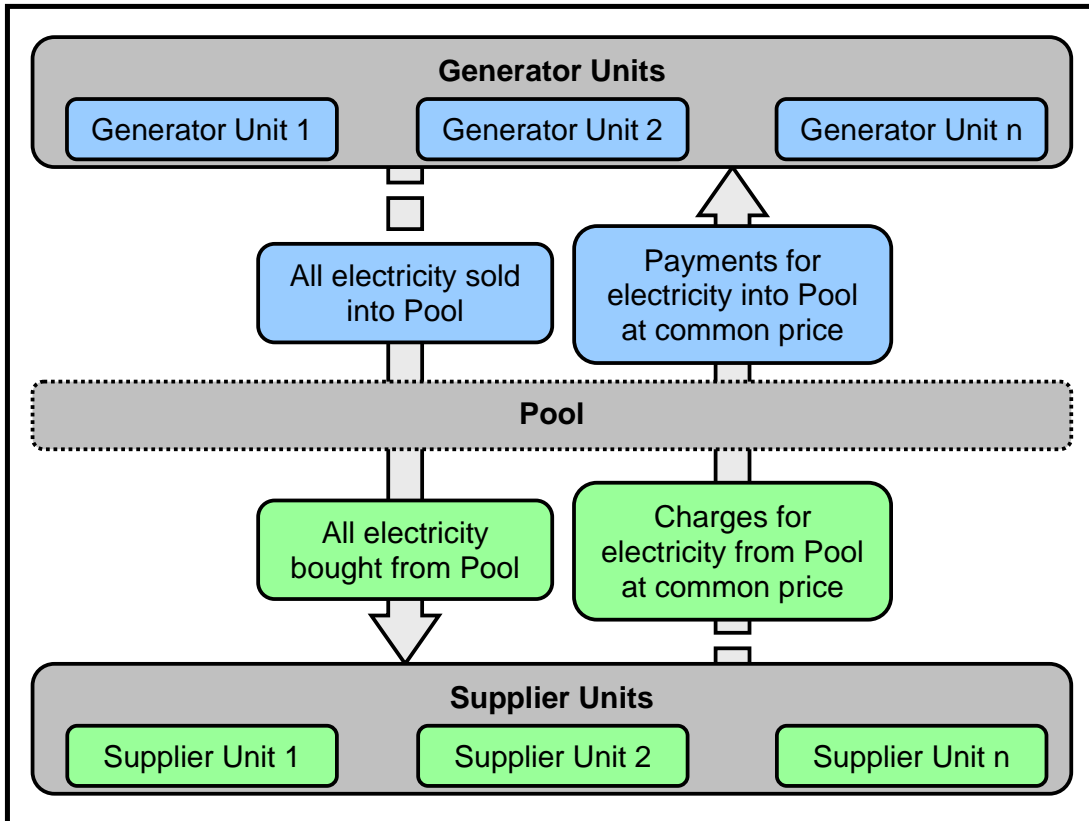
3.2 Mandatory gross pool

Participation in the pool is mandatory for licensed generators and suppliers, save for generators which have a maximum export capacity of less than 10MW (the de minimis threshold) for whom direct participation is voluntary. As a consequence, almost all electricity generated has to be sold into/purchased from the pool.

Under the pool arrangements, the sale and purchase of electricity is conducted on a gross basis, with all generators/suppliers receiving/paying the same price for the electricity sold into/bought via the pool. Bilateral financial contracting (e.g. contracts for differences) can still occur, but the arrangements for doing so are separate from and not covered within the TSC.

The mandatory gross Pool arrangements discussed above are summarised in Figure 3.

Figure 3 – Mandatory gross Pool arrangements



3.3 Day ahead complex bidding

Participants are required to submit Offers into the pool in respect of each Generator Unit for each Trading Day. The data contained within Offers applies equally for all Trading Periods within the relevant Trading Day⁵. Offers must be submitted by Gate Closure, which is at 10:00 on the day before the relevant Trading Day (i.e. 10:00 D-1), but may be submitted up to 28 days before Gate Closure.

Offers consist of Commercial Offer Data and Technical Offer Data, as explained further below. The components of Commercial Offer Data and Technical Offer Data vary depending upon the type of Generator Unit in question. Full details of the data required for each Generator Unit type are specified in Appendix I of the TSC.

Offer data is submitted in pounds sterling or euro depending upon the Currency Zone in which the relevant Generator Unit is registered (and connected). Where values are submitted in pounds sterling, the MO converts the values into euro on the basis of the Trading Day Exchange Rate, which is published at 08:00 D-1.

Technical Offer Data relates to the technical capabilities of the Generator Unit and consists of parameters such as ramp rates. Standard Commercial Offer Data consists of:

⁵ Interconnector Units are an exception to this rule. Interconnector Units are able to submit individual Offers to apply for each Trading Period in order to enable effective interaction with interconnected markets.

- **No Load Cost:** one No Load Cost, which is the element of operating costs which is invariant with the actual level of Output;
- **Start Up Costs:** a minimum of one and a maximum of three Start Up Costs, which reflect the costs associated with starting up the Generator Unit from cold, warm or hot states⁶; and
- **Price Quantity Pairs:** a minimum of one and a maximum of 10 Price Quantity Pairs, each of which sets out a Quantity up to and equal to which the associated Price applies. Price Quantity Pairs must be strictly monotonically increasing with only one Price for each Quantity. Price Quantity Pairs are bounded, in terms of Quantity, by the Minimum Output and Actual Availability of the Generator Unit from and, in terms of Price, by the Market Price Floor and the Market Price Cap (which are values set by the Regulatory Authorities). Examples of Price Quantity Pairs are shown in Figure 4.

Figure 4 – Price Quantity Pairs

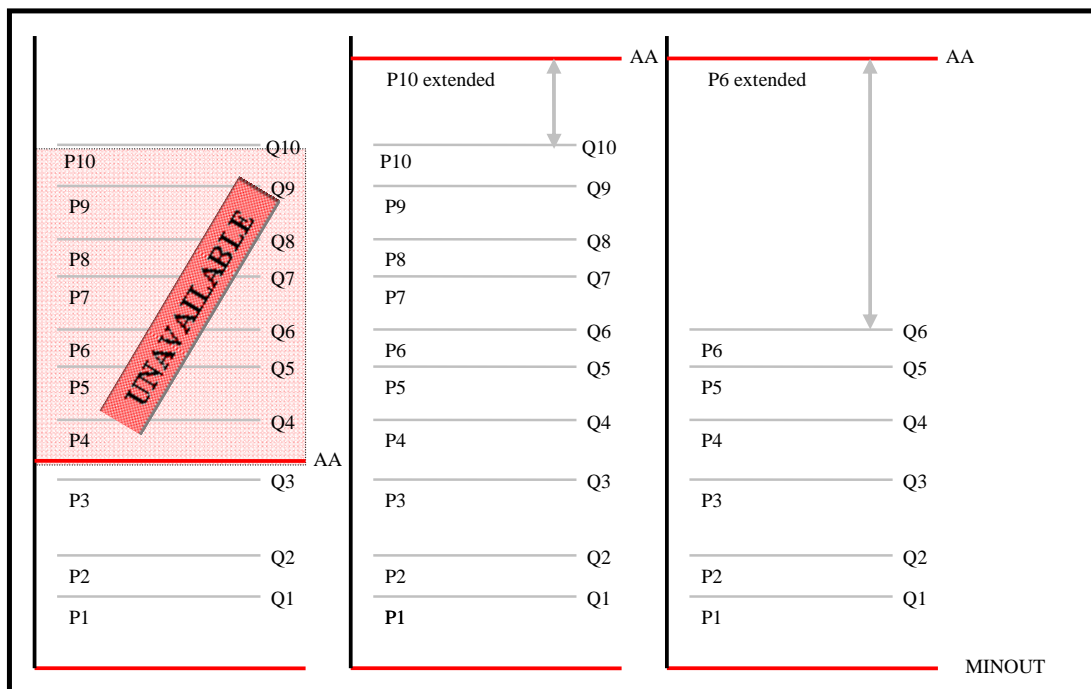


Table 3 and Table 4 identify, for the generic settlement classes discussed above, the data which must be submitted to represent Commercial Offer Data and Technical Offer Data. This flags that:

- Price Maker and Predictable Price Taker Generator Units submit Price-Quantity Pairs, No-Load Costs and Start-Up Costs of the nature outlined above only;
- Price Taker Generator Units submit Nomination Quantities, which outline the intended output of the Generator Unit in question during a Trading Period, and a Decremental Price, which must be set to zero, instead of or in addition to standard Commercial Offer Data;

⁶ The definition of how long a unit takes to cool from hot to warm and to cold is defined within the submitted technical characteristics.

- Autonomous Generator Units do not submit any Commercial Offer Data; and
- all Units within the generic settlement classes submit the same categories of Technical Offer Data, except for Autonomous Generator Units which do not submit any Technical Offer Data.

Table 3 – Commercial Offer Data submission for generic settlement classes

	Predictable Price Maker	Predictable Price Taker	Variable Price Maker	Variable Price Taker	Autonomous
PQ Pairs, start-up, no load costs	✓	✓	✓	✗	✗
Nomination Quantities, Decremental Price	✗	✓	✗	✓	✗

Table 4 – Technical Offer Data submission for generic settlement classes (sample)

	Predictable Price Maker	Predictable Price Taker	Variable Price Maker	Variable Price Taker	Autonomous
Forecast Profiles (Availability, Minimum Output, Minimum Stable Generation)	✓	✓	✓	✓	✗
Min On Time, Max On Time, Min Off Time	✓	✓	✓	✓	✗
Ramp Rates, Soak Times, Dwell Times	✓	✓	✓	✓	✗

3.3.1 Default Data

As part of the registration process, Participants are required to provide standing Commercial Offer Data and Technical Offer Data in respect of each of its Units. This is referred to as Default Data. Participants are required to review the Default Data in respect of their Units at least once per quarter and to update it as appropriate to maintain its accuracy. Where Commercial Offer Data or Technical Offer Data are not submitted by Gate Closure, or, where such data are submitted and are not determined to be valid by the Market Operator, then Default Data shall apply for the relevant Trading Day.

3.4 SMP Pricing

Under the pool arrangements described above, all Generator Units receive and all Supplier Units pay the same energy component of price in a Trading Period for electricity;

the System Marginal Price (SMP). The SMP is determined via the Market Scheduling and Pricing (MSP) Software, which is run by the Market Operator. A high-level overview of the workings of the MSP Software is set out below.

3.4.1 Outputs of MSP Software

The MSP Software is used to calculate:

- the SMP for each Trading Period; and
- the Market Schedule Quantity (MSQ) (being the quantity of Output scheduled by the MSP Software) for each Price Maker Generator Unit⁷ for each Trading Period, ignoring transmission constraints and reserve requirements (i.e. assuming an unconstrained schedule).

The MSP Software runs for an Optimisation Time Horizon, which is a 30 hour period from and 06:00 on the relevant Trading Day (typically up to 12:00 on the subsequent Trading Day, other than for clock-change days).

3.4.2 Principles of MSP Software

The MSP Software gives individual consideration only to Price Maker Generator Units which are not Under Test. No other Units are represented individually within the MSP Software. Based on the Commercial and Technical Offer Data provided by Participants, the MSP Software seeks to identify the lowest cost solution at which Price Maker Generator Units provide sufficient generation to meet demand that is not met by Price Taker and Autonomous Generator Units.

The MSP Software calculates the SMP in each Trading Period to:

- reflect the cost of the marginal MW required to meet demand in a Trading Period within the context of an unconstrained schedule – this is the **Shadow Price** component; and
- recover operating costs associated with Start Up Costs and No Load Costs – this is the **Uplift** component.

The resultant formula for the derivation of SMP in a Trading Period is:

- $SMP = \text{Shadow Price} + \text{Uplift}$

SMP is bounded by a Market Price Cap and a Market Price Floor, which are set by the Regulatory Authorities.

3.4.3 High level processes associated with the operation of the MSP Software

3.4.3.1 MSP Software Run Types

The MSP Software is run over three timescales resulting in the following three MSP Software Run Types:

- Ex-Ante Indicative MSP Software Runs;
- Ex-Post Indicative MSP Software Runs; and
- Ex-Post Initial MSP Software Runs

⁷ Generator Units under test are effectively treated as price takers within the MSP Software.

The Ex-Ante Indicative MSP Software Run is performed by the Market Operator by 11:00 D-1 (i.e. 1 hour after Gate Closure for the relevant Trading Day). The outputs of this run are:

- indicative SMP values;
- indicative values of MSQ for each Price Maker Generator Unit that is not Under Test in order to determine the Ex-Ante Indicative Market Schedule for Price Maker Generator Units that are not Under Test; and
- Interconnector Unit Nominations (being the quantity nominated for import or export for an Interconnector Unit) for each Interconnector Unit (but subject to alteration by the Moyle Interconnector Trading System (MITS) software).

The Ex-Post Indicative MSP Software Run is performed by the Market Operator by 16:00 on the day after the start of the relevant Trading Day. The outputs of this run are:

- indicative SMP values; and
- indicative values of MSQ for each Price Maker Generator Unit that is not Under Test.

The Ex-Post Initial MSP Software Run is performed by the Market Operator by 16:00 four days after the start of the relevant Trading Day. The outputs of this run are:

- SMP; and
- values of MSQ for each Price Maker Generator Unit that is not Under Test.

3.4.3.2 Operation of the MSP Software

The following steps are taken by the MSP Software in calculating SMP values and MSQ values, assuming an unconstrained schedule, for each Price Maker Generator Unit that is not Under Test for each Trading Period:

1. Determine the Unit Commitment Schedule for each Trading Period in the Optimisation Time Horizon, which denotes whether or not each Price Maker Generator Unit that is not Under Test will be scheduled to run.
2. Based on the Unit Commitment Schedule, determine the Shadow Price values and the MSQ values for each Price Maker Generator Unit that is not Under Test for each Trading Period in the Optimisation Time Horizon.
3. Calculate Uplift for each Trading Period in the Optimisation Time Horizon.
4. Calculate SMP for each Trading Period in the Trading Day based on the Shadow Price values plus the Uplift values, within the bounds of the Market Price Floor and the Market Price Cap.

In determining Unit Commitment Schedules and MSQ values, the high-level objective of the MSP Software is to minimise the sum of MSP Production Costs (being the production costs of each Price Maker Generator Unit that is not Under Test which is scheduled to run) subject to the following constraints:

1. to schedule output by Price Maker Generator Units that are not Under Test to meet demand; and
2. to schedule each Price Maker Generator Unit that is not Under Test within its capacities and technical capabilities.

When calculating Uplift, the high-level objective of the MSP Software is to reflect the marginal cost of producing or consuming electricity during the Optimisation Time Horizon such that:

1. energy prices should be reflective of underlying market dynamics such that the recovery of Start Up and No Load Costs through SMP should not deviate significantly from the Shadow Prices; and
2. revenue paid through Uplift revenues should be minimised.

3.5 Central dispatch

Under the SEM, dispatchable Generator Units are dispatched centrally by the SOs, rather than autonomously through self-dispatch by the Generator Unit operator. Arrangements for dispatch are included in the relevant Grid Code and are not contained within the TSC.

As for the market schedule determined by the MSP Software, actual dispatch patterns are in principle based upon economics, and it is a reasonable expectation that the cheapest generation will be scheduled to run first, whilst respecting the technical capabilities of the Generator Units. However, while the MSP Software produces a market schedule on the assumption of an unconstrained system, ignoring the impact of, for example, transmission constraints, voltage and reserve requirements, the SOs must dispatch Generator Units taking system constraints and reserve requirements into account (and must also consider real-time issues on the system such as unplanned outages). Therefore, the actual dispatch schedule followed is likely to deviate from the market schedule produced by the MSP Software.

Following the Ex-Ante MSP Software Run at 11:00 D-1, the SOs produce an Ex-Ante Indicative Operations Schedule at 16:00 D-1. This is a day-ahead schedule which takes system constraints and reserve requirements into account to give indicative MW outputs for the Trading Day. Actual dispatch is achieved through the issue of Dispatch Instructions throughout the Trading Day.

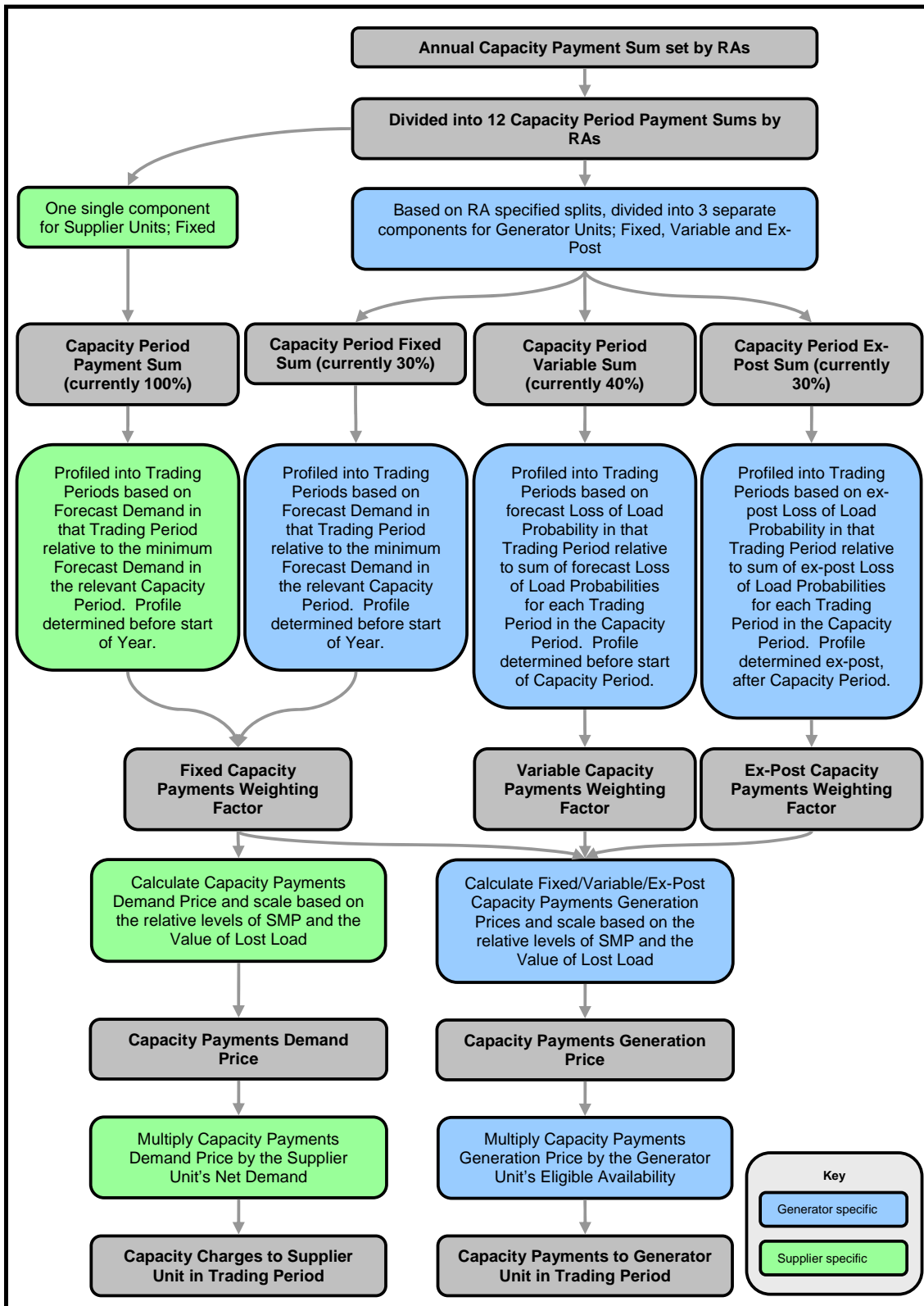
3.6 Capacity Payments Mechanism

While SMP pricing ensures that SMP reflects the value of energy, the Capacity Payments Mechanism attaches a value to the provision of capacity within the market. The Capacity Payments Mechanism is intended to strike a balance between providing the highest capacity prices at periods of highest loss-of-load probability or tightest margin in order to value the provision of capacity appropriately, and providing a stable set of investment signals.

Under the Capacity Payments Mechanism, Capacity Payments are made in respect of Generator Units based on a measure of their availability, and hence the provision of capacity. Capacity Payments are funded by Capacity Charges, which are levied in respect of Supplier Units based upon their electricity consumption.

The methodology by which Capacity Payments are derived and funded is summarised in simplified form in Figure 5.

Figure 5 – Derivation of Capacity Payments and Capacity Charges



3.7 Transmission losses

All trading under the SEM pool is deemed to take place at the Trading Boundary. The Trading Boundary is the notional balancing point for generation and supply and is the point of sale for trading in the SEM at which the title for all products and services settled through the trading arrangements set out in the TSC transfers. Adjustments are made to all values expressed in MW, MW/min or MWh to reflect the transmission losses incurred on the transmission system as electricity is transported to or from the Trading Boundary from or to the relevant point of connection to the transmission system for the Generator Unit or Supplier Unit. These adjustments are made through the application of Transmission Loss Adjustment Factors (TLAFs) set by the SO for each Generator Unit for each Trading Period (the TSC specifies that TLAFs for Supplier Units will be set equal to 1).

3.8 Firm and Non-Firm Access

A Generator Unit can have Firm Access or Non-Firm Access. If a Generator Unit has Firm Access for a certain quantity of output, it has firm rights under a Connection Agreement to be able to export that quantity of output onto the system at its point of connection. Where a Generator Unit does not have Firm Access for its Maximum Export Capacity, it has Non-Firm Access for the quantity of output above that for which it has Firm Access rights, which limits its eligibility for compensation if its dispatch is constrained.

4. PAYMENTS, CHARGES AND SETTLEMENT

4.1 Introduction

This section provides a high-level overview of the following aspects of SEM:

- payments and charges to/from Participants;
- settlement; and
- credit cover.

4.2 Payments and Charges

Figure 6 and Figure 7 below illustrate the different elements payments and charges for Generator Units and Supplier Units.

Figure 6 – Generator Unit Payments

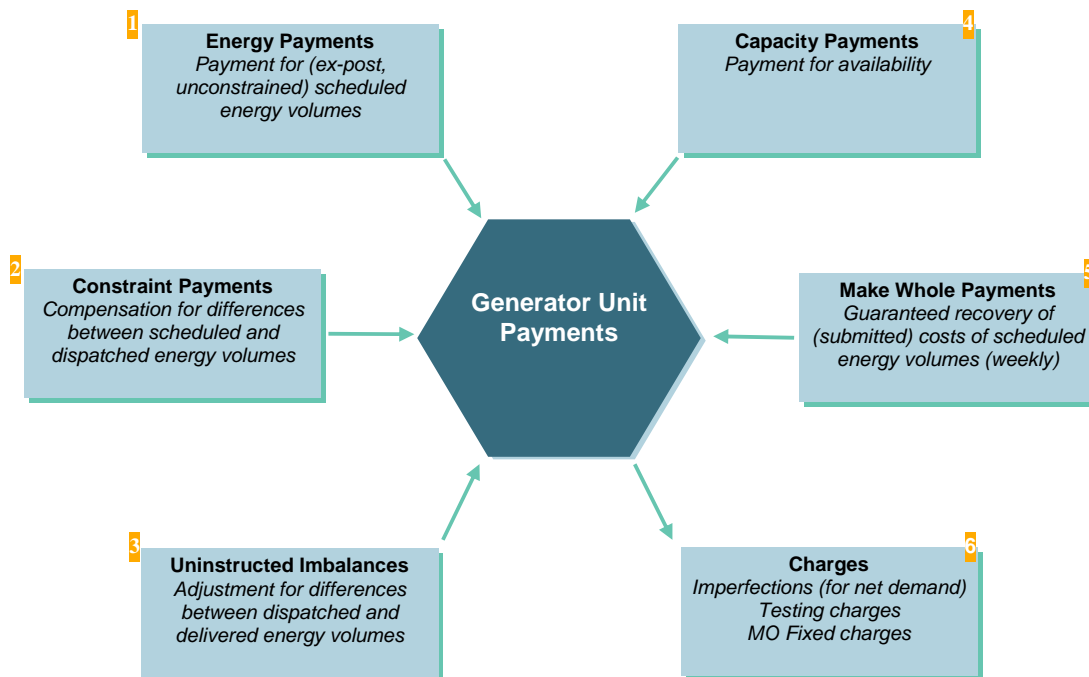
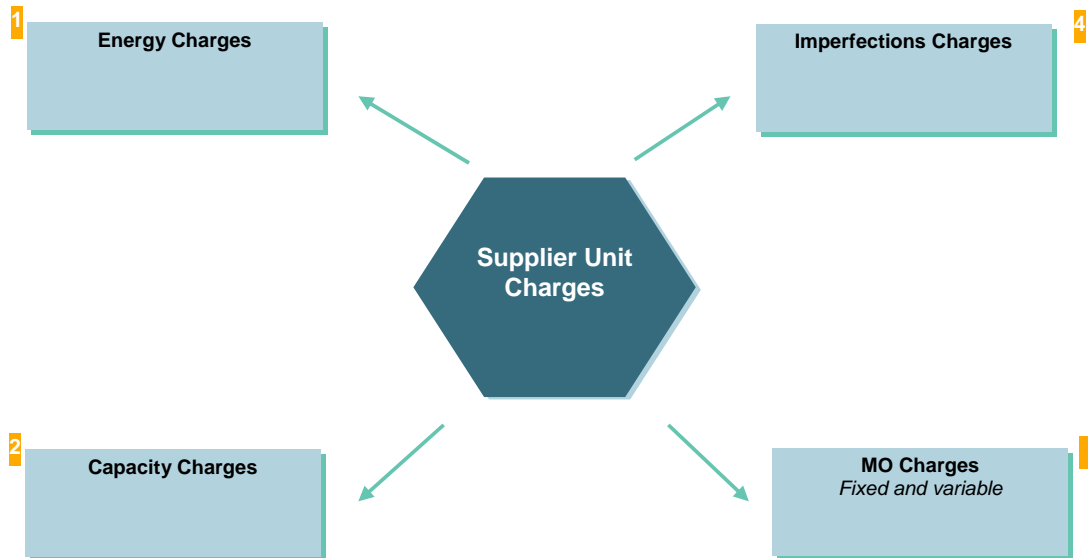


Figure 7 – Supplier Unit Charges



4.2.1 Generator Unit Payments

Generator Unit Payments fall into the following broad classes:

- **Trading Payments:** payments to Participants in respect of their Generator Units over a Billing Period. Such payments will comprise Energy Payments, Constraint Payments, Uninstructed Imbalance Payments and Make Whole Payments less any Testing Charges, as discussed below; and
- **Capacity Payments:** payments to Participants in respect of their Generator Units over a Capacity Period as outlined in Section 4.2.1.5.

4.2.1.1 Energy Payments

An Energy Payment is made to a Participant for a Billing Period in respect of a Generator Unit based upon the energy sold by the Generator Unit over the Billing Period calculated as the product of MSQ and the prevailing SMP. Table 5 highlights the basis of the MSQ values for Generator Units belonging to the generic settlement classes discussed above.

Table 5 – MSQ determination for generic settlement classes

	Predictable Price Maker	Predictable Price Taker	Variable Price Maker	Variable Price Taker	Autonomous
MSQ	Calculated by MSP Software	Minimum of Nominated Quantity and Availability Profile (which is calculated as the time weighted average of Outturn Availability)	Calculated by MSP Software	Actual Output or (if constrained down) the maximum of Actual Output and the time weighted average of Outturn Availability	Actual Output

4.2.1.2 Constraint Payments

A Constraint Payment is made to a Participant in respect of a Generator Unit in any Trading Period when its Dispatch Production Cost (being the implied cost incurred by a Generator Unit for producing the Dispatch Quantity (DQ) specified in a Dispatch Instruction, determined based on Commercial/Technical Offer Data submissions) differs from its Schedule Production Cost (being the implied cost incurred by a Generator Unit for producing the level of output in accordance with the MSQ, determined based on Commercial/Technical Offer Data submissions). Table 6 highlights the eligibility of Generator Units belonging to the generic settlement classes to receive Constraint Payments.

Note that where a generator is constrained down such that its Dispatch Quantity (instructed by the System Operator) is lower than its Market Schedule Quantity, it will receive energy payments for its Market Schedule Quantity (at SMP) and will typically **pay back** to the MO a Constraint Payment, based on the saving in cost between the dispatch quantity and the market schedule quantity. In this case, it retains any difference between the SMP and the costs which would have been incurred to deliver its Market Schedule Quantity.

If the Constraint Payment is zero (as for Predictable or Variable Price Takers which are constrained down), then there are no repayments and the generator retains the full energy payment even if its real dispatch is at a lower level.

Table 6 – Constraint Payment eligibility for generic settlement classes

	Predictable Price Maker	Predictable Price Taker	Variable Price Maker	Variable Price Taker	Autonomous
Eligible: Constrained up payments (payments to generators)	✓ as outlined above	✓ as outlined above	✓ as outlined above	X	X
Eligible: Constrained down payments (payments from generators)	✓ as outlined above	(✓ - Zero) based on difference between MSQ and DQ multiplied by the Decremental Price (but as Decremental Price must be zero , Constraint Payment equals zero)	✓ as outlined above	(✓ - Zero) based on difference between MSQ and DQ multiplied by the Decremental Price (but as Decremental Price must be zero , Constraint Payment equals zero)	X

4.2.1.3 Uninstructed Imbalance Payments

An Uninstructed Imbalance Payment is made to (or by) a Participant in respect of a Generator Unit when its Actual Output differs from its Dispatch Quantity (i.e. when an Uninstructed Imbalance occurs). Tolerance bands exist for both positive and negative Uninstructed Imbalances. When the Uninstructed Imbalance is outside specified tolerance bands, the imbalance above (or below as applicable) the tolerance band is charged for/paid for at a premium/discount.

If a Generator Unit's actual generation is above its Dispatch Quantity:

- for over-generation up to and including the Tolerance Band for over-generation the Unit is paid, for each MWh, at the minimum of SMP and its Dispatch Offer Price (DOP).
- for any over-generation over and above the Tolerance Band for over-generation the Unit is paid, for each MWh, at the minimum of SMP or DOP, less the Discount for Over Generation.

If a Generator Unit's actual generation is below its Dispatch Quantity:

- for under-generation down to the Tolerance Band for under-generation the Unit has to pay back, for each MWh, at the maximum of SMP and DOP.
- for under-generation below the Tolerance Band for under-generation the Unit has to pay back, for each MWh, at the maximum of SMP or DOP, plus the Premium for Under Generation.

Table 7 highlights the eligibility of Generator Units belonging to the generic settlement classes to receive Uninstructed Imbalance Payments.

Table 7 – Uninstructed Imbalance Payment eligibility for generic settlement classes

	Predictable Price Maker	Predictable Price Taker	Variable Price Maker	Variable Price Taker	Autonomous
Eligible: Over/under generation payments = payments to/from generators)	✓ as outlined above	✓ as outlined above, but when Actual Output is greater than MSQ, DOP is set to equal SMP	✓ as outlined above only when dispatched to deliver reduced output	✓ as outlined above only when dispatched to deliver reduced output, but DOP is set to equal SMP	X

4.2.1.4 Make Whole Payments

A Make Whole Payment is made to a Participant in respect of a Generator Unit designed to make up any difference between the total Energy Payments to the Generator Unit in a Billing Period and the sum of the Schedule Production Cost for that Generator Unit for each Trading Period within the Billing Period (where the difference is arithmetically positive calculated over the Billing Period). Table 8 highlights the eligibility of Generator Units belonging to the generic settlement classes to receive Make Whole Payments.

Table 8 – Make Whole Payment eligibility for generic settlement classes

	Predictable Price Maker	Predictable Price Taker	Variable Price Maker	Variable Price Taker	Autonomous
Eligible	✓ as outlined above	X	✓ as outlined above	X	X

4.2.1.5 Capacity Payments

A Capacity Payment is made to a Participant in respect of a Generator Unit in each Capacity Period on the basis of the Unit's Eligible Availability, which is based on the Unit's Availability Profile. This methodology for determining Capacity Payments is set out in section 3.5. Table 9 highlights the eligibility of Generator Units belonging to the generic settlement classes to receive Capacity Payments.

Table 9 – Capacity Payment eligibility for generic settlement classes

	Predictable Price Maker	Predictable Price Taker	Variable Price Maker	Variable Price Taker	Autonomous
Eligible	✓ as outlined above	✓ as outlined above	✓ with Availability Profile set equal to Actual Output when instructed to run or the maximum of Actual Output and the time weighted average of Outturn Availability when constrained down	✓ with Availability Profile set equal to Actual Output when instructed to run or the maximum of Actual Output and the time weighted average of Outturn Availability when constrained down	✓ with Availability Profile set equal to Actual Output

4.2.1.6 Generator Charges

Participants face the following charges in respect of their Generator Units:

- Imperfections Charges when in position of net demand (discussed further below);
- Testing Charges for Generator Units which are Under Test; and
- Fixed Market Operator Charge (discussed further in Section 4.2.3).

4.2.2 Supplier Unit Charges

Supplier Unit Charges fall into the following broad classes:

- **Trading Charges:** charges required to be made in respect of a Supplier Unit during a Trading Period, comprising Energy Charges and Imperfections Charges; and
- **Capacity Charges:** charges to Participants in respect of their Supplier Units over a Capacity Period as outlined in Section 4.2.2.3.

4.2.2.1 Energy Charges

An Energy Charge is paid by a Participant for a Billing Period in respect of a Supplier Unit based upon the energy purchased by the Supplier Unit over the Billing Period calculated as the sum over the Billing Period of the product of Net Demand and the prevailing SMP in each Trading Period within the Billing Period.

4.2.2.2 Imperfections Charges

An Imperfections Charge is paid by a Participant in respect of a Supplier Unit on the basis of the Unit’s Net Demand in each Trading Period in a Billing Period multiplied by an Imperfections Price approved by the Regulatory Authorities. The Imperfections Charge is intended to recover (over the year as a whole) the payments in respect of Constraints,

Uninstructed Imbalances (less Testing Charges for Generator Units) over each Billing Period and any net differences between Energy Payments and Energy Charges.

4.2.2.3 Capacity Charges

A Capacity Charge is paid by a Participant in respect of a Supplier Unit in each Capacity Period on the basis of the Unit's Net Demand in each Trading Period in the Capacity Period. This methodology for determining Capacity Charges is set out in section 3.5.

4.2.2.4 MO Charges

The MO Charges faced by a Participant in respect of its Supplier Units are outlined in Section 4.2.3 below.

4.2.3 MO Charges

Market Operator Charges are levied on Participants in order to recover costs and expenses incurred by the MO. The Market Operator Charge shall comprise:

- a Fixed Market Operator Generator Charge applicable to all Participants in respect of their Generator Units;
- a Fixed Market Operator Supplier Charge applicable to all Participants in respect of their Supplier Units; and
- a Variable Market Operator applicable to all Participants in respect of their Supplier Units, which is calculated based on the Net Demand at Supplier Units multiplied by a Variable Market Operator Price approved by the Regulatory Authorities.

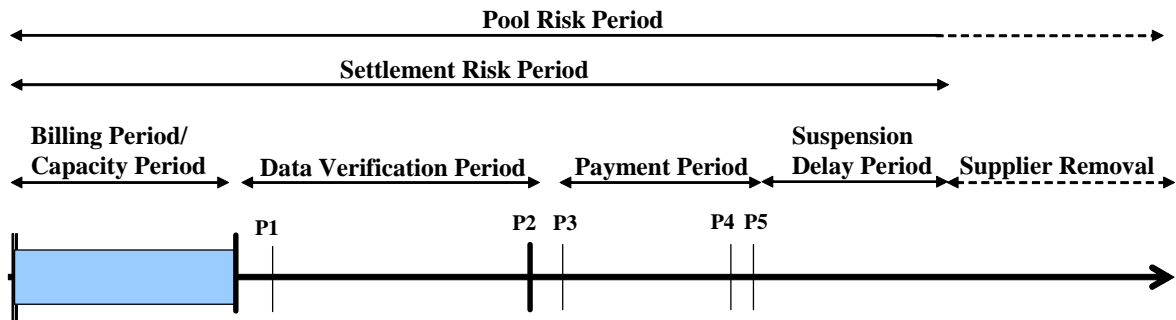
4.3 Settlement

Settlement refers to the financial settlement of the pool through the determination of relevant payments and charges.

Settlement of all Trading Payments and Trading Charges is conducted on a Billing Period basis which is defined as one Week commencing at 00:00 on Sunday. Settlement of all Capacity Payments and Capacity Charges is conducted on a Capacity Period basis which is defined as one Month commencing at 00:00 on the first day of the Month.

Figure 8 highlights the settlement timelines under SEM. This separates out the timelines for energy payments/charges which are settled on the basis of a Billing Period and for capacity payments/charges which are settled on the basis of a Capacity Period.

Figure 8 – Settlement timeline



Settlement Period	P1 – Ex-post Indicative Settlement Statements	P2 – Verification period finished	P3a – Initial Settlement statements sent	P3b – Invoice sent	P4 – Invoice due	P5 – Credit due
Billing Period (Weekly)	SD+1WD at 17:00	SD+4WD at 17:00	SD+5WD at 12:00	BP+5WD at 12:00	BP+8WD at 12:00	BP+9WD at 17:00
Capacity Period (Monthly)	CP+3WD at 17:00	CP+6WD at 17:00	CP+5WD at 12:00	CP+5WD at 12:00	CP+8WD at 12:00	CP+9WD at 17:00

Focusing on Billing Period cycle, the key points along the timeline are as follows:

- Following the Ex-Post Indicative Software Run at 16:00 D+1 an Ex-Post Indicative Settlement Statement for the relevant Settlement Day is issued to each Participant in respect of their Units at 17:00 D+1WD.
- The issuance of Ex-Post Indicative Settlement Statements triggers the start of the Data Verification Period, during which time a Participant may raise a Data Query relating to any data included on the relevant Ex-Post Indicative Settlement Statement. The MO will seek to resolve any Data Queries within 3WD and must resolve them within 10WD. The Data Verification Period for a Settlement Day closes at 17:00 D+4WD.
- An Initial Settlement Statement for the relevant Settlement Day is issued to each Participant in respect of their Units at 12:00 D+5WD.
- At 12:00 BP+5WD, Invoices are issued to Participants outlining all payments which are to be made by Participants in respect of their Units for all Settlement Days in the Billing Period. At the same time, Self Billing Invoices are issued to Participants outlining all payments which are to be made to Participants in respect of their Units for all Settlement Days in the Billing Period.
- At 12:00 BP+8WD, Participants are required to pay the full value specified in the Invoice.
- Any Participant is entitled to file a Settlement Query and/or a Settlement Dispute based on its Initial Settlement Statements and/or Invoices/Self Billing Invoices up until 5WD after the last timetabled Settlement Rerun. Such a Query or Dispute does not affect a Participant’s obligation to pay an Invoice in full and on time.

Similar steps apply to Capacity Payments/Charges in accordance with the timescales outlined in Figure 8.

There are two Timetabled Settlement Reruns for each Billing Period and for each Capacity Period. The first Timetabled Settlement Rerun occurs in the fourth month after the Billing Period (BP+4M)/Capacity Period (CP+4M) and the second Timetabled Settlement Rerun occurs in the 13th month after the Billing Period (BP+13M)/Capacity Period (CP+13M).

4.4 Credit Cover

Credit Cover is required under the TSC to protect creditors (normally Participants with Generator Units) from the effects of the financial failure of a debtor leading to Unsecured Bad Debt. The level of Credit Cover required of Participants under the TSC is a balance between protecting creditors on the one hand and avoiding raising barriers to entry to the market (particularly for suppliers) through requiring high levels of credit cover to be provided. The level of Required Credit Cover is determined in part by the value set by the Regulatory Authorities for the Supplier Suspension Delay Period. This is because the calculation of the Required Credit Cover for each Participant is based upon the following elements of actual and potential debt:

- Amounts invoiced but not paid: Amounts presently owed – basically, the SEM's receivables.
- Amounts calculated but not invoiced: Settlement amounts which have been calculated, but not yet included on an invoice. These may include Ex-Post Indicative Settlement Statement and Initial Settlement Statement amounts (depending upon the latest information available).
- Exposure incurred but not calculated: Exposures related to a period that has passed (and electricity has been consumed), but the Ex-Post Indicative Settlement Statement amount has not yet been determined (generally due to time lag in receiving metering data and/or determining price).
- Potential exposures during the time until the Participant cease to incur further liabilities. This period of time cannot be precisely determined, because the processes required to force a Participant's removal from the Market involve regulatory decisions which cannot be time limited. In addition, even if the time could be precisely determined, it is not possible to put a financial cap on the liabilities that could be incurred because of future uncertainty about prices. It is therefore not possible to protect Pool creditors fully from the risk of a failing debtor.
- Resettlement exposures: Additional exposures that may result from Resettlement of an already settled period.

Credit Cover is collateral required to be posted as a protection against a Participant's Credit Risk in the SEM. However, a guarantee cannot be achieved and the level of protection is determined by the value for the Supplier Suspension Delay Period (currently 14 calendar days) that is determined by the Regulatory Authorities. This is because the Undetermined Exposure Period calculated by the Market Operator ends at the end of the Supplier Suspension Delay Period. In the event of a payment default, this Credit Cover can be utilised by the MO to satisfy the Participant's outstanding financial obligations in the SEM. Because of the potential for Resettlement, a Participant's Required Credit Cover includes an element of Fixed Credit Cover (which applies to both Generator and Supplier Units) which is intended to cover the possibility of changes in payments after Resettlement leading to the possibility of further debt. A Participant withdrawing from the market will not receive a return of the Fixed Credit Cover in respect of each of its Units until the Resettlement period (currently 14 months) has passed since the Unit was Deregistered.

Credit Cover for use in the SEM must be posted in the form of either:

- Cash (in the designated Currency of the Participant) in a SEM Collateral Reserve Account; or
- Letter of Credit (LC) from a Bank that meets the Banking Eligibility Requirements and in the form set out in the TSC.

A Participant may meet its Credit Cover requirements by posting a combination of these types of Credit Cover. In the event of a Shortfall, being the failure of a Participant to pay an Invoice in full, Posted Credit Cover will need to be accessible in a timely manner such that the MO can meet all payment obligations of the SEM. For this reason, Letters of Credit are required to be capable of being drawn for “same day value”.

4.5 Settlement reallocation

The Settlement Reallocation process offers significant benefits to Participants, in terms of cash flow and credit risk management, allowing Participants to reduce Credit Cover requirements by offsetting debits and credits and also to reduce circular flows of money.

When two Participants have a Settlement Reallocation Agreement in place with the MO, one Participant (called Debited Participant) will effectively transfer an amount in respect of payments due to this Participant from the MO to another Participant (called Credited Participant) through their payments (Trading Payments or Capacity Payments). This amount shall also have an affect on the credit cover calculation of the two Participants.

4.6 Unsecured Bad Debt

Unsecured Bad Debt arises as a result of underpayment (or anticipated underpayment) in respect of any Invoice (with Unsecured Bad Capacity Debt relating to non-payment of Capacity Charges and Unsecured Bad Energy Debt relating to non-payment of Energy Charges). Unsecured Bad Debt is charged to all Participants (excluding that which has caused the Unsecured Bad Debt to arise).

4.7 Default, Suspension and Termination

A Participant will be in Default in the event it is in any material breach of the TSC or the Framework Agreement. A Participant can be deemed as a Defaulting Participant in the event it has not paid an Invoice by the Invoice Due Date and in respect of which a Credit Call has produced a sum which does not cover the Shortfall.

Suspension means the process whereby the Market Operator suspends a Participant from trading in the Pool in respect of some or all of its registered Units in accordance with a Suspension Order issued or the process whereby the Market Operator suspends an Interconnector from importing energy to the Pool and from exporting energy from the Pool. A Suspension Order means an order from the Market Operator to a Participant stating that its participation in respect of any or all of its Units will be suspended in accordance with the terms of the Suspension Order or an order from the Market Operator stating that an Interconnector will be suspended.

Termination means the termination of a person's status as a Party to the TSC. A Termination Order means an order from the Market Operator to a Party stating that the Party will be Terminated, and that all of its Units will be Deregistered.

4.8 Currency Costs

As the Participant's currency is Jurisdictional, the Market Operator will be faced with Currency Costs. These are the cost or benefit of converting the currency necessary to pay Participants given the funds received.

Currency Costs can arise in the context of Energy Payments and Capacity Payments based on the difference in currency rates between:

- Gate Closure and the actual payment of Invoices and Self Billing Invoices, in the case of Energy Payments/Charges; and
- the annual determination of capacity costs in respect of Capacity Payments and Capacity Charges and the actual payment of Invoices and Self Billing Invoices, in the case of Capacity Payments/Charges.

The costs/benefits associated with Currency Costs are distributed across Participants.

5. OPERATION OF THE MARKET – DAY IN THE LIFE

5.1 Introduction

On the basis of the market overview provided above, this section provides a day-in-the life description of the main operational timescales of the SEM from the perspective of a Participant as defined by the TSC. This focuses on key operational activities in the run up to the relevant Trading Day, on the relevant Trading Day and after the relevant Trading Day.

5.2 Before the Trading Day

5.2.1 Before D-1

- **From D-29:** Commercial Offer Data and Technical Offer Data for the relevant Trading day can be submitted from this point onwards by Participants in respect of their Generator Units.
- **10:00 D-2:** the MO must publish the Available Transfer Capacity (import and export) for each Interconnector.

5.2.2 D-1

- **08:00 D-1:** Daily Trading Day Exchange Rate published by MO.
- **10:00 D-1:** Commercial Offer Data and Technical Offer Data for the relevant Trading Day must be submitted by this point by Participants in respect of their Generator Units.
- **10:00 D-1:** the Interconnector Administrator provides Active Interconnector Unit Capacity Holdings Data to the MO.
- **11:00 D-1:** the MO carries out the Ex-Ante Indicative MSP Software Run.
- **11:00 D-1:** based on the output of the Ex-Ante Indicative MSP Software Run, the MO supplies Interconnector Unit Nominations to the Interconnector Administrator.
- **12:00 D-1:** the Interconnector Administrator provides Modified Interconnector Unit Nominations to the MO.
- **12:00 D-1:** the MO issues Modified Interconnector Unit Nominations individually to each Interconnector User.
- **12:00 D-1:** the MO issues Aggregated Modified Interconnector Unit Nominations to the SO.
- **13:00 D-1:** based on the output of the Ex-Ante Indicative MSP Software Run, the MO publishes indicative SMP values.
- **13:00 D-1:** based on the output of the Ex-Ante Indicative MSP Software Run, the MO issues Participant specific details of the Ex-Ante Indicative Market Schedule (i.e. MSQ values for Price Maker Generator Units) to each Participant.
- **13:00 D-1:** based on the output of the Ex-Ante Indicative MSP Software Run, the MO publishes an Ex-Ante Market Schedule Summary.
- **16:00 D-1:** Ex-Ante Indicative Operations Schedule produced by SO and published by MO.

5.3 During the Trading Day

Dispatch Instructions are issued by the SOs to Generator Units in real time.

5.4 After the Trading Day

5.4.1 D+1

- **16:00 D+1:** the MO carries out the Ex-Post Indicative MSP Software Run.
- **16:00 D+1:** Daily Ex-Post Indicative Market Schedule Summary published by MO.
- **17:00 D+1:** Ex-Post Indicative Market Schedule by Participant issued by MO.

5.4.2 D+4

- **16:00 D+4:** the MO carries out the Initial MSP Software Run.
- **16:00 D+4:** Daily Initial Market Schedule Summary published by MO.
- **17:00 D+4:** Initial Market Schedule by Participant issued by MO.

5.5 Settlement

The Settlement timescales are outlined in Section 4.3.