



Integrated Single Electricity Market (I-SEM)

Energy Trading Arrangements Detailed Design

Discussion Paper 1.1

SEM-14-092

10 October 2014

1 INTRODUCTION

1.1 THE ETA DETAILED DESIGN PHASE

- 1.1.1 The Energy Trading Arrangements (ETA) Detailed Design Phase is the first stage of Phase 3, the ‘Detailed Design and Implementation Phase’, of the I-SEM project. The objective of the ETA Detailed Design Phase is to develop a set of detailed energy trading market rules that are consistent with the High Level Design of the I-SEM. This set of market rules must be sufficiently detailed, consistent and clear so as to allow the TSOs to go to market to procure the necessary systems to run the I-SEM.
- 1.1.2 The I-SEM ETA Detailed Design Phase will be split into a number of distinct workstreams. These workstreams are linked but are distinct and important enough in and of themselves to require discussion at separate meetings. The splitting of the detailed design into separate workstreams should also allow for more efficient working arrangements within the project.
- 1.1.3 The focus is on areas that must be included in the system specifications that the TSOs will be bringing to market in order to procure the market systems for I-SEM. The workstreams explicitly exclude the Capacity Remuneration Mechanism (CRM), the Market Power Mitigation Strategy and any Liquidity Promoting Measures that are to be developed. These will form separate workstreams.

1.2 CONSULTATION AND DECISION PAPERS

- 1.2.1 The ultimate deliverables from this project phase will be three SEM Committee Decision Papers that collectively form a complete detailed design of the ETA for I-SEM. The two main Decision Papers will be on “Building Blocks” and “Markets”. The “Building Blocks” Decision Paper will contain decisions on policy issues such as treatment of losses and priority dispatch. The “Markets” Decision Paper will contain decisions on the detailed design of the Day Ahead, Intraday and Balancing Markets.
- 1.2.2 There will be earlier deliverables of two Consultation Papers which will be published for public consultation in order to seek stakeholder views on the key elements of the I-SEM Detailed Design.
- 1.2.3 There will also be two Consultation Papers and a Decision Paper on the Aggregator of Last Resort. The first Consultation Paper will consider the high level framework for the aggregator of last resort and the second consultation paper will consider its detailed operation. The Decision Paper will then include overall decisions on the aggregator.

- 1.2.4 The SEM Committee aims to publish the following Consultation and Decision Papers:

2 nd February 2015	“Building Blocks” Consultation Paper
4 th June 2015	“Building Blocks” Decision Paper
1 st April 2015	“Markets” Consultation Paper
7 th August 2015	“Markets” Decision Paper
1 st December 2014	“Aggregator of Last Resort Framework” Consultation Paper
1 st April 2015	“Aggregator of Last Resort Operation” Consultation Paper
7 th August 2015	“Aggregator of Last Resort” Decision Paper

1.3 DESCRIPTION OF WORKING ARRANGEMENTS

- 1.3.1 The Detailed Design Phase will be led by the Regulatory Authorities (RAs). An RA project team will be responsible for delivering the detailed market design, and will be supported by the I-SEM Project Team in the TSOs. The RA project team will also be assisted by consultancy support.
- 1.3.2 Given their important position as Transmission System Operators and Market Operator, EirGrid and SONI will be involved in supporting the RAs in this project phase. This support will include the presentation of material on specific subjects and the presentation of relevant topics at the Rules Liaison Group (RLG) meetings (discussed further below). The TSOs will cooperate with the RAs through governance arrangements and working arrangements for the I-SEM project.
- 1.3.3 The RAs will hold six working group meetings between October 2014 and February 2015. These working groups will be known as the Rules Liaison Group (RLG). The RLG will be made up of nominated members from participant groups, including the Interconnector Owners, and interested parties.
- 1.3.4 There will be three RLG meetings on topics relating to the “Building Blocks” consultation and three RLG meetings on topics relating to the “Markets” consultation.

The provisional dates for the Rules Liaison Group meetings are set out below.

	Date	Venue
“Building Blocks” Workshop 1.1	15/10/14	Dublin
“Building Blocks” Workshop 1.2	29/10/14	Belfast

“Building Blocks” Workshop 1.3	13/11/14	Dublin
“Markets” Workshop 2.1	21/01/15	Belfast
“Markets” Workshop 2.2	04/02/15	Dublin
“Markets” Workshop 2.3	18/02/15	Belfast

- 1.3.5 A separate Discussion Paper will be published in the week before each Workshop, outlining the topics to be covered by the RLG. After “Building Blocks” Workshop 1.3 and “Markets” Workshop 2.3, the RAs will call for the submission of views from the RLG members on the topics covered. These views will help inform the relevant Consultation Papers.
- 1.3.6 The Rules Liaison Group will be an advisory and information sharing body, made up of nominated members from participant groups and interested parties. The group will be chaired by the Regulatory Authorities.
- 1.3.7 Given the various different subjects that will be discussed at different meetings the RAs expect that participants may wish to send different staff members as their representatives to different meetings. However, representation at any one RLG meeting will be limited to one person per participant organisation.
- 1.3.8 The final RLG members will be representative of the various industry sectors and shall be used exclusively for the I-SEM ETA Detailed Design Rules Liaison Group (RLG).

1.4 OUTLINE OF THE TOPICS TO BE COVERED IN THE SIX “BUILDING BLOCKS” AND “MARKETS” WORKSHOPS

The topics to be covered in the six “Building Blocks” and “Markets” Workshops include, inter alia:

Workshop 1.1	Introduction of topics
	Treatment of Transmission Losses
	Treatment of Firm Access
Workshop 1.2	Constraints
	Curtailement
	Priority Dispatch
	De Minimis level
Workshop 1.3	Currency
	Participant Registration
	Clearing and Settlement
	Credit Risk Requirements
	Treatment of VAT

	Billing and Funds Transfer
	Shipping (Financial)
	Market Information
Workshop 2.1	Day Ahead Market and EUPHEMIA
	Units under Test
	Fallback Procedures
	Intraday Market
	Participant Nomination Process
Workshop 2.2	Shipping (Physical)
	Reaching a Feasible Dispatch
	Balancing Market
Workshop 2.3	Imbalance Settlement
	Metering
	Global Aggregation
	Instruction Profiling
	Tagging and Flagging
	Classes of Non-Energy Actions
	Local Market Power considerations
	Reserves

1.5 LIST OF TOPICS TO BE COVERED IN WORKSHOP 1.1

The next section outlines the topics to be covered in Workshop 1.1.

These topics are:

- Introduction of the topics to be covered in the six “Building Blocks” and “Markets” Workshops
- Treatment of Transmission System Losses
- Treatment of Firm Access

2 TOPICS TO BE COVERED IN WORKSHOP 1.1

2.1 INTRODUCTION OF THE TOPICS TO BE COVERED IN THE SIX WORKSHOPS

The six planned “Building Blocks” and “Markets” Discussion Papers and Workshops will be introduced at the start of Workshop 1.1.

The topics to be covered in each individual Workshop will be listed and briefly explained.

2.2 TREATMENT OF TRANSMISSION SYSTEM LOSSES

The treatment of transmission system losses will be considered in Workshop 1.1.

Description of the Issue

At a high level, transmission system losses refer to the difference between the amount of electricity injected into the transmission system and the amount of electricity taken off the transmission system.

Current Policy Implementation

The Final HLD Decision for the current SEM set out that loss adjustment factors would be calculated on a locational basis and would be applied to the outputs of each generator, with the loss adjustment factors being set ex-ante each year (Section 3.8 of AIP/SEM/42/05; June 2005).

The treatment of transmission losses in the SEM was confirmed most recently by the SEM Committee in June 2012 (SEM-12-049). The current methodology in SEM uses the same principles (TLAFs calculated on a locational basis) as those in the original high level design but includes a compression calculation which tightens the range of the loss factors.

In SEM all transmission losses are accounted for by generators and interconnector users through an adjustment to their Commercial Offer Data. The supplier TLAF is accordingly set to 1.

Differences between the ex-ante set TLAFs and actual transmission losses are recovered from all suppliers through global aggregation.

Questions for Detailed Design

The I-SEM HLD Decision has not explicitly signaled any changes to the current policy on losses and therefore the issues under consideration in general relate to how the policy works in I-SEM.

It would appear that there is an approach for the I-SEM which maintains the current high level policy on transmission losses.

- One approach would be that the traded volumes in the Day Ahead Market (DAM) and Intra Day Market (IDM) would be at the Trading Boundary and thus net of transmission losses. Market Participants would have to account for their losses in the price aspect of their offers to these markets.
- The physical nominations of Market Participants would be at the station gate and thus gross of Transmission losses. Market Participants themselves would be responsible for converting traded volumes to physical quantities. Units would have to produce the correct gross volume at the station gate to be in balance.
- The metered generation volumes of generators would then be adjusted by their individual Transmission Loss Adjustment Factor (TLAF) in imbalance settlement. As an example, under this approach, a generator with a TLAF of 0.98 which sells 98 MWh in the DAM would have to account for its own transmission losses in its offer price and would need to make a physical nomination of 100 MW to the TSO. In the Balancing Market if the output of this generator was increased by 1MW at the station gate for 1 hour it would receive payment for 0.98MWh.

The TLAFs for generators in SEM are currently calculated in the year previous to implementation. Day and Night TLAFs are calculated for each month. There is inevitably a difference in this ex-ante forecast of transmission losses and the actual outturn losses in real time. The cost of this difference is currently dispersed on all suppliers through global aggregation.

Interconnector Loss Factors

The detailed implementation of interconnector loss factors will need to be considered as part of the detailed design. The two interconnectors between I-SEM and GB (Moyle and EWIC) have different loss factors.

Loss factors on DC lines can be represented in the Day Ahead Market through EUPHEMIA. There are two potential methods for how this could be done:

- Represent one line between I-SEM and GB with a loss factor equal to the weighted average of the loss factors on Moyle and EWIC; or
- Represent the Moyle and EWIC lines separately with each having its own individual loss factor.

The implementation of the chosen methodology will also need to be considered in the context of the Intraday Market and the Balancing Market. The final design for the

treatment of interconnector losses in the EU Intraday Market is not yet finalised. The implementation in I-SEM will be informed by this.

Treatment of Transmission System Losses Worked Example

The following is a worked example to help illustrate some of the ideas in this section.

Unit Capacity is 450MW at the station gate.

Unit TLAF is 0.98.

The Day Ahead Market (One hour Trading Period)

The unit's price at the station gate is 50 €/MWh.

The unit:

- submits an offer of 441MWh to the Day Ahead Market (DAM) at 51.0204 €/MWh;
- is scheduled at 392MW in the DAM for hour X (comprising half hours X1 and X2);
- nominates a position of 400MW (at the station gate) to the TSO for hour X.

The Balancing Market (Half hour Trading Period)

The unit has no trades in the Intraday Market (IDM).

The unit has 50MW of unused capacity at the station gate to offer into the Balancing Market (BM) for half hours X1 and X2.

The unit

- submits an offer of 49MW to the BM with an offer price of 51.0204 €/MWh for half hours X1 and X2;
- is dispatched up by 20MW in the BM (at the trading point) in half hour X1;
- is dispatched up by 20.4082MW (at the station gate) by the TSO for half hour X1.
- is dispatched up by a further 10MW in the BM in half hour X2;
- is dispatched up by 10.2041MW (at the station gate) by the TSO for half hour X2.

Settlement

Assume that the unit sets the marginal clearing price in all markets.

In hour X the unit therefore receives:

- $(392\text{MW} * 51.0204 \text{ €/MWh} * 1 \text{ hour}) + (20\text{MW} * 51.0204 \text{ €/MWh} * 0.5 \text{ hour}) + (30\text{MW} * 51.0204 \text{ €/MWh} * 0.5 \text{ hour});$
- $€19999.996 + €510.204 + €765.306;$
- $€21275.51$

The unit's costs at the station gate are:

- $(400\text{MW} * 50 \text{ €/MWh} * 1 \text{ hour}) + (20.4082\text{MW} * 50 \text{ €/MWh} * 0.5 \text{ hour}) + (30.6123\text{MW} * 50 \text{ €/MWh} * 0.5 \text{ hour});$
- $€20000 + €510.205 + €765.3075;$
- $€21275.51$

2.3 TREATMENT OF FIRM ACCESS

The treatment of generators with non-firm access in the Day Ahead and Intra Day Markets will be considered in Workshop 1.1.

Description of the Issue

The SEM permits physical access to the transmission system at the date of shallow connection and prior to completion of deep reinforcements in certain circumstances. The provision of access to the transmission system at shallow connection is contingent on the transmission system being able to take the generation export. The capability of the system to do so will be subject to change and variation. There are a number of possible scenarios that may arise in this instance including:

- When the generation plant's associated deep reinforcements (as set out in its connection agreement) are completed the plant shall have firm physical access;
- Where deep reinforcements are not completed and the generator is permitted to connect on a non-firm basis at the shallow connection date and export subject to the transmission system being able to accommodate it. The generator will not be considered firm until the associated deep reinforcements are completed.

Current Policy Implementation

Generators with non-firm access in the current SEM which are dispatched by the TSO are then assigned availability in the ex-post pool equal to their actual dispatch level, allowing them to be scheduled up to this level in the ex-post market if they are in merit. This current treatment works in the context of an ex-post unconstrained pool.

Questions for Detailed Design

It is not clear that the implementation of the SEMC policy can be achieved in the same manner in the I-SEM as it is in SEM. The Day Ahead and Intra Day Markets in I-SEM are firm ex-ante markets so the current ex-post setting of availability will not be possible. It will need to be decided if generators with non-firm access are eligible to offer into these markets, and it needs to be decided how their availability will be calculated if they are eligible. It also needs to be decided how generators with non-firm access should offer into the Balancing Market and how their offers would be accepted.

There are a number of issues which will inform the considerations around the treatment of firm access. These considerations could include the following:

- The treatment of priority dispatch in the market;
- The level of information that is available ahead of time about whether or not the firm access constraint will bind.

The question of whether or not a unit with non-firm access has priority dispatch could be important. Priority dispatch will give those units which have it greater rights in dispatch than units without it. For example, wind generators with non-firm access have greater priority in dispatch than thermal plant with full firm access but without priority dispatch.

The below sets out potential methods for non-firm plant to participate in the I-SEM:

- Plant can participate in the Day Ahead Market (DAM) and Intraday Market (IDM) up to the level of its firm access. In such a scenario all non-firm running is achieved through the Balancing Market. Consideration would need to be given to whether this would apply to all non-firm plant or whether it should exclude priority dispatch units.
- Plant with non-firm access can trade in the DAM and IDM for its non-firm portion. If this was permitted then there are a number of potential methods for dealing with the times where the TSO cannot accommodate such plant above their firm access level in dispatch. These are:
 - The plant must trade itself out of its trades for any non-firm volume in the IDM if notified that it will not be dispatched above its firm access level by the TSO in time.
 - The plant must bid to buy back any non-firm volumes in the Balancing Market at the DA price, or some price related to its actual trades (including trades in the IDM).
 - The plant must buy back any non-firm volumes at the Imbalance price. Its own Decremental bid price would be ignored in the setting of the Imbalance price in this instance.

Treatment of Firm Access Worked Example

The following is a worked example to help illustrate some of the ideas in this section.

Unit capacity is 450MW at the station gate.

Unit has 300MW firm access and 150MW non-firm access.

Unit TLAF is 0.98.

The Day Ahead Market (One hour Trading Period)

The unit's price at the station gate is 50 €/MWh.

The unit:

- submits an offer of 441MWh to the Day Ahead Market (DAM) at 51.0204 €/MWh;
- is scheduled at 441MWh in the DAM for hour X (comprising half hours X1 and X2);
- nominates a position of 450MW (at the station gate) to the TSO for hour X.

The Balancing Market (Half hour Trading Period)

Assume:

The unit has no trades in the Intraday Market (IDM).

The unit submits a buy bid to the Balancing Market (BM) at a bid price of 51.0204 €/MWh for half hours X1 and X2.

The TSO cannot dispatch the unit above its firm access quantity of 300MW (at the station gate) in either X1 or X2. The TSO dispatches the unit to 300MW (at the station gate) in X1 and to 250MW in X2.

The BM clearing price in both X1 and X2 is 55 €/MWh.

Settlement

Assume the unit sets the marginal clearing price in the DAM.

In hour X the unit receives from its DAM trade:

- $441\text{MW} * 51.0204 \text{ €/MWh} * 1 \text{ hour}$;
- €22500.

In X1, the unit is 'cashed out' at the Imbalance price of 55 €/MWh for its non-firm portion of 147MW (150MW non-firm access quantity scaled by the TLAF of 0.98) in the BM. Note that its own buy bid of 51.0204 €/MWh is ignored both in generator payments and in the setting of the Imbalance price.

Thus in half hour X1 the generator pays back:

- $150\text{MW} * 0.98 * 55 \text{ €/MWh} * 0.5 \text{ hour}$;
- €4042.50.

In X2 the unit is 'cashed out' at the imbalance price of 55 €/MWh for its non-firm portion of 150MW (at the station gate) and constrained down a further 50MW of firm access quantity. Note that its own bid of 51.0204 €/MWh is ignored both in generator payments and in the setting of the Imbalance price for the non-firm quantity but that it is used, in the case of an energy balancing action, on the 50MW firm access quantity to set the Imbalance price or, in the case of a non-energy action, to determine generator payments but not the Imbalance price.

Thus, in X2, if the action is a non-energy balancing action, the generator pays back:

(a) in respect of the non-firm access quantity

- $150\text{MW} * 0.98 * 55 \text{ €/MWh} * 0.5 \text{ hour};$
- €4042.50

(b) In respect of the firm access quantity

- $50\text{MW} * 0.98 * 51.0204 \text{ €/MWh} * 0.5 \text{ hour};$
- €1250