METROLOGY PROCEDURE: PART B

METERING DATA VALIDATION, SUBSTITUTION AND ESTIMATION

PREPARED BY:	AEMO Markets
DOCUMENT REF:	
VERSION:	7.011
EFFECTIVE DATE:	1 ~~July 2021~~Oct 2021
STATUS:	~~FINAL~~Initial Consolidated

Approved for distribution and use by:

APPROVED BY:	~~Peter Geers~~Violette Mouchaileh
TITLE:	Chief ~~Strategy &~~ Markets Officer
DATE:	~~22 March 2019~~TBA

Australian Energy Market Operator Ltd ABN 94 072 010 327 www.aemo.com.au info@aemo.com.au
NE Australian Energy Market Operator Ltd ABN 94 072 010 327 www.aemo.com.au info@aemo.com.au
NEW SOUTH WALES QUEENSLAND SOUTH AUSTRALIA VICTORIA AUSTRALIAN CAPITAL TERRITORY TASMANIA

VERSION RELEASE HISTORY

Version	Effective Date	Summary of Changes
4.01	April 2009	Updated to incorporate Victorian jurisdictional metrology material to support Victorian AMI rollout
4.01a	15 July 2011	The extension of retail contestability to business customers consuming between 50 – 150 MWh per annum in Tasmania.
5	31 October 2011	Updated to incorporate provisions of NER Change: Provision of Metering Data Services and Clarification of Existing Metrology Requirements.
5.10	1 January 2014	Introduction of FRC in Tasmania
5.20	1 March 2014	Updated to incorporate provisions of NER Change: National Electricity Amendment (Small Generation Aggregator Framework) Rule 2012 ERC 0141 and text corrections
5.30	15 May 2015	Updated to incorporate traffic signal dimming, introduce type 65 substitutions and text corrections.
6.00	1 December 2017	Updated to incorporate: • National Electricity Amendment (Expanding competition in metering and related services) Rule 2015. No.12; • National Electricity Amendment (Embedded Networks) Rule 2015 No. 15; and National Electricity Amendment (Meter Replacement Processes) Rule 2016 No. 2.
6.01	20 May 2020	Updated to include Substitution Type 69 Linear interpolation substitution type for accumulation metering installations.
7.0	1 ~~July 2021~~October 2021	Updated for National Electricity Amendment (Five Minute Settlement) Rule 2017 No. 15
7.01	1 October 2021	Updated to include changes for the Metering ICF Package 2020 consultation, the changes are for the following Information Change Requests (ICFs): ICF_025 Removal of 'N' Metering Data Quality Flag
7.011	1 October 2021	V6.01, 7.0 & 7.01 consolidated

CONTENTS

1. INTRODUCTION

1.1. Purpose and Scope

This is the Metrology Procedure: Part B made under clause 7.16.3, 7.16.4 and 7.16.5 of the NER (Procedure), which addresses the Validation, Substitution and Estimation of *metering data*.

This Procedure has effect only for the purposes set out in the NER. The NER and the *National Electricity Law* prevail over this Procedure to the extent of any inconsistency.

1.2. Definitions and Interpretation

The Retail Electricity Market Procedures – Glossary and Framework:

(a) is incorporated into and forms part of this Procedure; and

(b) should be read in conjunction with this Procedure.

1.3. Related AEMO Documents

Title	Location
Retail Market Procedures – Glossary and Framework	http://aemo.com.au/Electricity/National-Electricity-Market-NEM/Retail-and-metering/Glossary-and-Framework
Metrology Procedure: Part A	http://www.aemo.com.au/Electricity/Policies-and-Procedures/Metrology-Procedures-and-Unmetered-Loads
Metering Data File Format	http://www.aemo.com.au/Electricity/Retail-and-Metering/Metering-Services
NEM RoLR Processes	http://www.aemo.com.au/Electricity/Policies-and-Procedures/B2B/NEM-RoLR-Processes
Service Level Procedure (MDP)	http://www.aemo.com.au/Electricity/Retail-and-Metering/Metering-Services
Service Level Procedure (MP)	http://www.aemo.com.au/Electricity/Retail-and-Metering/Metering-Services

2. PRINCIPLES FOR VALIDATION, SUBSTITUTION AND ESTIMATION

2.1. General Validation, Substitution and Estimation Requirements

The principles to be applied to Validation, Substitution and Estimation in the *NEM* include the following:

(a) The MC must coordinate the resolution of issues arising from the non-performance of *metering systems*, including any liaison with associated *Registered Participants*, MP(s), MDP(s), and ENM(s). The MC must respond promptly to requests for remedial action from the MDP or AEMO.

(b) The MDP must identify metering data errors resulting from data collection and processing operations using Validation processes in accordance with this Procedure.

(c) The MDP must apply Substitutions in accordance with this Procedure to ensure that *metering data* is delivered to AEMO and *Registered Participants*.

2.2. Substitution requirement

The MDP must undertake Substitutions on behalf of AEMO or the MC, as appropriate, in a manner consistent with this Procedure. Substitutions may be required in the following circumstances:

(a) Where the system or equipment supporting the remote or manual collection of *metering data* has failed or is faulty.

(b) Where the *metering installation* for a *connection point* has failed or is removed from service.

(c) To enable timely provision of *metering data* to *AEMO* for *settlements* purposes.

(d) In situations where *metering data* has been irretrievably lost.

(e) Where the *metering data* is found to be erroneous or incomplete.

(f) Where *metering data* has not completed Validation as part of the registration or transfer of a *connection point*.

(g) Where *metering data* has failed or has not completed the Validation process.

(h) Where *metering data* cannot be obtained in the performance timeframes required for the data period in question:

  (i) *metering data* for *metering installations* with *remote acquisition* must be Substituted if *metering data* cannot be obtained to meet either *settlements* timeframes or the required performance of the applicable Service Level Procedure (MDP).

  (ii) *metering data* for manually read *metering installations* must be Substituted if *metering data* cannot be obtained on or within the expected timeframe of the NSRD for a *connection point*. Any historical or previous *estimated metering data* must be replaced with *substituted metering data*.

(i) When an inspection or test on the *metering installation* establishes that a measurement error exists due to a *metering installation* fault.

(j) When the affected FRMP, LR, and LNSP have all agreed and subsequently informed the MDP that a previous Substitution was inaccurate and that a re-Substitution of *metering data* is required.

(k) When an inspection or test on the respective algorithms, Inventory Table, Load Table or On/Off Table for calculated *metering data* establishes that an error exists in the *metering data* calculation or when a more accurate Inventory Table becomes available.

(l) Where the *metering data* calculation has failed the Validation tests for a *metering installation* with *calculated metering data.*

(m) In situations involving Meter Churn.

(n) In response to End User transfers following a RoLR Event.

2.3. Estimation Requirement

The MDP must undertake Estimations on behalf of the MC in a manner consistent with this Procedure. Estimations may be required in the following circumstances:

(a) Routinely for a period equal to or just greater than the period to the NSRD or another forward period.

(b) In response to End User transfers authorised by a Jurisdiction or RoLR Events, as outlined in section 13.

(c) Where the current published Scheduled Reading Date has changed due to a revised scheduled reading route and the existing *estimated metering data* does not extend to or beyond the revised NSRD, the MDP must adjust the *estimated metering data* for the revised NSRD.

This section only applies to the Jurisdiction specified in the following table:

Jurisdiction	Variation in accordance with jurisdictional policy
Victoria	Where *metering data* for a type 5 *metering installation* is collected ~~more frequently than required by Metrology Procedure Part A~~by *remote aquisition*, Estimations need not be provided routinely or as a result of a change to the current published Scheduled Reading Date. Estimations must, however, be provided where necessary to meet the data requirements of Schedule 8 of the Service Level required for Metering Data Collection, Processing and Delivery Services for Metering Provider category 5D, 6D and 7D, but are not required to be for a period to the next Scheduled Reading Date.

Note: The effective date of this Jurisdictional provision is 1 July 2009. The review date of this Jurisdictional provision is 31 December 2017.

2.4. Metering Data Quality Flags

MDPs must assign the relevant *metering data* quality flags to *metering data* as follows:

Quality Flag	Description
A	Actual Metering Data.
S	For any *substituted metering data* that is considered temporary and may be replaced by Actual Metering Data. Substitutions apply to historical date/time periods at the time of Substitution.
E	For any *estimated metering data* that is considered temporary and may be replaced by Actual Metering Data or *substituted metering data*. Estimations apply to a period that has an end date/time in the future.
F	For Substitutions that are of a permanent or final nature and, subject to section 2.5(b) & 2.5(~~e~~h), the final Substituted *metering data* would not be replaced by Actual Metering Data at any time.
~~N~~	~~This quality flag is only utilised within the *interval metering data* file for instances where no *metering data* exists in the *metering data services database* for the periods concerned.~~

Unless specified otherwise in this Procedure, MDPs must apply the following quality flag rules in the *metering data services database:*

'A' *metering data* can only be replaced with 'A', 'S' or 'F' *metering data.*

'S' *metering data* can only be replaced with 'A', 'S' or 'F' *metering data.*

'E' *metering data* can only be replaced with 'A', 'E', 'S' or 'F' *metering data*.

'F' *metering data* can only be replaced with 'F' *metering data* as per section 2.5.~~1~~(f) or 'A' *metering data* as per section 2.5.~~1~~(b) or 2.5.~~1~~(h).

2.5. Final Substitution

The MDP must undertake final Substitutions in the following circumstances:

(a) Where a notice has been received from either the MC or the MP detailing a failure of the *metering installation* that affects the quality of the *energy data*.

(b) If Actual Metering Data is unexpectedly recovered from the *metering installation* and a final Substitution has been undertaken in accordance with paragraph (a), the MDP must replace

the final *substituted metering data* with the Actual Metering Data and maintain a record of the reason.

(c) Where the MDP must undertake final Substitutions following a Meter Churn.

(d) Where the MDP has received a notice that the affected FRMP, LR and LNSP have agreed that the *metering data* is erroneous and that a final Substitution is required.

(e) As a result of a RoLR Event or where a Jurisdiction has requested AEMO to undertake End User transfers requiring the provision of Substitutions and Final Readings.

(f) The MDP may undertake to replace existing final *substituted metering data* with new final *substituted metering data* in accordance with this Procedure.

(g) Where the MDP has found Actual Metering Data to be erroneous.

(h) The MDP may replace type 6 final *substituted metering data* with *accumulated metering data* that spans consecutive Meter Readings.

2.6. Summary Table of Substitution and Estimation Types

Type	EST or SUB	Short Descriptor
Type 11	SUB	Check
Type 12	SUB	Calculated
Type 13	SUB	SCADA
Type 14	SUB	Like Day
Type 15	SUB	Ave Like Day
Type 16	SUB	Agreed
Type 17	SUB	Linear
Type 18	SUB	Alternative
Type 19	SUB	Zero
Type 20	SUB	Churn Correction (Like Day)
Type 21	SUB	Five-minute No Historical Data
Type 51	SUB or EST	Previous Year
Type 52	SUB or EST	Previous Read
Type 53	SUB	Revision
Type 54	SUB	Linear
Type 55	SUB	Agreed
Type 56	SUB or EST	Prior to First Read - Agreed
Type 57	SUB or EST	Customer Class
Type 58	SUB or EST	Zero
Type 59	SUB o EST	Five-minute No Historical Data
Type 61	SUB or EST	Previous Year
Type 62	SUB or EST	Previous Read
Type 63	SUB or EST	Customer Class
Type 64	SUB	Agreed
Type 65	SUB or EST	ADL

Type 66	SUB	Revision
Type 67	SUB	Customer Read
Type 68	SUB or EST	Zero
Type 69	SUB	Linear Interpolation
Type 71	SUB	Recalculation
Type 72	SUB	Revised Table
Type 73	SUB	Revised Algorithm
Type 74	SUB	Agreed
Type 75	EST	Existing Table

3. SUBSTITUTION FOR METERING INSTALLATIONS WITH REMOTE ACQUISITION OF METERING DATA

3.1. Application of section 3

For *metering installations* with *remote acquisition* installed in accordance with clause 7.8.9(b) of the NER, the MDP may perform Substitutions in accordance with section 4. For all other *metering installations* with *remote acquisition*, the MDP must perform Substitutions in accordance with section 3.

3.2. Substitution Rules

The MDP must apply the following rules when performing a Substitution:

(a) The MDP must obtain clear and concise identification as to the cause of any missing or erroneous *metering data* for which Substitutions are required.

(b) The MDP must undertake to do a type 11 Substitution and use *metering data* obtained from any *check metering installation* associated with the *connection point* as the first choice considered for the source of *metering data* for any Substitutions undertaken.

(c) SCADA data, where available, may be used by the MDP as *check metering data* for Substitutions.

(d) The MDP may only undertake Substitution type 13 where Substitution types 11 and 12 are not applicable or cannot be carried out.

(e) For *connection points* where the FRMP is either a *Generator* or MSGA:

  (i) MDPs may directly undertake type 11, type 12 or type 13 Substitutions if *metering data* has failed Validation.

  (ii) MDPs may undertake type 16 or 18 Substitutions following consultation and agreement with the affected *Generator* or MSGA that the *substituted metering data* is an accurate reflection of the *interval metering data* concerned.

  (iii) If *metering data* cannot be collected from a *metering installation* or Substituted within the required timeframes, the MDP must undertake type 19 Substitutions as an interim until *metering data* can be collected from the *metering installation* or Substituted.

(f) The MDP may only undertake Substitution types 14, 15, 16, 17, 18, 19~~, or~~ 20 or 21 where Substitution types 11, 12 and 13 are not applicable or cannot be carried out.

(g) The MDP may perform all Substitution types except type 16 or 18 without the agreement of the affected FRMP, LNSP or LR. MDPs may change the quality flag to an existing type 16 or 18 Substitution without seeking further agreement from those parties.

(h) The MDP must notify the LNSP, LR and the FRMP for the *connection point* of any Substitution within two *business days* of the Substitution being carried out. Notification is to be achieved via the Participant *metering data* file as detailed in the MDFF.

(i) Where there is a *metering installation malfunction* that cannot be repaired within the periods specified in clause 7.8.10 of the NER, the MDP must:

(i) Where the *metering installation malfunction* is due to a failure of the *meter* to correctly record *interval energy data* and the MC has been granted an exemption to repair the *metering installation*, the MDP must Substitute the missing *metering data* in accordance with this Procedure;

(ii) For type 1-3 *metering installations* and other *instrument transformer* connected *metering installations*, and where a *metering installation malfunction* is due to a failure of the *remote acquisition* system, arrange for an alternative method for the collection of *metering data* from the *metering installation* in a timeframe that ensures the MDP complies with *metering data* delivery requirements; or

(iii) For non-*instrument transformer* connected *metering installations*, and where a *metering installation malfunction* is due to a failure of the *remote acquisition* system, the MDP must Substitute the missing *metering data* in accordance with this Procedure.

(j) The MDP must ensure that all *substituted metering data* is replaced with Actual Metering Data when it becomes available.

(k) For VICAMI Meters, the MDP may also use Substitution types 51 and 52, as detailed in section 4.

3.3. Substitution Types

3.3.1. Type 11 – Check Data

To perform a type 11 Substitution, the MDP must use *interval metering data* obtained from the *check metering installation* for that *metering point* where the:

(a) ~~the m~~Metering installation and *check metering installation* are installed at the same *connection point*;

(b) ~~the m~~Metering installation and *check metering installation* are installed on different ends of a *transmission* line where the difference due to *transmission line* losses can be accurately determined; or

(c) ~~the m~~Metering installation and the *check metering installation* are installed across a parallel set of feeders having similar line impedances between a common set of busbars.

3.3.2. Type 12 - Calculated

To perform a type 12 Substitution, the MDP must calculate the *interval metering data* to be Substituted where they relate to a single unknown feed to a node based on the other known *energy* flows to or from that node.

3.3.3. Type 13 – SCADA

To perform a type 13 Substitution:

(a) The MDP must use SCADA data provided by AEMO in the agreed format for Substitution purposes, which originates from a similar measurement point as the *meter*.

(b) Where SCADA data is inferior in accuracy or resolution and in a dissimilar format to the *metering data*, (e.g. 30 Min. demand values). The MDP may have to adjust the data in both magnitude and form so that the Substitution is valid.

(c) Where SCADA data is to be used for Substitution, both the provided 'E' channel and 'B' channel SCADA Datastreams must be used.

3.3.4. Type 14 - Like Day

To perform a type 14 Substitution, the MDP must Substitute missing or erroneous *metering data* using the nearest equivalent day or like day method, as detailed in Table 1.

Table 1

TYPE 14	
Substitution Day	Nearest Equivalent Day or Like Day (in order of availability)
Monday	Monday ##
Tuesday	Tuesday## Wednesday## Thursday## Wednesday# Thursday#
Wednesday	Wednesday## Tuesday# Thursday## Thursday# Tuesday##
Thursday	Thursday## Wednesday# Tuesday# Wednesday## Tuesday##
Friday	Friday##
Saturday	Saturday##
Sunday	Sunday##
Substitutions for like day to be as detailed above, unless:	
(a)	No *metering data* is available on the first listed day, the next listed preferred day is to be used. If there is no other suitable listed day, or no *metering data* is available on any of the listed days type 15 Substitution must be used.
(b)	The Substitution day was a public holiday, in which case the most recent Sunday is to be used.
(c)	The Substitution day was not a public holiday and the listed day is a public holiday, then the next listed preferred day that is not a public holiday is to be used.
#	Occurring in the same week as the Substitution day.
##	Occurring in the week preceding that in which the Substitution day occurs

3.3.5. Type 15 - Average Like Day

To perform a type 15 Substitution, the MDP may Substitute for the missing or erroneous *metering data* using the average like day method, as detailed in Table 2.

Table 2

TYPE 15
The *interval metering data* to be Substituted will be calculated using an average of the *metering data* from each corresponding Interval from the preceding four weeks, or any part of those. This averaging technique may be applied in either of the following ways:

(a) Where the averaged *interval metering data* is used to provide the value for the *metering data requiring* Substitution.
(b) Where the averaged *interval metering data* is used to provide the *profile* and is scaled to a pre-determined consumption value for the *metering data* to be Substituted.
Type 15 Substitutions must not be used for public holidays.

3.3.6. Type 16 - Agreed Method

Where the MDP is required to undertake Substitution for any period greater than seven *days* for type 1-3 *metering installations* or greater than fifteen *days* for other *metering installation* types, the MDP must consult and use reasonable endeavours to reach an agreement with the FRMP, LR and the LNSP for the *connection point*. This may include changes to existing Substitutions for any period where those affected parties have directed that as a result of Site or End User information, the original Substitutions are in error and a correction is required.

3.3.7. Type 17 - Linear Interpolation

To perform a type 17 Substitution, the MDP may Substitute *metering data* for consecutive intervals up to, but not exceeding two hours, by using simple linear interpolation.

3.3.8. Type 18 – Alternative

To perform a type 18 Substitution, the MDP may use an alternative method of Substitution subject to agreement with the FRMP, the LR and the LNSP for the *connection point*. The specifics of this Substitution type may involve: ~~a globally applied method or a method where an adjusted profile is used to take into account local conditions that affect consumption (e.g. local holiday or End User shutdown), or where alternative *metering data* may be available for quality checks and minor adjustments of an estimated profile, such as using *metering register* data.~~

(a) a globally applied method, or

(b) a method where an adjusted *profile* is used to take into account local conditions that affect consumption (e.g. local holiday, End User shutdown or Extreme Weather), or

(c) where alternative *metering data* may be available for quality checks and minor adjustments of an estimated *profile*, such as using *metering register* data.

3.3.9. Type 19 -– Zero

The MDP must undertake Substitutions of 'zero' where:

(a) either the LNSP or the MP has informed the MDP of a de-energised *connection point* or an inactive *meter* and where the consumption is reasonably believed to be zero;

(b) following a Meter Churn, where the Current MDP has no access to Historical Data and the previous MDP has yet to provide *metering data* for the start of the Meter Churn day; or

(c) substitutions are applicable for *connection points* where the FRMP is either a *Generator* or MSGA in accordance with section 3.2.

3.3.10. Type 20 - Churn Correction

Where an MDP applies a type 19 Substitution following a Meter Churn and the previous MDP has not provided *metering data* for the start of the Meter Churn day the Current MDP may, at a time after the Meter Churn day, use the nearest equivalent *day* or like *day*, as detailed in Table 3, and apply that *metering data* retrospectively to the start of the Meter Churn *day*.

Table 3

TYPE 20	
Churn Day	Nearest Equivalent Day or Like Day (in order of availability)
Monday	Monday ## Monday###
Tuesday	Tuesday## Wednesday## Thursday## Wednesday# Thursday# Tuesday###
Wednesday	Wednesday## Thursday## Thursday# Tuesday## Wednesday###
Thursday	Thursday## Wednesday## Tuesday## Thursday###
Friday	Friday## Friday###
Saturday	Saturday## Saturday###
Sunday	Sunday## Sunday###
Substitutions for like day to be as detailed above, unless: (a) The Churn *day* was a public holiday, then the earliest Sunday after the Churn *day* is to be used. (b) The Churn *day* was not a public holiday and the listed day is a public holiday, then the next listed preferred *day* that is not a public holiday is to be used. # Occurring in the same week as the Churn *day*. ## Occurring in the week after the Churn *day*. ### Occurring in the second week after the Churn *day*.	

3.3.11. Type 21 - Five-minute Conversion No Historical Data

Where no five-minute Historical Data exists for a five-minute *metering installation*, following the conversion of 15 or 30-minute metering to five-minute metering, the MDP may provide a Substitute for the *interval metering data* as follows:

(a) For 15-minute Historical Data, divide the 15-minute *energy* values by three to produce 5-minute *energy* values.

(b) For 30-minute Historical Data, divide the 30-minute *energy* values by six to produce 5-minute *energy* values.

4. SUBSTITUTION AND ESTIMATION FOR MANUALLY READ INTERVAL METERING INSTALLATIONS

4.1. Application of section 4

(a) The Substitution and Estimation requirements in this section 4 are only to be used for *metering installations* where:

(i) ~~i~~*Interval metering data* is manually collected as a Scheduled Meter Reading; or

(ii) ~~t~~The *metering installations* have been installed with *remote acquisition* in accordance with clause 7.8.9(b) of the NER.

(b) Where *remote acquisition* of *metering data* has failed at the *metering installation* and manual collection of *interval metering data* is required, the Substitution requirements specified in section 3 apply.

4.2. Substitution and Estimation Rules

(a) The MDP must ensure that all *substituted metering data* and *estimated metering data* are replaced with Actual Metering Data when it becomes available.

(b) The MDP must obtain clear and concise identification as to the cause of any missing or erroneous *metering data* for which Substitutions are required.

(c) Where there is a *metering installation malfunction* that cannot be repaired within the periods specified in the NER, the MDP must Substitute the missing *metering data* in accordance with this Procedure.

(d) The MDP must only apply the following Substitution and Estimation types:

(i) Substitutions: type 51, 52, 53, 54, 55, 56, 57, ~~or~~ 58 or 59.

(ii) Estimations: type 51, 52, 56, 57, ~~or~~ 58 or 59.

(e) The MDP must only use type 56 or 57 Substitutions or Estimations where the Historical Data does not support the application of a type 51 or 52 Substitution or Estimation.

(f) The MDP must notify the LNSP, the LR and the FRMP for the *connection point* of any Substitution or Estimation within two *business days* of the Substitution. Notification is to be achieved via the Participant *metering data* file as detailed in the MDFF.

(g) MDPs must not perform type 53 or 55 Substitutions or type 56 Substitutions or Estimations without the agreement of the LNSP, the LR and the FRMP for the *connection point*. MDPs may change the quality flag to an existing type 53 or 55 Substitution or type 56 Substitution or Estimation without seeking further agreement from those parties.

4.3. Substitution and Estimation Types

4.3.1. Type 51 - Previous Years Method (Nearest Equivalent Day or Like Day)

To perform a type 51 Substitution, the MDP must provide a Substitute or Estimate using the *metering data* from the nearest equivalent *day* or like *day* from the same, or similar, Meter Reading period in the previous year. The nearest equivalent *day* or like *day* is to be determined from Table 3.

4.3.2. Type 52 - Previous Meter Reading Method (Nearest Equivalent Day or Like Day method)

(a) To perform a type 52 Substitution, the MDP must Substitute or Estimate using the *metering data* from the nearest equivalent *day* or like *day* from the previous Meter Reading period. The nearest equivalent *day* or like *day* is to be determined from Table 4.

Table 4

Type 51 or 52	
Substitution or Estimation Day	Nearest Equivalent Day or Like Day (in order of availability)
Monday	Monday## Monday #
Tuesday	Tuesday## Wednesday## Tuesday# Wednesday#
Wednesday	Wednesday## Tuesday## Thursday## Wednesday# Thursday# Tuesday#
Thursday	Thursday## Wednesday## Tuesday## Thursday# Wednesday# Tuesday#
Friday	Friday## Friday#
Saturday	Saturday## Saturday#

Sunday	Sunday## Sunday#
Substitutions or Estimations for like day to be as detailed above, unless: a) No *metering data* is available on the first listed day, the next listed preferred day is to be used. If there is no other suitable day, or no *metering data* is available on any of the listed days type 52 must be used. b) The Substitution or Estimation day was a public holiday, in which case the most recent Sunday is to be used. c) The Substitution or Estimation day was not a public holiday and the listed day is a public holiday, the next listed preferred day that is not a public holiday, Saturday or Sunday is to be used.	
## For type 51 utilise *metering data* from the corresponding week in the previous year. ## For type 52 utilise *metering data* from the corresponding week of the previous *meter* reading period. # For type 51 utilise *metering data* from the week preceding the corresponding week in the previous year. # For type 52 utilise *metering data* occurring in the week preceding the corresponding week of the previous *meter* reading period.	

(b) Alternatively, the MDP must provide *substituted metering data* or *estimated metering data* using the average like day method, as detailed in Table 5.

Table 5

TYPE 52 (Alternative)
The *interval metering data* for which Substitution or Estimation is to be carried out will be calculated using an average of the *metering data* from each corresponding Interval from any part, or all, of the preceding four weeks. This averaging technique may be applied in either of the following ways: • Where the averaged *interval metering data* is used to provide the value for the *metering data* requiring Substitution or Estimation. • Where the averaged *interval metering data* is used to provide the *profile* and are scaled to a pre-determined consumption value for the *metering data* that are the subject of Substitution or Estimation. Type 52 Substitutes or Estimates must not be used for public holidays

4.3.3. Type 53 - Revision of Substituted Metering Data

To perform a type 53 Substitution, the MDP must re-Substitute or change the original *substituted metering data* prior to collecting an Actual Meter Reading or prior to the date referred to as R2 in the Data Delivery Calendar (whichever occurs first), where the FRMP, the LR and the LNSP have agreed that the original *substituted metering data* is in error and a correction is required on the basis of Site or End User information ~~that the original *substituted metering data* is in error and a correction is required~~.

4.3.4. Type 54 - Linear Interpolation

To perform a type 54 Substitution, the MDP may Substitute *metering data* for intervals up to, but not exceeding two hours, by using simple linear interpolation.

4.3.5. Type 55 - Agreed Substitution Method

To perform a type 55 Substitution, the MDP may undertake to use another method of Substitution (which may be a modification of an existing Substitution type), where none of the existing Substitution types apply, subject to using reasonable endeavours to form an agreement with the

FRMP, LR and LNSP for the *connection point*. The specifics of this Substitution type may involve a globally applied method.

4.3.6. Type 56 - Prior To First Reading - Agreed Method

Prior to the first Actual Meter Reading and where no Historical Data exists for the *connection point*, the MDP may provide a Substitution or Estimation for the *interval metering data* using a method agreed between the FRMP, the LR and the LNSP.

4.3.7. Type 57 - Prior to First Reading - Customer Class Method

Prior to the first Actual Meter Reading and where no Historical Data exists for the *connection point*, the MDP may provide a Substitute or Estimate for the *metering data* based on the given ADL. The *interval metering data* must be *profiled* to suit the relevant End User class. MDPs electing to undertake this type of Substitute or Estimate must develop a suite of *profiles* acceptable to the MC for use and application.

4.3.8. Type 58 - Zero

The MDP must undertake Substitutions or Estimations of 'zero' where:

(a) Either the LNSP or the MP has informed the MDP of a de-energised *connection point* or an inactive *meter* and where the consumption is known to be zero; or

(b) ~~f~~Following a Meter Churn.

4.3.9. Type 59 – Five-minute Conversion No Historical Data

Where no five-minute Historical Data exists for a five-minute *metering installation*, following the conversion of 15 or 30-minute metering to five-minute metering, the MDP may provide a Substitute or Estimate for the *interval metering data* as follows:

(a) For 15-minute Historical Data, divide the 15-minute *energy* values by three to produce 5-minute *energy* values.

(b) For 30-minute Historical Data, divide the 30-minute *energy* values by six to produce 5-minute *energy* values.

5. SUBSTITUTION AND ESTIMATION FOR METERING INSTALLATIONS WITH ACCUMULATED METERING DATA

5.1. Application of section 5

The Substitution and Estimation types detailed in sections 5.2 and 5.3 are to be undertaken by MDPs accredited for the collection, processing and delivery of *accumulated metering data*.

5.2. Substitution and Estimation Rules

5.2.1. Replacing Estimated Metering Data

(a) The MDP must replace all *estimated metering data* with either Actual Metering Data or *substituted metering data*:

(i) ~~w~~When Actual Metering Data covering all or part of the Estimation period is obtained;

(ii) ~~w~~When the Scheduled Meter Reading could not be undertaken, the MDP must replace the *estimated metering data* with *substituted metering data* with a quality flag of 'F'; or

(iii) ~~w~~When the Scheduled Meter Reading could not be undertaken, the MDP must replace the *estimated metering data* with *substituted metering data* with a quality flag of 'F' unless it was identified that the *metering installation* no longer has an Accumulation Meter installed, in which case a quality flag of 'S' may be used.

(b) Any final *substituted metering data* provided by the MDP must be re-Validated, updated or re-calculated by the MDP when the:

(i) ~~the v~~Value of the *metering data* obtained at the next Actual Meter Reading is found to be less than the previous final Substitution; or

(ii) ~~the f~~Final Substituted value is disputed and following consultation and agreement with the FRMP, LR and the LNSP for the *connection point*, the new agreed value will be determined using type 64 Substitution.

(c) The MDP must obtain clear and concise identification as to the cause of any missing or erroneous *metering data* for which Substitutions are required.

(d) The MDP may apply the following Substitution and Estimation types:

(i) Substitutions: type 61, 62, 63, 64, 65, 66, 67, 68 or 6~~8~~.

(ii) Estimations: type 61, 62, 63, 65 or 68.

5.2.2. When to use Type 62 Substitution

Where the Scheduled Meter Reading cycle is less frequent than monthly, the MDP may only use a type 62 Substitution or Estimation method when *metering data* from the same, or similar, Meter Reading period last year (i.e. type 61) is not available.

5.2.3. When to use Type 63 Substitution

The MDP may use type 63 Substitutions or Estimations only when the *metering data* from the same, or similar, Meter Reading period last year and *metering data* from the previous Meter Reading period is not available (i.e. when type 61 and type 62 Substitution or Estimation methods cannot be used).

5.2.4. When to use Type 65 Substitution

The MDP may use type 65 Substitutions or Estimations only when the *metering data* from the same, or similar, Meter Reading period last year or the *metering data* from the previous Meter Reading period is not available (i.e. when type 61 and type 62 Substitution or Estimation methods cannot be used).

5.2.5. When to use Type 67 Substitution

The MDP must only use a type 67 Substitution when:

(a) Directed by the MC;

(b) Not expressly disallowed in the Jurisdiction concerned;

(c) The End User provided Meter Reading meets the Validation rules for that Datastream; or

(d) The MDP has no Actual Metering Data.

5.2.6. When to use Type 64 or 66 Substitution

(a) MDPs must not perform type 64 or 66 Substitutions without seeking the agreement of the FRMP, LR and the LNSP for the *connection point*. MDPs may, however, undertake to change the quality flag to an existing type 64 or 66 Substitution without seeking further agreement from those parties.

(b) The MDP must notify the LNSP, LR and FRMP for the *connection point* of any Substitution or Estimation within two *business days* of the Substitution or Estimation. Notification is achieved via the Participant *metering data* file as detailed within the *service level procedures*.

5.2.7. When to use Type 69 Substitution

When an Actual Meter Reading for an accumulation meter has a value lower than a previous substituted Meter Reading, the MDP may re-substitute the substituted Meter Reading using the type 69 Linear Interpolation method.

5.3. Substitution and Estimation Types

5.3.1. Type 61 - Previous Year Method (Average Daily Consumption method)

To perform a type 61 Substitution, the MDP must provide a Substitution or Estimation of the Meter Reading by calculating the *energy* consumption as per the following formula:

Energy Consumption = ADC_{LY} * number of *days* required

where

ADC_{LY} = average daily consumption from the same or similar Meter Reading period last year.

5.3.2. Type 62 - Previous Meter Reading Method (Average Daily Consumption Method)

To perform a type 62 Substitution, the MDP must provide a Substitution or Estimation of the Meter Reading by calculating the *energy* consumption as per the following formula:

Energy Consumption = ADC_{PP} * number of *days* required.

where

ADC_{PP} = average daily consumption from the previous Meter Reading period.

5.3.3. Type 63 - Customer Class Method

To perform a type 63 Substitution, the MDP must provide a Substitution or Estimation by calculating the *energy* consumption as per the following formula:

Energy Consumption = ADC_{CC} * number of *days* required

where

ADC_{CC} = average daily consumption for this End User class with the same type of usage.

5.3.4. Type 64 - Agreed Method

To perform a type 64 Substitution, the MDP may undertake to use another method of Substitution (which may be a modification of an existing Substitution type), where none of the existing Substitution types are applicable, subject to using reasonable endeavours to form an agreement

with the FRMP, LR and LNSP for the *connection point*. The specifics of this Substitution type may involve a globally applied method.

5.3.5. Type 65 - ADL Method

To perform a type 65 Substitution, the MDP must provide a Substitution or Estimation by calculating the *energy* consumption in accordance with the following formula:

Energy Consumption = ADL * number of *days* required

5.3.6. Type 66 - Revision of Substituted Metering Data

To perform a type 66 Substitution, the MDP must re-Substitute or change *substituted metering data* prior to collecting an Actual Meter Reading or prior to the date referred to as R2 in the Data Delivery Calendar (whichever occurs first), where the FRMP, LR and LNSP for the *connection point* have agreed to revise the original *substituted metering data*, on the basis of Site or End User-specific information.

5.3.7. Type 67 - Customer Reading

Unless the MDP is required to apply a type 68 Substitution, the MDP must Substitute any previously *substituted metering data* or *estimated metering data* based directly on a Meter Reading provided by an End User.

5.3.8. Type 68 – Zero

The MDP must undertake Substitutions or Estimations of 'zero' where either the LNSP or MP has informed the MDP of a de-energised *connection point* or an inactive *meter* and where the consumption is known to be zero.

5.3.9. Type 69 - Linear Interpolation

To perform a type 69 Substitution, the MDP must calculate the ADL between two validated Meter Readings and apply this ADL pro-rated to the number of days for the substituted read.

6. SUBSTITUTION AND ESTIMATION FOR CALCULATED METERING DATA

6.1. Substitution Rules

The MDP must:

(a) ~~o~~Obtain clear and concise identification as to the cause of any missing or erroneous *calculated metering data* for which *substituted metering data* are required;

(b) ~~e~~Ensure that all *substituted metering data* and *estimated metering data* are based on *calculated metering data* and not on any previous Substitutions or Estimations (as applicable);

(c) ~~b~~Base *calculated metering data* for type 7 *metering installations* on Inventory Table data as follows:

(i) ~~w~~Where the Inventory Table has not been updated for the period concerned, *calculated metering data* must be based on the most recent available information and provided as an Estimate; and

(ii) ~~w~~Where the Inventory Table is correct for the period concerned, the *calculated metering data* must be flagged as 'A' *metering data*, however, when the Inventory Table is subsequently updated for the period concerned, the *calculated metering data* must be flagged as 'F' *metering data*;

(d) ~~n~~Notify the LNSP, LR and FRMP for the *connection point* of any Substituted *calculated metering data* within two *business days* of the Substitution. Notification is achieved via the Participant *metering data* file as detailed within the *service level procedures*; and

(e) ~~f~~Flag all *calculated metering data* Substitutions as 'F'.

The MDP may apply the following Substitution and Estimations types:

(f) Substitutions: type 71, 72, 73, or 74.

(g) Estimations: type 75.

6.2. Substitution and Estimation Types

6.2.1. Type 71 – Recalculation

To perform a type 71 Substitution, the MDP must Substitute *calculated metering data* with the *calculated metering data* obtained by a recalculation based on the current Inventory Tables, Load Tables and On/Off Tables.

6.2.2. Type 72 - Revised Tables

Where the error in the *calculated metering data* is due to errors in the Inventory Table, Load Table or On/Off Table, the MDP must Substitute *calculated metering data* by a recalculation based on the most recent Inventory Tables, Load Tables and On/Off Tables in which there were no errors.

6.2.3. Type 73 - Revised Algorithm

Where the error in the *calculated metering data* is due to an error in its calculation the MDP must Substitute the most recent *calculated metering data* for which there was no error.

6.2.4. Type 74 - Agreed Method

6.2.5.

The MDP may use another method of *calculated metering data* Substitution (which may be a modification of an existing Substitution type), where none of the existing Substitution types is applicable, subject to using reasonable endeavours to form an agreement between the FRMP, LR and LNSP for the *connection point*. The specifics of this Substitution type may involve a globally applied method.

6.2.6. Type 75 - Existing Table

The MDP must provide an Estimate for the *calculated metering data* based on the most recent Inventory Table until such time as an updated Inventory Table is received for the period concerned.

7. GENERAL DATA VALIDATION REQUIREMENTS

7.1. Validation requirements for all metering installations

MDPs must manage systems and processes on the basis that:

(a) ~~s~~Stored *metering data* held in the *meter* buffer might be subject to installation measurement error;

(b) ~~d~~Data delivered by reading systems, (e.g. remote reading systems, hand-held readers and conversion software) might not be recovered from the *meters* without corruption; and

(c) ~~a~~Auditable Validation procedures are of critical importance and can have a direct impact on disputes. It is essential that MDPs comply with these Validation procedures and that all *metering data* is subject to Validation prior to delivery to AEMO and *Registered Participants*.

7.2. Validation of Interval Metering Data Alarms

(a) The MDP must Validate *interval metering data* against the following Meter Alarms when these are provided in the *meter*:

(i) ~~p~~Power failure/*meter* loss of supply

(ii) VT or phase failure;

(iii) ~~p~~Pulse overflow;

(iv) ~~c~~Cyclic redundancy check error; and

(v) ~~t~~Time tolerance.

(b) Where *interval metering installations* assign alarms to the data channel and the *interval metering data* concerned, the MDP must process the alarm along with the *metering data* as part of the required Validation.

(c) The MDP must ensure that all *metering data* alarm reports are signed off and dated by the person actioning the data exception report review as part of the Validation.

(d) The MDP must Validate all *interval metering data* with all *metering data* alarms prior to dispatch to AEMO or *Registered Participants*.

(e) All MDP exception reports must provide, for all instances where the *interval metering data* was found to be corrupted an indication of the subsequent actions undertaken by the MDP.

8. VALIDATION WITHIN THE METER READING PROCESS

8.1. Validations during Collection of Metering Data from Manually Read Interval Metering Installations

The Validations to be performed by MDPs responsible for the collection of *interval metering data* from manually read *metering installations* are as follows:

(a) The Meter Serial ID matches the recorded Meter Serial ID.

(b) The security of the *metering installation* is intact, e.g. *meter* seals in place and in good order.

(c) The time synchronisation of the *metering installation* is correct to *EST* inclusive of any *load* control devices.

8.2. Validations during collection of Accumulated Metering Data

The Validations to be performed by MDPs responsible for the collection of *accumulated metering data* are as follows:

(a) The value of metering data from the current Meter Reading ≥ the value of metering data from the previous Meter Reading.

(b) The value of metering data from the current Meter Reading is valid against an expected minimum value.

(c) The value of metering data from the current Meter Reading is valid against an expected maximum value.

(d) The Meter Serial ID matches the recorded Meter Serial ID.

(e) The security of the metering installation is intact, e.g. meter seals in place and in good order.

(f) The time synchronisation of the metering installation is correct to EST inclusive of any load control devices.

(g) The dial capacity is checked against the recorded dial capacity.

9. VALIDATION AS PART OF THE REGISTRATION PROCESS

9.1. Validation of Metering Installations – General Requirements

MDPs must confirm that the *NMI* is registered in MSATS after any installation or change to a *metering installation* prior to the distribution of any *interval metering data* to AEMO or *Registered Participants* for the purposes of *settlements*.

9.2. Validation of Metering Installations with Remote Acquisition of Metering Data

MDPs must carry out the following Validations after any installation or change to a *metering installation* with *remote acquisition* of *metering data* prior to the distribution of any *interval metering data* to AEMO or *Registered Participants* for the purposes of *settlements*:

(a) For instrument transformer connected *metering installations*, the *metering installation* is recording *metering data* correctly, in conjunction with the MP.

(b) For whole current *metering installations*, the *metering data* correctly pertains to the registered *metering installation*.

(c) All Datastreams are captured.

9.3. Validation for Manually Read Interval Metering Installations

The MDP must carry out the following Validations in conjunction with the MP for manually read interval *metering installations* after any changes to a *metering installation* prior to the distribution of any *interval metering data* to AEMO or *Registered Participants* for the purposes of *settlements*:

(a) The metering data correctly pertains to the registered metering installation.

(b) All Datastreams are captured.

9.4. Validation for Metering Installations with Accumulated Metering Data

MDPs must carry out the following Validations, following any changes to a *metering installation* and prior to the distribution of any *accumulated metering data* to AEMO or *Registered Participants* for the purposes of *settlements*:

(a) The metering data correctly pertains to the registered metering installation.

(b) All Datastreams are captured.

9.5. Validation for Metering Installations with Calculated Metering Data

MDPs must Validate the *calculated metering data* on registration of all *metering installations* to verify that the Inventory Tables, Load Tables and On/Off Tables are complete and correct for the specifics of the *metering installation*.

10. VALIDATION OF METERING DATA

10.1. General

For *connection points* where AEMO is required to appoint an MDP to provide *metering data services*, AEMO may also request the MDP to perform Validations in addition to those specified in section 10 to further ensure the quality and completeness of the *metering data*.

For *metering installations* with *remote acquisition* installed in accordance with clause 7.8.9(b) of the NER, the MDP may perform Validation in accordance with sections 10.4 and 10.5, instead of section 10.2.

10.2. Validations for Metering Installations with Remote Acquisition of Metering Data

MDPs must, as a minimum, undertake the following Validations within the *metering data services database* for *metering installation* types with *remote acquisition* of *metering data*:

(a) A check of all *interval metering data* against a nominated maximum value.

(i) This Validation is to ensure that erroneous *interval metering data* spikes are trapped and Substituted.

(ii) This check may additionally be performed in the polling software.

(b) A check of the maximum value of *active energy* and *reactive energy*.

(i) For CT *metering installations*, the maximum value is to be initially determined by the connected CT ratio of the *metering installation*.

(ii) For whole current *metering installations*, the maximum rating of the *meter* is to be used.

(c) Check against a nominated minimum value or, alternatively, a 'zero' check that tests for an acceptable number of zero Intervals values per day to be derived from the Site's Historical Data.

(d) Check for null (no values) *metering data* in the *metering data services database* for all Datastreams.

(i) The aim of this check is to ensure that there is a 100% *metering data* set (and Substitution for any missing *interval metering data* is undertaken).

(ii) The minimum check required is to ensure that there is at least one non-null *active energy* or *reactive energy* value per Interval per Datastream.

(e) Check for the Meter Alarms referred to in section 7.2 and ensure:

(i) ~~a~~A process is in place that captures these Meter Alarms within the Validation and ensures that any Meter Alarm occurrences are retained as part of the *metering data* audit trail; and

(ii) ~~p~~Provide details of the occurrences of Meter Alarms to relevant *Registered Participants* within the *metering data* file in accordance with the MDFF Specification.

10.3. Validations for Metering Installations with Check Metering or Partial Check Metering

MDPs must undertake the following Validations by comparing the *metering data* and *check metering data* for all *metering installations* that have associated *check metering installations* or partial *check metering installations*:

(a) For *metering installations* where the *check metering installation* duplicates the *metering installation* accuracy, the MDP must Validate the *metering installation* Datastreams and check metering Datastreams on a per Interval basis. The average of the two Validated *metering data* sets will be used to determine the energy measurement.

(b) For installations where the *check metering data* Validation requires a comparison based on nodal balance (comparing the sum energy flow to the busbar against energy flow from the busbar):

(i) The MDP must construct a Validation algorithm within the *metering data services database* that will facilitate comparison of *interval metering data* for each *energy* flow on a per Interval basis.

(ii) The MDP must conduct an analysis of the Historical Data for each *connection point* to ascertain whether error differences in nodal balance are acceptable.

(iii) The MDP should use this information to refine its Validation algorithms to minimise the error difference for each *connection point*, based on Historical Data.

(iv) The maximum error difference considered acceptable for any *connection point* is 1% on a per Interval basis. The MDP should minimise this for each *connection point*, based on Historical Data.

(c) Where the *check metering installation* is remote from the *metering installation* (e.g. at the other end of a *transmission line* or the other side of a *transformer*):

(i) The MDP must construct a Validation algorithm within the *metering data services database* that will facilitate comparison of *interval metering data* from the *metering installation* and the *check metering installation* on a per Interval basis with adjustment for respective *transformer* or *transmission line* losses.

(ii) The MDP must conduct an analysis of the Historical Data for each *connection point* to ascertain whether the error differences between the *metering data* from the *metering installation* and *check metering installation* are acceptable.

(iii) The MDP should use this information to refine its Validation algorithms to minimise the error difference for each *connection point*, based on Historical Data.

(iv) The maximum error difference considered acceptable for any *connection point* is 5% on a per Interval basis. The MDP should minimise this for each *connection point*, based on Historical Data.

(d) For *connection points* where SCADA data is made available by AEMO for the purposes of Validation, the MDP must Validate the *metering data* by comparison of the *interval metering data* against the SCADA data as provided by AEMO in the agreed format:

(i) The MDP must construct a Validation algorithm within the *metering data services database* that will facilitate comparison of *interval metering data* from the *metering installation* and the SCADA data on a per Interval basis.

(ii) The MDP must conduct an analysis of the Historical Data for each *connection point* to ascertain whether error differences between the *interval metering data* from the *metering installation* and the SCADA data are acceptable.

(iii) The MDP should use this information to refine its Validation algorithms to minimise the error difference value for each *connection point*, based on Historical Data.

(iv) The MDP must construct an appropriate Validation algorithm as the SCADA data may be derived from a different measurement point, have a different interval collection period or have a different base unit of measurement, (e.g. power not *energy* value) with allowances for a larger error of measurement.

(v) The MDP is only required to undertake Validation of *metering data* against the SCADA data on the primary data channel i.e. only 'B' channel Validation where the FRMP is either a *Generator* or MSGA and only 'E' channel Validation for *loads*, such as pumps.

10.4. Validations for Manually Read Interval Metering Installations with CTs

MDPs must, as a minimum, undertake the following Validations on *metering data* from manually read interval *metering installation* with CTs within the *metering data services database*:

(a) Check of all *interval metering data* against a nominated maximum value.

(i) This Validation is to ensure that erroneous *interval metering data* spikes are trapped and Substituted.

(ii) This check may additionally be performed in the collection software.

(b) A check of the maximum value of *active energy*, which must initially be determined by the connected CT ratio of the *metering installation* (maximum *reactive energy* checks may also be performed as an option).

(c) Check against a nominated minimum value or, alternatively, a 'zero' check that tests for an acceptable number of zero Interval values per day to be derived from the Site's Historical Data.

(d) Check for null (no values) *metering data* in the *metering data services database* for all Datastreams.

(i) The aim of this check is to ensure that there is a 100% *metering data* set (and Substitution for any missing *interval metering data* is undertaken).

(ii) The minimum check required is to ensure that there is at least one non-null *active energy* or *reactive energy* value per Interval per Datastream.

(e) Check for Meter Alarms referred to in section 7.2 and ensure:

(i) ~~a~~A process is in place that captures these Meter Alarms within the Validation and ensures that any Meter Alarm occurrences are retained as part of the *metering data* audit trail; and

(ii) ~~t~~The relevant *Registered Participants* are notified of the occurrences of these Meter Alarms within the *metering data* file in MDFF.

(f) Where supported by the *meter(s)*, Validation for a given period of *interval metering data* by comparison of the totalised *interval energy data* (accumulation register reading) and the change in the *meter* cumulative registers (*energy* tolerance). It is acknowledged that this check would not identify CT ratio changes that have occurred after initial commissioning and have not been advised to the MDP.

(g) A check of the *metering data* for continuity and reasonability over the *meter* reading period.

(i) Check that no gaps in the *metering data* exist.

(ii) Check that *metering data* for the expected period has been delivered based on the Scheduled Meter Reading date.

10.5. Validations for Whole Current Manually Read Interval Metering Installations

MDPs must, as a minimum, undertake the following Validations on *metering data* from whole current manually read interval *metering installations* within the *metering data services database*:

(a) Check of all *interval metering data* against a nominated maximum value.

(i) This Validation is to ensure that erroneous *interval metering data* spikes are trapped and Substituted.

(ii) This check may additionally be performed in the collection software.

(b) A check of maximum value of *active energy*. (Maximum *reactive energy* checks may also be performed as an option). The maximum value is to be initially set to the rating of the *meter*.

(c) Check for null (no values) *metering data* in the *metering data services database* for all Datastreams.

(i) The aim of this check is to ensure that there is a 100% *metering data* set (and Substitution for any missing *metering data* is undertaken).

(ii) The minimum check required is to ensure that there is at least one non-null *active energy* or *reactive energy* value per Interval per Datastream.

(d) Check for the Meter Alarms referred to in section 7.2. The MDP is not required to Validate the *interval metering data* for power outage or power failure alarms, but must ensure:

(i) ~~a~~A process is in place that captures these Meter Alarms within the Validation and ensures that any Meter Alarm occurrences are retained as part of the *metering data* audit trail; and

(ii) ~~t~~The relevant *Registered Participants* are notified of the occurrences of Meter Alarms within the *metering data* file in accordance with the MDFF Specification.

(e) Where supported by the *meter(s)*, Validation for a given period of *interval metering data* by comparison of the totalised *interval energy data* values (accumulation register reading) and the change in the *meter* cumulative registers (*energy* tolerance).

(f) A check of the *metering data* for continuity and reasonability over the *meter* reading period.

(i) Check that no gaps in the *metering data* exist.

(ii) Check that *metering data* for the expected period has been delivered based on the expected reading date.

10.6. Validations for Metering Installations with Accumulated Metering Data

MDPs must undertake the following Validations within the metering data services database for metering installations with accumulated metering data:

(a) Check against a nominated minimum value of metering data collected from the metering installation.

(g) Check against a nominated maximum value of metering data collected from the metering installation. This is to be applied to both the metering data collected from the metering installation and the calculated energy consumption values.

(h) The current value of metering data collected from the metering installation ≥ previous value of metering data collected from the metering installation.

(i) The current value of metering data collected from the metering installation is numeric and ≥ 0.

(j) The current date that metering data is collected from the metering installation > the previous date that metering data was collected from the metering installation.

(k) Check for null (no values) metering data in the metering data services database for all Datastreams. The aim of this check is to ensure that there is a 100% metering data set and Substitution for any missing metering data is undertaken.

10.7. Validations for Metering Installations with Calculated Metering Data

MDPs must undertake the following Validations of *calculated metering data* within the *metering data services database*:

(a) Check against a nominated maximum calculated metering data value.

(a) Calculated metering data value is numeric and ≥ 0.

(b) Check for null (no values) calculated metering data for all Datastreams. The aim of this check is to ensure that there is a 100% calculated metering data set (and Substitution for any missing calculated metering data has been undertaken).

(c) Check the Inventory Tables, Load Tables and On/Off Tables using a process approved by the MC to ensure that the correct version of these tables is being used for the production of calculated metering data.

(d) Check against a nominated minimum value, or alternatively, a 'zero' check that tests for an acceptable number of zero Interval values per day.

(e) Calculated metering data date > previous calculated metering data date.

11. LOAD PROFILING – CONVERSION OF ACCUMULATED METERING DATA

11.1. Requirements for Load Profiling

Load Profiling is required to determine *interval metering data*, for *settlements* for type 6 *metering installations*. The requirements vary from Jurisdiction to Jurisdiction.

11.1.1. Victoria, ACT and Tasmania

The requirements for Load Profiling in Victoria, ACT, and Tasmania are to:

(a) ~~d~~Determine an estimate of the average Load Profile for a Profile Area over a given period of time (Profile Preparation Service); and

(b) ~~a~~Allocate that Load Profile to End Users in that Profile Area (Basic Meter Profiler).

11.1.2. NSW and Queensland

The requirements for Load Profiling in NSW and Queensland are to:

(a) ~~d~~Determine an estimate of the average Load Profile for First-Tier Controlled Loads and Second-Tier Controlled Loads for a Profile Area over a given period of time (Profile Preparation Service – Controlled Load Profile);

(b) ~~a~~Allocate that profile to both first-tier and second-tier Controlled Loads metering data (Basic Meter Profiler – Controlled Load Profile);

(c) ~~d~~Determine an estimate of the average Load Profile of the remaining first-tier loads and second-tier loads for a Profile Area (that is, excluding the first-tier and second-tier Controlled Loads) over a given period of time (Profile Preparation Service – Net System Load Profile); and

(d) ~~a~~Allocate that Load Profile to second-tier non-Controlled Loads in that Profile Area (Basic Meter Profiler – Net System Load Profile).

11.1.3. South Australia

The requirements for Load Profiling in South Australia are to:

(a) ~~d~~Determine an estimate of the average Load Profile for first-tier and second-tier Controlled Loads for a Profile Area over a given period of time (Profile Preparation Service – Controlled Load Profile);

(b) ~~a~~Allocate that profile to second-tier Controlled Loads in that Profile Area (Basic Meter Profiler – Controlled Load Profile);

(c) determine an estimate of the average Load Profile of the remaining first-tier loads and second-tier loads for a Profile Area (that is, excluding the first-tier and second-tier Controlled Loads) over a given period of time (Profile Preparation Service – Net System Load Profile); and

(d) ~~a~~Allocate that Load Profile to second-tier non-Controlled Loads in that Profile Area (Basic Meter Profiler – Net System Load Profile).

11.2. Profile Preparation Service - Controlled Load Profile

11.2.1. NSW

Profile Preparation Service - Controlled Load is applied in NSW as follows:

(a) In accordance with section ~~5.9.2~~12.8.2 of Metrology Procedure: Part A, CLPs for each Profile Area must be prepared by AEMO using *interval metering data* from a samples of Controlled Load *interval meters* in accordance with section 11.3.3 and paragraphs (b) and (c).

(b) The sample *meters* to be installed by the LNSPs must provide *remote acquisition* of *interval metering data*.

(c) Two *NMIs* must be allocated to each sample *meter*.

(i) One *NMI* must be used for the *interval metering data* from the sample *meter* that is used to prepare the CLP; and

(ii) Where the *metering installation* has a sample *meter* and the FRMP for the *market load* in MSATS is not the LR, a second *NMI* must be used to transfer the *accumulated metering data* to which the CLP is applied.

(d) The requirements for one CLP are:

(i) There shall be at least one CLP in each Profile Area.

(ii) An LNSP may introduce a second CLP in its Profile Area.

(iii) If the LNSP does not introduce a second CLP, one CLP must be calculated for all Controlled Loads in a Profile Area, which is based on a sample of Controlled Load Interval Meters.

(iv) For each TI, the CLP must be calculated by Profile Area as follows:

CLP for a Profile Area for TIj

$$= \sum_{n=1}^{N} (\text{sample } \textit{meter load} \text{ in TIj})_n * (\text{wf})_n$$

where:
N = represents the set of sample *NMIs* in the Profile Area
wf = is the weighting factor associated with the *NMIs*.

(e) The requirements for two CLPs are:

(i) if the LNSP introduces a second CLP, it must notify the commencement date of the second CLP in writing to AEMO and all *retailers*;

(ii) the commencement date must be at least six months after the date of the notice; and

(iii) from the commencement date, CLPs must be calculated for each Profile Area.

(f) For each TI, the CLPs must be calculated by Profile Area as follows:

(i) CLP for *loads* on the Controlled Load 1 network tariff

$$= \sum_{n=1}^{N} \left(\begin{matrix} \text{load for sample meter on the controlled} \\ \text{load 1 network tariff in trading interval j} \end{matrix} \right)_n * (\text{wf})_n$$

where:
N = represents the set of sample *NMIs* on the Controlled Load 1 Network Tariff in the Profile Area.
wf = weighting factor associated with the *NMIs*.

(ii) CLP for loads on the Controlled Load 2 network tariff

$$= \sum_{m=1}^{M} \left(\begin{matrix} \text{load for sample meter on the controlled} \\ \text{load 2 network tariff in trading interval j} \end{matrix} \right)_m * (\text{wf})_m$$

where:
M = represents the set of sample *NMIs* on the Controlled Load 2 network tariff in the Profile Area
wf = weighting factor associated with the *NMIs*.

11.2.2. Queensland

Profile Preparation Service - Controlled Load is applied in Queensland, except in Ergon Energy's distribution area, as follows:

(a) In accordance with section ~~5.9.2~~12.8.2 of Metrology Procedure: Part A, CLPs for the Profile Area must be prepared by AEMO using *interval metering data* from a sample (or samples) of Controlled Load Interval Meters in accordance with section 11.3.3 and paragraphs (b) and (c).

(b) The sample *meters* to be installed by the LNSP must be type 4 *metering installations*.

(c) Two *NMIs* may need to be allocated to each sample *meter*:

(i) ~~o~~One *NMI* must be used for the *interval metering data* from the sample *meter* that is used to prepare the CLP; and

(ii) ~~w~~Where the *metering installation* that has a sample *meter* is second-tier, a second *NMI* must be used to transfer the *accumulated metering data* to which the CLP is applied.

(d) Two CLPs must be calculated for the Profile Area:

(i) ~~o~~One for Controlled Loads in the Profile Area based on a sample of Controlled Load Interval Meters on the Controlled Load 1 network tariff; and

(ii) ~~o~~One for Controlled Loads in the Profile Area based on a sample of Controlled Load Interval Meters on the Controlled Load 2 network tariff.

(e) For each TI, the CLPs must be calculated by Profile Area as follows:

(i) *CLP* for *loads* on the Controlled Load 1 network tariff

$$= \sum_{n=1}^{N} \left(\begin{matrix} \text{load for sample meter on the controlled} \\ \text{load 1 network tariff in trading interval j} \end{matrix} \right)_n * (\text{wf})_n$$

where:
N = represents the set of sample *NMIs* on the Controlled Load 1 network tariff in the Profile Area.
wf = weighting factor associated with the *NMIs*.

(ii) CLP for loads on the controlled load 2 network tariff

$$= \sum_{m=1}^{M} \left(\begin{matrix} \text{load for sample meter on the controlled} \\ \text{load 2 network tariff in trading interval j} \end{matrix} \right)_m * (\text{wf})_m$$

where:
M = represents the set of sample *NMIs* on the Controlled Load 2 network tariff in the Profile Area
wf = weighting factor associated with the *NMIs*.

11.2.3. South Australia

Profile Preparation Service - Controlled Load is applied in South Australia as follows:

(a) In accordance with section ~~5.9.2~~12.8.2 of Metrology Procedure: Part A, a single CLP for all Controlled Loads for each Profile Area must be prepared by AEMO using *interval metering data* from a sample of Controlled Load Interval Meters in accordance with section 11.3.3 and paragraphs (b) and (c).

(b) The sample *meters* to be installed by the LNSP must be a type 4 *metering installation*.

(c) Two *NMIs* may need to be allocated to each sample *meter*:

(i) ~~o~~One *NMI* must be used for the *interval metering data* from the sample *meter* that is used to prepare the CLP; and

(ii) ~~w~~Where the *metering installation* that has a sample *meter* is second-tier, a second *NMI* must be used to transfer the *accumulated metering data* to which the CLP is applied.

(d) For each TI, the CLP must be calculated by Profile Area as follows:

CLP for a profile area for a TIj

$$= \sum_{n=1}^{N} (\text{sample } \textit{meter load} \text{ in TIj})_n * (\text{wf})_n$$

where:
N = represents the set of sample *NMIs* in the Profile Area
wf = is the weighting factor associated with the *NMIs*.

11.3. Accumulation Meter Profiler – Controlled Load

11.3.1. NSW & Queensland

Basic Meter Profiler - Controlled Load is applied in NSW & Queensland as follows:

(a) In accordance with section ~~5.9.2~~12.8.2 of Metrology Procedure: Part A, AEMO must apply the appropriate CLP for the Profile Area to which the *NMI* is connected, to the *accumulated metering data* for all *first-tier* and *second-tier* Controlled Loads in order to obtain *interval metering data*.

(b) The requirements for one CLP are:

(i) For NMIs in a Profile Area with one CLP, the CLP must be applied as follows:

~~Half hourly~~*Interval metering data* for TI_j for a NMI Datastream

$$= \frac{(\text{Accumulation energy data between start date and end date}) * (\text{CLP j})}{\sum_{i=startdate}^{enddate} CLP_i}$$

where:
CLP_j = the calculated CLP energy for TI_j

$\sum_{i=startdate}^{enddate} CLP_i$ = the sum of CLP energy between the start date and the end date and;

'start date' and 'end date' are defined in Section 11.6.

(c) The requirements for two CLPs are:

(i) In a Profile Area where the LNSP has introduced a second CLP, the CLPs shall be applied as follows:

Loads on the Controlled Load 1 network tariff (CLP1) must be applied to the *accumulated metering data* for all first tier and second-tier Controlled Loads, which are on the Controlled Load 1 network tariff:

Interval metering data for TI_j for a NMI Datastream on the Controlled Load 1 network tariff

$$= \frac{(\text{Accumulation energy data between start date and end date}) * (\text{CLP1}_j)}{\sum_{i=start\,date}^{end\,date} \text{CLP1}_i}$$

where:
CLP1_j = the calculated CLP energy for TI_j
$\sum_{i=startdate}^{enddate} \text{CLP1}_i$ = the sum of CLP energy between the start date and the end date and;

'start date' and 'end date' are defined in Section 11.6.

Loads on the Controlled Load 2 network tariff (CLP2) must be applied to the *accumulated metering data* for all first-tier and second-tier Controlled Loads, which are on the Controlled Load 2 network tariff:

Interval metering data for TI_j for a NMI Datastream on the Controlled Load 2 network tariff

$$= \frac{(\text{Accumulation energy } data \text{ between start date and end date}) * (\text{CLP2}_j)}{\sum_{i=start\,date}^{end\,date} \text{CLP2}_i}$$

where:

CLP2_j = the calculated CLP energy for TI_j
$\sum_{i=startdate}^{enddate} \text{CLP2}_i$ = the sum of CLP energy between the start date and the end date and;

'start date' and 'end date' are defined in Section 11.6.

(d) The resulting interval metering data produced by applying the CLP is at the NMI Datastream level. The total of these Datastreams is used in the calculation of the Net System Load Profile.

11.3.2. South Australia

Basic Meter Profiler - Controlled Load is applied in South Australia as follows:

(a) In accordance with section ~~5.9.2~~12.8.2 of Metrology Procedure: Part A, AEMO must apply the CLP for the Profile Area to which the *NMI* is connected, to the *accumulated metering data* for all *first-tier* and *second-tier* Controlled Loads, in order to obtain *interval metering data*.

(b) The *accumulated metering data* for *first-tier loads* is represented by a weekly load scaling factor that is transferred to AEMO in accordance with section ~~5.9.4~~12.8.2 of Metrology Procedure: Part A.

(c) The *profile* must be applied as follows:

(i) *Interval metering data* for TI_j for a NMI Datastream

$$= \frac{(\text{Accumulation energy data between start date and end date}) * (\text{CLP}_j)}{\sum_{i=start\,date}^{end\,date} \text{CLP}_i}$$

where:
CLPj = the calculated CLP energy for TI_j
$\sum_{i=startdate}^{enddate} CLP_i$ = the sum of CLP energy between the start date and the end date and;

'start date' and 'end date' are defined in Section 11.6.

(ii) If the *accumulated metering data* is based on an Actual Meter Reading:

(A) Start date = 00:00 on the day of the previous Meter Reading.

(B) End date = the end of the TI commencing at 23:~~30~~ 55 on the day prior to the current Meter Reading date.

(iii) If the *accumulated metering data* is Estimated:

(A) Start date = 00:00 on the first day of the billing period, or 00:00 on the previous Meter Reading date (whether actual or Estimate), or 00:00 on the first day that the load becomes second-tier, whichever is the later.

(B) End date = the end of the TI commencing at 23:~~30~~ 55 on the last day of the billing period, or the end of the TI commencing at 23:~~30~~ 55 on the Estimated Meter Reading date, whichever is the earlier.

(iv) The resulting interval metering data produced by applying the CLP is at the NMI Datastream level. The total of these Datastreams is used in the calculation of the NSLP.

11.3.3. Sample Meters

(a) Where *metering* equipment to sample Controlled Loads is installed, the MC must ensure that:

(i) ~~a~~At least 200 Controlled Load sample *meters* are installed for the purposes of calculating each CLP within a *profile* area unless otherwise agreed by AEMO; and

(ii) ~~t~~The method it adopts for selecting sample *meters* is statistically sound.

(b) This paragraph (b) only applies to South Australia.

(i) The *LNSP* must ensure that at least 200 Controlled Load sample *meters* are installed for the purposes of calculating the CLP.

(ii) The method of selecting sample *meters* adopted by the LNSP must be approved by *AEMO*.

(iii) The LNSP must use reasonable endeavours to ensure that sample *meters*:

(A) ~~a~~Are used at occupied Sites;

(B) ~~h~~Have historical annual energy consumption with a lower range exceeding 1,000kWh and an upper range not exceeding two standard deviations of the mean Controlled Load annual consumption;

(C) ~~s~~Subject to sub-paragraph (D), must be randomly selected such that each *meter* that meets the other criteria has an equal chance of being included in the sample; and

(D) ~~n~~New sample *meters* are selected to maintain a sample distribution that is representative of the Controlled Load in accordance with section 11.3.3(b)(ii).

(iv) If an existing sample *meter* becomes inappropriate for a sample *meter*, the sample *meter* must be removed or relocated to an appropriate Site selected in accordance with section 11.3.3(b)(iii).

(v) The LNSP must ensure that a *meter*, which is a sample Interval Meter installed for the purposes of calculating the CLP, is not removed without the consent of AEMO.

(c) The weighting factor assigned to each sample meter NMI in the calculation of the CLP should be proportional to 1/n, where n is the number of sample meters contributing to the calculation of the CLP in the respective LNSP area.

$$\text{Weighting Factor} = \frac{(\text{sf}) * (\text{dlf})}{n}$$

where:

sf = scaling factor (for South Australia = 200)

dlf = *distribution loss factor* applicable to the sample *meter*

n = number of sample *meters* used in the calculation of the CLP

(d) Paragraph (d) only applies to South Australia.

(i) AEMO must approve the calculation of the *load* scaling factor for the CLP at least once every six months.

(ii) For each week, the *LNSP* must calculate the *load* scaling factor as follows:

$$(\text{Weekly Load Scaling Factor}) = X * \frac{(\text{Weekly Sample Energy}) * (\text{Annual CL Energy})}{(\text{Annual Sample Meter CL Energy})}$$

where:

Weekly Load Scaling Factor (MWh) = a value calculated to be the total *energy* consumed for a one week period by Accumulation Metered Controlled Loads that are *first-tier loads*.

X = the estimated proportion of Accumulation Metered Controlled Loads that are *first tier loads* determined for the six month period beginning 1 July and 1 January respectively.

Annual CL Energy (MWh) = the annual Controlled Load *energy* of all End Users for the whole calendar year preceding the regulatory year t.

Annual Sample Meter CL Energy (MWh) = total annual sample *meter* Controlled Load *energy* for the whole calendar preceding regulatory year t.

Weekly Sample Energy (MWh) = the value representing the actual *energy* consumption recorded by the sample *meters* in a one week period.

(iii) The LNSP must send the *load* scaling factor to *AEMO* as an active *first-tier load accumulation metered* Datastream, with the Actual Meter Read Date as the last day in the settlement week, at a frequency which is at least once per week.

11.4. Profile Preparation Service - Net System Load Profile

Profile Preparation Service – Net System Load Profile is to be applied as follows:

(a) In accordance with section ~~5.9.2~~12.8.2 of Metrology Procedure: Part A, the form of profiling that AEMO must use for the metering installations to which the metrology procedure applies, excluding metering installations for Controlled Loads where applicable to a Jurisdiction, is the NSLP.

(b) The NSLP must be calculated by Profile Area as follows:

NSLP for a Profile Area for a TI

~~$= \sum_{i=1}^{j} \left(\text{Energy inflows to the profile area at the TNI level}\right)_i * MLF_i$~~

~~$+\sum_{m=1}^{n}\left(\text{Energy generated within profile area from embedded generation}\right)_m * MLF_m * DLF_m$~~

~~$\sum_{s=1}^{t}\left(\text{Half hourly load in profile area}\right)_s * MLF_s * DLF_s$~~

$$= \sum_{i=1}^{j}(Energy \text{ inflows to the Profile Area at the TNI (wholesale boundary) level})_i \times MLF_i$$

$$+ \sum_{m=1}^{n}(Energy \text{ generated within Profile Area from } Embedded\ Generation)_m \times MLF_m \times DLF_m$$

$$- \sum_{s=1}^{t}(\text{TI } load \text{ (including type 7) in Profile Area})_s \times MLF_s \times DLF_s$$

$$- \sum_{u=1}^{v}(\text{TI } Controlled\ Load \text{ in Profile Area}) \times MLF_u \times DLF_u$$

$$- \sum_{w=1}^{x}(\text{TI } metering\ data \text{ for } 15-minute\ metering\ installations) \times MLF_w \times DLF_w$$

$$- \sum_{y=1}^{z}(\text{TI } metering\ data \text{ for } 30-minute\ metering\ installations) \times MLF_y \times DLF_y$$

Commented [JK1]: These are the new calc it was too difficult to show them as a change mark. They did not change between initial and final version of V7.0

Commented [DR2R1]: They can stay as they are.

where:

MLF = *marginal loss factor* applicable for the *NMI* that is stored in MSATS

DLF = *distribution loss factor* applicable for the *NMI* that is stored in MSATS

i = Each TNI with *energy* inflows to Profile Area

m = Each *energy generated* by *embedded generating units* within Profile Area

s = ~~Half hourly5~~Five-minute *loads* (including *market* type 7 *loads*) in Profile Area except *interval metering data* in respect of *loads* at *child connection points* in an *embedded network*.

u = Five-minute *metering data* for First-Tier and Second-Tier Controlled Loads

w = Five-minute *metering data* representation for *metering installations* with 15-minute *metering data* except *interval metering data* in respect of *loads* at *child connection points* in an *embedded network*

y = Five-minute *metering data* representation for *metering installations* with 30-minute *metering data* except *interval metering data* in respect of *loads* at *child connection points* in an *embedded network*

11.5. Accumulation Meter Profiler - Net System Load Profile

Accumulation Meter Profiler – Net System Load Profile is to be applied as follows:

(a) In accordance with section ~~5.9.2~~ 12.8.2 of Metrology Procedure: Part A, AEMO must apply the NSLP for the Profile Area to which the NMI is connected, to the metering data for type 6 metering installations in order to obtain interval metering data.

(b) The profile must be applied as follows:

Interval metering data for TI_j for NMI Datastream

$$= \frac{(\text{Accumulation energy data between start date and end date}) * NSLP_j}{\sum_{i=\text{start date}}^{\text{end date}} NSLP_i}$$

(i) ~~w~~Where the *accumulated metering data* is based on an Actual Meter Reading,

start date = 00:00 on the day of the previous *meter* reading, and

end date = the end of the TI commencing at 23:~~30~~ 55 on the day prior to the current *meter* reading date; or

(ii) ~~w~~Where the *accumulated metering data* is an Estimate:

start date = 00:00 on the first day of the *billing period*, or 00:00 on the day of the previous *meter* reading date (whether actual or Estimate), or 00:00 on the first day that the *load* becomes a *second-tier load*, whichever is the later; and

end date = the end of the TI commencing at 23:~~30~~ 55on the last day of the *billing period*, or the end of the TI commencing at 23:~~30~~ 55 on the Estimate *meter* reading date, whichever is the earlier.

(c) The resulting interval metering data produced by applying the NSLP is at the NMI Datastream level.

11.6. Start Dates and End Dates

(a) If the *accumulated metering data* is based on a Meter Reading:

(i) ~~t~~The start date is 00.00 on the *day* of the previous Meter Reading; and

(ii) ~~t~~The end date is the end of the TI commencing at 23.~~30~~ 55 on the *day* prior to the current Meter Reading date; and

(b) if the *accumulated metering data* is based on an Estimate where the *estimated metering data* ends on a date in the future:

(i) ~~t~~The start date is the later of:

(A) 00.00 on the first *day* of the *billing period* related to the *profile* period; and

(B) 00.00 on the previous Meter Reading date (i.e. the start of the *estimated metering data* period).

(ii) ~~t~~The end date is the end of the TI commencing at 23.~~30~~ 55 on the last *day* of the *billing period* related to the *profile* period.

12. PROFILING – CONVERSION OF INTERVAL METERING DATA

12.1. Profile Area sample metering 15-minute to 5-minute conversion – uniform allocation method

(a) For each sample *metering installation* 15-minute interval period described in clause 3.9(b) of Metrology Procedure: Part A, divide the 15-minute *energy* value by three to produce a 5-minute *energy* value.

(b) For each 15-minute period in (a) apply the 5-minute *energy* value to each TI in the corresponding 15-minute interval period to create 5-minute *interval metering data* for that sample *metering installation*.

(c) The TI *metering data* produced in (b) will be used in the Profile Preparation Service – Controlled Load Profile Process.

12.2. Profile Area sample metering 30-minute to 5-minute conversion – uniform allocation method

(a) For each sample metering installation 30-minute interval period described in clause 3.9(c) of Metrology Procedure: Part A, divide the 30-minute energy value by six to produce a 5-minute energy value.

(b) For each 30-minute period in (a) apply the 5-minute energy value to each TI in the corresponding 30-minute interval period to create 5-minute interval metering data for that sample metering installation.

(c) The TI metering data produced in (b) will be used in the Profile Preparation Service – Controlled Load Profile Process.

12.3. Profile Area five-minute load profile calculation

(a) For each Profile Area, the *energy* inflows are the sum of *energy* flows at all TNIs (wholesale boundary) plus the sum of *energy* generated from *distribution connection points* where the FRMP is a *Market Generator* or MSGA.

(b) The *energy* associated with all non-wholesale boundary *metering installations* that have five-minute *metering data* (excluding those specified in (a)) is summed, both for *first-tier* and *second-tier loads*. This includes *metering data* associated with *market* type 7 *metering installations*. *Metering data* for *child connection points* are excluded.

(c) The *energy* associated with non-sample Controlled Load *metering installations* producing *accumulated metering data* is summed, both for First-Tier and Second-Tier Controlled Loads, and then profiled by applying the controlled load profile (CLP) calculated in accordance with section 11.3.

(d) The five-minute load profile is then determined by subtracting the sum of the *metering data* calculated in (b) and (c) from the *metering data* calculated in (a).

12.4. Applying the five-minute profile to 15-minute and 30-minute metering data for a Profile Area

(a) The energy associated with all metering installations producing 15-minute metering data is summed, both for first-tier and second-tier loads.

(b) The total of the 15-minute metering data (calculated in (a)) is profiled using the five-minute load profile shape (calculated in 12.3(d)), using the method below, to provide a five-minute representation of the 15-minute metering data.

(i) For each 15-minute interval calculated in 12.4(a),identify the three corresponding five-minute intervals from the five-minute load profile calculated in 12.3(d).

(ii) Sum the three five minute interval values to produce the total five-minute load profile energy volume for the 15-minute period.

(iii) For each five-minute interval energy value within the 15-minute period, express the five-minute energy value as a percentage of the total energy volume calculated in (b)(ii).

(iv) Apply each 5-minute percentage value, calculated in (b)(iii), to the 15-minute interval in (b)(i) to produce a five-minute representation of the 15-minute energy volume.

Example calculation: 5-minute profile for 15-minute *metering data*

5-minute TI	1	2	3	Total for 15 minutes
Profile Area TI values	250	400	350	1000
TI value % of 15-minute total	25%	40%	35%	100%

Corresponding 15-minute interval	10

5-minute TI	1	2	3	Total for 15 minutes
15-minute interval converted to 5-minute	10 x 25%	10 x 40%	10 x 35%	
5-minute converted values	2.5	4	3.5	10

(c) The energy associated with all metering installations producing 30-minute metering data is summed, both for first-tier and second-tier loads.

(d) The total of the 30-minute metering data (calculated in (c)) is profiled using the five-minute load profile shape (calculated in 12.3(d)), using the method below, to provide a five-minute representation of the 30-minute metering data.

(i) For each 30-minute interval calculated in 12.4(c),identify the six corresponding five-minute intervals from the five-minute load profile calculated in 12.3(d).

(ii) Sum the six five minute interval values to produce the total five-minute load profile energy volume for the 30-minute period.

(iii) For each five-minute interval energy value within the 30-minute period, express the five-minute energy value as a percentage of the total energy volume calculated in (d)(ii).

(iv) Apply each 5-minute percentage value, calculated in (d)(iii), to the 30-minute interval in (d)(i) to produce a five-minute representation of the 30-minute energy volume.

Example calculation: 5-minute profile for 30-minute *metering data*

5-minute TI	1	2	3	4	5	6	Total for 30 minutes
Profile Area TI values	100	150	120	150	230	250	1000
TI value % of 30-minute total	10%	15%	12%	15%	23%	25%	100%

Corresponding 30-minute interval	10

5-minute TI	1	2	3	4	5	6	Total for 30 minutes
30-minute interval converted to 5-minute	10 x 10%	10 x 15%	10 x 12%	10 x 15%	10 x 23%	10 x 25%	
5-minute converted values	1	1.5	1.2	1.5	2.3	2.5	10

(e) The five-minute *metering data* calculated in (b) and (d) are used to calculate NSLP in accordance with 11.4.

13. UNMETERED LOADS – DETERMINATION OF METERING DATA

13.1. Requirement to produce Calculated Metering Data

13.1.1. Market Loads

(a) In accordance with clauses S7.3 and S7.4 of the NER, trading interval data is required to be calculated by NMI Datastream for those loads with type 7 metering installations.

(b) AEMO will publish a list of the loads that are classified as market loads and will keep this list up to date.

(c) If there is a Load Table, an Inventory Table or an On/Off Table, a type 7 metering installation may be classified as a market load.

13.1.2. Unmetered Devices

(a) A *market load* can result from the operation of an Unmetered Device. The only *market loads* in the *NEM* where Unmetered Devices are being used are:

(i) street lights; and

(ii) traffic lights in NSW and SA.

(b) There are two types of Unmetered Devices: Controlled Unmetered Devices and Uncontrolled Unmetered Devices.

(c) For each *market load* there may be one or more Unmetered Device types that are listed in the Load Table.

13.1.3. Application of NMI

(a) *Metering data* for an unmetered *load* is calculated by NMI Datastream. A *NMI* is assigned for each unique combination of:

(i) FRMP;

(ii) End User;

(iii) LNSP;

(iv) TNI; and

(v) DLF.

(b) An unmetered *load NMI* may contain different *market loads* or different Unmetered Device types, but they must have the same FRMP, End User, LNSP, TNI and *distribution loss factor*.

13.1.4. Load Table

(a) The Load Table must set out:

(i) ~~f~~For each Controlled Unmetered Device, its *load* (which includes any associated control gear, in watts) for use in calculating *interval metering data* in accordance with section ~~12~~13.2; and

(ii) ~~f~~For each Uncontrolled Unmetered Device, its annual *energy* consumption in accordance with section ~~12~~13.3. The annual *energy* consumption is used to calculate the calculated device wattage (in watts) which is used to calculate the *interval metering data* for each device type as follows:

$$(\text{Calculated device wattage})_i = \frac{(\text{device annual energy consumption})_i}{365 * 24}$$

where:

i = Uncontrolled Unmetered Device type *i*.

(b) AEMO must maintain Load Tables by:

(i) ~~d~~Deleting redundant data;

(ii) ~~c~~Considering (including by taking into account the views of other interested parties) and *publishing* proposals from interested parties to add Unmetered Devices to a Load Table; and

(iii) ~~p~~*Publish* updated Load Tables.

(c) No *Registered Participant* may use an Unmetered Device as a *market load* for which there is no *load* data in a Load Table.

(d) Proposals to add a new Unmetered Device *load* to the Load Table must include load measurement tests conducted by a *NATA* accredited laboratory or an overseas equivalent.

(e) Agreement for an Unmetered Device *load* to be added to the Load Table does not replace any obligation for an interested party to obtain appropriate approvals related to the performance and acceptance of use of the Unmetered Device.

13.2. Controlled Unmetered Devices

13.2.1. Metering Data Calculation

The MC must ensure that the *interval metering data* for Controlled Unmetered Devices classified as a type 7 *metering installation* are calculated in accordance with the following algorithm:

Interval metering data for TIj for *NMI* (in watt hours)

$$= \frac{\sum_{i=1}^{n}(k) * (\text{Device wattage})_i * (\text{Device count for NMI})_i * (\text{Period load is switched on})_j * (\text{Trading interval})}{60}$$

where:

i = Unmetered Device type

j = TI

k = proportion of Unmetered Device attributable to that *NMI*

TI is in minutes

Unmetered Device wattage/Device wattage is determined from the Load Table.

Unmetered Device count/Device count is determined from the Inventory Table.

Period load is switched on is determined from the On/Off Table.

13.2.2. Inventory Table

(a) For each *NMI*, a separate Inventory Table is required that identifies each Unmetered Device type that forms part of the *load* and for each Unmetered Device type lists:

(i) ~~t~~The Unmetered Device type;

(ii) ~~t~~The form of on/off control – photoelectric cell control, timer control, ripple control or other control;

(iii) ~~i~~If timer control or ripple control, the on/off times for the timer control or the ripple control system;

(iv) ~~i~~If other control, the on/off times;

(v) ~~i~~If an Unmetered Device is shared with another *NMI*, the proportion of *load* that is agreed by affected *Registered Participants* to be attributable to that *NMI* (k). Each k factor will be less than 1. The sum of the k factors for a shared Unmetered Device across each respective *NMI* must be equal to 1;

(vi) ~~i~~If an Unmetered Device is not shared with another *NMI*, the k factor must be equal to 1;

(vii) ~~n~~Number of such Unmetered Devices installed;

(viii) ~~e~~Effective start date – the first day on which that record in the Inventory Table is to be included in the calculation of *metering data* for that *NMI*;

(ix) ~~e~~Effective end date – the last day on which that record in the Inventory Table is to be included in the calculation of *metering data* for that *NMI*; and

(x) ~~l~~Last change date – the date that record in the Inventory Table was most recently created or modified.

(b) Each Unmetered Device in the Inventory Table is a unique combination of physical hardware, time control classification and shared portion. For example, if an Unmetered Device is shared with another *NMI*, the individual portions of the Unmetered Device(s) must be included in the Inventory Table as a separate Unmetered Device type on each *NMI*.

(c) Each MC must develop the initial Inventory Table for the *NMIs* for which it is responsible. The initial Inventory Table must be agreed by each affected *Registered Participant*, AEMO and the relevant End User.

(d) Each MC must update the Inventory Table for the *NMIs* for which it is responsible on at least a monthly basis to ensure that the accuracy requirements in section ~~13~~12.5 of Metrology Procedure: Part A are met. Any changes to the Inventory Table may only be made on a retrospective basis where:

(i) ~~a~~Agreed by the MC and the affected *Registered Participants*; or

(ii) ~~n~~Necessary to comply with clause 7.9.4 of the NER.

(e) The MC must communicate any material changes to the Inventory Table to the affected *Registered Participants*.

(f) The MC must provide the Inventory Table to relevant *Registered Participants* when requested.

13.2.3. On/Off Table

The form of on/off control may be:

(a) ~~p~~Photoelectric cell control;

(b) ~~t~~Timer control, or ripple control; or

(c) ~~o~~Other control.

13.2.4. Photoelectric cell control

(a) If the on/off times for an Unmetered Device are controlled by a photoelectric cell:

(i) On time = sunset time + ON delay.

(ii) Off time = sunrise time + OFF delay.

The ON delay and OFF delay are set out in section ~~12~~13.4.

(b) The MC must ensure that the appropriate sunset times and sunrise times are obtained from the Australian Government Geoscience website (www.ga.gov.au/geodesy/astro/sunrise.jsp), based on the longitude and latitude of the relevant town as specified below:

Jurisdiction	LNSP	Town	Latitude	Longitude
Victoria	CitiPower Pty	Melbourne	37 deg 49 min S	144 deg 58 min E
Victoria	Jemena Electricity Networks (Vic) Ltd	Essendon	37 deg 44 min S	144 deg 54 min E
Victoria	Powercor Australia Ltd	Ballarat	37 deg 30 min S	143 deg 47 min E
Victoria	AusNet Electricity Services Pty Ltd	Morwell	38 deg 13 min S	146 deg 25 min E
Victoria	United Energy Distribution Pty	Dandenong	38 deg 01 min S	145 deg 12 min E
NSW	Ausgrid	Sydney	33 deg 52 min S	151 deg 12 min E
NSW	Endeavour Energy	Cecil Park	33 deg 52 min S	150 deg 50 min E
NSW	Essential Energy	Armidale	30 deg 31 min S	151 deg 40 min E
NSW	Essential Energy	Broken Hill	31 deg 57 min S	141 deg 27 min E
NSW	Essential Energy	Dubbo	32 deg 15 min S	148 deg 36 min E
NSW	Essential Energy	Wagga Wagga	35 deg 06 min S	147 deg 22 min E
SA	SA Power Networks	Adelaide	34 deg 55 min S	138 deg 35 min E
ACT	Actew Distribution Ltd and Jemena Networks (ACT) Pty Ltd trading as ActewAGL Distribution	Canberra	35 deg 20 min S	149 deg 10 min E
Queensland	Energex Limited	Brisbane	27 deg 28 min S	153 deg 01 min E
Queensland	Ergon Energy Corporation	Townsville	19 deg 15 min S	146 deg 48 min E
Queensland	Ergon Energy Corporation	Toowoomba	27 deg 33 min S	151 deg 57 min E
Tasmania	Tasmanian Networks Pty Ltd	Ross	42 deg 01 min S	147 deg 29 min E

(c) The MC must ensure that the period that the load is switched on during a TI is calculated as follows:

Trading interval	Period load is switched on
For the TIs commencing after sunset and finishing prior to sunrise	Period *load* is switched on = 1

For the TIs commencing after sunrise and finishing prior to sunset	Period *load* is switched on = 0
For the TI during which the sunset occurs	$(\text{Period load is switched on}) = \frac{(\text{End time of TI}) - (\text{Time of sunset})}{30\sout{5}}$
For the TI during which the sunrise occurs	$(\text{Period load is switched on}) = \frac{(\text{Time of sunrise}) - (\text{Start time of TI})}{30\sout{5}}$

(d) Should testing on the operation of photoelectric cells by an independent party agreed to by the MC, affected Registered Participants, AEMO and relevant End User, indicate that the on/off times for an Unmetered Device controlled by a photoelectric cell are influenced materially and consistently by other variables, AEMO shall revise this Procedure accordingly.

13.2.5. Timer Control

(a) If the on/off times for an Unmetered Device is controlled by a timer or ripple injection system:

(i) On time = ON time set on timer or ripple injection system.

(ii) Off time = OFF time set on timer or ripple injection system.

(b) The MC must ensure that the period that the *load* is switched on during a TI is calculated as follows:

Trading interval	Period load is switched on
For the TIs commencing after on time and finishing prior to off time	Period *load* is switched on = 1
For the TIs commencing after off time and finishing prior to on time	Period *load* is switched on = 0
For the TI during which the on time occurs	$(\text{Period load is switched on}) = \frac{(\text{End time of TI}) - (\text{On time})}{30\sout{5}}$
For the TI during which the off time occurs	$(\text{Period load is switched on}) = \frac{(\text{Off time }) - (\text{Start time of TI})}{30\sout{5}}$

13.2.6. Other control

(a) Where the on/off times for an Unmetered Device are not in accordance with section 12\sout{12}13.2.4 or 12\sout{12}13.2.5, the following alternative forms of control may be used:

(i) On time = sunset time + ON delay or ON time set on timer or ripple injection system.

(ii) Off time = sunrise time + OFF delay or OFF time set on timer or ripple injection system or a fixed duration after ON time.

(b) Where sunrise or sunset times are used, the time is determined in accordance with section 12\sout{12}13.2.4(b).

(c) The MC must ensure that the period that the *load* is switched on during a TI is calculated as follows:

Trading interval	Period load is switched on
For the TIs commencing after on time and finishing prior to off time	Period *load* is switched on = 1

For the TIs commencing after off time and finishing prior to on time	Period *load* is switched on = 0
For the TI during which the on time occurs	$(\text{Period load is switched on}) = \frac{(\text{End time of TI}) - (\text{On time})}{30\sout{5}}$
For the TI during which the off time occurs	$(\text{Period load is switched on}) = \frac{(\text{Off time}) - (\text{Start time of TI})}{30\sout{5}}$

13.3. Uncontrolled Unmetered Devices

Other unmetered *loads* do not have a constant *load* and, therefore, the *energy* calculation is based on an annual *energy* consumption determined by AEMO in accordance with section \~~12~~13.1.4.

13.3.1. Energy calculation

The *MC* must ensure that the *interval metering data* for other Uncontrolled Unmetered Devices classified as a type 7 *metering installation* is calculated in accordance with the following algorithm:

Interval metering data for TIj for *NMI* (in watt hours)

$$= \frac{\sum_{i=1}^{n}(k) * (\text{Device wattage})_i * (\text{Device count for NMI})_i * (\text{Period load is switched on})_j * (\text{TI})}{60}$$

where:

i = Unmetered Device type

j = TI

k = proportion of Unmetered Device attributable to that *NMI*

TI is in minutes

Unmetered Device wattage/Device wattage is determined from the Load Table.

Unmetered Device count/Device count is determined from the Inventory Table.

Period *load* is switched on is determined from the On/Off Table.

13.3.2. Inventory Table

(a) For each *NMI*, a separate Inventory Table is required that identifies each Unmetered Device type that forms part of the *NMI load* and for each Unmetered Device type lists:

(i) ~~t~~The Unmetered Device type;

(ii) ~~t~~The form of on/off control (24 hours per day);

(iii) ~~i~~If an Unmetered Device is shared with another *NMI*, the proportion of *load* that is agreed by affected *Registered Participants* to be attributable to that *NMI* (k). Each k factor will be less than 1. The sum of the k factors for a shared Unmetered Device across each respective *NMI* must be equal to 1;

(iv) ~~i~~If an Unmetered Device is not shared with another *NMI*, the k factor must be equal to 1;

(v) ~~n~~Number of such Unmetered Devices installed;

(vi) ~~e~~Effective start date – the first day on which that record in the Inventory Table is to be included in the calculation of *metering data* for that *NMI*;

(vii) ~~e~~Effective end date – the last day on which that record in the Inventory Table is to be included in the calculation of *metering data* for that *NMI*; and

(viii) ~~l~~Last change date – the date that record in the Inventory Table was most recently created or modified.

(b) Each Unmetered Device in the Inventory Table is a unique combination of physical hardware, time control classification and shared portion. For example, if an Unmetered Device is shared with another *NMI*, the individual portions of the Unmetered Device(s) shall be included in the Inventory Table as a separate Unmetered Device type on each *NMI*.

(c) Each MC must develop the initial Inventory Table for the *NMIs* for which it is responsible. The initial Inventory Table must be agreed with the affected *Registered Participants*, AEMO and the relevant End User.

(d) Each MC must update the Inventory Table for the *NMIs* for which it is responsible on at least a monthly basis to ensure that the accuracy requirements in section ~~3~~12.5 of Metrology Procedure: Part A are met. Any changes to the Inventory Table may only be made on a retrospective basis where:

(i) ~~a~~Agreed by the MC and the affected *Registered Participants*; or

(ii) ~~n~~Necessary to comply with clause 7.9.4 of the NER.

(e) The MC must communicate any material changes to the Inventory Table to the affected *Registered Participants*.

(f) The MC must provide the Inventory Table to relevant *Registered Participants* when requested.

13.3.3. On/Off Table

(a) Other unmetered loads are assumed to operate 24 hours per day.

(b) For each TI: Period load is switched on = 1.

13.4. ON delay and OFF delay

(a) In Victoria, New South Wales, Queensland, Tasmania and South Australia the ON delays and OFF delays are zero.

(b) In the Australian Capital Territory, the MC must use the ON delay and OFF delay for each *day*, as provided in the following tables, when determining the on time and off time of photoelectric cells in accordance with section ~~12~~13.2.4.

January

Day	ON delay (minutes)	OFF delay (minutes)	Day	ON delay (minutes)	OFF delay (minutes)
January 1	20	21	January 16	19	20
January 2	19	20	January 17	19	20
January 3	19	20	January 18	19	20
January 4	19	20	January 19	19	20
January 5	19	20	January 20	19	20
January 6	19	20	January 21	19	20
January 7	19	20	January 22	19	20
January 8	19	20	January 23	19	20
January 9	19	20	January 24	19	20
January 10	19	20	January 25	18	20
January 11	19	20	January 26	18	20
January 12	19	20	January 27	18	20
January 13	19	20	January 28	18	20
January 14	19	20	January 29	18	20
January 15	19	20	January 30	18	20
			January 31	18	20

February

Day	ON delay (minutes)	OFF delay (minutes)	Day	ON delay (minutes)	OFF delay (minutes)
February 1	18	20	February 15	18	20
February 2	18	20	February 16	17	20
February 3	18	20	February 17	17	20
February 4	18	20	February 18	17	20
February 5	18	20	February 19	17	20
February 6	18	20	February 20	17	20
February 7	18	20	February 21	17	20
February 8	18	20	February 22	17	20
February 9	18	20	February 23	17	20
February 10	18	20	February 24	17	20
February 11	18	20	February 25	17	20
February 12	18	20	February 26	17	20
February 13	18	20	February 27	17	20
February 14	18	20	February 28	17	20
			February 29	17	20

March

Day	ON delay (minutes)	OFF delay (minutes)	Day	ON delay (minutes)	OFF delay (minutes)
March 1	17	20	March 16	16	19
March 2	17	20	March 17	16	19
March 3	17	20	March 18	16	19
March 4	17	19	March 19	16	19
March 5	17	19	March 20	16	19
March 6	17	19	March 21	16	19
March 7	17	19	March 22	16	19
March 8	17	19	March 23	16	19
March 9	17	19	March 24	16	19
March 10	17	19	March 25	16	19
March 11	16	19	March 26	16	19
March 12	16	19	March 27	16	19
March 13	16	19	March 28	16	19
March 14	16	19	March 29	16	19
March 15	16	19	March 30	16	19
			March 31	16	19

April

Day	ON delay (minutes)	OFF delay (minutes)	Day	ON delay (minutes)	OFF delay (minutes)
April 1	16	19	April 16	15	19
April 2	16	19	April 17	15	19
April 3	15	19	April 18	15	19
April 4	15	19	April 19	15	19
April 5	15	19	April 20	15	19
April 6	15	19	April 21	15	19
April 7	15	19	April 22	15	19
April 8	15	19	April 23	15	19
April 9	15	19	April 24	15	19
April 10	15	19	April 25	15	19
April 11	15	19	April 26	14	19
April 12	15	19	April 27	14	19
April 13	15	19	April 28	14	19
April 14	15	19	April 29	14	19
April 15	15	19	April 30	14	19

May

Day	ON delay (minutes)	OFF delay (minutes)	Day	ON delay (minutes)	OFF delay (minutes)
May 1	14	19	May 16	14	18
May 2	14	19	May 17	14	18
May 3	14	19	May 18	14	18
May 4	14	18	May 19	13	18
May 5	14	18	May 20	13	18
May 6	14	18	May 21	13	18
May 7	14	18	May 22	13	18
May 8	14	18	May 23	13	18
May 9	14	18	May 24	13	18
May 10	14	18	May 25	13	18
May 11	14	18	May 26	13	18
May 12	14	18	May 27	13	18
May 13	14	18	May 28	13	18
May 14	14	18	May 29	13	18
May 15	14	18	May 30	13	18
			May 31	13	18

June

Day	ON delay (minutes)	OFF delay (minutes)	Day	ON delay (minutes)	OFF delay (minutes)
June 1	13	18	June 16	12	18
June 2	13	18	June 17	12	18
June 3	13	18	June 18	12	18
June 4	13	18	June 19	12	18
June 5	13	18	June 20	12	18
June 6	13	18	June 21	12	18
June 7	13	18	June 22	12	18
June 8	13	18	June 23	12	18
June 9	13	18	June 24	12	18
June 10	12	18	June 25	12	18
June 11	12	18	June 26	12	18
June 12	12	18	June 27	12	18
June 13	12	18	June 28	12	18
June 14	12	18	June 29	12	18
June 15	12	18	June 30	12	18

July

Day	ON delay (minutes)	OFF delay (minutes)	Day	ON delay (minutes)	OFF delay (minutes)
July 1	12	18	July 16	12	18
July 2	12	18	July 17	12	18
July 3	12	18	July 18	12	18
July 4	12	18	July 19	12	18
July 5	12	18	July 20	12	18
July 6	12	18	July 21	13	18
July 7	12	18	July 22	13	18
July 8	12	18	July 23	13	18
July 9	12	18	July 24	13	18
July 10	12	18	July 25	13	18
July 11	12	18	July 26	13	18
July 12	12	18	July 27	13	18
July 13	12	18	July 28	13	18
July 14	12	18	July 29	13	18
July 15	12	18	July 30	13	18
			July 31	13	18

August

Day	ON delay (minutes)	OFF delay (minutes)	Day	ON delay (minutes)	OFF delay (minutes)
August 1	13	18	August 16	14	18
August 2	13	18	August 17	14	18
August 3	13	18	August 18	14	18
August 4	13	18	August 19	14	18
August 5	13	18	August 20	14	18
August 6	13	18	August 21	14	18
August 7	13	18	August 22	14	18
August 8	13	18	August 23	14	18
August 9	13	18	August 24	14	18
August 10	13	18	August 25	14	18
August 11	13	18	August 26	14	18
August 12	14	18	August 27	14	19
August 13	14	18	August 28	14	19
August 14	14	18	August 29	14	19
August 15	14	18	August 30	14	19
			August 31	14	19

September

Day	ON delay (minutes)	OFF delay (minutes)	Day	ON delay (minutes)	OFF delay (minutes)
September 1	14	19	September 16	15	19
September 2	14	19	September 17	15	19
September 3	14	19	September 18	15	19
September 4	15	19	September 19	15	19
September 5	15	19	September 20	15	19
September 6	15	19	September 21	15	19
September 7	15	19	September 22	15	19
September 8	15	19	September 23	15	19
September 9	15	19	September 24	15	19
September 10	15	19	September 25	15	19
September 11	15	19	September 26	15	19
September 12	15	19	September 27	16	19
September 13	15	19	September 28	16	19
September 14	15	19	September 29	16	19
September 15	15	19	September 30	16	19

October

Day	ON delay (minutes)	OFF delay (minutes)	Day	ON delay (minutes)	OFF delay (minutes)
October 1	16	19	October 16	16	19
October 2	16	19	October 17	16	19
October 3	16	19	October 18	16	19
October 4	16	19	October 19	16	19
October 5	16	19	October 20	17	19
October 6	16	19	October 21	17	19
October 7	16	19	October 22	17	19
October 8	16	19	October 23	17	19
October 9	16	19	October 24	17	19
October 10	16	19	October 25	17	19
October 11	16	19	October 26	17	19
October 12	16	19	October 27	17	20
October 13	16	19	October 28	17	20
October 14	16	19	October 29	17	20
October 15	16	19	October 30	17	20
			October 31	17	20

November

Day	ON delay (minutes)	OFF delay (minutes)	Day	ON delay (minutes)	OFF delay (minutes)
November 1	17	20	November 16	18	20
November 2	17	20	November 17	18	20
November 3	17	20	November 18	18	20
November 4	17	20	November 19	18	20
November 5	17	20	November 20	18	20
November 6	17	20	November 21	18	20
November 7	17	20	November 22	18	20
November 8	17	20	November 23	18	20
November 9	17	20	November 24	18	20
November 10	17	20	November 25	18	20
November 11	17	20	November 26	18	20
November 12	18	20	November 27	18	20
November 13	18	20	November 28	18	20
November 14	18	20	November 29	18	20
November 15	18	20	November 30	18	20

December

Day	ON delay (minutes)	OFF delay (minutes)	Day	ON delay (minutes)	OFF delay (minutes)
December 1	18	20	December 16	19	20
December 2	18	20	December 17	19	20
December 3	18	20	December 18	19	20
December 4	19	20	December 19	19	20
December 5	19	20	December 20	19	20
December 6	19	20	December 21	19	20
December 7	19	20	December 22	19	20
December 8	19	20	December 23	19	20
December 9	19	20	December 24	19	20
December 10	19	20	December 25	19	20
December 11	19	20	December 26	19	20
December 12	19	20	December 27	20	21
December 13	19	20	December 28	20	21
December 14	19	20	December 29	20	21
December 15	19	20	December 30	20	21
			December 31	20	21

13.5. Traffic signal dimming

Section ~~12~~13.5 applies from 1 July 2015 where traffic signals are classified as a *market load*.

These *loads* have characteristics similar to Controlled Unmetered Devices as they have specifically defined periods that *calculated metering data* is based on full *load* values and dimmed *load* values. These *loads* also have characteristics similar to Uncontrolled Unmetered Devices as they do not have a constant *load* and *calculated metering data* is based on an annual *energy* consumption for the *load*.

13.5.1. Metering Data Calculation

The MC must ensure that the *interval metering data* for traffic signal unmetered *loads* classified as a type 7 *metering installation* and can be dimmed, is calculated in accordance with the following algorithm:

(*Interval metering data* for full wattage TI*j* for *NMI* – in watt hours) + (*Interval metering data* for dimmed wattage TI*j* for *NMI* – in watt hours).

$$= \frac{\sum_{i=1}^{n}(k) * (\text{Unmetered Device full wattage})_i * (\text{Unmetered Device count for NMI})_i * (\text{Period full wattage switced on})_j * (\text{TI})}{60}$$

$$+ \frac{\sum_{i=1}^{n}(k) * (\text{Unmetered Device dimmed wattage})_i * (\text{Unmetered Device count for NMI})_i * (\text{Period dimmed wattage on})_j * (\text{TI})}{60}$$

where:

i = Unmetered Device type

j = TI

k = proportion of Unmetered Device attributable to that *NMI*

TI is in minutes

Unmetered Device full wattage is determined from the Load Table.

Unmetered Device dimmed wattage is determined from the Load Table.

Unmetered Device count is determined from the Inventory Table.

Period full wattage switched on is determined from On/Off Table.

Period dimmed wattage switched on is determined from On/Off Table.

13.5.2. Inventory Table

(a) For each *NMI*, a separate Inventory Table is required that identifies each Unmetered Device type that forms part of the *NMI load* and for each Unmetered Device type lists:

(i) ~~t~~The Unmetered Device type;

(ii) ~~t~~The form of on/off control – photoelectric cell control or timer control;

(iii) ~~i~~If photoelectric cell control, sunset and sunrise times;

(iv) ~~i~~If timer control, the on/off times for the timer control;

(v) ~~i~~If an Unmetered Device is shared with another *NMI*, the proportion of *load* that is agreed by affected *Registered Participants* to be attributable to that *NMI* (k). Each k factor will be less than 1. The sum of the k factors for a shared Unmetered Device across each respective *NMI* must be equal to 1;

(vi) ~~n~~Number of such Unmetered Devices installed;

(vii) ~~e~~Effective start date – the first *day* on which that record in the Inventory Table is to be included in the calculation of *metering data* for that *NMI*;

(viii) ~~e~~Effective end date – the last *day* on which that record in the Inventory Table is to be included in the calculation of *metering data* for that *NMI*; and

(ix) ~~l~~Last change date – the date that record in the Inventory Table was most recently created or modified.

(b) Each Unmetered Device in the Inventory Table is a unique combination of physical hardware, time control classification and shared portion, for example, if an Unmetered Device is shared with another *NMI*, the individual portions of the Unmetered Device(s) must be included in the Inventory Table as a separate Unmetered Device type.

(c) Each MC must develop the initial Inventory Table for the *NMI*s for which it is responsible. The initial Inventory Table must be agreed by the affected *Registered Participants*, *AEMO* and the relevant End User.

(d) Each MC must use reasonable endeavours to update the Inventory Table, for the *NMIs* for which it is responsible, on at least a monthly basis to ensure that the accuracy requirements in section 12.5 of Metrology Procedure: Part A are met. Such changes to the Inventory Table may only be made on a retrospective basis where:

(i) ~~a~~Agreed by the MC and the affected *Registered Participants*; or

(ii) ~~n~~Necessary to comply with clause 7.9.4 of the NER.

(e) The MC must communicate any material changes to the Inventory Table to the affected *Registered Participants*.

(f) The MC must provide the Inventory Table to relevant *Registered Participants* when requested.

13.5.3. On/Off Table

The form of on/off control may be:

(a) Photoelectric cell control; or

(b) Timer control.

13.5.4. Photoelectric cell control

(a) If the on/off times for the dimming operation is controlled by a photoelectric cell:

(i) Dimming on time = sunset time.

(ii) Dimming off time = sunrise time.

(b) The MC must ensure that the appropriate sunset times and sunrise times are obtained from the Australian Government Geoscience website (www.ga.gov.au/geodesy/astro/sunrise.jsp), based on the longitude and latitude of the relevant town as specified in section 13.2.4(b).

(c) The MC must ensure that the period that the *load* is operated at dimmed wattage during a TI and the period that the *load* is operated at full wattage during a TI are calculated as follows:

Trading Interval	Period load is switched on
For the TIs commencing after sunset and finishing prior to sunrise	Period dimmed wattage is switched on = 1
For the TIs commencing after sunrise and finishing prior to sunset	Period full wattage is switched on = 1
For the TI during which sunset occurs	$\text{(Period dimmed wattage switched on)} = \frac{\text{(End time of TI)} - \text{(Time of sunset)}}{\cancel{30}5}$ $\text{(Period full wattage switched on)} = 1 - \left(\frac{\text{(End time of TI)} - \text{(Time of sunset)}}{\cancel{30}5}\right)$
For the TI during which sunrise occurs	$\text{(Period dimmed wattage switched on)} = \frac{\text{(Time of sunrise)} - \text{(Start time of TI)}}{\cancel{30}5}$ $\text{(Period full wattage switched on)} = 1 - \left(\frac{\text{(Time of sunrise)} - \text{(Start time of TI)}}{\cancel{30}5}\right)$

(d) Should testing on the operation of photoelectric cells by an independent party, agreed to by the MC, affected *Registered Participants*, AEMO and relevant End User, indicate that the on/off times for an Unmetered Device controlled by a photoelectric cell are influenced materially and consistently by other variables, AEMO shall revise this Procedure accordingly.

13.5.5. Timer control

(a) If the on/off times for the dimming operation is controlled by a timer:

(i) On time = ON time set on timer (dimming operation ON)

(ii) Off time = OFF time set on timer (dimming operation OFF)

(b) The MC must ensure that the period that the *load* is switched on during a TI is calculated as follows:

Trading Interval	Period load is switched on
For the TIs commencing after on time and finishing prior to off time	Period dimmed wattage is switched on = 1
For the TIs commencing after off time and finishing prior to on time	Period full wattage is switched on = 1
For the TI during which the on time occurs	$\text{(Period dimmed wattage switched on)} = \frac{\text{(End time of TI)} - \text{(On time)}}{\cancel{30}5}$ $\text{(Period full wattage switched on)} = 1 - \left(\frac{\text{(End time of TI)} - \text{(On time)}}{\cancel{30}5}\right)$
For the TI during which the off time occurs	$\text{(Period dimmed wattage switched on)} = \frac{\text{(Off time)} - \text{(Start time of TI)}}{5}$ $\text{(Period full wattage switched on)} = 1 - \left(\frac{\text{(Off time)} - \text{(Start time of TI)}}{\cancel{30}5}\right)$

14. SUBSTITUTION FOR TRANSFER

14.1. Application

Sections ~~13~~14.2 and ~~13~~14.3 apply during a RoLR Event or where a Jurisdiction has requested AEMO to undertake End Use transfers requiring Substitutions.

14.2. Manually Read Interval Metering Installations

14.2.1. Mandatory Requirements

For Manually Read Interval Metering Installations affected by a RoLR Event, the MDP must ensure that:

(a) ~~t~~The correct management of the NMI Datastream status for the connection points concerned that meets Jurisdictional requirements for settlements and profile preparation;

(b) ~~m~~Metering data is provided to the Current FRMP up to the transfer date;

(c) ~~m~~Metering data is provided to the New FRMP from the transfer date which may include provision of a new Estimation;

(d) Estimations are undertaken in accordance with Section 4; and

(e) ~~a~~All substituted metering data and estimated metering data is replaced by Actual Metering Data.

14.2.2. Optional

For Manually Read Interval Metering Installations affected by a RoLR Event, the MDP may Substitute the *metering data* up to the transfer date in order to facilitate End User billing. Notification to the LNSP, LR, the Current FRMP and New FRMP is in MDFF, with the following configuration:

(a) ~~u~~Utilise a reason code of '27', with an entry in the free text field of 'AEMO directed substitution'; and

(b) ~~u~~Utilise a transaction code of 'N'.

14.3. Manually Read Accumulation Metering Installations

For Manually Read Accumulation Metering Installations, the MDP must:

(a) ~~e~~Ensure the correct management of the NMI Datastream status for the *connection points* concerned that meets Jurisdictional requirements for *settlements* and *profile* preparation;

(b) ~~e~~Ensure that *metering data* is provided to the Current FRMP up to the transfer date;

(c) ~~p~~Provide the necessary *substituted metering data* labelled with an 'F' quality flag;

(d) ~~e~~Ensure that *metering data* is provided to the New FRMP from the transfer date, which may include provision of a new Estimation;

(e) ~~e~~Ensure Estimations are undertaken in accordance with section 5;

(f) ~~c~~Calculate the final *substituted metering data* in accordance with section 5;

(g) ~~n~~Notify the LNSP, LR, the Current FRMP and New FRMP for the *connection point* of the Substitution. Notification is via the *metering data* file in MDFF with the following configuration:

(i) ~~a~~A reason code of '27'; and

(ii) ~~a~~A transaction code of 'N'; and

(h) The MDP must Validate the final *substituted metering data,* re-calculate and update the *metering data* where:

(i) ~~t~~The final Substitution is found to be greater than the Actual Metering Data when next obtained; or

(ii) ~~f~~Following consultation and agreement with the Current and New FRMP, the LR and LNSP for the *connection point* a new agreed value as per Section ~~6.4.3~~5.3 (type 64) must be provided.