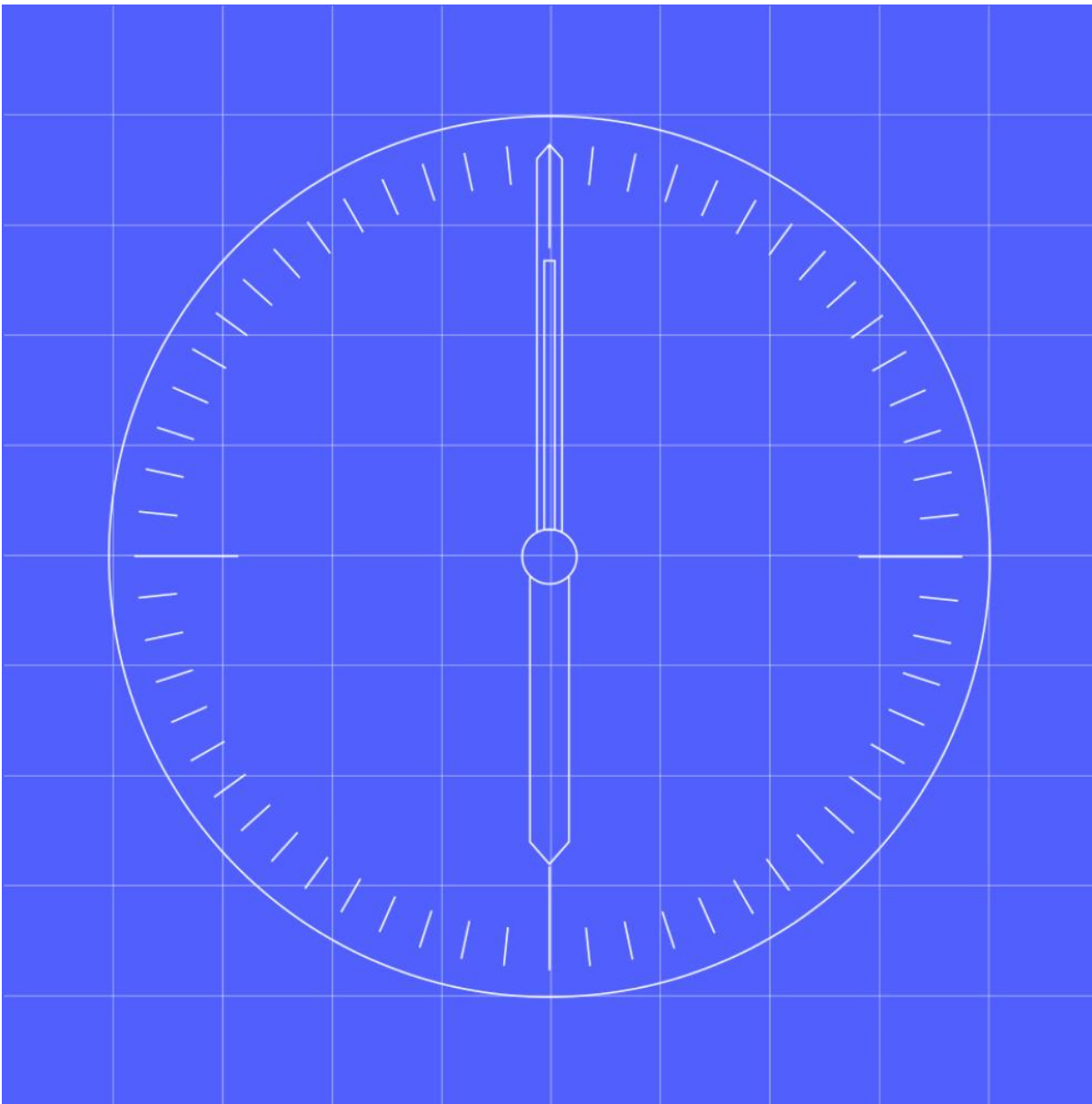




Smart Data Service Validation and Estimation: Methodology Statement

Version 5.2, 06 July 2023



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1. Background

- 1.1 This document sets out the Smart Data Service (SDS) requirements for validation of Consumption data and register reads and the estimation processes required where data is invalid or missing. It also sets out the estimation process for Metering Systems where the customer has opted-out of provision of data for Market-wide Half Hourly Settlement.
- 1.2 This document also sets out the methodology by which Meter Advances are calculated based on Register Readings for smart and non-smart Meters. It also describes how such Meter Advances are used or are converted into new values to be used within the estimation processes.
- 1.3 The following validation scenarios are covered in this document:
- SDS smart Meter data at UTC Period Level
 - SDS smart Meter data versus non-smart Meter Readings
 - General Validation Requirements for Register Readings
 - Validation of smart Meter data
 - Validation of smart Register Reading
 - Identifying Load Shape Categories using Registration data
 - Meter Advances, Actual Daily Advances, Daily Consumptions and Daily Advance Estimates
 - Calculation of Meter Advances for different Meter types:
 - Smart meters with daily advances or daily consumptions
 - Non-communicating smart Meters
 - Non-smart non-E7 Metering systems: single rate or multi-rate
 - Non-smart meters with Switched Load
- 1.4 This document sets out how to identify Load Shape Categories for each Metering Point and the estimation methodologies to be used using each type of advance that is available.
- 1.5 The defined term **UTC Period Level Consumption** refers to import or export data that is of UTC Period granularity and the same duration as a Settlement Period (E.g. 30 minutes or potentially 15 minutes in the future).
- 1.6 The SDS must have flexibility to the duration of a UTC Period. The SDS must be able to process varying durations of a UTC Period. The UTC Period will not change in a UTC date and there will not be different UTC durations per Load Shape Category. All participant systems will be future proofed to handle changes to the definition of a 'Settlement Period'. This does not mandate the complete re-design of participants existing systems, however, any changes to existing functionality or new functionality introduced to support MHHS should allow for different Period lengths (E.g 30 minutes or potentially 15 minutes in the future).

SDS accesses smart Meter Data

- 1.7 The SDS will access smart Meter consumption or Register Read data using its Meter Data Retrieval Service (MDR). The MDR Service can be provided by the Supplier using his own Data and Communications Company (DCC) credentials under the Smart Energy Code (SEC) to schedule Service Requests. Otherwise, the MDR Service can be provided by another entity procured by the Supplier as part of the SDS using the MDR User role developed under the SEC. The Service Requests available to Suppliers and MDR User are set out in the SEC Modification MP162.

SDS smart Meter data with UTC Period Level Consumption

- 1.8 Where UTC Period Level Consumption (Active Import Profile Data or Export Profile Data) is available for Settlement from the Meter for either Import or Export this data shall be used for Settlement provided it is deemed valid according the requirements set out below. Otherwise it shall be deemed invalid and not used for Settlement.

SDS Smart Meter versus non-smart Meter Readings

- 1.9 For smart Metering (import or export) Systems the Total Cumulative Register Readings for either Import or Export or Daily Consumption (ElecActiveImportRegisterConsumption or ActiveExportRegisterValue as set out in Smart Energy Code: Appendix A) shall be used in calculating Meter Advances. For non-smart Meters the Settlement Registers as identified in the Meter Technical Detail shall be used in the calculations. Where there are no communications for smart Meters the Total Cumulative Register can either be read at site or be provided by the Supplier if a customer own read has been supplied.

Valid Service Requests for the Meter Data Retrieval Service of the SDS

- 1.10 The MDR can send the following Service Requests to the DCC:

DCC SR Ref.	Service Request Name	On Demand?	DCC Scheduled?
4.1.1	Read Instantaneous Import Registers	Yes	No
4.2	Read Instantaneous Export Register Values	Yes	No
4.6.1	Retrieve Import Daily Read Log	Yes	Yes
4.6.2	Retrieve Export Daily Read Log	Yes	Yes
4.8.1	Read Active Import Profile Data	Yes	Yes
4.8.3	Read Export Profile Data	Yes	Yes
4.17	Retrieve Daily Consumption Log	Yes	Yes
5.1	Create Schedule	Yes	No
5.2	Read Schedule	Yes	No
5.3	Delete Schedule	Yes	No
8.2	Read Inventory	Yes	No

2. General Validation Requirements for Register Readings

- 2.1 The SDS shall validate all Register Read data before it is used for Settlement or estimation. For smart Meters the SDS shall validate all Active Import and Active Export data and Register Read (ElecActiveImportRegisterConsumption or ActiveExportRegisterValue as set out in Smart Energy Code: Appendix A) data before it is used for Settlement or estimation. For non-smart the Register Reads will be for the Settlement Registers identified in the non-smart Meter Technical Details (D0149/ D0150). The initial reading may need to be validated once a further reading becomes available. The SDS shall re-estimate or re-publish all data with new data if more recent valid data is received while the data is prior to Final Reconciliation. The minimum validation rules apply equally for whether the reading to be validated lies after other valid Meter readings in time, or before other valid Meter readings or between other valid Meter readings in time. If the Register Read fails any of the validation checks it shall be deemed invalid.
- 2.2 The SDS shall always use actual Register Reading data where available directly from the Meter in favour of Supplier supplied reads. The exception to this rule, is where Supplier provides an "Agreed" or "Override" reading, in these cases the SDS must use this data in his estimation calculation(s), even where valid actual data from the meter is available, with the acceptance that the supplier will have taken greatest of care when deciding to submit these readings and that the resulting impact on settlement submissions is the suppliers responsibility to monitor and resolve. Supplier and SDS should bilaterally agree a process for highlighting and resolving any disagreement in the usage of either Agreed or Override Readings as part of their contractual agreements

- 2.3 All smart Meters have the same length on the internal billing data log (10 characters long in Wh) and, for the display, it will be 5 digits (kWh) if the meter is single phase and 6 digits (kWh) if it is polyphase. The information on display digits is provided on confirmation of appointment to the SDS on the I/F-036/ PUB-036 and updates whenever the data item changes (e.g. on Meter exchange). Where the SDS retrieves readings remotely via the Data and Communications Company (DCC) from smart Meters care should be taken when calculating Meter Advances where display register data has been collected. The SDS should ensure that the number of register digits collected remotely is consistent with the number of register digits defined as part of the Registration Data against the Meter Asset where register data has been collected from the display. Where necessary, the leading digits from the reading should be adjusted/ truncated to match the display length to ensure this consistency when calculating Meter advances for estimation purposes. Also, the SDS shall ensure that Meter Advances are calculated in kWh converting the internal billing read appropriately.).
- 2.4 The validation requirements described below are the minimum requirements that the SDS shall carry out for each Settlement register:

Long Term Vacant Sites

- 2.5 The SDS shall take account of notifications by the Supplier that a site is deemed to be Long Term Vacant (LTV) and apply appropriate Method (see SDS Estimation Methods below) where no actual data is available...

Check Meter Serial Number

- Check that where Register Read data is collected at site the Meter Serial Number (MSN) for the non-smart MPANs to which the SDS has been appointed is the same as the serial number provided by the Metering Service in the Meter Technical Details and the Registration data for that MPAN.

Checks for Zero consumptions

- Check for zero Consumption, where the zero Consumption on the Meter register is not expected based on available previous history for the MPAN collected following the SDS appointment, and if so:
 - a) check for previous zero consumption patterns for import MPANs
 - b) check for zero export patterns for export MPANs
 - c) check Site Visit Report where provided by the Meter Reading Service of the SDS
 - d) check whether Metering System is being treated as a Long Term Vacant site as notified by the Supplier.
 - e) for smart Meters check whether the Metering System is remotely disabled as notified by the Supplier as provided on the I/F 024.
 - f) Check if site is de-energised.
- 2.6 If zero explained by historical Consumption, Site Visit Reports, remote disablement or Metering System being settled on at zero then valid, otherwise invalid.

Check for Negative Consumption

- Check for negative Consumption and if so:
 - a) check for Meter Register rollover – check the calculation has been performed correctly.
 - b) check if the previous Meter register reading is a deemed reading and that the reading prior to the deemed reading is an actual Meter register reading, and that the current Meter register reading advance creates a positive Consumption with respect to the last actual Meter register reading (i.e. obtained prior to the deemed reading), making allowance for any Meter register rollover. If so then reading valid, otherwise invalid.
- 2.7 Where consumption data has been deemed invalid the SDS shall inform the Supplier using the Meter Reading Reason Code on the IF-041/PUB-41.

3. Validation of smart Meter data

SDS validation requirements (General)

- 3.1 Operational Smart Meter means where a Meter Reading is capable of being able to be retrieved remotely from the asset and made available to the Registered Supplier. Where data has been collected remotely or via a site visit the SDS shall perform all of the appropriate general validation checks set out in Section 2. Where a Smart Meter is not operational then the cumulative register will need to be read a site noting the number of display digits provided by the Registration Service on IF-006/PUB-006.
- 3.2 The SDS shall validate all Active Import and Active Export data and Register Read (ElecActiveImportRegisterConsumption or ActiveExportRegisterValue as set out in Smart Energy Code: Appendix A) data before it is used for Settlement or estimation. The SDS shall process or re-estimate and publish if more recent data is received while the data is prior to Final Reconciliation or if the MPAN is subject to an upheld dispute.

SDS checks data is from expected source

- 3.3 The SDS shall validate that the data has been received from one of the expected source(s) i.e. from the DCC, MRS, MSS, Registration Service or Supplier associated with the MPAN. This includes consumption data, notifications and MTDs.

SDS stores data

- 3.4 The SDS must store all data for the appropriate amount of time according to the non-functional requirements set out in the BSC for validation, estimation, error resolution and audit purposes.

SDS checks MDR data is for expected MPAN and Meter

- 3.5 Where relevant Registration data has been accessed the SDS shall validate that consumption or Register Read data has been received for the expected combination of MPAN and Electricity Smart Meter Equipment (ESME) GUID, as set out in the Registration data. The EMSE GUID for each device associated with the MPAN will be provided to the SDS on its appointment (see IF-006/PUB-006) and on any changes to the smart Metering Equipment details held in the Registration system. It is assumed that if the ESME GUID is NULL then no data can be collected by the SDS. The SDS shall then apply the relevant estimation method as defined below.
- 3.6 The SDS shall record all occurrences where data entering Settlements has been changed by/ or following instruction from the Supplier. E.g. Theft Data or following a manifest error.
- 3.7 When SDS carries out validation, it shall retain the original reading value and the reason for failure, where the value is invalid.

SDS validates data recognising any Supplier notifications

- 3.8 The SDS shall take account of any notifications by the Supplier (provided on IF-024/PUB-024) when validating data and apply the appropriate estimation Method (see SDS Estimation Methods below). In the absence of actual consumption the only notification that should impact validation and estimation are:
- a) Long Term Vacant Sites
 - b) Supply remotely disabled

SDS validates UTC Period Level Consumption is not negative

- 3.9 The SDS shall validate that every period of UTC Period Consumption data is not NULL and is greater than or equal to 0.

SDS validates UTC Period Level Consumption (UTCP) data against permissible maximum energy

- 3.10 UTCP data is received in Watt hours (Wh) and will need to be converted to kilo-Watt hours (kWh) and to three decimal places prior to validation and processing. During validation where the energy recorded exceeds the limits in the table below, for one or more given UTC Period, the SDS will take the action defined below.

	Max. kW	Max kWh / UTC Period	Permissible Allowed: kWh per UTC Period*
Smart Meter Consumption	90	[45]	[60]

**Note the values above may be adjusted if the duration of a UTC Period changes.*

- 3.11 If valid the SDS shall enter the actual data into Settlements else replace the actual data with estimated data and enter this into Settlements once all other validation checks are completed.

Reconciliation for smart Meter Advance Reconciliation

- 3.12 The SDS shall validate that the sum of the UTC Period Level Consumption data is equal to the consumption between Cumulative Register Reads (ElecActiveImportRegisterConsumption or ActiveExportRegisterValue as set out in Smart Energy Code: Appendix A) or against the daily consumption values sourced from the Metering System at a minimum of once a month. If data previously submitted to the MDS is deemed invalid a replacement estimate will be calculated by the SDS using the methods in this document.
- 3.13 A Meter Advance Reconciliation (MAR) is the reconciliation of the advance on the Cumulative register between two specific date(s) and time(s) compared with the summation of the relevant valid UTC Period Level Consumption Data used in Settlement over the same date(s) and time(s).
- 3.14 Care should be exercised where the Cumulative register reading does not align with the end of a UTC Period, and this should be taken into consideration in the reconciliation, as described below.
- 3.15 The SDS shall use a level of tolerance set to take into account the period over which the check was performed. The maximum levels are $[\pm 0.7\%]$ where the check is carried out at least on a weekly basis for months data or $[\pm 5\%]$ where the check is carried out on a daily basis using daily data. Data failing the Meter Advance Reconciliation check will be deemed invalid.
- 3.16 Where consumption or register read data has been deemed invalid the SDS seek to resolve the cause of the discrepancy. Appropriate action should be taken if the cause of the discrepancy can be identified. If the UTC Period Level Consumption data is deemed valid following investigation then the data can be published, otherwise the SDS shall estimate all UTC Periods within the period of the MAR.

SDS identifies missing or corrupted data

- 3.17 If the UTC Period Level Consumption is missing, uncollected or corrupted (E.g., non-numeric data) or if for any other reason the data is deemed to be invalid then the data shall be estimated using the data estimation processes for Smart Meters set out in below. The estimated data should also be re-validated to ensure there were no issues caused by the estimation process. The data shall then be provided to the Market-wide Data Service in line with the Operational Choreography.

Supplier reconciliation of Settlement and Billing data

- 3.18 It should be noted that where a Supplier is using the actual UTC Period Level Consumption to reconcile billing data the sum of the UTC Period Level Consumption may not equal the advance on the ToU billing registers due to the randomised off-set applied to the billing registers when load is being switched.

4. SDS Estimation: Load Shapes

- 4.1 The following sets out how Load Shapes are identified by the SDS for use in the estimation Methods set out in Section 6. The processes for calculating Load Shapes are set out in the Load Shaping Service Method Statement

Identifying Load Shape Categories (LSC) using Registration data

- 4.2 The SDS shall use the Registration data for each MPAN. These items are configurable so new LSCs are introduced in the future. However, the following Data Items required to identify the appropriate Load Shape Category 'C' initially:

Data Item	Definition
Market Segment Indicator	An enumeration of Smart/Advanced/Unmetered. Must be S for SDS processing.
GSP Group ID	Identifies the distinct grid supply point group (physical region of the country) where the metering point is located.
Domestic Premise Indicator	A flag that indicates if the MPAN of the registration appointment is used to identify a domestic premise.
Measurement Quantity ID	Identifies UTC Period if the data is Active Import or Active Export. The Measurement Quantity Table in ISD maps Measurement Quantity ID to the Energy Direction which matches the Registration data item.
Connection Type Indicator	Unmetered (U), Whole Current (W), Low Voltage Current Transformer (L), High Voltage Current Transformer (H) or Extra High Voltage Current Transformer (E). Must be W for SDS Processing

Please note: The Metered Indicator data item is not required and should be ignored.

- 4.3 The SDS should also validate that the MPAN is in the correct Market Segment (S) and has the correct Connection Type indicator (W) on each update received from the Registration Service and updates to the Industry Standing Data (ISD). The SDS shall identify the correct Load Shape for the MPAN based upon the Registration data. If the MPAN is a non-smart Meter and Profile Class 02 or 04 then the SDS must be aware of the Off-Peak Period in order to correctly apply the Period Meter Advances (PMAs) to the Load Shapes. The use of the non-smart Switched Load option will be time limited to 5 years, subject to an impact assessment, after transition to MHHS or discontinued once the majority of remaining non-smart Economy 7 or other Economy tariff (e.g. E8 or E10) Meters have been replaced. The Data Items are set out in the headers of the following ISD table:

Market Segment Indicator	GSP Group ID	Domestic Premises Indicator	Measurement Quantity	Non-Smart Switched Load Profile Class	Off-Peak Period (UTC) Start Time	Off-Peak Period (UTC) End Time	Connection Type Indicator	De-minimis Data count*
S	_A	T	AI	02	00:00	07:00	W	[50]
S	_A	F	AI	04	00:00	07:00	W	[50]
S	_A	T	AE				W	[50]
S	_A	F	AE				W	[50]
S	_B	T	AI	02	00:30	07:30	W	[50]
S	_B	F	AI	04	00:30	07:30	W	[50]
S	_B	T	AE				W	[50]
S	_B	F	AE				W	[50]
S	_C	T	AI	02	00:30	07:30	W	[50]

S	_C	F	AI	04	00:00	07:30	W	[50]
S	_C	T	AE				W	[50]
S	_C	F	AE				W	[50]
S	_D	T	AI	02	00:30	07:30	W	[50]
S	_D	F	AI	04	00:30	07:30	W	[50]
S	_D	T	AE				W	[50]
S	_D	F	AE				W	[50]
S	_E	T	AI	02	00:30	07:30	W	[50]
S	_E	F	AI	04	00:30	07:30	W	[50]
S	_E	T	AE				W	[50]
S	_E	F	AE				W	[50]
S	_F	T	AI	02	00:00	07:00	W	[50]
S	_F	F	AI	04	00:00	07:00	W	[50]
S	_F	T	AE				W	[50]
S	_F	F	AE				W	[50]
S	_G	T	AI	02	00:30	07:30	W	[50]
S	_G	F	AI	04	00:30	07:30	W	[50]
S	_G	T	AE				W	[50]
S	_G	F	AE				W	[50]
S	_H	T	AI	02	00:30	07:30	W	[50]
S	_H	F	AI	04	00:30	07:30	W	[50]
S	_H	T	AE				W	[50]
S	_H	F	AE				W	[50]
S	_J	T	AI	02	00:30	07:30	W	[50]
S	_J	F	AI	04	00:30	07:30	W	[50]
S	_J	T	AE				W	[50]
S	_J	F	AE				W	[50]
S	_K	T	AI	02	00:30	07:30	W	[50]
S	_K	F	AI	04	00:30-	07:30	W	[50]
S	_K	T	AE				W	[50]
S	_K	F	AE				W	[50]
S	_L	T	AI	02	00:00	07:00	W	[50]
S	_L	F	AI	04	00:00	07:00	W	[50]
S	_L	T	AE				W	[50]
S	_L	F	AE				W	[50]
S	_M	T	AI	02	00:30	07:30	W	[50]
S	_M	F	AI	04	00:30	07:30	W	[50]
S	_M	T	AE				W	[50]
S	_M	F	AE				W	[50]
S	_N	T	AI	02	00:00	07:00	W	[50]
S	_N	F	AI	04	00:00	07:00	W	[50]
S	_N	T	AE				W	[50]
S	_N	F	AE				W	[50]
S	_P	T	AI	02	00:00	07:00	W	[50]
S	_P	F	AI	04	00:00	07:00	W	[50]
S	_P	T	AE				W	[50]
S	_P	F	AE				W	[50]

- De-minimis count used by the Load Shaping Service and not used by SDS

Load Shape Data Items

4.4 The Load Shape data items can be found in: MHHP-IF-022 - Consumption Central Settlement LSS Period to Data Service

Load Shape Totals definition using Industry Standing Data (ISD)

4.5 The following Load Shape totals will be provided for each LSC:

Load Shape Total	Description
Load shape total	The sum of all LS Period Values for the UTC Date.
Load shape peak total	The sum of LS Period Values for UTC times (07:00 to 00:00) or (00:00 to 00:30 and 07:30 to 00:00) as defined in ISD
Load shape off-peak total	The sum of LS Period Values for UTC times (00:00 to 07:00) or (00:30 to 07:30) as defined in ISD
Load shape 7 day rolling total	The sum of the Load Shape Total defined above and the Load Shape Total for the past 6 UTC Dates.
Load shape 7 day rolling peak total	The sum of the Load Shape Peak Total defined above and the Load Shape Peak Total for the past 6 UTC Dates.
Load shape 7 day rolling off-peak total	The sum of the Load Shape Off-Peak Total defined above and the Load Shape Off-Peak Total for the past 6 UTC Dates.

4.6 The Load Shape Totals can be found in: MHHP-IF-023 Load Shape Totals Data

5. Meter Advances, Actual Daily Advances, Actual Daily Consumptions and Daily Advance Estimates

5.1 The estimation methods will use different types of advances according to the estimation Method being deployed:

Advance Type	Definition	DCC Service Request/ Non-smart
Period Meter Advance (PMA) ¹	A Meter Advance is defined as an Advance calculated over two or more UTC Datetimes, where the time is part way through a UTC period it should be deemed to be at the start of the UTC period, where the time of the reading is not available it should be deemed to have occurred at midnight at the start of the day on which the reading was collected.	SRV4.6.1 (Import) SRV4.6.2 (Export) or Manual Read for Non-smart
Actual Daily Advance (ADA)	An advance calculated between two consecutive	SRV4.6.1 (Import) SRV4.6.2 (Export)

¹ The PMA will be deemed to cover from mid-night to mid-night on the days the read occurred regardless to the timing of the readings. This allows PMAs to be allocated to whole UTC dates when applying estimation methods.

	midnight reads for the Total Cumulative Register of a smart Meter	
Actual Daily Consumption (ADC)	A Daily consumption value collected from a smart Meter using the SRV: Retrieve Daily Consumption Log	SRV4.17
Daily Advance Estimate (DAE)	An estimated advance to be used for a UTC Date (YYYY-MM-DD) for which estimation is required until an actual Advance is available.	NA
Annual Consumption	An estimate of annual consumption in kWh calculated by Elexon Central Systems or provided by the Supplier	Provided via I/F-020/ PUB-040

Validation of ADA and ADC Values

- 5.2 For the purposes of the document the term Daily Advance (DA) refers to either an ADA or ADC.
- 5.3 The DA values must follow the general validation processes set out in Sections 2 and 3.

Daily Advance Estimate Calculations

- 5.4 The Daily Advance Estimate will depend on the type of Advance that is available for an MPAN and in the following hierarchy (a to c):
- For a Period Meter Advance (PMA) the DAE is calculated by dividing the Meter Advance, using the actual datetime readings, by the duration of the Meter Advance and extrapolating to 24 hours);
 - The average of the previous 7 consecutive DAs: otherwise
 - where daily advance records are available [either in the past or future] and less than 90 days different from the UTC Date requiring a daily advance - use the mean actual Meter advance from the closest [4] weeks for the same Day Type (as defined in ISD).
- 5.5 Where DAEs are required to be calculated the SDS shall use the most recent data based on the event that triggered the estimation. If no DAE can be calculated then the next appropriate Method of estimation below shall be used noting if the MPAN is for Active Import or Active Export.

Non-smart Meter Advances for single and Multi-Rate MPANs

Single Rate MPANs and Multi-Rate E7 non-smart MPANs with Switched Load

- 5.6 The SDS shall calculate a single Period Meter Advance (PMA) for two valid Meter Readings by differencing the earlier read from the next available.
- 5.7 Where the non-smart is not Profile Class 02 or 04 for the MPAN and the Meter is multi-rate but no Register is associated with switched load as defined in the D0149/D0150 the SDS shall calculate a single Period Meter Advance (PMA) by firstly calculating a PMA for each Settlement Register then summing the PMAs into a single value.

Multi-Rate non-smart MPANs with Switched Load

- 5.8 Where the Registration Data identifies the non-smart MPAN is in Profile Class 02 or 04 with switched load capability the SDS shall calculate two Period Meter Advance (PMA) one for the Peak Load Register(s) and one for the Off-peak Register(s) for the MPAN as identified by the non-smart Meter Technical Details (MTDs). This approach will be time-limited until 5 years after the end of Transition to MHHS. This approach can be used for any non-smart Meter with E7 or other Switched load duration (e.g. E8 or E10). However, the load during the switched period will be allocated to a 7 hour window regardless of duration. The switched load register can be identified on the retained D0149/ D0150 and the SSC/ TPR combination in the 'frozen MDD' tables for 5 years. After 5 years, subject to an impact assessment, this facility will be removed and Suppliers will have that window to reduce the remaining non-smart Meters on these arrangements.

6. SDS Estimation: General

SDS Estimates of UTC Period Consumption

- 6.1 The SDS shall ensure that UTC Period Level Consumption data will be estimated for any periods of missing or invalid data using a number of estimation techniques. The Method to be used will be dependent on the data available at the times of estimation. Estimated data will be labelled with the estimation technique used.
- 6.2 Estimation must be re-calculated if newer consumption/ export data becomes available for a Settlement Day that is prior to Final Reconciliation.

The SDS amends consumption data following detection of theft from RPU service or other Consumption adjustments

- 6.3 The SDS must enter UTC Period Level Consumption data into settlement in the appropriate time period when notified by the BRP (supplier) according to the rules set out in the BSC or BSC subsidiary documents. The SDS shall apply the most applicable estimation method and set the Estimation Reason Code to 'Adjustment'.

The SDS estimates a SP level consumption data where a Meter Advance is not available.

- 6.4 The SDS must be able to estimate the consumption for UTC Periods where a Meter Advance is not available according to the Estimation Rules and method and flag each estimation according to its method.

SDS validates estimated data

- 6.5 When UTC Period Level Consumption data has been estimated, this data shall be validated against the Maximum Permissible Limit prior to being used in subsequent processing. Any data that fails validation following estimation should be flagged appropriately and investigated. If deemed to be correct it shall be passed as valid. Otherwise, it should be recalculated using an alternative Method before being allowed to be used.

SDS receives actual UTC Period data when data has previously been estimated

- 6.6 If the SDS receives new data, and this new data from an expected source and is successfully validated, it shall be published in accordance with the Operational Choreography timescales for Load Shaping (if not concluded) or Reconciliation Runs prior to Final Reconciliation.

SDS receives new data when data has previously been estimated

- 6.7 If the SDS receives new Meter Register data which is not UTC Period Level Consumption data but allows a better estimate to be calculated the SDS must recalculate the estimate using the appropriate Estimation

Method and publish in accordance with the Operational Choreography timescales for Reconciliation Runs prior to Final Reconciliation.

Estimation for Export data

- 6.8 Export may be estimated for non-smart Meters with an Export register or smart Meters with communication issues (that prevent UTC Period Level Consumption data being collected) provided there is a valid Meter Advance that spans the UTC Date. Otherwise, the SDS shall estimate zero data for export MPANs using Method 10 below where such UTC Period Level Consumption data or Register Reading data is unavailable. If subsequently the UTC Period Consumption is retrieved (and successfully validated) the estimated data shall be replaced.

7. SDS Estimation Methods

Identifiers used in this Method Statement

- 7.1 The following Identifiers are used in this document which will form part of the BSC Technical Glossary (link below table):

Identifier	Data item
<i>C</i>	Load Shape Category
<i>D</i>	UTC Date
<i>E</i>	Previous UTC Date
<i>j</i>	UTC Period
<i>k</i>	MPAN
<i>M</i>	Missing UTC Periods
<i>N</i>	Period Meter Advance duration
<i>P</i>	Valid available Periods
<i>X</i>	DA 7 Day Average DA Data
<i>Y</i>	Year

Note: Where identifiers are in italics these are new MHHS Identifiers and do not have the same meaning as those set out in: <https://www.elexon.co.uk/documents/bsc-codes/bsc-sections/bsc-section-x-2-technical-glossary/>

E.g. *j* is Settlement Period which is in clock time but italic *j* is a UTC Period i.e. in Coordinated Universal Time.

- 7.2 Where notified by a Supplier that a sites is Long Term Vacant (LTV) or remotely disabled the SDS shall use Methods 11 or 12 respectively. Otherwise, the SDS shall use the following hierarchy when estimating UTC Period Consumption. Where Load Shape data is used in the estimation Method it is assumed that the SDS has identified the correct Load Shape 'C' for the MPAN from the Registration data and ISD. The SDS shall apply the estimation flags to the data as defined below and the reason for estimation should also be recorded (e.g. Opted-out (Consent Granularity<>H) or no communications):

Method 0: SDS processes Supplier provided 'Agreed' or 'Override' Readings and Consumption Amendments

The Supplier can provide and Override, Agreed Readings (I/F-041/ PUB-041) or a Consumption Amendment (I/F-027/ PUB-027). The (I/F-041/ PUB-041) can be used for a number of scenarios including read on install, removal or change of energisation status.

Agreed or Override readings

This reading shall be used by the SDS even where actual valid reading data from the meter is available. Where the Supplier has provided an Agreed Read or and 'Override' Read then the SDS shall process the data as follows:

Calculate a Period Meter Advance (PMA) using the reading provided and another valid reading to determine the Meter Advance Period N (PMA_N) where N is the period between the two readings.

Consumption Amendments

The Supplier will provide a gross volume, together with a 'Consumption Amendment Period Start Date' and a 'Consumption Amendment Period End Date'. This data shall be processed as though it is a PMA for the Meter Advance Period N (PMA_N) where N is the period between the 'Consumption Amendment Period Start Date' and 'Consumption Amendment Period End Date'

The SDS should calculate UTC Period data using the PMA (spanning the UTC Period and scaling the Load Shape and daily totals data from the LSS, and store these records as "E0"

Calculation for UTC Period j on UTC Date D and Supplier provided Meter Advance Period N where LS_TOT_N is the Load shape totals summed over Meter advance period N using PMA_N:

$$UTCP_{Dj} = LSPV_{Dj} / LS_TOT_N * PMA_N$$

Method A: SDS estimates data for smart Meter where there is one missing UTC period; DA is available (Import or Export)

Where 47 UTC Periods are valid and 1 UTC Period of data is missing or invalid in a UTC day and a DA is available, use the daily advance to calculate the missing time period data and flag the calculated data as "A" flag.

$$UTCP_{Dj} = (DA_D) - \text{Sum}(\text{UTC Period Level Consumption}_D)$$

Where j is the missing UTC period to be estimated and UTC Period Level Consumption_D is the data collected and validated from the smart Meter.

Method 1: SDS estimates data for smart Meter where there is more than one missing UTC period; ADA Import and Export or ADC Import only is available

Where 2 or more UTC Periods of data are missing or invalid in a UTC day and at least one UTC period of data is valid and a DA is available, use the DA and the available/valid UTC period consumption to calculate the sum of the missing consumption. Allocate this consumption to the relevant UTC periods using the appropriate load shape obtained from the LSS. Flag the estimated data as "E1" flag.

Calculation for missing UTP periods j of UTC Date D with valid/available periods P and missing periods M:

$$UTCP_{Dj} = \frac{LSPV_{Dj}}{\sum_M LSPV_{Dj}} (DA_D - \sum_P UTCP_{DP})$$

Where DA is the ADA and LSPV is the Load Shape Period Value published by the Load Shaping Service.

Method 2: SDS estimates data for smart Meter where there is no UTC Period Consumption; DA available

Where all UTC Periods of data are missing or invalid in a UTC Date, or where the MPANs Consent Granularity = 'D' and a DA is available, allocate the daily advance consumption to UTC Periods using the appropriate load shape obtained from the LSS. Flag the estimated data as "E2" flag.

Calculation for UTC Period j on UTC Date D and LS_TOT_D is the Load shape total for UTC Date D ;

$$UTCP_{Dj} = LSPV_{Dj} / LS_TOT_D * DA_D$$

Where the MPAN is for Domestic Import and has switched load and the MPANs Consent Granularity <> 'H' and the SDS has received an IF-024 / PUB-024

'Supplier Advisory Notification to Data Service' notifying the Peak and Off-Peak proportions the SDS shall calculate the OFF_Peak_Consumption_D and the Peak_Consumption_D by applying the proportions notified to the DA. The SDS shall then calculated the UTC Period Level Consumption (UTCP_{Dj}) as follows:

$UTCP_{Dj} = LSPV_{Dj} / LS_TOT_OFFD * OFF_Peak_Consumption_D$ for periods j in the Off-peak period

AND

$UTCP_{Dj} = LSPV_{Dj} / LS_TOT_PEAKD * Peak_Consumption_D$ for periods j in Peak period

For UTC Period ' j ' on UTC Date ' D ' and where $LS_TOT_OFF_D$ is the Load shape off-peak total and $LS_TOT_PEAK_D$ is the Peak Load shape total.

Method 3: SDS estimates for smart Meters using a non-daily Meter advances

In the absence of a DA consumption data to calculate daily Meter advances, the SDS should calculate UTC Period data for any period where valid actual UTC Period data is not present, from a valid PMA spanning the UTC Period and scaling the Load Shape and daily totals data from the LSS and netting off any valid actual data available during the PMA Period, and store these records as "E3"

Calculation for UTC Period j on UTC Date D and Meter Advance Period N where LS_TOT_N is the Load shape totals summed over Meter advance period N and $UTCP_N$ is the sum of the valid actual UTC period data during the PMA and $LSPV_N$ is the sum of the LSPV values that coincide with the valid actual UTC period data during the PMA::

$$UTCP_{Dj} = (LSPV_{Dj} / (LS_TOT_N - LSPV_N)) * (PMA_N - UTCP_N)$$

Method 4: SDS estimates where smart Meter daily register reads are unavailable but daily register read history is present (Import only)

For Settlement Periods where valid actual consumption data is available the data shall be used. For other Settlement Periods where DA values for the relevant UTC day are unavailable from the smart Meter but a DA is available [either in the past or future] and less than [3] months different from the UTC Date requiring a daily Meter advance - use the average actual Meter advance from the closest [4] weeks for the same Day Type (DAE). The average will then be applied to the appropriate Load Shape for the UTC Date. Record the estimated as "E4".

Calculation for UTC Period j on UTC Date D and using DAE_X (DA) based on the y DA average data X and where and where LS_TOT_D is the Load Shape total:

$$UTCP_{Dj} = LSPV_{Dj} / LS_TOT_D * (DAE_X)$$

Method 5: SDS estimates for smart Meters where previous DAs are available (Import only)

For Settlement Periods where valid actual consumption data is available the data shall be used. For other Settlement Periods Where DAs for the UTC date are unavailable and the most recent actual settlement data is [7] consecutive previous DAs prior to the UTC Date being processed, the SDS shall calculate the UTC Period data using the average daily consumption for the most recent [7] consecutive actual daily advances and the load shape and load shape rolling total from the LSS. This estimate shall be store as type "E5"

Calculation for UTC Period j on UTC Date D and using DAE (DA) for the period X is the most recent actual settlement data is [7] consecutive previous DAs and where $LS_ROLL_TOT_D$ is the Load Shape 7 day rolling total:

$$UTCP_{Dj} = LSPV_{Dj} / LS_ROLL_TOT_D * (DAE_X * 7)$$

Method 6: SDS estimates for non-smart Meters with PMAs available (Import and Export)

Where non-smart Meter advances spanning the UTC period are available the advances shall summed across all Settlement Registers. The PMA will be applied to the load shapes for the Meter advance period using the appropriate load shape and daily totals notified by the LSS. This data will be recorded as ""E6"".

Calculation for UTC Period j on UTC Date D and Meter Advance Period N where LS_TOT_N is the Load Shape totals LS_TOT_D summed over Meter advance period N :

$$UTCP_{Dj} = LSPV_{Dj} / LS_TOT_N * PMA_N$$

Where the non-smart Meter has switch load (Economy 7 customers), the SDS applies the PMAs to the Peak (PMA_PEAK_N) and Off-Peak (PMA_OFF_N) Periods as appropriate. The Peak and Off-Peak Meter advances shall be identified using the relevant MTD and the Periods they are applied to as set out in the Load Shape categories in ISD.

Calculation for UTC Period *j* on UTC Date *D* and Meter Advance Period *N* where LS_TOT_OFF_D is the Load shape off-peak total summed over the PMA Period *N* and LS_TOT_PEAK_N is the Load Shape total summed over the PMA Period *N*:

$$UTCP_OFF_{Dj} = LSPV_{Dj} / LS_TOT_OFF_N * PMA_OFF_N \text{ for } j \text{ in Off-peak period}$$

AND

$$UTCP_PEAK_{Dj} = LSPV_{Dj} / LS_TOT_PEAK_N * PMA_PEAK_N \text{ for } j \text{ in Peak period}$$

Method 7: SDS estimates where no recent Meter data is available (Import only)

For Settlement Periods where valid actual consumption data is available the data shall be used. For other Settlement Periods where daily DA values and register consumption data are unavailable and the most recent actual settlement data is a period covered by actual Meter register advances the SDS shall calculate the UTC Period data using the Daily Estimated Advance (DAE) defined above and the load shape and load shape rolling total from the LSS. This estimate shall be store as type ""E7""

Calculation for UTC Period *j* on UTC Date *D* and using DAE (PMA) for the most recent PMA period *N* and LS_ROLL_TOT_D is the Load shape 7 day rolling total:

$$UTCP_{Dj} = LSPV_{Dj} / LS_ROLL_TOT_D * (DAE_N * 7)$$

Where the Meter is a non-smart Meter that has switched load or a Domestic Import MPAN Consent Granularity <> 'H' and the SDS has received an IF-024 / PUB-024

'Supplier Advisory Notification to Data Service' notifying the Peak and Off-Peak proportions that has switch load. The SDS shall calculated the DAE (DAE_OFF) to the off-peak Period defined for the Load Shape Category (Off-Peak or Low) UTC Period and the DAE (DAE_PEAK) from the non-smart Meter Data or by applying the proportions notified by the Supplier where a Smart DA is unavailable, the SDS allocates the DAE (DAE_OFF) to the off-peak Period defined for the Load Shape Category (Off-Peak or Low) UTC Period and the DAE (DAE_PEAK) to the Normal (Peak or Normal) UTC Periods as follows:

Calculation for UTC Period *j* on UTC Date *D* and using DAE (PMA) *N* where LS_ROLL_OFF_D is the Load shape 7 day rolling off-peak total and LS_ROLL_PEAK_D is the Load shape 7 day rolling peak total :

$$UTCP_OFF_{Dj} = LSPV_{Dj} / LS_ROLL_OFF_D * (DAE_{N_OFF} * 7) \text{ for } j \text{ in Off-peak period}$$

AND

$$UTCP_PEAK_{Dj} = LSPV_{Dj} / LS_ROLL_PEAK_D * (DAE_{N_PEAK} * 7) \text{ for } j \text{ in Peak period}$$

Method 8: SDS estimates using an Annual Consumption (AC) or an Supplier Nominated Annual Consumption (SNAC)

Where only an Annual Consumption value, or Supplier Nominated Annual Consumption (AC_Y) provided on the I/F-024/ PUB-024 for a year *Y* is available then the SDS shall process the data as follows and store these records as "E8":

Where a year of Load Shape Totals (LS_TOT_Y) are available then the calculation for UTC Period *j* on UTC Date *D* is as follows:

$$UTCP_{Dj} = (LSPV_{Dj} / (LS_TOT_Y)) * AC_Y$$

OR

Where less than a year of Load Shape Totals are available then the SDS shall use the Annual Consumption (AC_Y) to calculate a DAE for the Settlement Date D :

$$DAE_D = AC_Y / 365$$

Then the calculation for UTC Period j on UTC Date D is as follows:

$$UTCP_{Dj} = LSPV_{Dj} / LS_ROLL_TOT_D * (DAE_D * 7)$$

Method 9: SDS estimates where no Meter data or Daily Advance Estimate (DAE) is available (Import Only)

Where there is no previous data is available the SDS shall use the appropriate load shape. This data will be recorded as "E9".

Calculation for UTC Period j on UTC Date D :

$$UTCP_{Dj} = LSPV_{Dj}$$

Method 10: SDS estimates Export where no UTC Period Level Consumption for a UTC date or Meter Advance spanning the UTC date is available.

Where there is no UTC Period Consumption for export and a Meter Advance that spans the UTC date cannot be calculated. The SDS shall estimate the data as zero. This data will be recorded as "ZE1"

Calculation for UTC Period j on UTC Date D :

$$UTCP_{Dj} = 0$$

Method 11. Estimation for Long Term Vacant Sites

Where the Supplier has notified a Flag to identify that a Site is LTV and in cases where no access to consumption data is available, then in the presence of this flag the SDS will estimate zero and set a LTV estimation reason code. This data will be recorded as "ZE2" and the estimation reason code 'LTV' should identify as LTV.

$$UTCP_{Dj} = 0$$

Method 12 Estimation where a Site where Supply is disabled

Where the Supplier has notified a Flag to identify a Site where the supply is disabled and in cases where no access to consumption data is possible, then in the presence of this flag the SDS will estimate zero and set a LTV estimation reason code. This data will be recorded as "ZE3" and set estimation reason code 'Disabled' to supply disabled.

$$UTCP_{Dj} = 0$$

Method 13 Estimation for a Site where Supply is de-energised

In the absence of Actual data recovered from the Smart Meter or an Advance Meter Reading received from the MRS or Supplier, no submission to settlements is required in these circumstance (ie there is no need to submit zero consumption for de-energised MPAN's).

Deeming Reads on Change of Supplier (CoS) or Change of Data Service by outgoing SDS

For import where there is a Change of Supplier (CoS) and no cumulative total CoS reading (or Peak and Off-Peak readings) is available the out-going SDS shall estimate a deemed Meter Reading(s) by calculating a DAE from a

previous PMA (where available) and extrapolating from the last Meter Reading for the MPAN until the CoS date using **Method 7** above.

For export the last available meter reading shall be deemed to be valid.

The deemed reading shall be provided to the incoming SDS and the Supplier using the IF-041.

Deeming Reads on Change of Supplier (CoS) by incoming SDS

For import where there is a CoS and no CoS reading is available, from the out-going SDS, the incoming SDS shall estimate a deemed Meter Reading(s) by calculating a DAE following the first PMA calculated for the Site and extrapolating backwards from the first Meter Reading collected by the incoming SDS for the MPAN back until the CoS date using **Method 7** above. This reading shall be used for estimation where UTC Period Level data is unavailable.

For export the first available meter reading shall be deemed to be valid.

The deemed reading shall be provided to the outgoing SDS and the Supplier using the IF-041.

Back-Stop Readings. The SDS shall calculate back-stop readings where required

1. Change of metering: As a 'back-stop' in situations where no reading(s) are provided alongside the change in metering, the SDS shall, after 5wd, generate an estimated reading(s) for the Date of the Removal of the previous meter(s) using the most appropriate method above. Any newly installed meter should be assumed to have been installed with an index position of Zero.

2. Change of energisation: As a 'back-stop' in situations where no reading(s) are provided alongside the change in Energisation Status, the SDS shall where required, by 5wd, generate an estimated reading(s) for the Date of the Change of Energisation Status (reflecting the nature of the Energisation Change) using the most appropriate method above. Estimation Reason Codes

7.3 The following are the initial set out Estimation Reason Codes to Estimated Methods

Estimation Reason Code	Commentary	Estimation Methods
Opt Out	The customer has Opted Out of providing HH Data for MHHS (Consent Granularity <>H)	Any estimation Methods where the MPAN has a Consent Granularity <>H
Missing	The data is missing	Methods 1 & 2 where periods are missing. Method 9 where no data is available.
Invalid	The data failed validation	Any estimation Method used where actual data has been collected but failed validation.
Comms. Fault	There is a communications fault with the smart Meter	Any estimation Method where the SDS (MDR) is unable to contact a smart Meter or aware of an issue via the Supplier
De-Energised	The MPAN is de-energised	Method A or Method 1 where actual data appears on Meter where registration data says it is de-energised.
LTV	The Supplier has flagged the MPAN as Long Term Vacant	Method 11
Disabled	The Supplier has flagged the MPAN as remotely disabled	Method 12
Adjustment	The Supplier has provided adjusted Settlement data	Method 0
Non-Smart	The meter is non-smart so has to be estimated	Method 6

Site Checks of SVA Metering System - Site Visit Report.

7.4 The following checks shall be carried out by the SDS when visiting a site with a SVA MS installed:

1. Any changes to site which could affect the Load Shape Category registered in SMRS
2. Energisation Status (i.e. on/off)
3. Number of Maximum Demand Register (MDR) Resets where appropriate
4. Zero reading on an MDR, if fitted
5. Whether the MDR is on full scale, if fitted
6. Any evidence of suspected faults to the SVA MS
7. Any evidence of damage to LDSO equipment
8. Whether any timeswitch is set to the incorrect time
9. Evidence of tampering with the SVA MS or LDSO equipment, particularly seals
10. Evidence of stopped meters (particularly zero advance on an occupied premises
11. Evidence of supply being taken when the meters are de-energised
12. That the time and date shown on the Meter are correct

Change Record

Date	Author	Version	Change Detail
16/02/2023	SI Design	V5.0	Initial Version
04/05/2023	SI Design	V5.1	DIN 93, 97, 98, 203, 204 and 205.
06/07/2023	SI Design	V5.2	DIN 243