Summary Validation, Estimation and Substitution Rules for HH Interval Metering

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Edit History

Date	Details of changes	Version
16/02/2021	Document introduced as part of Schema Release V13.0 (Smart) MCR 1157 Smart Metering Data Processing and Data Aggregation	1.0
04/08/2021	Document updated to provide clarification on the Validation Process	1.1
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1. Introduction

This document covers the rules to be followed, for both validation and estimation of data, for customers with remotely read Import HH (half hour) MCC 12 interval metering.
A complete set of data for all HH sites is to be provided on D+1[1]; where actuals are unavailable estimates will be generated.[2]

Where an estimate is required, it is generated based on the rules in this document.

2. Interval Status

Actual data will be issued to the registered Supplier via MM343 with Interval Status VVAK (Valid Value).

Estimation of HH Interval data is carried out in the Meter Data Management System (MDMS). If in exceptional circumstances (e.g. due to a system failure) the MDMS fails to provide HH data (actual or estimated) to the Central Market System, the Central Market System will generate an estimate.

Data that has been estimated by the MDMS will be issued to the registered Supplier via MM343 with Interval Status VEST (indicates that the data is estimated). Data that has been estimated by the Central Market System will be issued to the Supplier via MM343 with Interval Status VCHG (indicates that a value has been changed by ESBN).

[1] ESB Networks will issue data collected on a given day by 6am the following day.

[2] Where estimates are issued on D+1 and actual HH data subsequently becomes available, ESB Networks will issue the replacement data to the Supplier as soon as possible.
The replacement data will be identified as a new version. Ref. MPD15.1 Data Processing for HH Interval Metering Section 3.3 Data Replacement.

3. Validation

Validation of Meter Interval Data
The MDMS has the ability to perform validation based on the interval data and register readings provided by the Smart Electricity Meter (SEM) and any accompanying data quality flags [3]. Where a full day of import intervals are validated successfully, these are marked as Valid Actual intervals (VVAK)

When data arrives into the MDMS database validation is performed to identify any Time Error or Data Integrity flags. Where a flag is identified, an estimate is generated. Where there is a mix of flagged and valid intervals in a single day all intervals will be marked as estimated (VEST). Estimates generated as a result of Time Error or Data Integrity flags will not subsequently be replaced by actuals.

Validation of Flagged Intervals – Time Error
The Time Error validation on the receipt of each interval will identify if the interval includes a flag identifying an unacceptable meter clock adjustment, or potential meter clock error.

Validation of Flagged Intervals – Data Integrity

The Data Integrity validation on the receipt of each interval, will identify if the interval includes a flag identifying an internal unacceptable meter data integrity error.

Where flags are identified these will be passed to Operational teams for awareness and further investigation.

Where no flags are identified the data is made available for further validation.

Further validation of Import HH data

On processing of the collected import meter interval data, where no Time Error or Data Integrity Flags are identified, the following validations are completed.

Sum Demand Check
This check is to determine if the sum of the full day of actual interval values (i.e. those that have passed all other validations and are not estimates) is equal to (within a configurable tolerance) the difference of the register reads at the start and end of the day.

If outside this tolerance, the data will be determined as invalid and all intervals for that day will be marked as estimated. In this circumstance the actual values received will be marked as estimated due to failure of the Sum Demand Check. This data will not subsequently be replaced by actuals.

Missing/Invalid Register Read(s)
This check is to determine if there is a valid start and end of day register read for which the Sum Demand Check for the full day of interval data can be validated against. The lack of a register read or if either register read with an invalid status (due to presence of time error and data integrity flags on the register reads) will make this data invalid.

If invalid, all intervals for that day will be marked as Estimated (In this circumstance the actual values received will be marked as estimated due to register read failure.)

Missing Interval Data
This check is to determine if all intervals have been received for a full day. This will be 48 intervals on a ‘normal’ 24-hour day (46 and 50 on short and long days respectively due to clock changes).

3 Data quality flags indicate a variety of occurrences on the SEM such as time adjustment, memory corruption, power outage and power restoration.

Any missing intervals will be estimated (see Section 4) and the full day of data, including any actual intervals received, will be marked as Estimated.

4. Data Estimation & Substitution

4.1 Requirement for Data Estimation and Substitution

Data estimation is required to be undertaken in situations where metered data are incomplete, has been irretrievably lost or cannot be obtained within the timeframes required to issue the full set of intervals to the Supplier by 6am on D+1. Data substitution is required where the data obtained are erroneous. Where a full day of interval data is made up of a combination of actual and estimates, the full day of data will be issued to the Supplier with VEST (Valid Estimate) status.

The MDMS system is expected to provide a complete set of actual/estimated HH values for 100% of HH interval sites each day. However, in the exceptional scenario where such data provision is not possible by the MDMS, the Central Market system will act as a contingency for the provision of HH estimated values.
The 'contingency' estimation performed by Central Market System (denoted by the interval value status VCHG) is a simplified estimation algorithm, as follows:
If the site is de-energised, set each HH interval estimated value to 0.
If the site is not de-energised:

- Set each HH interval estimated value to the equivalent value from the previous week (D-7)
- If D-7 is not available, set each HH interval estimated value to the equivalent value from the previous month (D-28)
- If D-28 is not available, set each HH interval estimated value to 0.
- See also Section 4.3

When MDMS is restored, normal data processes will apply (including the retrospective sending of HH interval data regarding read dates for which ‘contingency’ estimation was previously performed by the Central Market System).

4.2 Data Estimation & Substitution Rules for MDMS

The sequence in which estimation methods are applied is as follows:

Sequence	Estimation Method
1	Device Event Based De-Energized Zero Reads Method
2	Linear Interpolation Estimation Method
3	Same Day Historical Estimation Method
4	Like Day Historical Estimation Method
5	Holiday Historical Estimation Method
6	Same Day Historical Second Pass Method
7	Like Day Historical Second Pass Method
8	Holiday Historical Second Pass Method
9	CLP without ADU Estimation Method

Table 3.2.1 Running order for Data Estimation

The estimation process uses interval history to find "like days". Like days are only considered if all intervals for that day are in a VAL status (validated). It uses three different algorithms such as Same Day, Like Day and Holiday to get the reference days from the historical data.

A full day’s data will be estimated / substituted when required using one of these methods in the order specified below.

Where a given estimation method fails to find VAL status reference data in the first instance, “Second Pass” estimation will be invoked for that method before moving to the next estimation method.

Device Event Based De-Energized Zero Reads Method
ESB Networks will default missing values to Nil where the site is De-Energised.

Linear Interpolation Estimation Method
This method generates estimated consumption to fill gaps between two valid readings

Same Day Historical Estimation Method

Same Day estimation method uses a 4 same day minimum reference in the previous 30 days to estimate.

This method equates the same day of the week, e.g. four validated Mondays within the last 30 days will be used to generate an estimate for a Monday; four validated Tuesday within the last 30 days will be used to generate an estimate for a Tuesday.

Like Day Historical Estimation Method

Like Day estimation method uses a 1 like day minimum reference in the previous 30 days to estimate.

This method compares weekdays with weekdays, and weekend days with weekend days. A validated weekday (Monday to Friday inclusive) within the last 30 days will be used to generate an estimate for a weekday; a validated weekend day (Saturday or Sunday) within the last 30 days will be used to generate an estimate for a weekend day.

Holiday Historical Estimation Method

Holiday Historical method uses a 1 like day minimum reference in the previous 30 days to estimate.

This method will be used to generate an estimate for (e.g.) a bank holiday by referencing a validated bank holiday that has occurred within the previous 30 days.

Same Day Historical Second Pass Estimation Method

Same Day second pass estimation method uses a 1 same day minimum reference in the previous 30 days to estimate.

For Same Day Historical Second Pass estimation, one validated Mondays within the last 30 days will be used to generate an estimate for a Monday; one validated Tuesday within the last 30 days will be used to generate an estimate for a Tuesday.

Like Day Historical Second Pass Estimation Method

Like Day second Pass estimation method uses a 1 like day minimum reference in the previous 90 days to estimate.

A validated weekday (Monday to Friday inclusive) within the last 90 days will be used to generate an estimate for a weekday; a validated weekend day (Saturday or Sunday) within the last 90 days will be used to generate an estimate for a weekend day.

Holiday Historical Second Pass Estimation Method

Holiday Historical Second Pass estimation method uses a 1 like day minimum reference in the previous 90 days to estimate.

This method will be used to generate an estimate for (e.g.) a bank holiday by referencing a validated bank holiday that has occurred within the previous 90 days.

CLP (Class Load Profile) without ADU (Average Daily Use) Estimation Method

Use of a generic curve acting as the profile of last resort which is invoked where no historical data is present allowing historical estimation methods to generate an estimate. The CLP will be based on the relevant standard load profile of MCC16 which is published annually by RMDS.

4.3 Alignment Non-Actual Interval Values to 24-Hour Cumulative Register Reads

Exceptional scenarios exist where non-actual interval values are not replaced by actual values which results in a misalignment between the sum of the interval values and 24-hour cumulative register reads.

As a result ESB Networks will conduct the following on a regular basis (at least weekly):

Reconciliation:

1. Identify MCC12 MPRNs where non-actual HH import interval values exist in the Central Market System.
    a. The 'look back' period will be set to a rolling 13 months and will be set to run 10 days in arrears[4].
2. Retrieve the most recent previous 24-hour cumulative register read prior to the presence of the non-actual intervals in the CMS
3. Retrieve the 24-hour cumulative register read post period of non-actual interval values (if no 24 hour cumulative register read is available then ignore until one is available)
4. Calculate the kWh consumption between the two cumulative 24-hour register reads
5. Sum all HH kW import interval values within the same period as the two 24-hour register reads
6. Convert the summed kW import interval values to kWh
7. Compare total kWh calculated from the cumulative 24-hour register reads against the kWh calculated from the sum of intervals.

Adjustment:

8. If the difference in the comparison of the total kWh between the cumulative 24-hour register reads and the kWh calculated from the sum of the intervals exceeds a threshold of +/-1 kWh, then
    a. Adjust the non-actual interval values to ensure that the sum of all the intervals between the two cumulative 24 hour register reads aligns to the register read consumption calculated between the two cumulative 24 hour register reads.
        i. The difference is uniformly smeared across each non-zero interval value by adding or subtracting the difference. This will ensure the consumption pattern shape is maintained as closely as possible whilst aligning to the consumption indicated by the cumulative register reads.
        ii. A floor of zero will be set to ensure the adjustment does not result in negative interval values. If there is potential for a negative interval value then further adjustments are completed to ensure that the total difference is smeared across relevant interval values.
        iii. If all non-actual interval values are zero then the adjustment will apply uniformly.

Dissemination of adjusted data to market participants:

9. The updated interval values will be issued to Market Participants via the 343 MM, same as any other updated interval values, and will be used for relevant market processes such as DUoS Billing and Data Aggregation etc.
10. The interval value status assigned to the adjusted non-actual values in the 343 MM will be 'VCHG' (indicates a value that has been changed manually by ESBN).

[4] ESB Networks reserve the right to adjust this parameter if analysis shows a more optimum setting. ESB Networks wishes to ensure that the right balance is struck between updating of data as soon as possible versus providing sufficient time to allow for the actual data to flow from the smart meter and AMI systems through to the Central Market Systems and onto the Market.