



SEM Committee Paper

Trading and Settlement Code

Terms of Reference for the 2010 Market Audit

CONSULTATION PAPER

27 May 2010

SEM-10-033

Background

The Trading and Settlement Code (“TSC” or the “Code”), requires an audit of the Code, its operation and implementation, and the operations, trading arrangements, procedures and processes under the Code to be performed on an annual basis. The Code also requires The Regulatory Authorities (“RAs”) to consult with Parties on the terms of reference for the audit and to specify annually the precise terms of reference.

In 2007/08 and 2009 the Market Audit represented an audit of compliance by the Single Electricity Market Operator (“SEMO”) and, in so far as it related to the calculation of Modified Interconnector Unit Nominations (“MIUNs”), the Interconnector Administrator with their requirements under the Code. The scope excluded discrete components of the MSP Pricing Engine (unit commitment, economic dispatch and the calculation of Shadow Prices)¹ as it was considered that the benefits of performing audit work over these components were outweighed by the costs and disruption in the initial period of market operation. For the second Market Audit, the scope was marginally extended to include a review of the decision process and approvals for using the Mixed Integer Programming (MIP) solver instead of Lagrangian Relaxation (LR) in MSP. The scope also excluded activities undertaken by the System Operators (“SOs”), Meter Data Providers (“MDPs”) and other participants as set out in the Code and Agreed Procedures. The RAs took the view that the resulting opinion provided the Market with a report that was both comprehensive and of value to participants, given the constraints of what is practically feasible at a reasonable cost and without undermining the ongoing operation of the Market.

The pricing and settlement outputs in the SEM (energy and capacity volumes and payments) are reliant on the integrity and accuracy of source data provided by Meter Data Providers (“MDPs”) and System Operators (“SOs”). Errors in metered generation, dispatch instructions, metered and profiled demand may result in significant errors in settlement outputs which may not be apparent to SEMO or market participants, however the Market Audit Scope does not currently extend to activities of the MDPs and SOs for sourcing, processing and provision of settlement data and it should be noted that the TSC does not impose any obligations on SEMO to check the validity of source data. The TSC does however require such data to be provided by the MDPs and SOs to the standards set out in the Metering Code and Grid Code (as applicable).

When mentioned previously, it was envisaged that an extension to SOs and MDPs would represent a significant expansion of the audit scope and cost and, as such, the RAs were not in favour of it at the time. However, the SEM Committee considers that there could be merit in gradually expanding the remit of the market audit to include certain activities of other parties to the TSC involved in the calculation of data that affects price and schedules.

While the SEM Committee is minded to continue with a similar scope to previous years, set out below are suggestions around potential extensions that would involve the Market Auditor assessing compliance of the MDPs and SOs with their obligations under the Code or conducting a limited examination of the accuracy of source data provided by the MDPs and SOs.

¹ For the rationale for exclusion of these components and a detailed discussion of the auditability of the MSP Software during the initial period of operation, see Section 5.2 of (AIP/SEM/07/502)

Option 1 - Status Quo

An equivalent scope for 2010 would provide a similar level of assurance to the RAs and market participants and continue the process of assessing compliance of the market pricing and settlement activities carried out by SEMO (and the IA in relation to the production of MIUNs) under the aegis of the TSC². The audit work would continue to be undertaken primarily at SEMO, covering the activities and processing performed by SEMO. As in previous years, assurance could only be provided on SEMO's (and the IA's) compliance with its obligations under the Code, and not over the material accuracy of settlement which is dependent on data provided by the SOs, MDPs and individual participants.

Option 2 - Assessing compliance of MDPs/SOs with their obligations under the Code

The proper functioning of the single electricity market and settlement processes is dependent upon the MDPs and SOs fulfilling their obligations and discharging their responsibilities which are set out the Code and Agreed Procedures (see extracts in Appendix I). These relate, inter alia, to provision of standing data and settlement parameters, maintenance of site registration and technical details, provision of metered generation data, provision of metered and profiled demand data, provision of dispatch instructions and availability data, and provision of forecast data.

Errors in data submissions by MDPs and SOs may not be detected (or detectable) by SEMO (which has no obligation to detect and no defined route to resolve such issues), the RAs or individual participants but the resulting impact on schedules, energy and capacity could be significant. Given the important role performed by the MDPs and SOs, it may be desired for audit work to be performed over the activities they undertake in order to provide the RAs and Parties with an assessment of their compliance with applicable Code requirements.

This work would require the Market Auditor to undertake sufficient audit work at each of the MDPs and SOs to be able to assess their compliance with Code requirements and produce assurance opinions (or incorporate within an overall assurance opinion). Similar to the audit work already performed over SEMO, it would involve:

- Identifying all applicable Code requirements;
- Identifying and documenting how each MDP or SO seeks to fulfil the requirements, including business processes, IT systems, reporting and KPIs, highlighting the key controls being relied upon by the MDP or SO for the purposes of compliance;
- Assessing the design of key controls and evaluating their operating effectiveness. This may include testing of automated controls (e.g. system-performed validations), exception reporting and resolution, review and approval processes, and security and integrity of relevant data;
- Testing individual items from each significant process (e.g. maintain generator technical details, retrieve meter data, collate dispatch instructions) on a limited sample basis to assess their compliance; and
- Evaluating the results of testing to consider whether the relevant audited entity has complied, in all material respects, with its obligations under the Code.

² For the 2009 Market Audit Terms of Reference see SEM-09-078

This additional work would require to be performed at two SOs and four MDPs, neither of which has yet been subject to any Market Audit procedures and over which we have limited information regarding processes, systems and current levels of compliance.

The resource requirements for undertaking the work would be firmed up during initial planning activities, but indicative estimates would be for 12 to 15 man weeks of audit work which would equate to approximately a 50 - 66% increase in the current market audit fee³. This assumes that each organisation has adequately documented its processes and key controls for measuring and reporting compliance with applicable Code requirements, and has instructed internal audit or similar work in these areas which meets the Market Auditor's requirements as to timeliness, coverage, competence, objectivity and reliability.

Option 3 - limited examination of activities of MDPs/SOs in respect of provision of key data feeds

In view of the important of certain processes performed and data feeds provided by SOs and MDPs, one option for the 2010 Market Audit would be for the Market Auditor to examine the main processes involved in the provision of all metered generation and related inputs into the settlement system. Given the limited means in the TSC of addressing errors in input data, the Market Audit could provide an additional mechanism of giving insight to the market on the quality of data that is supplied into the settlements process. It is recognised that some data types may be prioritised over others for inclusion within the audit activities and the Market Audit could focus in greater detail on any specific areas of weakness identified in future years, essentially narrowing and deepening its focus. It may be desirable to concentrate on price-affecting generator units only given their importance for the determination of the market schedule and calculation of the shadow price. Accordingly, the focus of the audit would be on dispatch instructions and metered generation for price-affecting generator units.

This extension to the audit testing would involve a limited examination of certain activities of the MDPs and SOs, potentially including assessment of the relevant findings of the internal audits performed by those organisations, supplemented by certain defined audit procedures. Such procedures would be expected to focus on the key controls and process for producing the relevant data rather than direct testing of detailed data items themselves. Potential matters which would be reviewed include:

- Maintenance of registration data and technical details – to assess whether controls and processes are in place to procure accurate data sets, e.g. register mappings, pulse multipliers
- Retrieval, processing and validation of reads data and calculation of meter advances to assess whether a robust process exists for the production of reliable metered generation data in accordance with the standards set out the Grid Code or Metering Code (as applicable)
- Application of estimation processes – to consider whether the estimation and substitution requirements contained within the Grid Code or Metering Code (as applicable) are applied
- Recording, processing and submission of dispatch instructions – to assess the key controls operated by the SOs over the compilation of dispatch instructions; and

³ The Market Audit fee is in accordance with the Market Audit allowance which may increase in proportion to the Market Audit fee as determined by the annual Market Audit scope. For the current Market Audit allowance see SEMO Revenue and Tariffs 2009-2010 Decision Paper – SEM/09/089: http://www.allislandproject.org/en/smo_decision_documents.aspx?article=7ebdf3d7-319e-4930-b2b4-d4a9ff4ddb89

- Handling and resolution of queries and disputes – to assess the level of issues and ascertain that resolution actions are being taken.

This proposed extension is consistent with the obligations on MDPs and SOs under the Code which requires compliance by MDPs and SOs with requirements contained in the Grid Code and Metering Code as applicable (e.g. 3.72 Each Meter Data Provider shall submit to the Market Operator the Data Transactions defined in Appendix L “Meter Data Transactions” in accordance with the timelines provided for in Agreed Procedure 16 “Provision of Metered Data” to the standards specified in the Metering Code or Grid Code as applicable). Furthermore, restricting to certain processes is consistent with the approach adopted for the IA where only the calculation of MIUNs is included.

For the avoidance of doubt, this is not an audit of the MDPs or SOs under the Metering Code or Grid Code (as applicable), but the performance of defined test procedures over their processes for the production of input data for settlements which is required under the TSC to standards set out in the Codes referred to.

To enable the audit work to be properly focused, it would be undertaken on an Agreed Upon Procedures (“AuP”) basis under International Standard for Related Services (ISRS) 4400 issued by the International Auditing and Assurance Standards Board (IAASB). This approach involves agreeing a detailed work programme with the RAs, executing the specific procedures, and reporting the factual findings to the RAs (although there would be similar reporting of significant/other issues, it would not contain an audit opinion). The AuP approach can provide flexibility, allowing the RAs to specify the nature and volume of testing, and enabling procedures to be focused on key areas of risk or concern.

An AuP engagement involves the following steps:

- Identify the key requirements under the Code, Agreed Procedures and any other applicable rules to be tested. This enables testing to be concentrated on those areas which impact on the data being provided into the settlement process.
- Define and agree test procedures, setting out the detailed testing steps and test volumes, to address the key requirements. These represent the AuP
- Execute the AuP at each of the applicable SOs and MDPs, recording the factual results of testing
- Report the factual findings arising from the AuP to the RAs and Parties. As is normal practice for this type of engagement, it would not lead to an audit or assurance opinion. To avoid any confusion with the compliance audit opinion covering SEMO (and the IA in respect of MIUNs), the AuP results will be reported separately within the Market Audit report.

Example

Code Requirement	SO/MDP process	Test procedure
3.71 Each Meter Data Provider shall provide such meter registration identification, estimation, substitution, aggregation, communication and storage services as are provided for in the Metering Code or Grid	· · Meter data retrieval software set to flag retrieval failures, warning or alarm messages.	· · Obtain understanding of relevant SO/MDP process and ascertain that key controls described therein

Code (as applicable) for the installed meters of categories of electricity generating units and electricity consuming units identified under Appendix L "Meter Data Transactions".	Validation is performed of retrieved data to confirm within tolerances or expected levels. Warnings, alarms, validation failures and other exceptions are investigated and resolved.	have been implemented. Select sample of 15 validation failures and 15 warning messages reported during September 2010. Ascertain each was reviewed by management and appropriate resolution action taken.
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An estimate of cost of this additional audit work would be in the region of a 12.5 - 25% in the first year, depending on the nature and volume of the specific Agreed Upon Procedures. As noted above, there can be flexibility in the design of the Agreed Upon Procedures to suit the desired budget and reporting level. It assumes that each organisation has undertaken internal audit or similar assurance work which provides meets the Market Auditor's requirements as to timeliness, coverage, competence, objectivity and reliability. It is also estimated there may be costs of approximately €5 - €10k in the first year which would represent one-off planning and set up for the change in scope.

Summary

Set out above are three potential options for the scope of the SEM 2010 Market Audit:

- Option 1 – continuing with Status Quo
- Option 2 - assessing compliance of MDPs/SOs with their obligations under the Code to provide assurance opinion
- Option 3 - limited examination of activities of MDPs/SOs in respect of provision of key data feeds on an Agreed Upon Procedures basis

The evaluation of these options needs to consider the benefits attainable (by way of assurance and insights) against the costs of delivering the work. The following table provides an outline summary of benefits and indicative costs:

	Option 1	Option 2	Option 3
Benefits	Status Quo – continued audit of SEMO's (and some IA roles) compliance with Code	Assurance over SO and MDP compliance with their obligations under the Code	Assessment of provision of key inputs to settlements process
Costs	Status Quo	Increase of 50–66% of current market audit fee*	Increase of 12.5 – 25% of current market audit fee*

*excludes relatively minor one-off planning/set-up costs

Consultation and Next Steps

In presenting this paper for consultation, the SEM Committee seeks views on the merits of the above proposed extensions to the Market Audit for 2010.

Responses to this consultation are requested by the close of business on **18 June 2010** and should be in writing and submitted, preferably via email, to

Philip Newsome

Commission for Energy Regulation
The Exchange
Belgard Square North
Tallaght,
Dublin 24.

E-mail: pnewsome@cer.ie

and

Jean Pierre Miura

Northern Ireland Authority for Utility Regulation,
Queens House
14 Queens Street
BELFAST
BT1 6ER

E-mail: JeanPierre.Miura@uregni.gov.uk

The RAs intend and prefer to publish all comments received, but are prepared to facilitate those respondents who wish for certain sections of their submission to remain confidential. Accordingly, respondents that so wish should submit these sections in an appendix that is clearly marked "confidential".

Further to their consideration of the comments received, the RAs will publish their decision on the terms of reference for the SEM Market Audit for the period January to December 2010.

Appendix I- Code requirements for Meter Data Providers and System Operators

- 2.45A If the Unit to be registered is a Generator Unit, the Meter Data Provider shall undertake Meter Data validation for that Generator Unit in accordance with the relevant Metering Code, and shall notify the Market Operator of
1. the Meter Data Export Date; and
 2. the Meter Validation Date.
- 2.57 On the registration of any new Generator Unit (other than a Demand Side Unit), the relevant System Operator shall provide to the Market Operator, in accordance with Appendix K “Market Data Transactions” and subject to the prior approval of the Regulatory Authorities, a set of Transmission Loss Adjustment Factors for that Generator Unit for each Trading Period from the start of the Effective Date to the end of the Year.
- 2.57A On the registration of any new Generator Unit (other than a Demand Side Unit) that is Distribution Connected, the relevant Distribution System Operator shall provide the relevant System Operator with a set of Distribution Loss Adjustment Factors for that Generator Unit for each Trading Period from the start of the Effective Date to the end of the Year.
- 2.57B On the registration of any new Generator Unit (other than a Demand Side Unit) that is Distribution Connected, the relevant System Operator shall provide the Market Operator with a set of Distribution Loss Adjustment Factors for that Generator Unit for each Trading Period from the start of the Effective Date to the end of the Year.
- 2.57C For each Generator Unit (other than a Demand Side Unit) that is Transmission Connected, the Distribution Loss Adjustment Factor used in the calculation of the Combined Loss Adjustment Factor for each Trading Period shall be set to 1 by the relevant System Operator.
- 2.57D For each Generator Unit (other than a Demand Side Unit) that is Distribution Connected, the relevant System Operator shall set the Distribution Loss Adjustment Factor, used in the calculation of the Combined Loss Adjustment Factor equal to 1 for all Trading Periods where the Distribution System Operator provides the Metered Generation data.
- 2.57E For each Generator Unit (other than a Demand Side Unit) that is Distribution Connected, the relevant System Operator shall set the Distribution Loss Adjustment Factor used in the calculation of the Combined Loss Adjustment Factor equal to the corresponding value provided by the Distribution System Operator, for all Trading Periods where the System Operator, in its role as Meter Data Provider, provides the Metered Generation data.
- 2.57F On the registration of any new Distribution Connected Generator Unit (other than a Demand Side Unit), the relevant System Operator shall provide the Market Operator with a set of Combined Loss Adjustment Factors for that Generator Unit for each Trading Period from the start of the Effective Date to the end of the Year.
- 2.57G In the event of a change in the classification of a Generator Unit that is Distribution Connected, the relevant System Operator shall recalculate and provide the Market Operator with a revised set of Combined Loss Adjustment Factors for that Generator Unit for each Trading Period from the date at which the new Classification becomes effective to the end of the Year.
- 2.83 Where the Interconnector Administrator is, in relation to the Interconnector, Suspended or Terminated under the Code or otherwise ceases to participate in respect of the Interconnector and the Interconnector Administrator is not the

System Operator for the Jurisdiction in which the Interconnector is connected, then the System Operator for the Jurisdiction in which the relevant Interconnector is connected shall temporarily assume the responsibilities of the Interconnector Administrator under the Code for a maximum of 2 months from the date of such Suspension, Termination or cessation (“the Interconnector Administrator Grace Period”) or such longer period agreed by the System Operator and the previous Interconnector Administrator shall co-operate with the System Operator’s requirements in this regard.

- 2.86 For each Interconnector, the System Operator for the Jurisdiction in which the Interconnector is connected shall register the Interconnector Residual Capacity Unit in accordance with the procedure for registration of Units set out in paragraphs 2.30 to 2.52, subject to paragraph 2.87 and 2.88.
- 2.95 Where the Participant in respect of an Interconnector Error Unit is Suspended or Deregistered (in relation to the Interconnector Error Unit) or Terminated under the Code or otherwise ceases to participate in respect of the Interconnector Error Unit and the Participant in respect of the Interconnector Error Unit is not the System Operator for the Jurisdiction in which the relevant Interconnector is located, then the System Operator for the Currency Zone in which that Unit is registered shall temporarily assume the responsibilities of the Participant in respect of the Interconnector Error Unit for a maximum of 2 months from the date of such Suspension, Deregistration, Termination or cessation (the “Interconnector Error Unit Grace Period”) and the previous Participant in respect of the Interconnector Error Unit shall co-operate with the System Operator’s requirements in this regard.
- 2.267 The Market Operator, the System Operators, the Transmission Asset Owners, the Distribution System Operators, the System Operators and the Meter Data Providers shall not be permitted to terminate their being a party to the Code except where so required by the Regulatory Authorities.
- 3.30 Subject to paragraphs 3.52 to 3.70 (concerning communication failures and system failures), the Sending Party shall send a CMS Data Transaction using either the Type 2 Channel or Type 3 Channel, and all System Operators, Meter Data Providers and Interconnector Administrators shall use Type 3 Channels.
- 3.33 If the Sending Party does not receive a Confirmation Notice within the relevant timescale set out in Agreed Procedure 4 “Transaction Submission and Validation”, then: (1) for CMS Data Transactions in Appendix I “Offer Data”, the Sending Party may, but shall not be obliged to, contact the Market Operator by calling the Market Operator helpdesk as described subject to Agreed Procedure 7 “Emergency Communications”; or (2) for CMS Data Transactions in Appendix J “Market Operator and System Operator Data Transactions” or Appendix L “Meter Data Transactions”, the Sending Party must contact the Market Operator by calling the Market Operator helpdesk as described in Agreed Procedure 7 “Emergency Communications”, in order to establish whether or not its CMS Data Transaction has been received.
- 3.38 If a Meter Data Provider or a System Operator does not receive confirmation of the receipt of a Data Transaction within the timeline provided for pursuant to Agreed Procedure 4 “Transaction Submission and Validation” then it must contact the Market Operator by calling the Market Operator helpdesk as described in Agreed Procedure 7 “Emergency Communications”.
- 3.50 In the event that a circumstance of the type set out in paragraph 3.47.1 arises due to a communications failure or any error affecting the System Operator, Interconnector Administrator, or Meter Data Provider outside of the Market Operator’s Isolated Market System, the System Operator, Interconnector

Administrator or Meter Data Provider will comply with Agreed Procedure 7 “Emergency Communications” to submit the required Data Transaction to the Market Operator within one day of the specified submission deadline in the Code.

- 3.71 Each Meter Data Provider shall provide such meter registration identification, estimation, substitution, aggregation, communication and storage services as are provided for in the Metering Code or Grid Code (as applicable) for the installed meters of categories of electricity generating units and electricity consuming units identified under Appendix L “Meter Data Transactions”.
- 3.72 Each Meter Data Provider shall submit to the Market Operator the Data Transactions defined in Appendix L “Meter Data Transactions” in accordance with the timelines provided for in Agreed Procedure 16 “Provision of Metered Data” to the standards specified in the Metering Code or Grid Code as applicable.
- 3.73 A Party (or Applicant as applicable) who applies to register a Generator Unit requesting, or whose Generator Unit is registered with, a Unit classification other than Autonomous Generator Unit must have appropriate equipment installed at the relevant Generator to permit real-time monitoring of the Output of that Generator.
- 3.74 Each Party that registers a Generator Unit must have Interval Metering installed by the Meter Data Provider responsible for installing, commissioning and maintaining such meters at the Generator to meter Active Power Generation. Such Interval Metering shall be to a standard sufficient to allow polling of that Meter by the responsible Meter Data Provider for provision of data to the Market Operator as identified under Appendix L “Meter Data Transactions”.
- 3.75 All Active Power Demand aggregated by a Meter Data Provider into Trading Site Supplier Unit or an Associated Supplier Unit for a Trading Site that contains a Generator Unit with Non-Firm Access must have Interval Metering installed by the Meter Data Provider responsible for installing, commissioning and maintaining such meters. Such Interval Metering shall be to a standard sufficient to allow polling of that Meter by the responsible Meter Data Provider for provision of data to the Market Operator as identified under Appendix L “Meter Data Transactions”.
- 3.77 During the registration process described in Agreed Procedure 1 “Participant and Unit Registration and Deregistration”, the Meter Data Provider or the System Operator as appropriate, shall inform the Market Operator if a Unit does not fulfil its metering or operational requirements for the Unit classification requested by the relevant Party.
- 3.78 If a Party does not have adequate metering installed in respect of any of its Units under paragraph 3.74 or 3.75 or appropriate equipment to permit real-time monitoring of Generator Unit availability by the System Operator under paragraph 3.73 to facilitate Settlement under the rules of the Code without further netting, aggregation or estimation rules, the Meter Data Provider shall determine, subject to accuracy, practicality and cost, in consultation with the affected Party, and subject to the prior written approval of the Regulatory Authorities, the appropriate bespoke netting, aggregation, or estimation rules to allow for Settlement of that Unit under the Code.
- 3.79 Where such netting, aggregation and estimation rules as provided for under paragraph 3.78 are determined by the Regulatory Authorities to be inaccurate or impractical following any information and advice provided by the Meter Data Provider, the Regulatory Authorities may require the Participant (or Applicant, as applicable) to adjust the form of registration of that Generator Unit or Trading Site until the appropriate metering equipment or equipment to permit real-time monitoring of Generator Unit availability under paragraph 3.73 is installed in

accordance with such timeframes as are provided for in the Metering Code or Grid Code as applicable.

- 3.80 The Meter Data Providers, System Operators and Interconnector Administrators shall facilitate the timely resolution of any relevant Data Query, Settlement Query, or Dispute raised under the Code, so that data shall comply with standards specified in the relevant Metering Code or Grid Code as applicable.
- 3.81 Parties that have registered Units must facilitate Meter Data Providers in fulfilling such obligations regarding the installation, commissioning, calibration, maintenance, testing, inspection, security, repair, reading of and access to meter equipment as are provided for in the relevant Metering Code or Grid Code as applicable.
- 3.82 Meter Data Providers are required to submit to the Market Operator, the Data Transactions as described in Agreed Procedure 1 “Participant and Unit Registration and Deregistration”.
- 4.31 Each System Operator shall submit to the Market Operator the following forecast values pertaining to its Jurisdiction in accordance with Appendix K “Market Data Transactions”:
1. Annual Load Forecast;
 2. Monthly Load Forecast;
 3. Four Day Load Forecast; and
 4. Wind Power Unit Forecast.
- 4.33 Each System Operator, each Meter Data Provider and each Participant shall provide all values expressed in MW, MW/min or MWh that are used in the MSP Software or in Settlement or referred to in Sections 4, 5 or 6 of the Code, net of Unit Load.
- 4.34 The Net Output Function is a linear transformation that shall be used by each System Operator to convert values relating to Gross Output to values that are net of Unit Load.
- 4.36 Each System Operator shall ensure that, with the exception of Pumped Storage Units, Interconnector Units, Interconnector Residual Capacity Units, Netting Generator Units and Interconnector Error Units, the results of applying the Net Output Function shall be positive (including zero) and shall be set to zero if negative.
- 4.38 The relevant System Operator shall convert the following values using the Net Output Function to represent values net of Unit Load:
1. Outturn Availability;
 2. Outturn Minimum Output;
 3. Outturn Minimum Stable Generation; and
 4. Dispatch Instructions.
- 4.40 In submitting data relating to any Generator Unit (other than a Demand Side Unit) that is Distribution Connected and for which the Distribution System Operator provides the Metered Generation data, the Distribution System Operator shall provide that all Meter Data values shall first have been scaled by the appropriate Distribution Loss Adjustment Factor.
- 4.41 At least four months before the start of each Year, each System Operator shall submit to the Regulatory Authorities a set of Transmission Loss Adjustment Factors for each Generator Unit (other than Demand Side Units and Interconnector Units) that is Connected within its Jurisdiction and each

Interconnector linked to that Jurisdiction, calculated in co-operation with the System Operator in the other Jurisdiction and in accordance with the statutory and Licence requirements pertaining within its Jurisdiction, for each Trading Period in the Year. Such Interconnector loss factors shall be applicable to each Interconnector Unit, Interconnector Error Unit and Reserve Capacity Unit registered to the relevant Interconnector.

- 4.41A The Transmission Loss Adjustment Factors for an Interconnector shall incorporate Transmission Losses incurred on the relevant Interconnector as estimated by the System Operator in consultation with the Interconnector Owner. The System Operator shall incorporate the estimated Transmission Losses incurred on the Interconnector into the Transmission Loss Adjustment Factors having regard to its expectation of the pre-dominant direction of flow on the Interconnector in the relevant Trading Period.
- 4.41B At least ten weeks before the start of each Year, each Distribution System Operator shall provide the relevant System Operator with a set of Distribution Loss Adjustment Factors for each Generator Unit that is Distribution Connected within its Jurisdiction, calculated in accordance with the statutory and Licence requirements pertaining within its Jurisdiction, for each Trading Period in the Year, and including the relevant supporting information to enable the System Operator to calculate the corresponding Combined Loss Adjustment Factors.
- 4.42 At least two months before the start of each Year each System Operator shall provide to the Market Operator in accordance with Appendix K "Market Data Transactions" the System Parameters Data Transaction which shall comprise a complete set of Combined Loss Adjustment Factors for each Generator Unit (other than Demand Side Units and Interconnector Units) Connected within its Jurisdiction, and each Interconnector linked to that Jurisdiction, for each Trading Period in that Year.
- 4.42A At least two months before the start of each Year each System Operator shall provide the Market Operator with a complete set of Transmission Loss Adjustment Factors for each Generator Unit (other than Demand Side Units) that is Connected within its Jurisdiction for each Trading Period in that Year in accordance with those prepared and submitted to the Regulatory Authorities under paragraph 4.41.
- 4.42B At least two months before the start of each Year each System Operator shall provide the Market Operator with a complete set of Distribution Loss Adjustment Factors for each Generator Unit (other than Demand Side Units) that is Distribution Connected within its Jurisdiction for each Trading Period in that Year.
- 4.44A The Combined Loss Adjustment Factor CLAF_{uh} for each Generator Unit *u* in Trading Period *h* shall be calculated by the relevant System Operator as follows:
$$CLAF_{uh} = \text{round}(TLAF_{uh} \times DLAF_{uh})$$

Where round(*x*) is a function that rounds *x* to 3 decimal places.
- 4.48 Each System Operator shall submit to the Market Operator the Generator Unit Technical Characteristics, consisting of Outturn Minimum Stable Generation, Outturn Availability and Outturn Minimum Output, in respect of each Generator Unit, which is Dispatchable, registered within its Currency Zone, for the previous Trading Day, in accordance with Appendix K "Market Data Transactions".
- 4.54 The values of Eligible Availability (EA_{uh}) for use within the determination of Capacity Payments will be taken from the values of Availability Profile (AP_{uh}), which are calculated by the Market Operator from Availability data submitted by the relevant System Operator. The Market Operator shall calculate the values of Availability Profile (AP_{uh}) in relation to the Availability of the Generator Unit without consideration of access limitations. The Market Operator shall calculate

the Eligible Availability (EA_{uh}) for each Generator Unit *u* in Trading Period *h* as follows:

$$EA_{uh} = AP_{uh}$$

Where

AP_{uh} is the Availability Profile for Generator Unit *u* in Trading Period *h*.

- 4.55 Each System Operator shall submit to the Market Operator the Dispatch Instructions in respect of each Generator Unit which is Dispatchable and is registered within its Currency Zone, and may submit an associated Ramp Rate for each Dispatch Instruction. Each System Operator shall submit this information to the Market Operator in accordance with Appendix K “Market Data Transactions”, based on Outturn Data, and the values submitted shall be net of Unit Load.
- 4.57 The relevant System Operator may issue a Maximisation Instruction to maximise the Output of a Generator Unit under the terms of the Grid Code. Where a System Operator issues a Maximisation Instruction in respect of a Generator Unit, that Generator Unit will be treated as subject to Maximisation in the relevant Trading Period or Trading Periods as set out within Appendix O “Instruction Profiling Calculations”. The values for Outturn Availability which are submitted to the Market Operator by the System Operator or the values of Availability Profile (AP_{uh}) which are calculated by the Market Operator for that Generator Unit *u* for those Trading Periods *h* will not be revised upwards to reflect the Short-Term Maximisation Capability (STMCut) for Generator Unit *u* within Trading Day *t*.
- 4.101 The System Operator shall calculate prior to the start of each Capacity Period the Loss of Load Probability (A_h) in each Trading Period *h* of that Capacity Period. The calculation methodology is set out in Appendix M “Description of the Function for the Determination of Capacity Payments”.
- 4.142 The System Operators shall make a report to the Regulatory Authorities at least four months before the start of the Year, proposing values for the following parameters to be used in the calculation of Uninstructed Imbalances for that Year:
1. the Engineering Tolerance (ENGTOL) (where $0 \leq \text{ENGTOL} \leq 1$);
 2. the MW Tolerance (MWTOL_t) (where $0 \leq \text{MWTOL}_t$) for each Trading Day *t*;
 3. the System per Unit Regulation parameter (UREG);
 4. the Discount for Over Generation (DOG_{uh}) for each Generator Unit *u* in each Trading Period *h*, such that $0 \leq \text{DOG}_{uh} \leq 1$; and
 5. the Premium for Under Generation (PUG_{uh}) for each Generator Unit *u* in each Trading Period *h* such that $0 \leq \text{PUG}_{uh} \leq 1$.
- 4.143 The System Operators’ report must set out any relevant research or analysis carried out by the System Operators and any justification for the specific values proposed. Such a report may, and shall if so requested by the Regulatory Authorities, include alternative values from those proposed and must set out the arguments for and against such alternatives.
- 4.144 The System Operators shall, in accordance with Appendix K “Market Data Transactions”, provide to the Market Operator at least two months prior to the start of each Year or within 5 Working Days of approval by the Regulatory Authorities, whichever is the later, the Uninstructed Imbalance Parameters Data Transaction, which comprises a complete set of Uninstructed Imbalance Parameters that have been approved by the Regulatory Authorities for that Year.

- 4.146 For each Trading Day, the System Characteristics Data, consisting of values of Nominal System Frequency (NORFRQh) and Average System Frequency (AVGFRQh) for each Trading Period h in that Trading Day, shall be submitted to the Market Operator by the System Operators, in accordance with Appendix K “Market Data Transactions”.
- 5.68 Subject to commercial agreement, the relevant System Operator which is the Participant in respect of an Interconnector Residual Capacity Unit shall be entitled under the terms of the Code to make SO Interconnector Trades across the relevant Interconnector in either direction, using any available Interconnector capacity which is not allocated to Interconnector Users under the aggregate of the prevailing Modified Interconnector Unit Nominations.
- 5.69 Any SO Interconnector Trades that are conducted by the System Operator must be conducted after Gate Closure and after receipt by the relevant System Operator of the Aggregate Modified Interconnector Unit Nomination Data Transaction.
- 5.70 For each Interconnector *l* on each Trading Day, the relevant System Operator shall submit, as part of the Dispatch Instruction and SO Interconnector Trades Data Transaction in accordance with Appendix K “Market Data Transactions”, data for each Trading Period h in the Optimisation Time Horizon relating to that Trading Day to the Market Operator no later than 14:00 on the day on which the Trading Day ends as follows:
1. SO Interconnector Import Price (SIIP_{lh}) which is the volume-weighted average price for each Trading Period for SO Interconnector Trades which are for import to the Pool (or zero if there are no such trades);
 2. SO Interconnector Export Price (SIEP_{lh}) which is the volume-weighted average price for each Trading Period for SO Interconnector Trades which are for export from the Pool (or zero if there are no such trades);
 3. SO Interconnector Import Quantity (SIIQ_{lh}) which is the time-weighted average quantity for each Trading Period (expressed as a positive number in MW) of SO Interconnector Trades which are for import to the Pool (or zero if there are no such trades); and
 4. SO Interconnector Export Quantity (SIEQ_{lh}) which is the time-weighted average quantity for each Trading Period (expressed as a negative number in MW) of SO Interconnector Trades which are for export from the Pool (or zero if there are no such trades).
- 5.97 In accordance with the relevant Grid Code, a System Operator may accept a revised declaration of the Energy Limit of an Energy Limited Generator Unit from the plant operator for operational purposes. In this event, the relevant System Operator shall submit Energy Limited Generator Unit Technical Characteristics, consisting of the revised Energy Limit for each Energy Limited Generator Unit on each Trading Day to the Market Operator in accordance with Appendix K “Market Data Transactions”, and this will replace the Energy Limit submitted by the Participant as part of its Technical Offer Data.
- 5.168 The relevant System Operator may grant Generator Units the status of Under Test for a limited period under the terms of the relevant Grid Code.
- 5.175 The relevant System Operator shall make a report to the Regulatory Authorities proposing values for the Testing Tariffs at least four months before the start of the Year to which they shall apply. The System Operator's report must set out the justification for the specific values proposed. Such a report may, and shall if so requested by the Regulatory Authorities, include alternative values from those proposed and must set out the arguments for and against such alternatives.

- 5.176 Each System Operator shall provide to the Market Operator at least two months prior to the start of each Year or within 5 Working Days of approval by the Regulatory Authorities whichever is the later the Testing Tariff Data Transaction, which comprises a complete set of Testing Tariffs that have been approved by the Regulatory Authorities for each Generator Unit (other than Demand Side Units) that is registered within its Currency Zone, for each Trading Period in the Year, in accordance with Appendix K “Market Data Transactions”.
- 5.189 Each Party (or Applicant as applicable) that registers an Aggregated Generator Unit must have Interval Metering, installed by the Meter Data Provider responsible for installing, commissioning and maintaining such meters at the Generators contained within the Aggregated Generator Unit to meter Active Power Generation of those Generators.
- 5.191 The Party (or Applicant as applicable) that has registered the Aggregated Generator Unit shall poll, or procure the polling of, those Meters and make available, or procure the making available of, a single set of Meter Data representing Meter Data for the Aggregated Generator Unit, by a method agreed between the relevant Meter Data Provider and the relevant Party (or Applicant as applicable) in a sufficiently timely manner to the responsible Meter Data Provider so that the Meter Data Provider’s obligations under Appendix L “Meter Data Transactions” may be met.
- 5.192 In the event that Meter Data for Aggregated Generator Units is unavailable according to the provisions of paragraph 5.191, the relevant Meter Data Provider shall provide estimated or substituted data as per the Metering Code⁴.

Agreed Procedure 1: Participant and Unit Registration and Deregistration

Agreed Procedure 16: Provision of Meter Data⁵

⁴ Note that Interim and Transitional arrangements set out in Sections 7 and 8 of the Code have not been included in the above extracts

⁵ And other Agreed Procedures where relevant

