Smart Metering Phase 2

Workstream 13

TUoS & Wholesale Market Settlement

November 2012

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1. Background

The National Smart Metering Programme (NSMP) a large and complex programme of work over several years, involving multiple and diverse stakeholders, aims to deliver a national rollout of electricity and gas smart metering and its related initiatives in an effective and efficient manner. This will enable the benefits of smart metering to be realised by all stakeholders, particularly energy consumers. In that context, CER as Programme Manager have defined a number of workstreams which need to be delivered. EirGrid is responsible for one workstream relating to Wholesale Market & TUoS tariff impacts. The objectives and outputs required from 'Workstream 13' are shown in the table below.

13. Wholesale Market Settlement & TUOS Tariff Impacts (EirGrid Led Work Stream) **(Phase 2)**
Description: Review impact of smart metering design on current wholesale market & systems & TUOS tariff processes & systems.
Scope: Electricity wholesale market only (assumed minimal to no impacts will occur for gas wholesale market)
13.1 Impact assessment on current Electricity Wholesale market settlement systems & processes (SEMO):
13.2 Impact assessment on current TUOS calculation systems & processes:
13.3 Examination of possible wholesale market / TSO improvements & 'value add' services arising from smart metering e.g. demand response.
13.4 Planning, Design, Testing & Implementation of any agreed changes that may be deemed required.
Deliverables:
A. High Level Design Stage 1 (end-2012): Impact Assessment & Proposals Paper (EirGrid)
B. TBC.
Interface workstreams: Market Systems Business & Technical; Data Protection; Tariffs; Commercial & Regulatory w/s

2. Scope

The scope of this workstream is to carry out an impact assessment of the smart metering programme on:

- Wholesale Electricity Market settlement systems and processes
- TUoS Calculation Systems & Processes
- Any other TSO Impacts e.g. system operation.

In addition, an examination is required of possible wholesale market/TSO improvements that could be delivered as a result of smart metering roll out.

The final output will be an initial assessment of the current practice and the impact of changes. It should be noted that this is not a detailed assessment of the impact of changes; this cannot be carried out at this stage because there is not sufficient information available as to what the detailed design will be.

3. Assumptions

The following assumptions were made in conducting this impact assessment:

- **SEM Meter data transactions** Any new meter data transactions to the SEM comply with the existing meter data transaction provisions of the Trading and Settlement Code. It is assumed that when smart metering is introduced, MDPs would continue to comply with their obligations under the Trading and Settlement Code in the submission of meter data and would package the market messages in a format that meets the metering interface validation requirements.
- **TUoS Settlement** An aggregated meter data and account structure similar to the existing methodology will be adopted.
- **Existing Governance Structures** apply
    - Any Retail market changes will need to be appropriately discussed in the Industry Governance Group (IGG).
    - Any changes to existing SEM (Wholesale market) processes and structures will need to be approved by the Trading and Settlement Modifications Panel and/or the SEM Committee.
- **Interdependencies** Where decisions made in one industry sector (retail or wholesale) impact the other, the RAs as the link between the two groups, will ensure that any changes impacting both groups will be communicated and require approval of all Members in both groups.

4. Summary of Considerations

At present, from a wholesale electricity market perspective, data feeds are received from the four meter data providers on the island. These meter data feeds are subject to specific timelines in order to meet market settlement timelines. (Section 4)

Section 4 also outlines that data which is utilised in TUoS settlement and sent from the Retail Market Interface. The existing methodology for TUoS settlement for demand customers is based on meter readings which are aggregated and provided to the TSO by the RMDS. Domestic Non-Interval Demand TUoS is settled based on aggregated meter readings received via retail market messages. Suppliers are invoiced for Demand TUoS (Non-Interval) on the basis of an equivalent single supplier TUoS account (Non-Interval) which holds the aggregated meter data for that supplier for each half hour. There may be tariff implications if there is any change to the Statement of Charges.

In Section 5, it is noted that cross-sector governance, approvals and co-ordination must take place to ensure effective and efficient programme delivery.

In terms of System Operation, the TSO is responsible for forecasting load on the system. This load forecast is used by the System Operators to derive a unit schedule. Also, this information is utilised by SEMO to create an indicative market schedule.

Also, the TSOs are currently undertaking a fundamental review of system services as part of the DS3 programme in conjunction with the Regulatory Authorities. As part of this, there is an opportunity to leverage demand response/ramping services (Section 6).

5. Detailed Considerations

Wholesale Market and Meter Data

SEM receives data feeds from four Meter Data Providers (MDPs) – ESB MRSO and EirGrid in Ireland and NIE (Transmission & Distribution) and SONI in Northern Ireland. All data submissions feed into the market according to the timelines of the Trading and Settlement Code[1].

Initial market settlement (i.e. the System Marginal Prices based on actual data) is currently not available until four days after the Trading Day (D+4). The reason for this is that all meter data is not currently available until D+3.

Given that the timeline for physical deployment of the meters is 2016-2019 and new market arrangements are scheduled to be in place for 2017, the impacts of Smart Metering would have to be considered in light of the new market arrangements.

[1] (Appendix L and Agreed Procedure 16)

A move to a greater proportion of interval metering should not impact upon the SEM metering interface with the MDPs, assuming that any new meter data transactions to the SEM comply with the existing meter data transaction provisions of the Trading and Settlement Code. It is assumed that when smart metering is introduced, MDPs would continue to comply with their obligations under the Trading and Settlement Code in the submission of meter data and would package the market messages in a format that meets the metering interface validation requirements.

If there are changes required to the metering interface then there is a potential significant impact not only to the SEMO systems but also to all meter data providers in Ireland and Northern Ireland. The development of the current metering interface was one of the more difficult areas to co-ordinate in the original SEM design. There would need to be all island agreement to change this interface which may be difficult to achieve. This is further complicated by the timeframe for implementation of the European Target Model (2017), and possible large scale change in Northern Ireland meter data provision to accommodate SAMRT metering by 2020. For these reasons, EirGrid would caution any consideration of changes to this SEM meter interface. However, if there are major system replacements as part of the implementation of the European Target Model, then the common metering interface file should be defined with a view to meeting the requirements of the smart metering roll-out also.

During the development of Global Aggregation (Mod_34_09v2), it was identified that profiling issues with Non-Interval metered consumers were a primary contributor to the level of the Residual Error Volume. As more customers move to interval meters, the Residual Error Volume should be lessened and Supplier Units should benefit as a result. However, in the event that a Residual Error Volume persists, the implementation of Global Aggregation should be reviewed to consider other potential drivers to this value. In this, care needs to be taken as Global Aggregation rules will be across both jurisdictions that make up the SEM while the smart metering roll-out only affects Ireland.

From a wholesale market perspective, the introduction of smart metering will increase the proportion of interval metering feeds. This is likely to improve the quality of metered data in the market in the long term and should reduce the necessity for resettlement. However, the transition between the use of profile data to the use of interval data may pose problems which if not managed appropriately could result in increased resettlement requirements. In addition, the extensive use of interval metering may have implications for how losses and errors are allocated across supply entities. This may require other changes to the wholesale energy market.

Further, as SEM is an all-island market, any changes to existing processes and structures will need to be approved by the Trading and Settlement Modifications Panel and/or the SEM Committee. Therefore, any unilateral change to the data structures, frequency or volumes from ESBN to SEMO has the potential to lead to changes in the common metering interface to SEMO which may have an impact on SONI, EirGrid and NIE metering systems. In

addition, the evolution of smart metering in Northern Ireland presents risks that there may be further changes required to the metering interfaces if or when smart metering is rolled-out in Northern Ireland.

Unless the overall timings of meter data submission change, which is unlikely as Northern Ireland has not yet made any decisions regarding smart metering, the impact on SEM is not likely to be high, unless, as discussed above, a change to the metering interface with the MDPs is necessitated, in which case the impact could be significant. Also, as the SEM deals with Supplier Units which are aggregations of individual customer meters, this means that a buffer system will still be required between the smart meter data feeds and the SEM interface. It cannot be a consideration that smart meter data feeds will interact directly with the SEM in the manner of TUoS as this will result in the management of retail market functions being ported to the wholesale market systems and operator.

As stated earlier in this section, SEMO data feeds are received from four meter data providers at present and any changes may need to be reflected in systems of all meter data providers even when they are not involved in the smart metering roll out. However, this can be mitigated in some ways –

- Firstly, the common metering interface is an xml data file. If this format is retained as is likely, we can make use of the Optional vs. Mandatory flagging of data elements. For example, when Global Aggregation was implemented in the SEM, this introduced a new field in the xml, the NIEP (Non-Interval Energy Proportion); however, this element was set to “Optional”. This means that Meter Data Providers who were not implementing Global Aggregation did not need to include this value in their file submission. Settlement rules were devised to apply different calculations dependent on whether this element was included or not. This allowed the SEMO to implement a Global Aggregation solution in May 2011 while NIE only implemented this in Northern Ireland in September 2012.
- Secondly, changes to the common metering interfaces could be governed under the implementation of the European Target Model for 2016. Assuming that by this time, there will be greater visibility of any changes needed for meter data submissions due to the smart metering rollout, these requirements can be incorporated within that project and included in the systems of all meter data providers.

Retail Market Data - TUoS Settlement Data Feeds

At present, aggregated meter data for domestic accounts (Non-Interval) is processed by suppliers and the TSO via the Retail Market Design Service within ESB (RMDS). The TUoS account data relating to charging is based on this retail market data.

Changes resulting from smart metering to the source and structure of meter data and/or standing data updates (ESB MRSO/RMDS) will require changes to the TUoS account structure and form within the billing and business settlement processes/systems.

The current TSO business model for TUoS settlement is based on a relationship directly with the Suppliers and not with their associated accounts. A similar structure to the existing processes for meter data (Non-Interval) and standing data could be implemented for smart metering. The meter data could be issued (via the retail market design service) and processed in the TUoS settlement systems via aggregated meter messages (at the half hour interval) and processed in a small number of aggregated smart meter accounts by supplier.

It is the TSO's view that it would not be practical to implement each smart meter account as a separate TUoS account for interval meter data processing and settlements due to the large number of accounts involved, i.e. >1.6 Million Domestic Meters, which are connected at Distribution level. An aggregated meter data and account structure similar to the existing methodology would be most pragmatic. If each individual smart meter account were to be processed by the TSO for TUoS settlement, this would require significant systems changes to cater for the increased volume of data.

List of TSO Processed Market Messages and Impacts:

Note: the impact of the smart metering roll out on each of these market messages is difficult to quantify at this stage given that there are no decisions yet regarding the treatment of smart meter data in the retail market.

This table is intended to provide an overview of the current market messages received by EirGrid and the frequency that they are received. There could be an impact on each of these messages depending on the approach taken with smart metering.

Market Message	**Description**	**Frequency**	**Impact**
341	Import Interval Meter Readings	Daily	Yes – If Non-aggregated interval meter data provided to TSO for new individual Smart Meter TUoS Accounts. Possible Field, Value and Code changes required. A new Non-aggregated smart meter interval message required if existing 341 not appropriate for Smart Meter Interval Data?
342	Export Interval Meter Readings	Daily	Currently not processed by EirGrid
591	Estimated Aggregated	Daily	No – Non-Interval accounts that

	Non-Interval Supplier Consumption		continue to be effective will still require this message
595	QH Import Aggregated	Daily	Yes - Possible Field, Value and Code changes required if Smart Meter MPRNs included. A New aggregated Smart Meter Message required if existing 595 is not appropriate for aggregated Smart Meter Interval Data?
101	New Connection Registration Acceptance	Event Based	Yes – Possible Field, Value and Code Changes for New Connection of Smart Meter Account
105	Change of Supplier Confirmation	Event Based	No – Message and process should be unaffected by New Aggregated or Non-Aggregated Smart Meter accounts. Possibly some minor changes required
106D	De-Energisation – Meter Point Status Confirmation	Event Based	No – Message and process should be unaffected by New Aggregated or Non-Aggregated Smart Meter accounts. Possibly some minor changes required
106E	Re-Energisation – Meter Point Status Confirmation	Event Based	No – Message and process should be unaffected by New Aggregated or Non-Aggregated Smart Meter accounts. Possibly some minor changes required
111	Registration Cancellation	Event Based	No – Message and process should be unaffected by New Aggregated or Non-Aggregated Smart Meter accounts. Possibly some minor changes required
114	Change of Customer Details Confirmation	Event Based	No – Message and process should be unaffected by New Aggregated or Non-Aggregated Smart Meter accounts. Possibly some minor changes required
115	Change SSAC and/or	Currently not processed by	No – Message and process should be unaffected by New Aggregated or Non-Aggregated

	Supplier Unit	EirGrid	Smart Meter accounts. Possibly some minor changes required
116A	Change of Legal Entity Confirmation	Event Based	No – Message and process should be unaffected by New Aggregated or Non-Aggregated Smart Meter accounts. Possibly some minor changes required
122	De-Registration Confirmation	Event Based	No – Message and process should be unaffected by New Aggregated or Non-Aggregated Smart Meter accounts. Possibly some minor changes required
301	Meter Point Characteristics	Event Based	Yes – Possible Field, Value and Code Changes for Update Meter Characteristics of Smart Meter Account e.g. DUoS Group, MIC, MEC and Voltage changes to Smart Meter Accounts
330	Non Interval to Interval Change	Event Based	Yes – Possible Field, Value and Code Changes. A new Market Message may be required for Non-Interval to Smart Meter Change
331	Interval Meter Technical Details	Event Based	Yes – Possible Field, Value and Code Changes. A new Market Message may be required for Non-Interval to Smart Meter technical details
602	Daily Summary Reconciliation Count	Daily	No – Other than a change in count totals for Smart Meter related messages

Changes resulting from smart metering to the source and structure of meter data and/or standing data updates (ESB MRSO/RMDS) will require changes to the TUoS account structure and form within the billing and business settlement processes/systems.

TUoS Calculations and Tariffs

There will also be a TUoS settlement process and systems impact if there are any changes to the calculations and tariffs contained in the current Statement of Charges (REF).

Smart metering is likely to be accompanied by Time of Use tariffs. This may require a change to the current structure / methodology for calculation of TUoS tariffs. The TSO's view is that changes to the TUoS calculation as a result of smart metering is a secondary consideration, the impacts on the retail market being the area with the primary impact. The only element of Time of Use tariffs in the current TUoS tariff structure is the differentiation between day and night charges for Demand Side Management Charge and the domestic Demand Network Capacity Charge[2].

While the TSO can consider changes to the TUoS structure to complement Smart Metering the benefit of changing the TUoS structure should be assessed in light of the relatively small size of TUoS in the retail customer bill. In particular, the portion of TUoS in the overall average retail customer bill is 5% (CER 10062[3]). The main component in an average retail bill is the cost of generation (54%). As this is the largest component, it is an area that can have a much greater influence in terms of sending signals to customers to modify demand. As TUoS is such a small portion, it has a much smaller influence in terms of sending signals to customers to manipulate demand.

The TSO can consider changes to the TUoS structure to complement smart metering. However, it is believed that there is limited benefit to changing TUoS structure in light of the relatively small size of TUoS in the overall retail customer bill.

EirGrid systems potentially impacted by changes

This section provides a short summary of the systems that could be impacted by the smart metering roll out.

- TUoS Settlement & Billing Systems
- Reporting mechanisms (Business Objects)
- Interface to Retail Market Systems (RMI & EMMA)
- SEM Wholesale Market Systems
- Interface between Wholesale market and TUoS Billing (Financing and any risks with variable TUoS)
- Load Forecasting

Until such time as a detailed design (including aggregation rules) is produced for the smart metering roll out, it will not be possible to carry out a detailed assessment of the impact on the above systems.

[2] DTS-D2
[3] CER Factsheet: Electricity Prices in Ireland, CER/10/062
http://www.cer.ie/GetAttachment.aspx?id=3837429b-96cd-4ce5-8ec5-51324e0a14d4

6. Cross-Sector Approvals and Co-ordination

Retail market changes are governed by the Industry Governance Group (IGG). Wholesale market changes are governed by the SEM Modifications Committee.

Different Industry Participants (including Suppliers, MRSO, DSO and TSO) are on the two panels and vote to approve changes. The Regulatory Authorities are the only link between the groups in terms of work and system delivery timelines.

Any project would need a co-ordinated interface between the two industry areas which govern changes to wholesale and retail market systems. In the past, cross-sector co-ordination did not happen in an optimal way, which has in the past led to difficulties in project roll-outs.

Where decisions made in one industry sector impact the other, there is a need to ensure that any changes being introduced are co-ordinated by the RA's, and have the approval of all Members in both groups. This will enable cross-sector system delivery to occur in a timely fashion.

7. Other TSO Impacts

As the level of variable generation on the power system continues to increase, the flexibility of the power system becomes even more crucial. In this context, the response capability of Demand Side could form part of the overall solution to the management of the power system. The availability of smart meters could assist in this by providing the required meter data to enable demand response on a large scale.

On the power system, over very short timeframes (seconds and minutes), imbalances between generation and demand are managed using frequency response services (e.g. operating reserves). Over longer timeframes, additional factors can cause an imbalance which, if not managed, would result in unacceptable frequency excursions. The net effect of these combined factors determines the ramping duty of the system at a point in time. The ramping duty represents the change in output that is required from centrally dispatched generation. In addition, there is always uncertainty about the future generation/demand balance which should be prudently accounted for. Therefore, a margin is required in addition to the projected ramping duty to securely manage the balance of generation and demand while allowing for un-forecasted variations. The sum of ramping duty and ramping margin comprise the ramping requirements. The demand side could potentially contribute to providing this ramping capability. A review of ramping requirements and the broader system services required on the power system in Ireland and Northern Ireland is being carried out as

part of the DS3 programme. Further information on the details of the system services workstream is available on the EirGrid website. [4]

The TSOs are responsible for load forecasting for the island and this data is submitted to the market operator in order to determine a unit commitment schedule, interconnector schedules and a system marginal price. The introduction of smart meters along with more dynamic time of use tariffs will have the potential to significantly alter the load curve. The TSOs in order to preserve system security and minimise system production costs may have a number of requirements to be resolved over the course of the Smart Metering Programme. These requirements may include but are not limited to the following

- Sight of tariffs and modifications to tariffs; and
- Forecasts by suppliers of expected load based on tariffs at different times.
- Data Granularity:

Note: some of the above issues may be resolved via the development of the European Target Model.

There is potential for added value in terms of demand response type services as part of the provision of system services (DS3 programme) e.g. ramping services.

The TSO is responsible for load forecasting and needs to be able to accurately predict the load. To do this effectively, there needs to be a new requirement on suppliers to provide necessary information to the TSO on likely changes to demand profiles arising from the application of dynamic tariff structures.

[4] http://www.eirgrid.com/operations/ds3/

8. Conclusions

It is important that the smart metering roll out considers the following when developing a detailed design:

- Impact on market systems interfaces (retail and wholesale)
- Rules for aggregation
- Timeline for implementation of the European Target Model
- Residual Error (Global Aggregation)

In that regard and to ensure co-ordination between the various workstreams within the smart metering programme, EirGrid would suggest that a workshop is held with all relevant participants (Wholesale and Retail Market) in Q2 2013 once a high level design has been proposed for the smart metering roll out. This would facilitate identification of any detailed impacts in terms of the wholesale market and retail market interfaces. In addition, at that stage, the implementation project for the European target model will be further advanced which will provide an opportunity to identify any interactions between the two projects and ensure that any dependencies are identified.

The TSO believes there is limited benefit in introducing a time of use element to TUoS tariffs given the relatively small value of TUoS in the customer retail bill.

In terms of load forecasting, there is a need for suppliers to provide the TSO with information about expected load profiles when dynamic time of use tariffs are introduced. Without this information, there is potential for inefficiencies in terms of scheduling of plant and also a risk to security of supply.

Smart meters can act as an enabler for enhanced demand response on the power system. However, to achieve this, there is a role for suppliers/aggregators to work with customers to provide system services.

It is EirGrid's view that it is a major risk to the project that smart metering is being rolled out on an Ireland only basis rather than as an all island project.

It should be noted that there has been no mention in this paper about the development of appropriate dynamic tariffs/structures; this is being addressed in a separate workstream to which we have provided input.