

Aggregation Briefing Document

Version 4.1

Aggregation Briefing Document

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1 Edit History

Date	Version Number	Nature of Changes
27 th May 2004	2.0	Document updated to reflect Data Aggregation for Unmetered sites. This content is added under section 9 on page 14. Section 2 Purpose of document updated to reflect revised purpose All other sections are identical to the original save reference being given to two Unmetered MPDs, below.
24 th October 2006	3.0	Document updated to reflect new requirements for Data Aggregation within the Single Electricity Market.
15 November 2006	3.1	Document updated to reflect review comments from MP's
7 th February 2007	3.2	Document updated to reflect the following: <ul style="list-style-type: none"> • Details related to the calculation of the Reading Data Status field in Section 5.1 • SEMO require a copy of the email to Suppliers when any Supplier Unit demand has been set to zero in Section 5.2 • Typo correction on the table in Section 5.1 • Typo correction on page 8 • Update of numbering on page 16
15-03-07	3.3	Removal of T&SC Version number in Section 5.1
30.04.07	3.4	Changes for RA324 Mitigation and PES Trading Sites
23.06.10	3.5	Changes for MCR0154
28.03.11	3.6	Document updated to reflect the changes made as part of the software release deployed in June 2011, which includes the following: MCR1024 – Global Aggregation MCR0178 - Treatment of Supplier Unit excess of Generation over Demand
11.02.15	3.7	All references to SMO amended to SEMO. Next Day changed to Same Day in Section 5 - Aggregation for Interval Meters (7 instances) and Section 6 -Aggregation for Meter Points without Interval Meters (1 instance). Deleted “new” in line 1 of Section 5-Aggregation Steps for SEMO.
01.10.2018	3.8	Changes for MCR1182 V4.0 Impact of I-SEM on the Retail Market in ROI Section 5.1 Import and 5.2 Export updated in line with MCR1182.
23.04.2019	3.9	Document updated to reflect MCR1167 V4.0 Facilitate energy efficiencies in Local Authority Public Lighting
16.02.2021	4.0	Revised Version as part of Schema Release V13.0 (Smart) MCR 1157 – Smart Metering Data Processing and Data Aggregation This version of the Aggregation Briefing Document is effective for settlement dates from the date of implementation of the v13.00.00 Market Release.
15.12.21	4.1	Updated as a result of MCR 1214 Interim Metering Responsibilities for DSO connected battery storage sites.

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2 Purpose of Document

The purpose of this briefing document is to describe how MRSO establishes the data to be sent to SEMO for Settlement.

The document:

- Provides an overview of the aggregation process; and
- Describes the treatment for QH and HH sites.
- Describes the treatment and Netting of Non Participant de minimis Generators
- Describes load profiles used for Non Interval sites
- Describes for Non Interval sites how usage factors are calculated and used in the proposed aggregation process.
- Describes for Unmetered sites how usage factors are calculated and used in the proposed aggregation process and the differences between the Non Interval and Unmetered processes.

The document should be read in conjunction with:

- MPD14 – Market procedure for Readings Processing for Non Interval Meters
- MPD 15 – Market procedure for Data Processing for QHMeters
- MPD 15.1 – Market procedure for Data Processing for HH Meters
- MPD16.2.1 – Market procedure for Data Aggregation
- MPD30 – Market Process for Change of inventory for Technical Meter Point
- MPD31 – Market Process for Grouped Unmetered Data Processing

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3 Objective of Data Aggregation Process

The objective of data aggregation is to provide a statement of consumption, summarised by Supplier, Supplier Unit and Supplier Sub Aggregation Code (SSAC) for Retail Market Participants and a parallel statement summarised by Supplier Unit and Generator Unit for Market Settlement. There are four types of aggregation process:

1. Aggregation of interval (QH) meter data for import
2. Aggregation of interval (HH) meter data for import
3. Aggregation of interval meter data for QH export (i.e. generators)
4. Aggregation of data for customers without interval meters, including Unmetered sites.

4 Supplier of Last Resort within Data Aggregation

Following the CRU direction on Supplier of Last Resort (CRU/06/006) the representation of the SOLR within the industry data model is as follows:

- The design for SOLR is based on the CRU decision that SOLR customers' usage and demand data is identified via a separate SSAC code [ref CRU/06/006]
- In addition, should the SOLR wish to identify explicit wholesale volumes in the SEM for SOLR customers, then a Supplier Unit can be registered in the SEM into which the SOLR can register the SOLR MPRNs.

This means that this Supplier Unit and these MPRNs are included in MRSO aggregation calculations and messages.

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5 Aggregation for QH Interval Meters

5.1 QH Import

The use of a QH interval meter is mandated where annual consumption exceeds a threshold defined by CRU. The current threshold is 300MWh per annum.

For each QH Meter Point, MRSO maintains a record of all the data to be used in aggregation. This data consists of:

- The Supplier Unit registered against the Meter Point. This describes the entity under which the Suppliers import net of Non Participant Generator Export will be aggregated.
- The Supplier registered against the Supplier Unit
- The Supplier Sub Aggregation Code (SSAC).
- The Distribution Loss Factor. This loss factor accounts for distribution network losses as settlement is struck on generated rather than consumed electricity. Loss factors normally depend on the voltage level at which the connection is made and vary between day and night.
- The Transformer Loss Factor. This accounts for any losses which occur in transformers fitted on the network side of the meter. A limited number of meter points have such transformers and the loss factor is applied prior to aggregation.
- The kW demand values supplied by the Data Collector (ESB Profile Data Services and Eirgrid) for each interval. Data is polled on a daily basis, validated and stored in the MV90 operated by the Data Collector and uploaded to the SAP system used by MRSO. In a minority of instances readings cannot be obtained and in these cases the Data Collector will provide an estimate or substitute reading.

Indicative aggregation is performed one week/work day after the settlement date. For each 15 minute interval MRSO will aggregate, for each combination of Supplier, Supplier Unit and SSAC, all import for Meter Points registered to that Supplier, Supplier Unit and SSAC on the settlement date. As part of the aggregation process:

- kW demands are converted to kWh consumption
- Distribution loss factors applying to the interval are applied in order to determine the consumption prior to the losses. This is achieved by multiplying the consumption by the loss factor.

This aggregated data is then provided to the relevant Supplier using message 595.

Aggregation Steps for SEMO

The following are requirements for the settlement of the Single Electricity Market that relate to the level of information required by the SEMO in the 590 Market Message.

- Import Data for SEMO for Non Interval, QH and HH sites are aggregated together
- Interval period in which aggregated data is provided to SEMO is half hourly
- All Aggregated data for SEMO is provided in MWh and specifically not kWh¹
- Generator data will not be signed, Import data is signed as negative
- The SEMO is expecting one daily file from each Metered Data Provider for each day's aggregation process. MRSO will provide separate files of supplier and generator data to the SEMO.

As such, these requirements result in the following further processing steps:

- All values used are loss adjusted
- First, for each Supplier Unit, for every 15-minute Interval, add the corresponding Non Interval Import Data and the QH Import Data
- Second, summate the 15-minute Import Interval Data to 30-minute Import Interval Data

¹ SEMO require MWh in the 590 messages and therefore, 596 and 597 messages will also contain MWh. Following consultation with Retail Market participants, the 591, 592, 595, 594 and 598 messages will contain kWh.

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- Third, add each 30-minute Smart HH Import Interval Data to its corresponding summated 30-minute Non Interval/QH Import Intervals and multiply the total by -1
- Fourth, summate to 15-minute Intervals all Non Participant Generator Data that has been registered to each Supplier Unit
- Fifth, summate the 15-minute Non Participant Generation Interval Data to 30-minute Interval Data
- Sixth, add each 30-minute Import Interval to each corresponding 30 minute Non Participant Generation interval Data for each supplier Unit.
- Finally, MRSO will convert the kWhs data to MWhs by division by 1000, representing MWh to three decimal places.

This is called the Measured Quantity

The loss adjusted aggregated data is then provided to the SEMO using message 590. A copy of aggregated data relevant to a Supplier is provided to that Supplier using message 596. The following table shows interval metered import related messages as a result of Indicative Aggregation:

WHOLESALE/SEM & RETAIL MARKETS				
AGGREGATION MESSAGES	Market	Recipient	Time	Day
595 - AGG. QH DATA (SUP UNIT/SSAC, 15-min, kWh)	RETAIL	TSO/SUP	am	Same Day
596 - SUPPLIER COPY SEMO AGG. DATA (SUP UNIT, 30-min, MWh)	WHOLESALE	SUP	14:00	Same Day
590 - SEMO AGG. DATA (SUP UNIT, 30-min, MWh)	WHOLESALE	SEMO	14:00	Same Day

As indicated in the above table, there is a fixed timetable for the receipt of messages by the SEMO. The SEMO will also provide a calendar for aggregation to MRSO with the required aggregation runs to be performed on each day.

All SEM settlement statements have the requirement to indicate if the settlement data is estimated or not [Table F.6 in T&SC]. The Reading Data Status field in the 590 and 596 messages will either contain an estimated or an actual flag where a code of 0 denotes estimated readings while a code of 1 denotes Actual readings.

In this situation SIMDRACS has defined the following definition of 'Estimated':

- For each Supplier Unit aggregation D+1, D+4, M+4, M+13, there are service level agreements for the different percentages of estimated data. If the Service Level Targets are met then the Supplier Units aggregated data will be marked with an actual flag (1), otherwise an Estimated flag (0), per half hourly interval
- Interval meter data only to be considered in arriving at the estimated or actual flag.

The SIMDRACS rules for determining whether an aggregation of meter readings was estimated or actual is based on the concept that there is only one meter reading to be considered per MPRN. This may not be the case where there is Generation on the site, particularly where there is splitting of the generation between several suppliers outside of the market.

- Therefore, when calculating the value of this flag the actual/estimated value will be determined only from import meters
- Also, where two 15 minute intervals are amalgamated together to a 30 minute settlement period, if either or both of the 15-minute meter reading is an estimate then the 30 minute trading period metered volume will be considered as an estimate.

For a variety of reasons the data used in indicative aggregation may be changed after initial aggregation; or new data may become available. These reasons include:

- Actual data is obtained and can be used to replace estimated data
- The registered Supplier may be retrospectively changed
- Meter data may be shown to have been incorrect
- Estimates generated for Indicative Aggregation at D+1 that are replaced by Data Collector estimates at D+4

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For these reasons there is a series of further aggregation runs for each Settlement Date:

- Initial Aggregation on Day + 4
- Re-aggregation at Month + 4
- Second Re-aggregation at Month + 13
- Ad-Hoc Aggregation

Each further aggregation follows the same process as the initial aggregation, only this time using the updated data. Prior to the SEM Re-aggregation differences would have been communicated for settlement but under SEM a full set of data is required in exactly the same manner as the original aggregation.

In the case of Initial Aggregation, Ad Hoc Aggregation, M+4 and M+13 Re-Aggregations a copy of QH aggregated data that is sent to the Supplier is forwarded to the TSO.

As with Indicative Aggregation further aggregations will issue the 595, 596 and 590 messages. The Settlement Run Indicator within each message will illustrate which aggregation the message relates to, as follows:

- 10 = Indicative
- 20 = Initial
- 30 = 1st ReAggregation at M+4
- 40 = 2nd ReAggregation at M+13
- 50 = Ad Hoc Aggregation

As an interim measure EirGrid will be acting as Meter Data Provider for DSO connected Battery Storage units and will provide the import and export data in a single data stream to SEMO.

This means that

- MRSO will not be aggregating the import for these sites, and will therefore not include the import for these sites in 595 and 596 market messages to suppliers or and 595 market message to TSO, and will not include the import for these sites in the 590 market message to SEMO.
- MRSO will send 341 market messages to the the registered supplier and TSO based on the following:
 - If the Battery Storage unit is transmission connected EirGrid will provide the QH import read data to MRSO.
 - If the Battery Storage unit is distribution connected ESB Networks will, in addition to EirGrid, poll the import for the site.
 - Where the Duos Group of this site indicates that it is an Autoproducer for DUoS Billing netting purposes, ESB Networks will, in addition to EirGrid, poll the export for DUoS billing netting purposes on a working day/week day basis. The netted value will be available to the supplier in the 341MM.

5.2 QH Export

The general approach for Export sites is the same as for Import sites. The following differences exist.

- Data is aggregated according to the Generation Unit rather than Supplier, Supplier Unit and SSAC.
- Treatment and Netting of Non Participant de minimis Generation
- Export kW data is converted to kWh generation.
- Export sites normally have site-specific loss factors
- Messages 594, 598 and 597 are used instead of 595 and 596.

Some generators may not participate in Settlement, i.e. will not receive money for their generated energy directly from the SEMO, and there is a requirement for their generator data to be netted from import of the registered Supplier who has in the new manual Non Participant Generator registration process, registered to buy the export. This process will allow for export arrangements to be uniquely identifiable by an 'Export Arrangement Reference Number'

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A below de minimis generator may sell its output to a maximum of three Supplier units. Sale to a maximum of three supplier units is facilitated by splitting the output between the supplier units in question based on a fixed, pre defined percentage or on the basis of metered output, where all percentages add up to 100%. Aligned with this sale Non Participant Export data is sent to the Supplier associated with each Export Arrangement in message 598.

The sale by a below de minimis generator to a number of supplier units above only pertains to the splitting of gross export amongst the relevant supplier units. Gross import of the site on which the generator is located, like any other demand, can only continue to be supplied by one supplier.

Non Participant generator data is aggregated to a specific Supplier Unit of the Supplier with which it has its export contract, i.e. the Generator data will be subtracted from the Import data by MRSO. This is done by MRSO prior to sending the aggregated import data to the SEMO in the file of data relevant to each aggregation

Normally only a single stream of data is provided by the Data Collector for each Generation Unit or Non Participant Generator meter, therefore the aggregated data is simply the kW data stream converted to kWh.

The series of further aggregations through Initial, Re-aggregation, Second Re-aggregation and Ad Hoc also operates for Export sites. As with interval metered import, aggregations of export data will issue similar messages. The following table demonstrates the nomenclature of each export relevant message:

WHOLESALE/SEM & RETAIL MARKETS				
AGGREGATION MESSAGES	Market	Recipient	Time	Day
594 - AGG. QH Exp. DATA (GEN UNIT, 15-min, kWh)	RETAIL	GEN	am	Same Day
597 - GENERATOR COPY SEMO AGG. DATA (GEN UNIT, 30-min, MWh)	WHOLESALE	GEN	14:00	Same Day
598 - SUPPLIER NON-PARTICIPATING GEN. UNIT AGG. DATA (GEN UNIT, 15-min, kWh)	SIMDRACS	SUP	am	Same Day
590 - SEMO AGG. DATA (GEN UNIT, 30-min, MWh)	WHOLESALE	SEMO	14:00	Same Day

The Settlement Run Indicator within each message will illustrate which aggregation the message relates to.

It should be noted that import can occur on export sites and this will be normally reported and aggregated separately (i.e. as import). It should also be noted that as per the aggregation of import interval data the following new requirements for the settlement of the Single Electricity Market relate to the level of information required by the SEMO for export interval data.

- Interval period in which aggregated data is provided to SEMO is Half-hourly
- All Aggregated data for SEMO is provided in MWh and specifically not kWh
- Generator data will not be signed, Import data is signed as negative (except where non participant generation exceeds demand)
- The SEMO is expecting one daily file from each Metered Data Provider for each day's aggregation process. MRSO will provide separate files of supplier and generator data to the SEMO.

As an interim measure EirGrid will be acting as Meter Data Provider for DSO connected Battery Storage units and will provide the import and export data in a single data stream to SEMO.

This means that

- Export data relating to Battery Storage units is handled by EirGrid for Data Processing and submission to SEMO.
- Meter data will be available to the participant via the established wholesale market mechanisms.

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- The export data for Battery Storage units will not be contained in any 342, 590, 594, 597 market messages.

6 Aggregation for HH Interval Meters

6.1 HH Import

For each HH Meter Point, MRSO maintains a record of all the data to be used in aggregation. This data consists of:

- The Supplier Unit registered against the Meter Point
- The Supplier registered against the Supplier Unit
- The Supplier Sub Aggregation Code (SSAC).
- The Distribution Loss Factor. This loss factor accounts for distribution network losses as settlement is struck on generated rather than consumed electricity. Loss factors normally depend on the voltage level at which the connection is made and vary between day and night.
- The kW demand values will be supplied by the Data Collector. D+1 Estimated or Substituted kW demand will be provided.

Indicative aggregation is performed one week/work day after the settlement date. For each 30 minute interval MRSO will aggregate, for each combination of Supplier, Supplier Unit and SSAC, all import for Meter Points registered to that Supplier, Supplier Unit and SSAC on the settlement date. As part of the aggregation process:

- kW demands are converted to kWh consumption
- Distribution loss factors applying to the interval are applied in order to determine the consumption prior to the losses. This is achieved by multiplying the consumption by the loss factor. This aggregated data is then provided to the relevant Supplier using message 592.

In the case of Initial Aggregation, Ad Hoc, M+4 and M+13 Re-Aggregations a copy of the HH Interval aggregated data that is sent to the Supplier is forwarded to the TSO

As for QH and NQH Non Interval meter points, a series of further aggregations are performed to account for changes to the indicative aggregation resulting from the subsequent receipt of meter readings and from changes in other data used in aggregation (e.g. changes to value of Supplier, Supplier Unit, SSAC or loss factor data).

Please refer to 5.1 QH Import 'Aggregation Steps for SEM-O' to see how the HH Import is included in MM590 and MM596.

The following table shows HH metered import related messages as a result of Aggregation:

WHOLESALE/SEM & RETAIL MARKETS				
AGGREGATION MESSAGES	Market	Recipient	Time	Day
592 - AGG. HH DATA (SUP UNIT/SSAC, 30-min, kWh)	RETAIL	TSO/SUP	am	SameDay

The Settlement Run Indicator within each message will illustrate which aggregation the message relates to.

7 Aggregation for Meter Points without Interval Meters

The approach for sites without interval meters differs in one key respect from those with interval meters. Whereas interval meters are read on a daily basis and interval readings are obtained, for non-interval metered sites readings are obtained periodically (normally every two months unless there is a planned or unplanned block estimate for the route) and interval readings are not available.

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To provide data for settlement in the absence of readings MRSO uses an estimate of consumption, known as an estimated usage factor. When readings are obtained, actual consumption, in the form of an actual usage factor, can be calculated. Usage factors are therefore used to represent consumption. These concepts are explored in more detail later in this paper.

The aggregation timetable is the same as that for interval meters and aggregation is performed as a multi stage process:

1. Indicative aggregation is performed on a daily basis one week/work day after the date of consumption. The Non Interval aggregated data relevant to a Supplier will be provided to that Supplier using message 591.
2. In the case of Initial Aggregation, Ad Hoc, M+4 and M+13 Re-Aggregations a copy of the Non Interval aggregated data that is sent to the Supplier is forwarded to the TSO
3. The distribution loss adjusted aggregated data is then provided to the SEMO and is included in the 590 message with a copy of the data relevant to the Supplier issued in the 596 message.
4. As for interval meters, a series of further aggregations is performed to account for changes to the indicative aggregation resulting from the receipt of meter readings² and from changes in other data used in aggregation (e.g. changes to value of Supplier, Supplier Unit, SSAC, loss factor or load profile data). The loss adjusted aggregated data is provided to the SEMO and a copy of aggregated data relevant to a Supplier is provided via the following messages:

WHOLESALE/SEM & RETAIL MARKETS				
INDICATIVE AGGREGATION MESSAGES (Day+1)	Market	Recipient	Time	Day
591 - AGG. NQH DATA (SUP UNIT/SSAC, 15-min, kWh)	RETAIL	TSO/SUP	am	Same Day

The Settlement Run Indicator within each message will illustrate which aggregation the message relates to.

The absence of interval reads presents an issue as for settlement purposes the consumption must be calculated for each 15-minute interval³. To achieve this aggregation is performed using load profiles. Load profiles describe how consumption is allocated over time.

For each Meter Point, MRSO maintains a record of all the data to be used in aggregation. This data consists of:

- The Supplier Unit registered against the Meter Point
- The Supplier registered against the Supplier Unit
- The Supplier Sub Aggregation Code (SSAC)
- The Distribution Loss Factor
- The Load Profiles
- The Usage Factors

The remainder of this document provides a more detailed explanation of Load Profiles and Usage Factors.

² Meter readings may be received from data collectors, meter operator, suppliers or customers.

³ A 15-minute interval is used due to the current design of the retail market however all data issued to the SEMO, and hence copied to market participants, for Market Settlement is within 30-minute interval systems.

8 What is a Load Profile

A load profile is a set of coefficients that describe the pattern of consumption over a calendar year. As MRSO will be aggregating consumption on a 15-minute basis there will be 96 coefficients for each day and 35,040 coefficients in a load profile in a 365-day year. Each of these coefficients is expressed as a proportion of annual consumption meaning that these coefficients will sum to 1 for a 365 day year. This means that if MRSO has a statement of consumption for a meter point register expressed as an annual volume then this can be multiplied by the coefficient for any given 15 minute interval to obtain the assumed consumption for that interval. This can then be aggregated. Over a year, because the coefficients sum to 1 the annual consumption will be entirely aggregated.

Below is the shape of Profile Class 1 (Domestic) for 2001, showing sum of the 96 interval coefficients for each day, the sum being known as the daily coefficient.

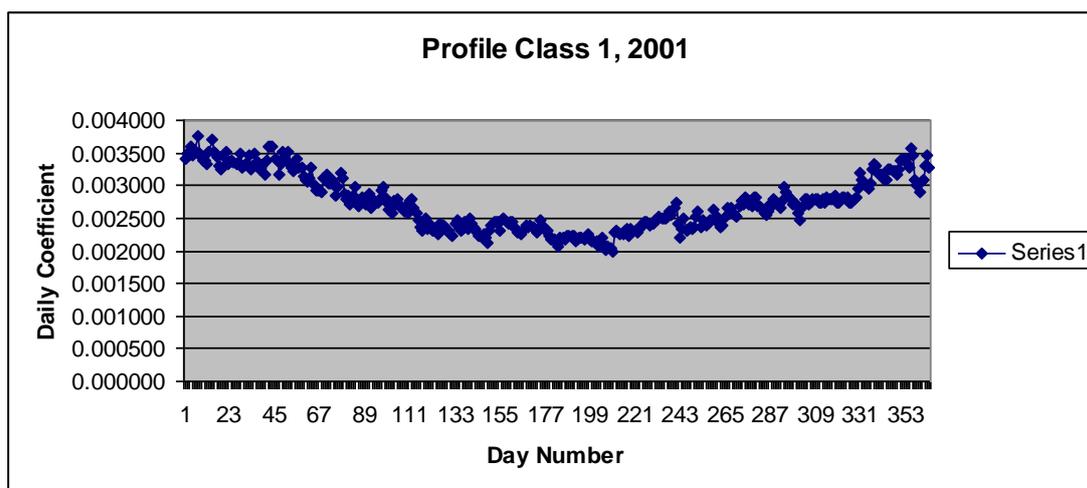


Figure 1: Profile Class 1, 2001

The table below shows just four coefficients for the early hours on January 1 and 2, 2001.

Date/Time	00.45-01.00	01.00-01.15
01 January 2001	0.0000356	0.0000285
02 January 2001	0.0000353	0.0000276

Table 1: Example of interval coefficients for Profile Class 1

In Ireland there are planned to be twelve standard profiles for metered sites reflecting the different consumption patterns applying to different classes of meter point. These are:

- Rural domestic unrestricted
- Rural domestic day/night
- Urban domestic unrestricted
- Urban domestic day/night
- Non-domestic non-MD unrestricted
- Non-domestic non-MD day/night
- MD load factor <30%
- MD load factor 30-50%
- MD load factor >50%
- Urban domestic SST Standard Profile
- Rural domestic SST Standard Profile
- Non-domestic SST Standard Profile

Because some of the standard profiles are day / night profiles but meter readings are obtained according to timeslot (i.e. day reading and night reading) it is necessary to derive a day time load

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profile and a night time profile from the standard profiles. The coefficients for each of these so-called derived profiles also sums to one over a 365 day year. This process of 'normalisation' means that the annual consumption for a day-time or night-time meter register will be fully accounted for in aggregation over the year and that the derived profile has the same pattern as the day-time or night-time coefficients in the standard profile from which it is derived..

The chart below shows the total of day-time coefficients and total of night-time coefficients for Profile Class 1 in 2001. Note that the fluctuations in day-time coefficients are due to differences between weekdays and weekends or public holidays.

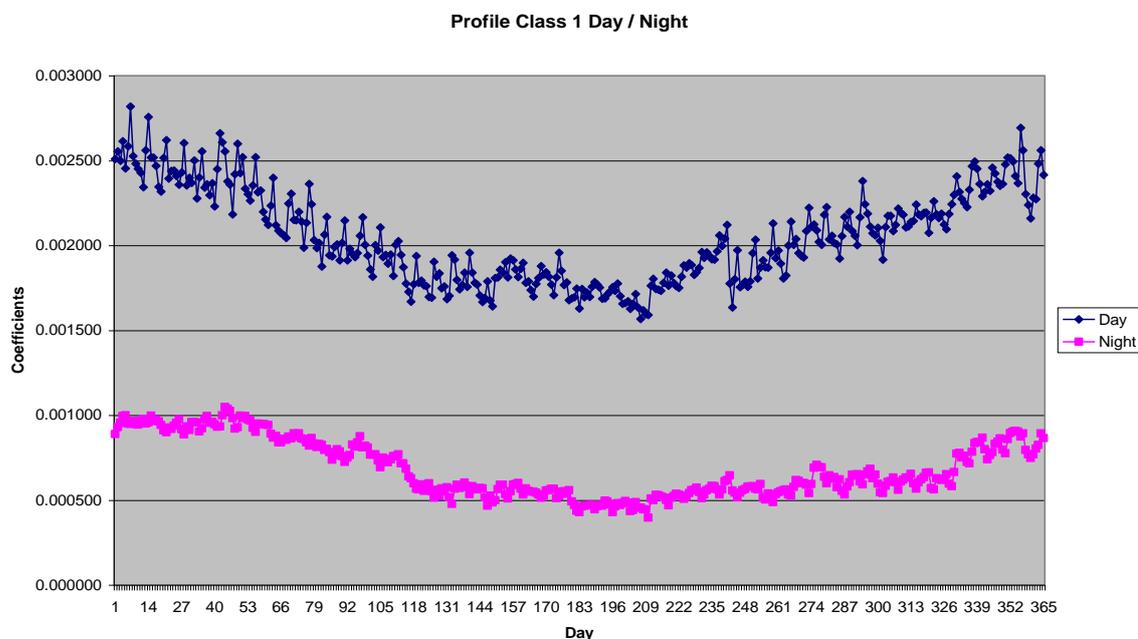


Figure 2: Profile Class 1 Day/Night Split, 2001

The table below shows the four night coefficients for the early hours on January 1 and 2, 2001 from table 1 converted into **derived** coefficients. These have been divided by a factor of 0.25011 so that the total of the night coefficients for the year sums to 1. This normalisation factor is the ratio of night-time annual consumption to total annual consumption.

Date/Time	00.45-01.00	01.00-01.15
01 January 2001	0.0001422	0.0001138
02 January 2001	0.0001410	0.0001102

Table 2: Example of derived night time coefficients for Profile Class 1

8.1 Using the Coefficients

The profile coefficient is used to obtain an interval consumption as follows. If the total consumption for a year is 10,000 kWh, then the consumption between 0045h and 0100h on 1st January 2001 would be 10,000 kWh multiplied by 0.0001422 or 1.422 kWh

Note that in the case of a leap year there are an additional 96 coefficients and the total of the coefficients for the year will still sum to one.

8.2 Mixed Profiles

A significant number of meter points in Ireland have a mixture of unrestricted and day or night registers. Because the MRSO systems will hold profiles against each timeslot implemented at a meter point, it is possible to use a unrestricted profile shape for an unrestricted usage and, for example, a researched night-time profile shape for a night meter such as is used for night storage.

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9 What is a Usage Factor

A usage factor is a statement of consumption during a specified read period for a timeslot⁴ at a meter point expressed as an annualised volume. Annualised means that the consumption is stated in terms of kWh per Year.

There are essentially four types of usage factor used in aggregation:

- Actual Usage Factor. This is obtained from meter readings and represents the consumption between the meter readings prorated to an annual volume. In some circumstances⁵ actual usage factors are calculated as a result of estimated meter readings and these are calculated and treated no differently to those calculated from readings.
- Estimated Usage Factor. This is calculated from previous consumptions and is used in the absence of actual usage factors (i.e. usually for initial Market Settlement until a reconciliation can be calculated from a meter reading).
- Initial Estimated Usage Factor. This is used for a new connection or when there is a change to the connection characteristics. The value to be used will depend on the DUoS Group, load factor and meter configuration. Research will be conducted to determine the appropriate values for each applicable combination of these characteristics.
- De-Energisation Estimated Usage Factor. This is zero, because the meter point is de-energised.

All usage factors are associated with a time period. For actual usage factors the time period is that between the meter readings. For estimated usage factors the time period is that since the last meter readings and is open-ended (i.e. the usage factor is used until the next reading is obtained and an actual usage factor can be calculated).

Usage is really another term for consumption. The figure on the following page shows the concept of 'usage' for a series of four readings as follows:

Date	Reading	Consumption
28 February 2005	2000	2000
24 June 2005	5600	3600
28 August 2005	7850	2250
31 December 2005	11700	3850

Table 3: Readings and Consumption (Usage).

Actual usage is calculated from the four readings, but usage after the fourth reading can only be estimated as there are no further readings.

9.1 Calculating Actual Usage Factors

Actual usage factor is calculated for all timeslots at a meter point whenever:

- any plausible reading is obtained at the meter point; or
- estimates are generated at the meter point in the circumstances previously described.

The actual usage factor is the consumption for a read period divided by the sum of the appropriate load profile coefficients for the read period. The read period runs from the date when usage factors were previously calculated (or opening read) to the date of the current reading.

The table below shows the Actual Usage Factors calculated for the four reads in the diagram above.

⁴ Timeslots currently in use are day; night, 24-hour, Day Off-Peak, Night Off-Peak and Peak.

⁵ Actual usage factors are calculated from estimates in the following circumstances:

- Estimates used for a change of supplier
- Estimates used for a change of tenancy
- Estimates used for meter removal or de-energisation
- Estimates used to replace implausible reads provided other plausible reads were obtained.

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Date	Consumption	Period Coefficients	Actual UF
28 February 2005	2000	0.2	10000
24 June 2005	3600	0.3	12000
28 August 2005	2250	0.15	15000
31 December 2005	3850	0.35	11000

Table 4: Actual Usage Factors

As an example, if we take the reading on 24th June the sum of the interval coefficients between 28th February and 24th June is 0.3. As the actual usage (or consumption) is 3600, then the usage factor is Obtained by dividing 3600 by 0.3. Therefore the usage factor is 12000.

The actual usage factor is effectively a statement of what the annual consumption would be if the consumption in the read period as a proportion of annual consumption exactly follows the load profile. In aggregation, the actual usage factor will be multiplied by the interval coefficients to obtain the consumption to be aggregated.

The actual usage factor will replace any previously initial or calculated estimated usage factor for the period between the readings. Each new actual usage factor is associated with the read period and the history is maintained. Therefore if there are four readings in a year, there will be four actual usage factors calculated and maintained, one for each read period.

9.2 Calculating Estimated Usage Factors

Estimated usage factor is also calculated when a reading is obtained⁶. Estimated usage factor is calculated as the weighted average of the actual usage factors over the preceding 365 days. The weighting of each actual usage factor is based on the number of days in the read periods associated with each actual usage factor.

The table below shows the estimated usage factors calculated from each of the read dates.

Date	Period Length	Consumption	Actual UF to date	Estimated UF from date
28 February 2005	59	2000	10000	10000
24 June 2005	116	3600	12000	11326
28 August 2005	65	2250	15000	12321
31 December 2005	125	3850	11000	11868

Table 4: Estimated Usage Factors

Taking the estimated usage factor calculated on 31st December as an example, this is the weighted average of the four actual usage factors over the preceding 365 days, i.e. 10000, 12000, 15000 and 11000. Each usage factor is weighted according to the read period length, i.e. 59, 116, 65 and 125.

In many cases there will not be a reading exactly 365 days prior to the current reading. In this case the earliest actual usage factor is weighted only according to the number of days falling within the preceding 365 days.

Where there is not sufficient actual usage recorded to cover the preceding 365 days, weighting of the actual usage that is found is based only on the periods that are present. Therefore in the example above, the actual usage factor calculated on 24th June is determined according to the preceding 175 days consumption: i.e. 59 days at 10000 and 116 days at 12000.

⁶ An estimated usage factor will not however be used in aggregation if all registers for a timeslot are removed or the meter point is de-energised.

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10 Using Usage Factors in Aggregation

As indicated from figure 3 a usage factor should always be available for each timeslot installed at a meter point.

Aggregation will simply pick up all the usage factors that are available for each date that is to be settled. It does not matter whether this is an estimated or actual usage factor. Over time estimated usage factors will be replaced by actual usage factors as readings are obtained.

10.1 Data Aggregation

In Data Aggregation a specific date is selected. For each usage factor that is associated with the selected date the aggregation process will:

- Determine the appropriate derived load profile
- Multiply the usage factor by each of the 96 coefficients⁷ to obtain 15-minute interval consumptions
- Apply loss factors to the interval consumptions
- Sum the interval consumptions according to Supplier, Supplier Unit and SSAC

If we take the estimated usage factor of 11868 calculated from 31st December 2005 and suppose that the interval coefficients for 1st January 2006 are as follows:

Date/Time	00.45-01.00	01.00-01.15
01 January 2006	0.0000330	0.0000300

The consumption, prior to application of loss factor, to be aggregated for the 15-minute period from 00:45 to 01:00 will be 11868 kWh * 0.000033 or 0.391644 kWh.

The consumption, prior to application of loss factor, to be aggregated for the 15-minute period from 01:00 to 01:15 will be 11868 kWh * 0.00003 or 0.35604 kWh.

If no more readings were obtained throughout the year, then because the total of the interval coefficients over the year sums to 1, a total of 11868 kWh will be aggregated.

Aggregation Steps for SEMO

As with interval metered import sites the following are new requirements for the settlement of the Single Electricity Market that relate to the level of information required by the SEMO in the 590 Market Message.

- Import Data for SEMO for Non Interval ,HH and QH sites are aggregated together rather than separately
- Interval period in which aggregated data is provided to SEMO is Half-hourly not Quarter Hourly
- All Aggregated data for SEMO is provided in MWh and specifically not kWh
- Generator data is not signed, Import data is signed as negative (except where non participant generation exceeds demand)
- The SEMO is expecting one daily file from each Metered Data Provider for each day's aggregation process. MRSO will provide separate files of supplier and generator data to the SEMO.

As with interval metered import sites SEMO requirements for Market Settlement result in the following further processing steps:

- All values used are loss adjusted, and the calculations for every step are carried out at a Supplier Unit level
- First, for each Supplier Unit, for every 15-minute Interval , add the corresponding Non Interval Import Data and the QH Import Data
- Second, summate the 15-minute Import Interval Data to 30-minute Import Interval Data

⁷ See section 9.2 for details on long and short days

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- Third, add each 30-minute Smart HH Import Interval Data to its corresponding summated 30-minute Non Interval/QH Import Intervals and multiply the total by -1
- Fourth, summate to 15-minute Intervals all Non Participant Generator Data that has been registered to each Supplier Unit
- Fifth, summate the 15-minute Non Participant Generation Interval Data to 30-minute Interval Data
- Sixth, add each 30-minute Import Interval to each corresponding 30 minute Non Participant Generation interval Data for each supplier Unit.
- Finally, MRSO will convert the kWhs data to MWhs by division by 1000, representing MWh to three decimal places.
- This is called the Measured Quantity

10.2 Passing Aggregation Data to SEMO

For each Supplier, Supplier Unit and SSAC combination, except on days where the clocks change, the SEMO will receive 48 interval values for the day.

It should be noted that the current long/short day format will apply in the SEM viz

- the long day will contain an extra hours data
 - in 4x15-minute intervals, for 1-2 am in the morning for messages 591, 595, 594, 598, 341 & 342. There will be 100 intervals in total for the long day in these messages.
 - in 2x30-minute intervals, for 1-2 am in the morning for messages 590, 592, 596, 597 and 343. There will be 50 intervals in total for the long day in these messages.
- the short day will have no data for one hour between 1-2am in the morning.
 - For messages 591, 595, 594, 598, 341 & 342, there will be 92 intervals in total for the short day.
 - For messages 590, 592, 596, 597 and 343, there will be 46 intervals in total for the short day in these messages.

The Settlement Interval field in messages 591, 594, 592, 595 and 598 contains a sequential counter value. The Reading Number field in messages 596, 597 and 590 contains a sequential counter value.

10.3 Rounding

It will be noted that profile coefficients are extremely small numbers. Within the MRSO systems they are held to 10 decimal places and the aggregation calculations are initially performed in kWh at this precision. When the results are rolled up by loss factor and then by Supplier and SSAC these calculations will be performed in kWh with a precision of not less than five decimal places.

As a result it has been calculated that the maximum annual loss across all participants that results from rounding in the aggregation process should not exceed 25kWh.

Rounding for SEMO messaging is as follows:

- To convert kWhs data to MWhs by division by 1000, representing MWh to three decimal places
- ESB Networks rounding procedure is that if the value of the 4th decimal place after division by 1000 is 5 or greater then the 3rd decimal place is rounded up by one.

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11 Aggregating for Unmetered Sites

The central processing surrounding Data Aggregation for Unmetered sites will be identical to that for NQH meters. As with NQH processes, Load Profiles will be defined for Unmetered sites and utilised by MRSO to calculate Usage Factors. As such, the aggregation timetable is also identical.

The primary difference in processing is the derivation of Usage Factors based upon the inventory in place on site rather than the use of meter readings to confirm consumption. This is made possible by the agreement of a singular, defined duty cycle, setting out exactly the times when that Unmetered site will consume electricity. Using these predefined durations it is, therefore, always possible to calculate consumption without the use of a meter reading

11.1 Unmetered Site Inventory

In addition to the data Networks would hold for the calculation of Usage Factors on NQH sites it will also maintain details relating to the specific inventory in place on the site. This data consists of:

- The Billable Wattage
- The Repetition Factor e.g. the number of streetlights
- The Burn Hour Calendar, representing the duty cycle

11.2 Use of Load Profiles

Unmetered Load Profiles are explicitly driven by the predefined duty cycle for the site and as a result are standardised into fourteen Load Profiles which are listed here with their corresponding Load Profile Code values:

10.	Unmetered - Flat
11.	Public Lighting - Dusk/Dawn
12.	Public Lighting - Dusk/Midnight
13.	Public Lighting - Dusk/Dawn with Extra Trimming
14.	Public Lighting - Dusk/Dawn with Extra Trimming and 75% dimming between midnight and 06.00 hrs
15.	Public Lighting - Dusk/Dawn with Extra Trimming and 67% dimming between midnight and 06.00 hrs
16.	Public Lighting - Dusk/Dawn with Extra Trimming and 50% dimming between midnight and 06.00 hrs
17.	Public Lighting - Dusk to Dawn with Extra Trimming, dimmed to 75% from 21:00 through to 07:00 next day
18.	Public Lighting - Dusk to Dawn with Extra Trimming, dimmed to 67% from 21:00 through to 07:00 next day
19.	Public Lighting - Dusk to Dawn with Extra Trimming, dimmed to 50% from 21:00 through to 07:00 next day
20.	Public Lighting - Dusk to Dawn with Extra Trimming, dimmed to 75% from 20:00 to 22:00 then to 50% until 07:00 next day
21.	Public Lighting - Dusk to Dawn with Extra Trimming, dimmed to 67% from 20:00 to 22:00 then to 50% until 07:00 next day
22.	Public Lighting - Dusk to Dawn with Extra Trimming, dimmed to 64% from 20:00 to 22:00 then to 47% until 07:00 next day)
23.	Public Lighting - Dusk to Dawn with Extra Trimming, dimmed to 64% from 20:00 to 22:00 then to 36% until 07:00 next day

There will be no mixed profiles.

As the number of hours between Dusk and Dawn or Midnight varies throughout the year, seasonality will be represented within the Load Profiles.

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11.3 Burn Hour Calendar and Load Profile

Whereas the Load Profile shows the proportion of annual consumption a site will consume in a 15 minute interval the Burn Hour Calendar simply states the total number of hours a site will 'burn' each day of the year.

11.4 Unmetered Usage Factors

As indicated above Unmetered Usage Factors are calculated based upon the Inventory held against that site. This Usage Factor calculation is therefore:

$$\text{Actual Usage Factor (kWh)} = \text{Billable Wattage (kWh)} * \text{Repetition Factor} * \text{Annual Burn Hours}$$

As Unmetered Usage Factors are driven solely by the defined inventory all Usage Factors can be considered as 'actual', and therefore Estimated Usage Factors are not used. Crucially, the only time a Usage Factor can change will, therefore, be upon a Change of Inventory.

It should also be noted that, as with NQH Usage Factors for metered sites, the Usage Factor will be set to zero when a site is de-energised.

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12 Global Aggregation

The 05.06.2011 will see Global Aggregation implemented in the ROI. This means that the ESB CS Jurisdictional Error Supplier Unit (SU_400071) will be declassified as the JESU from the 05.06.2011 and will no longer be settled in the market using differencing i.e. Total Generation – Total Non JESU Consumption. As ESBCS were liable for the difference between total generation and total Non JESU Consumption they also absorbed any errors such as electricity theft, inaccurate loss factors and inaccuracies due to the use of non profile meters.

Once Global Aggregation is implemented the residual difference (i.e. the difference between total generation and total consumption) will be spread across all supplier units including the former ESBCS JESU by SEMO according to their market share for each settlement period.

As the proportion of errors are thought to be higher for consumption that is not recorded by profile metering MRSO are obliged to communicate the Non Interval Energy Proportion (NIEP) per settlement period per supplier unit. The NIEP is calculated using the following:

Total Non Interval Consumption with DLF applied / Total Non Interval and Interval Consumption with DLF applied.

The calculation is based on values in KWH per 30 minutes. The NIEP value is rounded to 8 decimal places.

The NIEP value will be sent on every new 590 (NPED) and 596 message that is generated after the Global Aggregation go live date.