METROLOGY PROCEDURE:
PART B: METERING DATA VALIDATION, SUBSTITUTION AND ESTIMATION PROCEDURE FOR METERING TYPES 1 – 7

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C. PARR M. CLEARY
GROUP MANAGER – RETAIL MARKETS AND METERING CHIEF OPERATING OFFICER

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Preface

The metrology procedure has been prepared by the Australian Energy Market Operator (AEMO) in accordance with the requirements of the Rules.

This version of the Metrology Procedure: Part B has been updated to include the methodology for the preparation of calculated metering data related to dimming of traffic signal that have been classified as market loads, introduction of type 65 substitutions reflect the Rule Change: National Electricity Amendment (Small Generation Aggregator Framework) Rule 2012 ERC 0141 (effective date 1 January 2013) and other text corrections.

AEMO acknowledges the assistance of industry participants who contributed to the final form of the metrology procedure through the Metrology Reference Group.

The effective date of the metrology procedure is 15 May 2015, in accordance with the Rules.

AEMO maintains a development program in relation to the metrology procedure. Please address any comments to Roy Kaplan, Specialist Metrology Regulation at: (roy.kaplan@aemo.com.au).
Important Notice

This Metrology Procedure (Part B) is made by AEMO under clause 7.14 of the National Electricity Rules (Rules), and has effect only for the purposes set out in the Rules. The Rules and the National Electricity Law prevail over this Procedure to the extent of any inconsistency.

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### Document History

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<th>Comments</th>
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<td>AEMO</td>
<td>Incorporated as part of the <em>Service Level Requirements for Metering Data Agents.</em></td>
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<td>August 2000</td>
<td>MSWG</td>
<td><em>NEM Data Substitution and Validation Procedure</em> published as a procedure.</td>
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<td>3.00</td>
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<td>MSWG</td>
<td>Procedure updated to include <em>estimation and substitution for metering types 5, 6 and 7.</em></td>
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<td>4.00</td>
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<td>MSWG</td>
<td>Procedure updated to include clarifications and the process by which accumulated data and <em>unmetered loads</em> are converted into <em>trading intervals.</em> Procedure to become Part B of the <em>metrology procedure.</em></td>
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<td>AEMO</td>
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1 General

1.1 Introduction

1.1.1 The *Rules* define the obligations and responsibilities of *Registered Participants* in the *National Electricity Market* relating to the provisioning and operation of *a metering installation* and to the processes involved in the collection of *metering data*.

1.1.2 This document specifies the:

(a) *Metering Data Provider*’s obligations concerning the *validation, substitution* and forward *estimation* of *metering data* to satisfy the *Rules and metrology procedure obligations of AEMO* and the *responsible person*. These relate to all *metering installations for first-tier loads* and *second-tier loads* for which the *Metering Data Provider* has an obligation, as specified in *AEMO’s Market Settlement and Transfer Solution (MSATS)*; and

(b) The process of collating or determining type 6 and 7 *metering installation* data into *trading intervals*.

1.1.3 These requirements must be read in conjunction with the relevant *AEMO service level procedures for Metering Data Providers*.

1.1.4 As part of any *substitution* and forward *estimation* data quality analysis, *AEMO* will be undertaking periodical performance monitoring and benchmarking of all accredited *Metering Data Providers*.

1.2 References

1.2.1 Metrology Procedure: Part B makes reference to the documents listed in this section:

(a) Metrology procedure: Part A National Electricity Market.

(b) Service Level Procedure: Metering Data Provider Services Category D and C for Metering Installation Types 1, 2, 3, 4, 5, 6 and 7.

(c) Meter Data File Format Specification (ME_MA001).

(d) Meter Churn Data Management Procedure (ME_MA1818).

1.3 Definitions

1.3.1 A reference to a document or a provision of a document includes an amendment or supplement to, or replacement or novation of, that document or that provision of that document.

1.3.2 Words in this document and in Metrology Procedure: Part A that are shown in *italics* have the meaning specified in clause 1.7 of Metrology Procedure: Part A or, if they are not specified in this clause, they have the meaning specified in the *Rules*.

1.4 General data validation, substitution and forward estimation requirements

1.4.1 The principles to be applied to *metering data validation, substitution* and forward *estimation* tasks for all areas of the *National Electricity Market* include the following:
(a) The responsible person or AEMO (as appropriate) must ensure that the metering data associated with a metering installation, accurately reflects the energy flow within the respective metering installation.

(b) The Metering Data Provider must authenticate all validation failures to ensure metering data accurately reflects the energy flow.

(c) The Metering Data Provider must validate all substitutions and forward estimations before metering data is delivered to AEMO and Registered Participants.

(d) The responsible person must coordinate the resolution of issues arising from the non-performance of metering systems, including any liaison with associated Retailers, Local Network Service Provider(s), Metering Provider(s) and Metering Data Provider(s). The responsible person must respond promptly to requests for remedial action from the Metering Data Provider or AEMO.

(e) The timeliness of a Metering Data Provider’s detection of metering data errors and the responsible person’s response to metering installation malfunctions may place retailers at financial risk. The responsible person must, therefore, co-ordinate a response within the time frames required by the Rules and the metrology procedure and accordingly inform the affected Market Participants, so that they might implement remedial action to minimise their trading risks.

(f) The Metering Data Provider must notify all affected Registered Participants of any metering data substitution or forward estimation carried out.

(g) The Metering Data Provider must identify metering data errors resulting from data collection and processing operations using metering data validation processes in accordance with the metrology procedure. The Metering Data Provider must apply metering data substitution processes in accordance with these procedures including any default substitution procedures agreed to with the responsible person necessary to ensure that metering data is delivered to AEMO and Registered Participants.

1.5 Metering data substitution requirement

1.5.1 The Metering Data Provider must undertake substitutions on behalf of AEMO or the responsible person, as appropriate, in a manner that is consistent with the metrology procedure. Substitutions may be required in the following circumstances;

(a) Where the system or equipment that supports 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 obtained is found to be erroneous or incomplete.
(f) Where metering data has not completed validation within the registration process with the Metering Provider as detailed in clause 8.

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

(h) Where metering data cannot be obtained in the performance time frames required for the data period in question:
   i. Type 1, 2, 3 and 4 metering data must be substituted if metering data cannot be obtained to meet either settlement time frames or the required performance of the applicable service level procedures.
   ii. Type 5 and 6 metering data must be substituted if metering data cannot be obtained on or within the expected time frame of the next scheduled reading date for a connection point. Any historical or previous forward 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 parties have all agreed and subsequently direct the Metering Data Provider that a previous substitution is in error and that a re-substitution of metering data is required. Where the parties cannot reach agreement, the Rules’ dispute resolution procedures apply, and the existing substituted data should remain until the resolution of the dispute is achieved.

(k) When an inspection or test on the respective algorithms, inventory table, load table or on/off table for type 7 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 type 7.

(m) In situations involving meter churn as required by the Meter Churn Data Management Procedure.

(n) In response to customer transfers authorised by a participating jurisdiction or retailer of last resort events, as outlined in clause 15.

1.6 Metering data forward estimation requirement

1.6.1 The Metering Data Provider must undertake forward estimations on behalf of the responsible person in a manner that is consistent with the metrology procedure. Forward estimations may be required in the following circumstances;

(a) Routinely for a period that is equal to or just greater than the period to the next scheduled reading date or another forward period.

(b) In response to customer transfers authorised by a participating jurisdiction or retailer of last resort events, as outlined in clause 15.
1.6.2 Where the current published scheduled reading date has changed due to a revised scheduled reading route, the Metering Data Provider must replace any existing forward estimated metering data with new forward estimated metering data related to the revised next scheduled reading date.

1.6.3 This clause only applies to a jurisdiction as specified in the following table:

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Variation in accordance with jurisdictional policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria</td>
<td>Despite Clause 1.6.1(a) and 1.6.2, where metering data for a type 5 metering installation is collected more frequently than required by Metrology Procedure Part A Clause 3.3.9 (as allowed by Metrology Procedure Part A Clause 3.8.4A [Vic]), 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 Requirements 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.</td>
</tr>
</tbody>
</table>

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

1.7 Metering data quality flags

1.7.1 Metering Data Providers must assign the relevant metering data quality flags to metering data as follows:

(a) A - For validated and accepted actual metering data recovered from the metering installation.

(b) S – For any substituted metering data that is considered temporary and may be replaced by actual metering data at some time. Metering data substitutions apply to historical date/time periods at the time of substitution.

(c) E – For any forward estimated metering data that is considered temporary and may be replaced by actual metering data or substituted metering data at some time. Metering data forward estimations apply to a period that has an end date/time in the future.

(d) F – For substitutions that are of a permanent or final nature and subject to clause 1.7.3, the metering data would not be replaced by actual metering data at any time.

(e) N – This quality flag is only utilised within the participant interval metering data file for instances where no metering data exists within the metering data service database for the periods concerned.
1.7.2 Unless specified otherwise within the metrology procedure, Metering Data Providers must apply the following quality flag rules in the management of metering data:

(a) A metering data can only be replaced with A, S or F metering data.
(b) S metering data can only be replaced with A, S or F metering data.
(c) E metering data can only be replaced with A, E, S or F metering data.
(d) F metering data can only be replaced with F metering data as per clause 1.7.3 (f) or A metering data as per clause 1.7.3(b) or 1.7.3(h).

1.7.3 The Metering Data Provider must manage final substitutions as follows:

(a) The Metering Data Provider must undertake final metering data substitutions in the instance where a notice has been received from either the responsible person or the Metering Provider detailing a failure of the metering installation and that actual metering data cannot be obtained.

(b) In the rare instance where validated actual metering data is unexpectedly recovered from the metering installation and a final substitution has been undertaken in accordance with clause 1.7.3(a), the Metering Data Provider must replace the final substituted metering data with the actual metering data and maintain a record of the reason and instance.

(c) In the instance where the Metering Data Provider must undertake final metering data substitutions as identified within the Meter Churn Data Management Procedure.

(d) In the instance where the Metering Data Provider has received a notice that the financially responsible Market Participant, the Local Retailer and the Local Network Service Provider have all agreed that the metering data is erroneous and that a final metering data substitution is required.

(e) In the instance of a retailer of last resort event or where a Jurisdiction has requested AEMO to undertake authorised customer transfers requiring the provision of metering data substitutions and final readings, in accordance with clause 15.

(f) The Metering Data Provider may undertake to replace an existing final metering data substitution with a new final metering data substitution in accordance with the metrology procedure.

(g) In the instance where the Metering Data Provider has found previous validated actual metering data to be erroneous, then the actual metering data must be replaced with a final metering data substitution.

(h) The Metering Data Provider may replace type 6 final metering data substitutions with actual metering data that spans consecutive metering readings on agreement with the financially responsible Market Participant, the Local Retailer and the Local Network Service Provider.
### Summary table of substitution and forward estimation types

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2 SUBSTITUTION FOR METERING INSTALLATION TYPES 1 - 4

2.1 Application of clause 2

2.1.1 The requirements of clause 2.2 and clause 2.3 are applicable to all jurisdictions within the National Electricity Market and apply to metering installation types 1, 2, 3 and 4.

2.1.2 The requirements of clause 2.2 and clause 2.3 are applicable to all metering data substitution types to be undertaken by Metering Data Providers accredited for the collection, processing and delivery of metering data from metering installation types 1, 2, 3 and 4.

2.1.3 For all metering data substitutions undertaken under clause 2.2 and clause 2.3, for metering installations types 1, 2, 3 and 4, the Metering Data Provider must ensure the selected metering data substitution values correctly align with the adjoining intervals of metering data and that any intervals of metering data adjacent to the substituted period are valid.

2.2 Type 1 - 4 substitution rules

2.2.1 The Metering Data Provider must carry out all metering data substitutions in accordance with the metrology procedure.

2.2.2 The Metering Data Provider must obtain clear and concise identification as to the cause of any missing or erroneous metering data for which substitutions are required.

2.2.3 The Metering Data Provider 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.

2.2.4 Subject to clause 2.2.5, SCADA metering data, where available, may be used by the Metering Data Provider as check metering data for substitutions.

2.2.5 Metering Data Providers may only undertake substitution type 13 where substitution type 11 and type 12 are not applicable or cannot be carried out.

2.2.6 For connection points classified as Generators or Market Small Generation Aggregators:

(a) Metering Data Providers may directly undertake type 11, type 12 or type 13 substitutions as a consequence of missing or erroneous metering data that has failed validation.

(b) Metering Data Providers may undertake type 16 (Agreed Method) or Type 18 (Alternate) substitutions following consultation and agreement with the Generator or Market Small Generation Aggregator that the substituted metering data is an accurate reflection of the interval metering data concerned.

(c) In the situation where metering data cannot be recovered from the metering installation or substituted in accordance with this clause 2.2.6 within the required metering data delivery performance time frames, the Metering Data Provider must undertake type 19 substitutions as an interim until metering data can be recovered from the metering installation or substituted.
2.2.7 *Metering Data Providers* may only undertake *substitution* types 14, 15, 16, 17, 18, or 19 where *substitution* types 11, 12 and 13 are not applicable or cannot be carried out.

2.2.8 *Metering Data Providers* may perform all *metering data substitution* types except type 16 or type 18 without prior agreement from the affected parties. *Metering Data Providers* may however undertake to change the quality flag to an existing type 16 or type 18 *substitution* without seeking further agreement from the affected parties.

2.2.9 The *Metering Data Provider* must notify the *Local Network Service Provider*, *Local Retailer* and the financially responsible *Market Participant* for the connection point of any *metering data substitution* within two *business days* of the *metering data substitution* being carried out by the *Metering Data Provider*. Notification is to be achieved via the participant *metering data file* as detailed within the *service level procedures*.

2.2.10 Where a *metering installation malfunction* is a failure of the remote *acquisition* system, and the *responsible person* and *Metering Provider* cannot repair the data communications within the periods specified in the *Rules*, (two *business days* for type 1, 2 and 3 *metering installations* and 10 *business days* for type 4 *metering installations*) then the *Metering Data Provider* must:

(a) Request from the *responsible person*, the provision of a manual download of *metering data* from the *metering installation* in the time frames to meet *metering data delivery requirements*; and

(b) Where the *malfunction* includes a failure of the *meter* to correctly record *interval energy data* and the *responsible person* has acquired an exemption to repair the *metering installation*, then the *Metering Data Provider* must *substitute* for the missing *metering data* in accordance with the *metrology procedure*.

2.2.11 The *Metering Data Provider* must ensure that all *metering data substitutions* are replaced with actual *metering data* when that *metering data* becomes available.

2.3 **Type 1 - 4 substitution types**

2.3.1 **Type 11 - Check Data**

The *Metering Data Provider* must use *interval metering data* obtained from another *metering installation* that has been identified by the *Metering Provider* as being the *check metering installation* for that *metering point*. The *metering data* used must be for the same *trading intervals* as the *trading intervals* that are being *substituted*. *Metering installations* of this type include but are not limited to:

(a) The *metering installation* and check *metering installation* are installed at the same *connection point*.

(b) The *metering installation* and check *metering installation* are installed on different ends of a *transmission line* where the difference due to line losses can be accurately determined.

(c) *Metering installations* across a parallel set of feeders having similar line impedances between a common set of *busbars*.
2.3.2 Type 12 - Calculated

The *Metering Data Provider* must calculate the *interval metering data* values 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.

2.3.3 Type 13 - SCADA

(a) The *Metering Data Provider* must use EMS or SCADA data, as provided by *AEMO* in the agreed format, for *substitution* purposes, which originates from a similar measurement point as the *meter*.

(b) EMS or SCADA data may be data which is inferior in accuracy or resolution and which is in a dissimilar format to the *metering data*, (e.g. 30 Min. Demand values). The *Metering Data Provider* may have to adjust the data in both magnitude and form in order that the *substitution* is acceptable.

(c) In any instance where SCADA data is to be used for *substitution*, both the provided E channel and B channel SCADA *data streams* must be used.

2.3.4 Type 14 - Like Day

The *Metering Data Provider* must *substitute* for the missing or erroneous *metering data* using the *nearest equivalent day* or *like day* method, as detailed in Table 1 below.
### Type 14

<table>
<thead>
<tr>
<th>Substitution Day</th>
<th>Nearest Equivalent Day or Like Day (in order of availability)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>Monday ##</td>
</tr>
<tr>
<td>Tuesday</td>
<td>Tuesday## Wednesday## Thursday## Wednesday# Thursday#</td>
</tr>
<tr>
<td>Wednesday</td>
<td>Wednesday## Tuesday# Thursday## Thursday# Tuesday##</td>
</tr>
<tr>
<td>Thursday</td>
<td>Thursday## Wednesday# Tuesday# Wednesday## Tuesday##</td>
</tr>
<tr>
<td>Friday</td>
<td>Friday##</td>
</tr>
<tr>
<td>Saturday</td>
<td>Saturday##</td>
</tr>
<tr>
<td>Sunday</td>
<td>Sunday##</td>
</tr>
</tbody>
</table>

*Metering data substitutions* for **like day** to be as detailed above, unless:

(a) No *metering data* is available on the first listed day, then 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 then 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.

### 2.3.5 Type 15 - Average Like Day

The *Metering Data Provider* may substitute for the missing or erroneous *metering data* using the **average like day** method, as detailed in Table 2 below.

### 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 part thereof. 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 *interval(s)* 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 *interval(s)* to be substituted.

*Type 15 substitutions* must not be used for public holidays.
2.3.6 Type 16 - Agreed Method
Where the Metering Data Provider is required to undertake a metering data substitution for any period greater than seven days, consultation and agreement must be obtained from the financially responsible Market Participant, the Local Retailer and the Local Network Service Provider for the connection point as to the metering data substitution to be performed. This may include changes to existing metering data substitutions for any period which were carried out where the affected parties have directed that as a result of site or customer specific information, the original metering data substitutions are in error and a correction is required.

2.3.7 Type 17 - Linear Interpolation
The Metering Data Provider may substitute metering data for consecutive interval periods up to, but not exceeding two hours, by using simple linear interpolation.

2.3.8 Type 18 - Alternate
The Metering Data Provider may use an alternate method of metering data substitution subject to an agreement between the financially responsible Market Participant, the Local Retailer and the Local Network Service Provider 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 which affect consumption (e.g. local holiday or customer shutdown), or where alternate metering data may be able to be used for quality checks and minor adjustments of an estimated profile, such as using meter register data.

2.3.9 Type 19 - Zero
The Metering Data Provider must undertake metering data substitutions of ‘zero’ where:

(a) Either the Local Network Service Provider or the Metering Provider has informed the Metering Data Provider of a de-energised connection point or an inactive meter and where the consumption is known to be zero; or

(b) As specified within the Meter Churn Data Management Procedure; or

(c) Metering data substitutions are applicable for connection points classified as Generators or Market Small Generation Aggregators in accordance with clause 2.2.6(c).
3 SUBSTITUTION AND FORWARD ESTIMATION FOR METERING INSTALLATION TYPE 5

3.1 Application of clause 3

3.1.1 The requirements of clause 3.2 and clause 3.3 apply to the jurisdictions of Victoria, New South Wales, South Australia, Australian Capital Territory, Queensland, and Tasmania.

3.1.2 The substitution and forward estimation types, as detailed within clause 3.2 and clause 3.3, are to be undertaken by Metering Data Providers accredited for the collection, processing and delivery of metering data from a metering installation type 5.

3.1.3 For all metering data substitutions and forward estimations undertaken under clause 3.2 and clause 3.3, the Metering Data Provider must ensure the selected metering data substitution values correctly align with the adjoining interval metering data and that any interval metering data adjacent to the substituted period is valid.

3.2 Type 5 substitution and forward estimation rules

3.2.1 The Metering Data Provider must carry out all metering data substitutions and forward estimations in accordance with the metrology procedure.

3.2.2 The Metering Data Provider must ensure that all metering data substitutions and forward estimations are replaced with actual metering data if and when that metering data becomes available.

3.2.3 The Metering Data Provider must obtain clear and concise identification as to the cause of any missing or erroneous metering data for which metering data substitutions are required.

3.2.4 The Metering Data Provider must only use type 56 or type 57 substitutions or forward estimations where the historical metering data does not support the application of a type 51 or type 52 substitution or forward estimation.

3.2.5 Subject to clause 3.2.4 the Metering Data Provider must only apply the following substitution and forward estimation types:

(a) Substitutions may be type 51, 52, 53, 54, 55, 56, 57 or 58.

(b) Forward estimations may be type 51, 52, 56, 57 or 58.

3.2.6 The Metering Data Provider must notify the Local Network Service Provider, Local Retailer and the financially responsible Market Participant for the connection point of any metering data substitution or forward estimation within two business days of the metering data substitution or forward estimation being carried out by the Metering Data Provider. Notification is achieved via the participant metering data file as detailed within the service level procedures.

3.2.7 Metering Data Providers may not perform type 53 or type 55 substitutions or type 56 substitutions or forward estimations without prior agreement with the affected parties. Metering Data Providers may however undertake to change the quality flag to an existing type 53 or type 55 substitution or type 56 substitution or forward estimation without seeking further agreement from the affected parties.
3.3 Type 5 substitution and forward estimation types

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

The Metering Data Provider must provide a substitution or forward estimation for the metering data 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 below.

3.3.2 Type 52 - Previous Meter Reading Method (with the Nearest Equivalent Day or Like Day method)

(a) The Metering Data Provider must provide a substitution or forward estimation for the metering data 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 3 below.

<table>
<thead>
<tr>
<th>Type 51 or 52</th>
<th>Table 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substitution or Forward Estimation Day</td>
<td>Nearest Equivalent Day or Like Day (in order of availability)</td>
</tr>
<tr>
<td>Monday</td>
<td>Monday## Monday #</td>
</tr>
<tr>
<td>Tuesday</td>
<td>Tuesday## Wednesday## Tuesday# Wednesday#</td>
</tr>
<tr>
<td>Wednesday</td>
<td>Wednesday## Tuesday## Thursday## Wednesday## Thursday# Tuesday#</td>
</tr>
<tr>
<td>Thursday</td>
<td>Thursday## Wednesday## Tuesday## Thursday## Wednesday## Tuesday#</td>
</tr>
<tr>
<td>Friday</td>
<td>Friday## Friday#</td>
</tr>
<tr>
<td>Saturday</td>
<td>Saturday## Saturday#</td>
</tr>
<tr>
<td>Sunday</td>
<td>Sunday## Sunday#</td>
</tr>
</tbody>
</table>

**Metering data substitutions or forward estimations** for like day to be as detailed above, unless:

(a) No metering data is available on the first listed day, then 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 then Type 52 must be used.

(b) The substitution or forward estimation day was a public holiday, in which case the most recent Sunday is to be used.

(c) The substitution or forward estimation 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, 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 Metering Data Provider must provide substitution or forward estimation metering data using the average like day method, as detailed in Table 4.

<table>
<thead>
<tr>
<th>TYPE 52 (Alternate)</th>
<th>Table 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>The <em>interval metering data</em>, for which a <em>substitution</em> or forward <em>estimation</em> is to be provided, will be calculated using an average of the <em>metering data</em> from each corresponding <em>interval</em> from the preceding four weeks, or part thereof. This averaging technique may be applied in either of the following ways:</td>
<td></td>
</tr>
<tr>
<td>(a) Where the averaged <em>interval metering data</em> is used to provide the value for the <em>interval requiring substitution or forward estimation</em>.</td>
<td></td>
</tr>
<tr>
<td>(b) Where the averaged <em>interval metering data</em> is used to provide the <em>profile</em> and are scaled to a pre-determined consumption value for the <em>interval(s)</em> that are the subject of <em>substitution or forward estimation</em>.</td>
<td></td>
</tr>
</tbody>
</table>

Type 52 *substitutions* or forward *estimations* must not be used for public holidays.

3.3.3 Type 53 - Revision of Substituted Metering Data

The *Metering Data Provider* must re-substitute or change previously substituted metering data prior to the actual *meter reading* or prior to the second revision in the *AEMO settlements* timetable (whichever occurs first), where the *financially responsible Market Participant*, the *Local Retailer* and the *Local Network Service Provider* have agreed, on the basis of site or customer specific information, that the original substituted *metering data* is in error and a correction is required.

3.3.4 Type 54 - Linear Interpolation

The *Metering Data Provider* may substitute metering data for consecutive *interval* periods up to, but not exceeding two hours, by using simple linear interpolation.

3.3.5 Type 55 - Agreed Substitution Method

The *Metering Data Provider* may undertake to use another method of *metering data substitution* (which may be a modification of an existing *substitution* type), where none of the existing *substitution* types is applicable, subject to an agreement between the *financially responsible Market Participant*, the *Local Retailer* and the *Local Network Service Provider* for the *connection point*. The specifics of this *substitution* type may involve a globally applied method.

3.3.6 Type 56 - Prior To First Reading - Agreed Method

Prior to the first actual *meter reading* and where no previous *metering data* history exists for the *connection point*, the *Metering Data Provider* may provide a *substitution* or forward *estimation* for the *interval metering data* using a method agreed between the *financially responsible Market Participant*, the *Local Retailer* and the *Local Network Service Provider*. 
3.3.7 Type 57 - Prior to First Reading - Customer Class Method

Prior to the first actual meter reading and where no previous metering data history exists for the connection point, the Metering Data Provider may provide a substitution or forward estimation for the metering data based on the given average daily load. The interval metering data must be profiled to suit the relevant customer class. Metering Data Providers electing to undertake this type of substitution or forward estimation must develop a suite of profiles acceptable to the responsible person for use and application.

3.3.8 Type 58 - Zero

The Metering Data Provider must undertake metering data substitutions or forward estimations of ‘zero’ where:

(a) Either the Local Network Service Provider or the Metering Provider has informed the Metering Data Provider of a de-energised connection point or an inactive meter and where the consumption is known to be zero; or

(b) As specified within the Meter Churn Data Management Procedure.
4 SUBSTITUTION AND FORWARD ESTIMATION FOR METERING INSTALLATION TYPE 6

4.1 Application of clause 4

4.1.1 The requirements of clause 4.2 and clause 4.3 apply to the jurisdictions of Victoria, New South Wales, South Australia, Australian Capital Territory, Queensland, and Tasmania.

4.1.2 The metering data substitution and forward estimation types as detailed within clause 4.2 and clause 4.3 are to be undertaken by Metering Data Providers accredited for the collection, processing and delivery of metering data from a metering installation type 6.

4.2 Type 6 substitution and forward estimation rules

4.2.1 The Metering Data Provider must carry out all metering data substitutions and forward estimations in accordance with the metrology procedure.

4.2.2 The Metering Data Provider must replace all metering data forward estimations with either actual or substituted metering data:

(a) When actual metering data covering all or part of the forward estimation period is obtained; or

(b) When the next scheduled meter reading was unable to be undertaken, the Metering Data Provider must replace the forward estimated metering data with substituted metering data with a quality flag of F (final substitution).

4.2.3 Any final substituted metering data provided by the Metering Data Provider must be re-validated, updated or recalculated by the Metering Data Provider when:

(a) The value of the metering data obtained at the next actual meter reading is found to be less than the previous final substitution; or

(b) The final substituted value is disputed and following consultation and agreement from the financially responsible Market Participant, the Local Retailer and the Local Network Service Provider for the connection point a new agreed value as per clause 4.3.4 (type 64) must be provided.

4.2.4 The Metering Data Provider must obtain clear and concise identification as to the cause of any missing or erroneous metering data for which metering data substitutions are required.

4.2.5 Where the scheduled meter reading frequency is less frequent than monthly, the Metering Data Provider may only use a type 62 substitution or forward estimation method when metering data from the same, or similar, meter reading period last year (i.e. type 61) is not available.

4.2.6 The Metering Data Provider may use type 63 substitutions or forward 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 forward estimation methods cannot be used).
4.2.7 The Metering Data Provider may use type 65 substitutions or forward estimations type 65 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 forward estimation methods cannot be used).

4.2.8 The Metering Data Provider must only use a type 67 substitution when:

(a) Directed by the responsible person; and

(b) Not expressly disallowed in the jurisdiction concerned; and

(c) The end-use customer provided meter reading meets the validation rules for that data stream; and

(d) The Metering Data Provider has no actual metering data for the scheduled reading date for this connection point.

4.2.9 Subject to clause 4.2.5, clause 4.2.6, clause 4.2.7 and clause 4.2.8 the Metering Data Provider may apply the following substitution and forward estimation types:

(a) Substitutions may be type 61, 62, 63, 64, 65, 66, 67 or 68.

(b) Forward estimations may be type 61, 62, 63, 65 or 68.

4.2.10 Metering Data Providers may not perform type 64 or type 66 substitutions without prior agreement with the financially responsible Market Participant, the Local Retailer and the Local Network Service Provider for the connection point. Metering Data Providers may however undertake to change the quality flag to an existing type 64 or type 66 substitution without seeking further agreement from the financially responsible Market Participant, the Local Retailer and the Local Network Service Provider for the connection point.

4.2.11 The Metering Data Provider must notify the Local Network Service Provider, Local Retailer and the financially responsible Market Participant for the connection point of any metering data substitution or forward estimation within two business days of the metering data substitution or forward estimation being carried out by the Metering Data Provider. Notification is achieved via the participant metering data file as detailed within the service level procedures.

4.3 Type 6 substitution and forward estimation types

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

The Metering Data Provider must provide a substitution or forward estimation of the meter reading by calculating the energy consumption as per the following formula:

\[
\text{Meter Reading} \times \text{Energy Consumption} = ADCLY \times \text{number of days required}
\]

where

\[
ADCLY = \text{average daily consumption from the same or similar meter reading period last year.}
\]

4.3.2 Type 62 - Previous Meter Reading Method (Average Daily Consumption Method)
The Metering Data Provider must provide a substitution or forward estimation of the meter reading by calculating the energy consumption as per the following formula:

\[
\text{Meter Reading Energy Consumption} = \text{ADC}_{\text{PP}} \times \text{number of days required.}
\]

where

ADC_{\text{PP}} = \text{average daily consumption from the previous meter reading period.}

4.3.3 Type 63 Customer Class Method

The Metering Data Provider must provide a substitution or forward estimation of the meter reading by calculating the energy consumption as per the following formula:

\[
\text{Meter Reading Energy Consumption} = \text{ADC}_{\text{CC}} \times \text{number of days required}
\]

where

ADC_{\text{CC}} = \text{average daily consumption for this customer class with the same type of usage.}

4.3.4 Type 64 - Agreed Method

The Metering Data Provider may undertake to use another method of metering data substitution (which may be a modification of an existing substitution type), where none of the existing substitution types is applicable, subject to an agreement between the financially responsible Market Participant, the Local Retailer and the Local Network Service Provider for the connection point. The specifics of this substitution type may involve a globally applied method.

4.3.5 Type 65 – Forward Estimation by ADL Method

The Metering Data Provider must provide a substitution or forward estimation of the meter reading by calculating the energy consumption in accordance with the following formula:

\[
\text{Meter Reading Energy Consumption} = \text{Average Daily Load} \times \text{number of days required.}
\]

4.3.6 Type 66 - Revision of Substituted Metering Data

The Metering Data Provider must re-substitute or change previously substituted metering data, prior to an actual meter reading or prior to the second revision in the AEMO settlements timetable (whichever occurs first), where the financially responsible Market Participant, the Local Retailer and the Local Network Service Provider have agreed to revise the original substituted metering data, on the basis of site or customer specific information.

4.3.7 Type 67 – End-use customer Reading

Subject to clause 4.2.8, the Metering Data Provider must substitute any previously substituted or forward estimated metering data based directly on an end-use customer provided meter reading.
4.3.8 Type 68 - Zero

The *Metering Data Provider* must undertake data *substitutions* or forward *estimations* of 'zero' where:

(a) Either the *Local Network Service Provider* or the *Metering Provider* has informed the *Metering Data Provider* of a de-energised *connection point* or an inactive *meter* and where the consumption is known to be zero; or

(b) As specified within the *Meter Churn Data Management Procedure*. 
5 SUBSTITUTION AND FORWARD ESTIMATION FOR METERING INSTALLATION TYPE 7

5.1 Application of clause 5

5.1.1 The requirements of clause 5.2 and clause 5.3 apply to the jurisdictions of Victoria, New South Wales, South Australia, Australian Capital Territory, Tasmania and Queensland.

5.1.2 The substitution and forward estimation types detailed in clause 5.2 and clause 5.3 are to be undertaken by Metering Data Providers accredited for the calculation and delivery of metering data from a metering installation type 7.

5.2 Type 7 substitution rules

5.2.1 The Metering Data Provider must carry out all metering data substitutions and forward estimations in accordance with the metrology procedure.

5.2.2 The Metering Data Provider must obtain clear and concise identification as to the cause of any missing or erroneous calculated metering data for which metering data substitutions are required.

5.2.3 The Metering Data Provider must ensure that all metering data substitutions and forward estimations are based on calculated metering data and not on any previous substitutions.

5.2.4 The Metering Data Provider must base calculated metering data for type 7 metering installations on inventory table data as follows:

(a) 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 a forward estimated value; and

(b) Where the inventory table is correct for the period concerned, the calculated metering data must be provided as an actual value; and

(c) Where the inventory table in (b) above has a subsequent update for the period concerned, the calculated metering data must be provided as a substituted value.

5.2.5 Subject to clause 5.2.4, the Metering Data Provider may apply the following substitution and forward estimations types:

(a) Substitutions may be type 71, 72, 73, or 74.

(b) Forward estimations must be type 75.

5.2.6 The Metering Data Provider must notify the Local Network Service Provider, Local Retailer and the financially responsible Market Participant for the connection point of any calculated metering data substitution by the Metering Data Provider within two business days of the calculated metering data substitution being carried out by the Metering Data Provider. Notification is achieved via the participant metering data file as detailed within the service level procedures.

5.2.7 The Metering Data Provider must flag all calculated metering data substitutions as final (F).

5.2.8 Metering Data Providers may not perform a type 74 substitution without prior agreement with the affected parties.
5.3 Type 7 substitution and forward estimation types

5.3.1 Type 71 - Recalculation
The *Metering Data Provider* 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.

5.3.2 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 *Metering Data Provider* must substitute calculated metering data obtained by a recalculation based on the most recent inventory tables, load tables and on/off tables in which there were no errors.

5.3.3 Type 73 - Revised Algorithm
Where the error in the calculated metering data is due to an error in the algorithm, the *Metering Data Provider* must substitute the most recent calculated metering data for which there was no error.

5.3.4 Type 74 - Agreed Method
The *Metering Data Provider* may use another method of calculate metering data substitution (which may be a modification of an existing substitution type), where none of the existing substitution types is applicable, subject to an agreement between the financially responsible Market Participant, the Local Retailer and the Local Network Service Provider for the connection point. The specifics of this substitution type may involve a globally applied method.

5.3.5 Type 75 – Existing Table
The *Metering Data Provider* must provide a forward estimate for the calculated metering data based on the most recent inventory table information until such time as an updated inventory table is received for the period concerned.
6 GENERAL DATA VALIDATION REQUIREMENTS

6.1 Validation requirements for metering installations types 1 - 7

6.1.1 Metering Data Providers are requested to manage systems and processes on the basis that:

(a) Registration information given may not be inherently correct;
(b) Stored metering data held in the meter buffer may be subject to installation measurement error;
(c) Data delivered by reading systems, (e.g. Remote reading systems, hand held readers and conversion software) may not be recovered from the field meters without corruption.

6.1.2 The market use of auditable validation procedures is of critical importance and may have a direct impact on disputes. It is essential that Metering Data Providers comply with these validation procedures and that all metering data is subjected to validation prior to delivery to AEMO and Registered Participants.

6.2 Validation of interval metering data alarms for metering installation types 1 - 5

6.2.1 The Metering Data Provider must validate interval metering data from metering installation types 1, 2, 3, 4 and 5 against the following significant metering data alarms when these are provided in the meter:

- power failure / meter loss of supply,
- VT or phase failure,
- pulse overflow,
- CRC error, and
- time tolerance.

(a) Where interval metering installations assign alarms to the data channel and or the interval metering data concerned, the Metering Data Provider must process the alarm along with the metering data as part of the required metering data validation process.

(b) As a minimum requirement, the Metering Data Provider must have systems and processes in place that capture metering data alarms and process them by exception reporting.

(c) The Metering Data Provider must retain all metering data alarm exception reports for audit purposes.

(d) The Metering Data Provider must ensure that all metering data alarm exception report are signed off and dated by the person actioning the data exception report review as part of the validation process.

(e) The Metering Data Provider must validate all interval metering data with all metering data alarms prior to despatch to AEMO or Registered Participants.

(f) All Metering Data Provider exception reports must provide, for all instances where the interval metering data was found to be corrupted e.g. intervals substituted, an indication of the subsequent actions undertaken by the Metering Data Provider.
7  VALIDATION WITHIN THE METER READING PROCESS

7.1  Application of clause 7

7.1.1  The requirements of clause 7.2 are applicable to Metering Data Providers accredited for the provision of metering data services for type 5 metering installations.

7.1.2  The requirements of clause 7.3 are applicable to Metering Data Providers accredited for the provision of metering data services for type 6 metering installations.

7.2  Validations to be performed for type 5 metering data collection

7.2.1  The Metering Data Provider responsible for the collection of metering data from type 5 metering installations must undertake the following validations within the meter reading process:

(a)  The meter serial number is correct against the recorded meter serial number.

(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.

7.3  Validations to be performed for type 6 metering data collection

7.3.1  The Metering Data Provider responsible for the collection of metering data from type 6 metering installations must undertake the following validations within the meter reading process:

(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 number is correct against the recorded meter serial number.

(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.
8 VALIDATION WITHIN THE REGISTRATION PROCESS

8.1 General
8.1.1 This clause 8 relates to the validation of the NMI and respective metering data within the registration and connection point transfer process. This clause 8 is also applicable to current registered connection points which have a change of metrology and/or Metering Data Provider.

8.2 Application of clause 8
8.2.1 The requirements of clause 8.3 are applicable to Metering Data Providers accredited for the provision of metering data services for type 1, 2, 3 and 4 metering installations.
8.2.2 The requirements of clause 8.4 are applicable to Metering Data Providers accredited for the provision of metering data services for type 5 metering installations.
8.2.3 The requirements of clause 8.5 are applicable to Metering Data Providers accredited for the provision of metering data services for type 6 metering installations.
8.2.4 The requirements of clause 8.6 are applicable to Metering Data Providers accredited for the provision of metering data services for type 7 metering installations.

8.3 Validation in the registration process for type 1 – 4 metering installations
8.3.1 The Metering Data Provider must validate the metering data on registration of all type 1, 2, 3 and 4 metering installations to verify:
   (a) That the metering data correctly pertains to the registered metering installation, in conjunction with the Metering Provider.
   (b) That the magnitude and profile of the metering data is correct for the primary energy, in conjunction with the Metering Provider.
   (c) That all data streams are captured, in conjunction with the Metering Provider.
   (d) That the NMI is registered in MSATS.
   (e) That the NMI is correct and is within the range allocated for that Network Service Provider.
8.3.2 The Metering Data Provider must undertake all validations as detailed in clause 8.3.1 following any changes to the metering installation (e.g. a meter change or current transformer (CT) ratio change).
8.3.3 The validations performed by the Metering Data Provider as detailed in clause 8.3.1, must be carried out prior to the distribution of any actual interval metering data to AEMO or Registered Participants for the purposes of market settlements or billing.
8.4 Validation in the registration process for type 5 metering installations

8.4.1 The Metering Data Provider must validate the metering data on registration of all current transformer type 5 metering installations to verify:

(a) That the metering data correctly pertains to the registered metering installation, in conjunction with the Metering Provider.

(b) That the magnitude and profile of the metering data is correct for the primary energy, in conjunction with the Metering Provider.

(c) That all data streams are captured, in conjunction with the Metering Provider.

(d) That the NMI is registered in MSATS.

(e) That the NMI is within the range allocated for that Local Network Service Provider.

8.4.2 The Metering Data Provider must undertake all validations as detailed in clause 8.4.1 following any changes to the metering installation (such as a meter change or current transformer (CT) ratio change).

8.4.3 The validations performed by the Metering Data Provider, as detailed in clause 8.4.1, must be carried out prior to the distribution of any actual interval metering data to AEMO or Registered Participants for the purposes of market settlements or billing.

8.4.4 The Metering Data Provider must validate the metering data on registration of all whole current type 5 metering installations to verify:

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

(b) That the metering data acquired is of an expected magnitude and profile for the customer type.

(c) That all data streams are captured.

(d) That the NMI is registered in MSATS.

(e) That the NMI is within the range allocated for that Local Network Service Provider.

8.4.5 The validation performed by the Metering Data Provider, as detailed in clause 8.4.4, must be carried out prior to the distribution of any actual interval metering data to AEMO or Registered Participants for the purposes of market settlements or billing.

8.5 Validation in the registration process for type 6 metering installations

8.5.1 The Metering Data Provider must validate the metering data on registration of all type 6 metering installations to verify:

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

(b) That all data streams are captured.

(c) That the NMI is captured.

(d) That the NMI is registered in MSATS.

(e) That the NMI is within the range allocated for that Local Network Service Provider.
8.5.2 The *Metering Data Provider* must undertake all validations, as detailed in clause 8.5.1, following any changes to the *metering installation* (such as a meter change or current transformer (CT) ratio change).

8.5.3 The validations performed by the *Metering Data Provider*, as detailed in clause 8.5.1, must be carried out prior to the distribution of any actual *metering data* to AEMO or *Registered Participants* for the purposes of *market settlements* or billing.

8.6 Validation in the registration process for type 7 metering installations

8.6.1 The *Metering Data Provider* must validate the calculated *metering data* on registration of all type 7 metered sites to verify:

(a) That the *inventory tables*, *load tables* and *on/off tables* are complete and correct for the specifics of the type 7 *metering installation*. 
9 VALIDATION OF METERING DATA TYPE 1 - 4

9.1 General

9.1.1 For connection points where AEMO is required to appoint a Metering Data Provider to provide metering data services, AEMO may also request the respective Metering Data Provider to perform additional data validations (e.g. busbar or nodal validation) to further ensure the quality and completeness of the metering data.

9.1.2 Type 1 and 2 metering installations must have a check metering installation in accordance with the Rules.

9.1.3 Type 3, 4, 5 and 6 metering installations are not required to have (but may have) a check metering installation in accordance with the Rules.

9.2 Application of clause 9

9.2.1 The requirements of clause 9.3 are applicable to all Metering Data Providers accredited for the provision of metering data services for metering installation types 1, 2, 3 and 4.

9.2.2 The requirements of clause 9.4 are applicable to Metering Data Providers accredited for the provision of metering data services for metering installation types 1, 2, 3 and 4 that have associated check metering installations or partial check metering installations.

9.3 Validations to be performed for all metering installations

9.3.1 The Metering Data Provider must, as a minimum, undertake the following validations on metering data within the metering data services database:

(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 current transformer (CT) metering installations the maximum value is to be initially defined by the applied current transformer (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 which tests for an acceptable number of zero interval values per day to be derived from the site’s historical metering data.

(d) Check for null (no values) metering data in the metering data services database for all metering data streams.
   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 \textit{active energy} or \textit{reactive energy} value per interval per \textit{metering data stream}.

(e) Check for significant \textit{meter} alarms (power failure, \textit{voltage transformer} (VT) or phase failure, pulse overflow, CRC error and time tolerance).

i. A process must be in place that captures these significant \textit{meter} alarms within the \textit{metering data validation} process and ensures that any \textit{meter} alarm occurrences are retained as part of the \textit{metering data} audit trail. Refer to clause 6.2.

ii. The \textit{Metering Data Provider} must provide the occurrences of these alarms to relevant \textit{Registered Participants} within the \textit{metering data} file that has a format compliant with the \textit{Meter Data File Format Specification}.

(f) Where supported by the meter(s), \textit{validation}, for a given period, of \textit{interval metering data} by comparison of the totalised \textit{interval energy data} values (accumulation register reading) and the change in the \textit{meter} cumulative registers (energy tolerance). It is acknowledged that this check would not identify \textit{current transformer} (CT) ratio changes that have occurred after initial commissioning and have not been advised to the \textit{Metering Data Provider}.

9.4 Validations to be performed for metering installations with check metering or partial check metering

9.4.1 The \textit{Metering Data Provider} must undertake the following \textit{validations} by comparison of the \textit{metering data} and \textit{check metering data} for all \textit{metering installations} that have associated check or partial \textit{check metering installations}:

(a) For \textit{metering installations} where the \textit{check metering installation} duplicates the \textit{metering installation} accuracy level, the \textit{Metering Data Provider} must \textit{validate} the \textit{metering installation data streams} and \textit{check metering data streams} on a per interval basis. The average of the two \textit{validated metering data} sets will be used to determine the \textit{energy measurement}.

(b) For installations where the \textit{check metering data validation} requires a comparison based on nodal balance (comparing the sum \textit{energy flow} to the \textit{busbar} against \textit{energy flow} from the \textit{busbar}), the \textit{Metering Data Provider} must construct a \textit{validation} algorithm within the \textit{metering data services database} that will facilitate this test:

i. The \textit{Metering Data Provider} must construct a \textit{validation} algorithm within the \textit{metering data services database} that will facilitate comparison of \textit{interval metering data} for each \textit{energy flow} on a per interval basis.

ii. The \textit{Metering Data Provider} must conduct an analysis of the \textit{historical metering data} for each \textit{connection point} to ascertain whether error differences in nodal balance are acceptable.

iii. The \textit{Metering Data Provider} should use this information to refine its \textit{validation} algorithms to minimise the error difference value for each \textit{connection point}, based on historical \textit{metering data}.
iv. The maximum error difference considered acceptable for any connection point is 1% on a per interval basis. The Metering Data Provider should minimise this value 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), the validation system must employ the following functionality:

i. The Metering Data Provider 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 line losses.

ii. The Metering Data Provider must conduct an analysis of the historical metering data for each connection point to ascertain whether error differences between the metering data from the metering installation and check metering installation is acceptable.

iii. The Metering Data Provider should use this information to refine its validation algorithms to minimise the error difference value for each connection point, based on historical metering data.

iv. The maximum error difference considered acceptable for any connection point is 5% on a per interval basis. The Metering Data Provider should minimise this value for each connection point, based on historical data.

(d) For installation connection points where SCADA metering data is made available by AEMO for the purposes of metering data validation, the Metering Data Provider must validate the metering data by comparison of the interval metering data against the SCADA metering data as provided by AEMO in the agreed format. The validation system must employ the following functionality:

i. The Metering Data Provider 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 metering data on a per interval basis.

ii. The Metering Data Provider must conduct an analysis of the historical metering data for each connection point to ascertain whether error differences between the interval metering data from the metering installation and the SCADA metering data is acceptable.

iii. The Metering Data Provider should use this information to refine its validation algorithms to minimise the error difference value for each connection point, based on historical metering data.
iv. The *Metering Data Provider* must construct an appropriate validation algorithm as the SCADA metering data may be derived from a different measurement point, have a different interval collection period and/or have a different base unit of measurement, (e.g. power not energy value) with allowances for a larger error of measurement.

v. The *Metering Data Provider* is only required to undertake validation of metering data against the SCADA metering data on the primary data channel i.e. only ‘B’ channel validation for *Generators or Market Small Generation Aggregators* and only ‘E’ channel validation for loads such as pumps.
10 VALIDATION OF METERING DATA TYPE 5

10.1 Application of clause 10

10.1.1 Metering Data Providers accredited for the provision of metering data services for type 5 metering installations must apply the requirements of:

(a) Clause 10.2 for current transformer (CT) connected type 5 metering installations.

(b) Clause 10.3 for whole current type 5 metering installations.

10.2 Validations to be performed for type 5 metering installations with CTs

10.2.1 The Metering Data Provider must, as a minimum, undertake the following validations on metering data 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.

   iii. A check of the maximum value of active energy. (Maximum reactive energy checks may also be performed as an option).

   iv. The maximum value in 10.2.1(a)(iii) is to be initially defined by the applied current transformer (CT) ratio of the metering installation.

   v. On a per installation basis, the maximum value in 10.2.1(a)(iii) may be increased to cater for situations where the responsible person has confirmed that the current transformer (CT) is overloaded on a short-term basis.

(b) Check against a nominated minimum value or, alternatively, a ‘zero’ check which tests for an acceptable number of zero interval values per day to be derived from the site’s historical metering data.

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

   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 metering data stream.

(d) Check for significant meter alarms (power outage or power failure, VT or phase failure, pulse overflow, CRC error and time tolerance).

   i. A process must be in place that captures these significant meter alarms within the metering data validation process and ensures that any meter alarm occurrences are retained as part of the metering data audit trail. Refer to clause 6.2.
ii. The *Metering Data Provider* must provide the occurrences of these *meter* alarms to relevant *Registered Participants* within the *metering data* file that has a format compliant with the Meter Data File Format 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). It is acknowledged that this check would not identify current transformer (CT) ratio changes that have occurred after initial commissioning and have not been advised to the *Metering Data Provider*.

(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.

10.3 **Validations to be performed for whole current type 5 metering installations**

10.3.1 The *Metering Data Provider* must, as a minimum, undertake the following validations on *metering data* 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.
   iii. 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*.

(b) Check for null (no values) *metering data* in the *metering data services database* for all *metering data streams*.
   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 *metering data stream*.

(c) Check for significant *meter* alarms (voltage transformer (VT) or phase failure, pulse overflow, CRC error and time tolerance). The *Metering Data Provider* is not required to *validate* the interval *metering data* for power outage or power failure alarms.
   i. A process must be in place that captures these significant *meter* alarms within the *metering data validation* process and ensures that any *meter* alarm occurrences are retained as part of the *metering data* audit trail. Refer to clause 6.2.
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   ii. The *Metering Data Provider* must provide the occurrences of these *meter* alarms (inclusive of the occurrences of power outage or power failure alarms) to relevant *Registered Participants* within the *metering data* file that has a format compliant with the Meter Data File Format Specification.

   (d) 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).

   (e) 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.
11 VALIDATION OF METERING DATA TYPE 6

11.1 Application of clause 11

11.1.1 The requirements of clause 11.2 are applicable to Metering Data Providers accredited for the provision of metering data services for metering installations type 6.

11.2 Validations to be performed for type 6 metering installations

11.2.1 The Metering Data Provider must undertake the following validations on metering data within the metering data services database:

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

(b) 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.

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

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

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

(f) Check for null (no values) metering data in the metering data services database for all metering data streams.

   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).
12 VALIDATION OF METERING DATA TYPE 7

12.1 Application of clause 12

12.1.1 The requirements of clause 12.2 are applicable to Metering Data Providers accredited for provision on metering data services for type 7 metering installations.

12.2 Validations to be performed for type 7 metering installations

12.2.1 The Metering Data Provider must undertake the following validations on calculated metering data within the metering data services database:

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

(b) Calculated metering data value is numeric and $\geq 0$.

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

   i. 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).

(d) Check the inventory tables, load tables and on/off tables with a process approved by the responsible person to ensure that the correct version of the tables is being used for the production of calculated metering data.

(e) Check against a nominated minimum value or alternatively a ‘zero’ check which tests for an acceptable number of zero interval values per day.

(f) Calculated metering data date $> \text{previous calculated metering data date}$.
13 LOAD PROFILING – CONVERSION OF ACCUMULATED METERING DATA

13.1 Application of clause 13

13.1.1 A load profiling requirement for the conversion of accumulated metering data into trading intervals applies to the jurisdictions of Victoria, New South Wales, Queensland, South Australia, Australian Capital Territory, and Tasmania.

13.2 Requirement for load profiling

13.2.1 Load profiling is required in order to determine trading interval metering data, for wholesale market settlement purposes, for type 6 metering installations.

13.2.2 The requirements for load profiling in Victoria, Australian Capital Territory, and Tasmania are to:

(a) Determine an estimate of the average load profile for a profile area over a given period of time (Profile Preparation Service); and

(b) Allocate that load profile to end-use customers in that profile area (Basic Meter Profiler).

13.2.3 The requirements for load profiling in NSW and Queensland are to:

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

(c) Determine an estimate of the average load profile of the remaining first-tier 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) Allocate that load profile to second-tier non-controlled loads in that profile area (Basic Meter Profiler – Net System Load Profile).

13.2.4 The requirements for load profiling in South Australia are to:

(a) 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) 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 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) Allocate that load profile to second-tier non-controlled loads in that profile area (Basic Meter Profiler – Net System Load Profile).
13.3 **Controlled load profile**

13.3.1 Clause 13.3 applies to the Profile Preparation Service – Controlled Load. The requirements for the Profile Preparation Service - Controlled Load and the actions to be undertaken in each applicable jurisdiction are as specified in the following sub-clauses.

13.3.2 Profile Preparation Service – Controlled Load does not apply to the jurisdictions of the Australian Capital Territory, Tasmania and Victoria.

13.3.3 Profile Preparation Service - Controlled Load is applied in the jurisdiction of New South Wales as follows:

(a) In accordance with clause 3.10.2 of Metrology Procedure: Part A, controlled load profile(s) (CLP) for each profile area must be prepared by AEMO using interval metering data from a sample (or samples) of controlled load interval meters in accordance with clause 13.3.7 and sub-clauses 13.3.3 (b) and (c).

(b) The sample meters, which will be installed by the NSW Local Network Service Providers, must be a type 4 metering installation.

(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 in accordance with this clause 13.3.3; and
   
ii. 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 in accordance with clause 13.3.6.

(d) The requirements for one controlled load profile are:
   
i. There shall be at least one CLP in each profile area.
   
ii. A Local Network Service Provider may choose to introduce a second CLP in its profile area.
   
iii. If the Local Network Service Provider chooses not to 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 half hourly trading interval, the CLP must be calculated by profile area as follows:

\[
CLP \text{ for a profile area for a trading interval } j = \sum_{n=1}^{N} (\text{sample meter load in trading interval } j)_n \times \text{(wf)}_n
\]

where:

- \(N\) = represents the set of sample NMIs in the profile area
- \(\text{wf}\) = is the weighting factor associated with the NMIs.

(e) The requirements for two controlled load profiles are:
   
i. If the Local Network Service Provider chooses to introduce a second CLP, it must provide a written notice advising of the commencement date of the second CLP to:
   
   - AEMO, and
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- All Retailers.

ii. The commencement date must be at least six months after the date of the notice.

iii. From the commencement date, two CLPs must be calculated for the profile area:
   - 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
   - One for controlled loads in the profile area based on a sample of controlled load interval meters on the controlled load 2 network tariff.

(f) For each half hourly trading interval, the CLPs must be calculated by profile area as follows:

i. CLP for loads on the controlled load 1 network tariff

\[ \text{CLP} = \sum_{n=1}^{N} \left( \text{load for sample meter on the controlled load 1 network tariff in trading interval } j \right)_{n} \times \left( \text{wf} \right)_{n} \]

where:
\( N \) = represents the set of sample NMs on the controlled load 1 network tariff, in the profile area.
\( \text{wf} \) = weighting factor associated with the NMs.

ii. CLP for loads on the controlled load 2 network tariff

\[ \text{CLP} = \sum_{m=1}^{M} \left( \text{load for sample meter on the controlled load 2 network tariff in trading interval } j \right)_{m} \times \left( \text{wf} \right)_{m} \]

where:
\( M \) = represents the set of sample NMs on the controlled load 2 network tariff, in the profile area.
\( \text{wf} \) = weighting factor associated with the NMs.

13.3.4 The requirements for the Profile Preparation Service - Controlled Load in Queensland are:

(a) In accordance with clause 3.10.2 of Metrology Procedure: Part A, controlled load profiles (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 clause 13.3.7 and sub-clauses 13.3.4 (b) and (c).

(b) The sample meters, which will be installed by the Local Network Service Provider, must be type 4 metering installations.

(c) Two NMs may need to 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 in accordance with this clause 13.3.4; and
   ii. 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 in accordance with clause 13.3.6.

(d) Two CLPs must be calculated for the profile area:
i. 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. 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 half hourly trading interval, the CLPs must be calculated by profile area as follows:

i. CLP for loads on the controlled load 1 network tariff

\[
\text{CLP} = \sum_{n=1}^{N} \left( \text{load for sample meter on the controlled load 1 network tariff in trading interval } j \right) \times (\text{wf}_n)
\]

where:

\(N\) = represents the set of sample NMIs on the controlled load 1 network tariff, in the profile area.

\(\text{wf}\) = weighting factor associated with the NMIs.

ii. CLP for loads on the controlled load 2 network tariff

\[
\text{CLP} = \sum_{m=1}^{M} \left( \text{load for sample meter on the controlled load 2 network tariff in trading interval } j \right) \times (\text{wf}_m)
\]

where:

\(M\) = represents the set of sample NMIs on the controlled load 2 network tariff, in the profile area.

\(\text{wf}\) = weighting factor associated with the NMIs.

13.3.5 The requirements for the Profile Preparation Service - Controlled Load in South Australia are:

(a) In accordance with clause 3.10.2 of Metrology Procedure: Part A, a single controlled load profile (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 clause 13.3.7 and clauses 13.3.5 (b) and (c).

(b) The sample meters, which will be installed by the South Australian Local Network Service Provider, must be a type 4 metering installation.

(c) Two NMIs may need to 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 in accordance with this clause 13.3.5; and

ii. Where the metering installation that has a sample meter is second-tier, then a second NMI must be used to transfer the accumulated metering data to which the CLP is applied in accordance with clause 13.3.6.

(d) For each half hourly trading interval, the controlled load profile must be calculated by profile area as follows:

i. CLP for a profile area for a trading interval }
= \sum_{i=1}^{N} \text{(sample meter load in trading interval } j)_{n} \ast \text{(wf)}_{n} \\

where:\n
N = \text{represents the set of sample NMIs in the profile area} \\
wf = \text{is the weighting factor associated with the NMIs.}

13.3.6 For the Basic Meter Profiler – Controlled Load, actions are to be undertaken in each jurisdiction as specified in the following sub-clauses:

(a) The requirements for Basic Meter Profiler – Controlled Load in New South Wales and Queensland are:

i. In accordance with clause 3.10.2 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 trading interval metering data.

ii. The requirements for one controlled load profile are:

(1) For NMIs in a profile area with one CLP, the CLP must be applied as follows:

\begin{align*}
&\text{Half hourly metering data for trading interval } j \text{ for a NMI data stream} \\
&= \left(\text{Accumulation energy data between start date and end date}\right) \ast (\text{CLP } j) \\
&= \sum_{i=\text{startdate}}^{\text{enddate}} \text{CLP}_{i}
\end{align*}

where:

\text{CLP}_{j} = \text{the calculated controlled load profile energy for trading interval } j \\
\sum_{i=\text{startdate}}^{\text{enddate}} \text{CLP}_{i} = \text{the sum of controlled load profile energy} \\
\text{between the start date and the end date and;}

‘start date’ and ‘end date’ have the meanings given in clause 13.5.

iii. The requirements for two controlled load profiles are:

(1) In a profile area where the Local Network Service Provider has chosen to introduce a second CLP, the CLPs shall be applied as follows:

(a) 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:

\begin{align*}
&\text{Half hourly metering data for trading interval } j \text{ for a NMI data stream on the controlled load 1 network tariff}
\end{align*}
Metrology Procedure: Part B

\[
\frac{(\text{Accumulation energy data between start date and end date}) \cdot (\text{CLP}_1)}{\sum_{i=\text{start date}}^{\text{end date}} \text{CLP}_1}
\]

where:
\( \text{CLP}_1_j \) = the calculated \textit{controlled load profile} energy for \textit{trading interval} \( j \)
\[\sum_{i=\text{start date}}^{\text{end date}} \text{CLP}_1_i = \text{the sum of controlled load profile energy between the start date and the end date and;}
\]
‘start date’ and ‘end date’ have the meanings given in clause 13.5.

(b) \textit{Loads} on the \textit{controlled load 2 network tariff (CLP2)} must be applied to the \textit{accumulated metering data} for all \textit{first-tier and second-tier controlled loads}, which are on the \textit{controlled load 2 network tariff}:

Half hourly \textit{metering data for \textit{trading interval} } \( j \) for a \textit{NMI data stream} on the \textit{controlled load 2 network tariff}

\[
\frac{(\text{Accumulation energy data between start date and end date}) \cdot (\text{CLP}_2)}{\sum_{i=\text{start date}}^{\text{end date}} \text{CLP}_2}
\]

where:
\( \text{CLP}_2_j \) = the calculated \textit{controlled load profile} energy for \textit{trading interval} \( j \)
\[\sum_{i=\text{start date}}^{\text{end date}} \text{CLP}_2_i = \text{the sum of controlled load profile energy between the start date and the end date and;}
\]
‘start date’ and ‘end date’ have the meanings given in clause 13.5.

iv. The resulting half hourly \textit{metering data} produced by applying the \textit{controlled load profile} is at the \textit{NMI data stream} level. The total of these \textit{data streams} is used in the calculation of the \textit{Net System Load Profile} as explained in clause 13.4.2.

(b) The requirements for \textit{Basic Meter Profiler – Controlled Load in South Australia} are:

i. In accordance with clause 3.10.2 of Metrology Procedure: Part A, AEMO must apply the \textit{CLP} for the \textit{profile area} to which the \textit{NMI} is connected, to the \textit{accumulated metering data} for all \textit{first-tier and second-tier controlled loads}, in order to obtain \textit{trading interval metering data}.

ii. The \textit{accumulated metering data for first-tier loads} is represented by a weekly load scaling factor that is transferred
to AEMO in accordance with clause 3.10.5 of Metrology Procedure: Part A.

iii. The profile must be applied as follows:

Half hourly metering data for trading interval \( j \) for a NMI data stream

\[
(\text{Accumulation energy data between start date and end date}) \times (\text{CLP}_j) = \sum_{i=\text{start date}}^{\text{enddate}} \text{CLP}_i
\]

where:

- \( \text{CLP}_j \) = the calculated controlled load profile energy for trading interval \( j \)
- \( \sum_{i=\text{start date}}^{\text{enddate}} \text{CLP}_i \) = the sum of controlled load profile energy between the start date and the end date and;
- 'start date' and 'end date' have the meanings given in clause 13.5.

iv. If the accumulated metering data is based on an actual meter reading:

1. Start date = 00:00 on the day of the previous meter reading.
2. End date = the end of the trading interval commencing at 23:30 on the day prior to the current meter reading date.

v. If the accumulated metering data is a forward estimate:

1. Start date = 00:00 on the first day of the billing period, or 00:00 on the previous meter reading date (whether actual or forward estimate), or 00:00 on the first day that the load becomes second-tier, whichever is the later.
2. End date = the end of the trading interval commencing at 23:30 on the last day of the billing period, or the end of the trading interval commencing at 23:30 on the forward estimate meter reading date, whichever is the earlier.

vi. The resulting half hourly metering data produced by applying the controlled load profile is at the NMI data stream level. The total of these data streams is used in the calculation of the Net System Load Profile as explained in clause 13.4.2.

13.3.7 Sample Meters:

(a) Where metering equipment to sample controlled loads is installed, the responsible person must ensure that:

i. At least 200 controlled load sample meters are installed for the purposes of calculating each controlled load profile within a profile area unless otherwise agreed by AEMO; and
ii. The method it adopts for selecting sample sites is statistically sound.

(b) This sub-clause (b) relating to sample size and selection only applies to the jurisdiction of South Australia.

i. The Local Network Service Provider must ensure that at least 200 controlled load sample meters are installed for the purposes of calculating the controlled load profile.

ii. The method of selecting sample meter sites adopted by the Local Network Service Provider must be approved by AEMO.

iii. The Local Network Service Provider must use reasonable endeavours to ensure that sample meter sites:

1. Are occupied sites;
2. 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;
3. Subject to sub-clause (4), must be randomly selected such that each site which meets the other criteria has an equal chance of being included in the sample; and
4. New sample metering sites are selected to maintain a sample distribution that is representative of the controlled load in accordance with clause 13.3.7(b)(ii).

iv. In the event that an existing sample meter site becomes inappropriate for a sample meter, the sample meter must be removed or relocated to an appropriate site selected in accordance with clause 13.3.7 (b) (iii).

v. The Local Network Service Provider must ensure that a meter which is a sample interval meter installed for the purposes of calculating the controlled load profile is not removed without the consent of AEMO.

(c) The weighting factor assigned to each sample meter NMI in the calculation of the controlled load profile should be proportional to 1/n, where n is the number of sample meters contributing to the calculation of the controlled load profile in the respective Local Network Service Provider area.

\[
\text{Weighting Factor} = \frac{(sf) \times (dlf)}{n}
\]

where:

- \(sf\) = scaling factor (for South Australia = 200)
- \(dlf\) = distribution loss factor applicable to the sample meter site
- \(n\) = number of sample meters used in the calculation of the controlled load profile

(d) This sub-clause (d) relating to Weekly Load Scaling Factor only applies to the jurisdiction of South Australia.
i. AEMO must approve the calculation of the load scaling factor for the controlled load profile at a frequency which is at least once every six months.

ii. For each week, the Local Network Service Provider must calculate the load scaling factor as follows:

\[
(\text{Weekly Load Scaling Factor}) = X \times \frac{(\text{Weekly Sample Energy}) \times (\text{Annual CL Energy})}{(\text{Annual Sample MeterCL Energy})}
\]

where:

Weekly Load Scaling Factor (MWh) = a value calculated to be the total energy consumed for a one week period by accumulation metered controlled load end-use customers that are first-tier loads.

\(X\) = the estimated proportion of accumulation metered controlled load end-use customers 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-use customers 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 Local Network Service Provider must send the load scaling factor to AEMO as an active first-tier load accumulation metered NMI data stream, with the actual reading date as the last day in the settlement week, at a frequency which is at least once per week.

13.4 Net system load profile

13.4.1 Clause 13.4 applies to the jurisdictions of Victoria, New South Wales, South Australia, Queensland, the Australian Capital Territory, and Tasmania.

13.4.2 The requirements for the Profile Preparation Service – Net System Load Profile are:

(a) In accordance with clause 3.10.2 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 Net System Load Profile (NSLP).

(b) The NSLP must be calculated by profile area as follows:

\[
\text{NSLP for a profile area for a trading interval} = \sum_{i=1}^{j} (\text{Energy inflows to the profile area at the TNI level} \times MLF_i)
\]
\[
+ \sum_{m=1}^{n} \left( \text{Energy generated within profile area from embedded generation} \right)_m \times MLF_m \times DLF_m \\
- \sum_{s=1}^{j} \left( \text{Half hourly load in profile area} \right) \times MLF_s \times DLF_s
\]

where

MLF = marginal loss factor applicable for the NMI that is stored in MSATS
DFL = distribution loss factor applicable for the NMI that is stored in MSATS
i = Each TNI with energy inflows to profile area
m = Each Embedded Generator with energy generated within profile area
s = Half hourly loads in profile area, which include:
  - interval metered second-tier loads;
  - interval metered first-tier loads in accordance with clause 3.6.4 of Metrology Procedure: Part A;
  - unmetered first-tier and second-tier loads;
  - interval metered market loads that are not first-tier or second-tier loads;
  - where applicable to a participating jurisdiction, interval metering data for first-tier and second-tier controlled loads; and
  - but exclude child interval metered loads in an embedded network.

13.4.3 The requirements for the Basic Meter Profiler – Net System Load Profile are:

(a) In accordance with clause 3.10.2 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:

Half-hourly metering data for trading interval \( j \) for NMI data stream

\[
\text{Accumulation energy data between start date and end date)} \times NSLP, \\
\sum_{r=start date}^{end date} NSLP,
\]

where the accumulated metering data is based on an actual meter reading, then

start date = 00:00 on the day of the previous meter reading, and
end date = the end of the trading interval commencing at 23:30 on the day prior to the current meter reading date.

and where the accumulated metering data is a forward estimate, then

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 forward
estimate), or 00:00 on the first day that the load becomes second-tier, whichever is the later, and

end date = the end of the trading interval commencing at 23:30 on the last day of the billing period, or the end of the trading interval commencing at 23:30 on the forward estimate meter reading date, whichever is the earlier.

(c) The resulting half hourly metering data produced by applying the NSLP is at the NMI data stream level.

13.5 Start dates and end dates

13.5.1 For the purpose of clause 13.3.6:

i. If the accumulated metering data is based on an actual meter reading:
   (1) The start date is 00.00 on the day of the previous meter reading; and

ii. The end date is the end of the trading interval commencing at 23.30 on the day prior to the current meter reading date; and

iii. If the accumulated metering data is a forward estimate:
   (1) The start date is the later of:
       (A) 00.00 on the first day of the billing period;
       (B) 00.00 on the previous meter reading date (whether actual or forward estimate); and
       (C) 00.00 on the first day on which the load becomes second-tier.

   (2) The end date is the earlier of:
       (A) the end of the trading interval commencing at 23.30 on the last day of the billing period; and
       (B) the end of the trading interval commencing at 23.30 on the forward estimate meter reading date.
14 UNMETERED LOADS – DETERMINATION OF METERING DATA

14.1 Application of clause 14

14.1.1 The requirements of clause 14 apply to the jurisdictions of Victoria, New South Wales, Queensland, South Australia, Tasmania and Australian Capital Territory.

14.2 Requirement to produce calculated metering data

14.2.1 Agreed market loads

(a) In accordance with S7.6 and S7.2 of the Rules, half-hourly trading interval data is required to be calculated by NMI data stream for those loads that have been classified as type 7 metering installations in accordance with S7.2 of the Rules that, subject to clause 14.2.1 (d), are able under relevant legislation or regulation to be classified as market loads as agreed between a Minister and AEMO.

(b) AEMO will publish a list of the loads that have been classified, in accordance with clause 14.2.1 (a), as market loads and any amendments to these loads.

(c) Loads that have been classified, in accordance with clause 14.2.1 (a), as market loads may be either a “controlled unmetered load” (for which the market load is controlled) or “other unmetered load” (for which the market load is not controlled).

(d) If there is a load table under clause 14.2.4, an inventory table under clause 14.3.3 or clause 14.4.3 and for controlled unmetered loads an on/off table under clause 14.3.4, then a type 7 metering installation may be classified as a market load in accordance with clause 14.2.1 (a).

14.2.2 Application to device types

The agreed market load that is published by AEMO will be generic in nature (for example, street lighting). For each agreed market load there may be one or more device types that are listed in the load table developed in accordance with clause 14.2.4.

14.2.3 Application of NMI

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

i. Financially responsible Market Participant;  
ii. End-use customer;  
iii. Local Network Service Provider;  
iv. Transmission Node Identity; and  
v. Distribution loss factor.

The unmetered load NMI may contain different agreed market loads and/or different device types, but they must have the same financially responsible Market Participant, end-use customer, Local Network Service Provider, TNI and distribution loss factor.
(b) Where permitted by the Rules or guidelines issued by AEMO, an unmetered load may be included in the NMI for a related metered load, where the number of devices is small, for example watchman lights, the energy consumption of those devices is immaterial relative to the total energy consumption for that NMI, and the financially responsible Market Participant, end-use customer, Local Network Service Provider, TNI and distribution loss factor are the same.

14.2.4 Load Table

(a) The load table must set out:

i. The device load (in watts) for controlled unmetered loads for use in calculating interval metering data for each device type in accordance with clause 14.3. The load per device type must be the wattage of the device and associated control gear; and

ii. The annual energy consumption for other unmetered loads by device type in accordance with clause 14.4.1. 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:

\[
(Calculated \ device \ wattage) = \frac{\text{(device annual energy consumption)}}{365 \times 24}
\]

Where \(i\) = device type \(i\).

(b) AEMO must develop the initial load table in accordance with the Rules consultation procedures.

(c) The initial load table must be published by AEMO. Changes to the load table must be published by AEMO. AEMO should remove redundant device types from the published load table.

(d) AEMO must consider and publish proposals from interested parties to add device types to the load table. AEMO must determine whether to add the new device type and its corresponding device load or annual energy consumption to the load table taking into account the views of other interested parties. Agreement of device load to be added to the NEM 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 device.

(e) New device types must be included in the load table prior to installation of the device.

(f) AEMO must develop and publish a guideline for the determination of a load table device load or annual energy consumption. The guideline must be prepared, revised and published by AEMO in accordance with the Rules consultation procedures.

(g) Proposals to add a new load value for an unmetered device type to the load table must be accompanied by a relevant unique description of the device and evidence of the device load or energy consumption whichever the case may be. Wherever possible, the device load should be determined from measurement tests conducted by a NATA accredited laboratory or overseas equivalent.
14.3 Controlled unmetered loads

14.3.1 This clause 14.3 is applicable to all agreed “controlled unmetered loads”.

14.3.2 Metering Data calculation

(a) The responsible person must ensure that the interval metering data for controlled unmetered loads, which have been classified as a type 7 metering installation, are calculated in accordance with the following algorithm:

Half-hourly metering data for trading interval \( j \) for NMI (in watt hours)

\[
\sum_{i=1}^{n} (k_i \times \text{Device wattage})_i \times (\text{Device count for NMI})_i \times (\text{Period load is switched on})_i \times (\text{Trading interval})_i
\]

\[
= \frac{60}{j}
\]

where:

- \( i \) = device type
- \( j \) = trading interval
- \( k_i \) = proportion of device attributable to that NMI
- Trading interval is period in minutes
- Device wattage is determined from the load table.
- Device count is determined from the inventory table.
- Period load is switched on is determined from the on/off table.

14.3.3 Inventory Table

(a) For each NMI, a separate inventory table is required that identifies each device type which forms part of the NMI load and for each device type lists:

i. The device type;

ii. The form of on/off control – photoelectric cell control, timer control, ripple control or other control;

iii. If timer control or ripple control, the on/off times for the controlling device;

iv. If other control, the on/off times;

v. If a 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 device across each respective NMI shall be equal to 1;

vi. If a device is not shared with another NMI, the k factor must be equal to 1.

vii. Number of such devices installed;

viii. 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. 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
(b) Each device in the inventory table is a unique combination of physical hardware, time control classification and shared portions. For example, if a device is shared with another NMI, the individual portions of the device(s) must be included in the inventory table as a separate device type on each NMI.

(c) Each responsible person must develop the initial inventory table for the NMIs for which it is responsible. The initial inventory table must be agreed by the affected Registered Participants, AEMO and the relevant end-use customer.

(d) Each responsible person must use reasonable endeavours to update the inventory table, for the NMIs for which it is responsible, on at least a monthly basis for any additions, deletions and modifications to ensure that the accuracy requirements in clause 3.7.7 of Metrology Procedure: Part A are met. Such additions, deletions or modifications to the inventory table may only be made on a retrospective basis where:

i. Agreed by the responsible person and the affected Registered Participants; or

ii. Necessary to comply with clause 7.9.5 of the Rules.

(e) The responsible person must communicate any material changes to the inventory table to the affected Registered Participants.

(f) The responsible person must provide the inventory table to relevant Registered Participants when requested.

14.3.4 On/Off table

(a) The form of on/off control may be:

i. Photoelectric cell control;

ii. Timer control, or ripple control; or

iii. Other control.

14.3.5 Photoelectric cell control

(a) If the on/off times for a device is controlled by a photoelectric cell, then

i. On time = sunset time + ON delay

ii. Off time = sunrise time + OFF delay.

The ON delay and OFF delay are set out in clause 14.5.

(b) The responsible person 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, and Australian Eastern Time Eastern Standard Time:
Jurisdiction | LNSP | Town | Latitude | Longitude |
---|---|---|---|---|
Victoria | CitiPower | Melbourne | 37 deg 49 min S | 144 deg 58 min E |
Victoria | Jemena Electricity Networks | Essendon | 37 deg 44 min S | 144 deg 54 min E |
Victoria | Powercor | Ballarat | 37 deg 30 min S | 143 deg 47 min E |
Victoria | AusNet Services SP AusNET | Morwell | 38 deg 13 min S | 146 deg 25 min E |
Victoria | United Energy | 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 | ActewAGL | Canberra | 35 deg 20 min S | 149 deg 10 min E |
Queensland | Energex | Brisbane | 27 deg 28 min S | 153 deg 01 min E |
Queensland | Ergon Energy | Townsville | 19 deg 15 min S | 146 deg 48 min E |
Queensland | Ergon Energy | Toowoomba | 27 deg 33 min S | 151 deg 57 min E |
Tasmania | Aurora Distribution | Ross | 42 deg 01 min S | 147 deg 29 min E |

(c) The **responsible person** must ensure that the period that the **load** is switched on during a **trading interval** is calculated as follows:

<table>
<thead>
<tr>
<th>Trading interval</th>
<th>Period load is switched on</th>
</tr>
</thead>
<tbody>
<tr>
<td>For the <strong>trading intervals</strong> commencing after sunset and finishing prior to sunrise</td>
<td>Period load is switched on = 1</td>
</tr>
<tr>
<td>For the <strong>trading intervals</strong> commencing after sunrise and finishing prior to sunset</td>
<td>Period load is switched on = 0</td>
</tr>
<tr>
<td>For the <strong>trading interval</strong> during which the sunset occurs</td>
<td>(Period load is switched on) = ( \frac{\text{End time of trading interval} - \text{Time of sunset}}{30} )</td>
</tr>
<tr>
<td>For the <strong>trading interval</strong> during which the sunrise occurs</td>
<td>(Period load is switched on) = ( \frac{\text{Time of sunrise} - \text{Start time of trading interval}}{30} )</td>
</tr>
</tbody>
</table>
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(d) Should testing on the operation of photoelectric cells by an independent party, agreed to by the responsible person, affected Registered Participants, AEMO and relevant end-use customer, indicate that the on/off times for a device controlled by a photoelectric cell are influenced materially and consistently by other variables, then AEMO shall revise the metrology procedure accordingly.

14.3.6 Timer control

(a) If the on/off times for a device is controlled by a timer or ripple injection system, then
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 responsible person must ensure that the period that the load is switched on during a trading interval is calculated as follows:

<table>
<thead>
<tr>
<th>Trading interval</th>
<th>Period load is switched on</th>
</tr>
</thead>
<tbody>
<tr>
<td>For the trading intervals commencing after on time and finishing prior to off time</td>
<td>Period load is switched on = 1</td>
</tr>
<tr>
<td>For the trading intervals commencing after off time and finishing prior to on time</td>
<td>Period load is switched on = 0</td>
</tr>
<tr>
<td>For the trading interval during which the on time occurs</td>
<td>(Period load is switched on) = (End time of trading interval) – (On time)</td>
</tr>
<tr>
<td>For the trading interval during which the off time occurs</td>
<td>(Period load is switched on) = (Off time) – (Start time of trading interval)</td>
</tr>
</tbody>
</table>

14.3.7 Other control

(a) Where the on/off times for a device are not in accordance with clause 14.3.5 or clause 14.3.6, then 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 clause 14.3.5(b).

(c) The responsible person must ensure that the period that the load is switched on during a trading interval is calculated as follows:

<table>
<thead>
<tr>
<th>Trading interval</th>
<th>Period load is switched on</th>
</tr>
</thead>
<tbody>
<tr>
<td>For the trading intervals commencing after on time and finishing prior to off time</td>
<td>Period load is switched on = 1</td>
</tr>
</tbody>
</table>
### 14.4 Other unmetered loads

**14.4.1** This clause 14.4 is applicable to all agreed “other unmetered loads”. Other unmetered loads do not have a constant load and therefore the energy is calculated based on an annual energy consumption determined by AEMO in accordance with clause 14.2.4.

**14.4.2** Energy calculation

(a) The responsible person must ensure that the interval metering data for other unmetered loads, which have been classified as a type 7 metering installation, is calculated in accordance with the following algorithm.

#### Half-hourly metering data for trading interval \( j \) for NMI (in watt hours)

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

**where:**

- \( i \) = device type
- \( j \) = trading interval
- \( k \) = proportion of device attributable to that NMI

Trading interval is period in minutes
Device wattage is determined from the load table.
Device count is determined from the inventory table.
Period load is switched on is determined from the on/off table.

**14.4.3** Inventory Table

(a) For each NMI, a separate inventory table is required that identifies each device type which forms part of the NMI load and for each device type lists:

i. The device type;
ii. The form of on/off control (24 hours per day);
iii. If a 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 device across each respective NMI must be equal to 1;

iv. If a device is not shared with another NMI, the $k$ factor must be equal to 1.

iv-v. Number of such devices installed;

vi. 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;

vi-vii. 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

vii-viii. Last change date – the date that record in the inventory table was most recently created or modified.

(b) Each device in the inventory table is a unique combination of physical hardware, time control classification and shared portion, for example, if a device is shared with another NMI, the individual portions of the device(s) shall be included in the inventory table as a separate device type on each NMI.

c) Each responsible person must develop the initial inventory table for the NMIs for which it is responsible. The initial inventory table must be agreed by the affected Registered Participants, AEMO and the relevant end-use customer.

d) Each responsible person must use reasonable endeavours to update the inventory table, for the NMIs for which it is responsible, on at least a monthly basis for any additions, deletions and modifications to ensure that the accuracy requirements in clause 3.7.7 of Metrology Procedure: Part A are met. Such additions, deletions or modifications to the inventory table may only be made on a retrospective basis where:

i. Agreed by the responsible person and the affected Registered Participants; or

ii. Necessary to comply with clause 7.9.5 of the Rules.

e) The responsible person must communicate any material changes to the inventory table to the affected Registered Participants.

f) The responsible person must provide the inventory table to relevant Registered Participants when requested.

14.4.4 On/off Table

(a) Other unmetered loads are assumed to operate 24 hours per day. For each trading interval:

Period load is switched on = 1.

14.5 ON delay and OFF delay

14.5.1 This clause 14.5 applies only to the jurisdiction of the Australian Capital Territory. For the jurisdictions of Victoria, New South Wales, Queensland, Tasmania and South Australia the ON and OFF delays are zero.
(a) The responsible person must use the ON delay and OFF delay for each day of the year as provided in the following tables, when determining the on time and off time of photoelectric cells in accordance with clause 14.3.5.

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### Metrology Procedure: Part B

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### 14.6 Traffic signal dimming

#### 14.6.1 Application of clause 14.6

(a) This clause 14.6 applies only to jurisdictions where traffic signals are classified as a *market load*. Traffic signals that are dimmed have characteristics of both “controlled unmetered loads” and “uncontrolled unmetered loads”.

These traffic signals *loads* are similar to “controlled unmetered loads” as they have specifically defined periods that *calculated metering data* is based on full load values and dimmed load values. These *loads* are also similar to “uncontrolled unmetered loads” as they do not have a constant load and calculated metering data is based on an annual energy consumption for the *load*. Note:

(b) The effective date of clause 14.6 is 1 July 2015.

(c) The methodology for production of *calculated metering data* for dimmed traffic signals must be applied to periods from the clause 14.6 effective date stated in (b).

(d) Revision of *calculated metering data* for periods before the clause 14.6 effective date stated in (b) must be undertaken in accordance with the methodology detailed in clause 14.4.

#### 14.6.2 Metering Data calculation

(a) The responsible person must ensure that the *interval metering data* for traffic signal unmetered loads, which have been classified as a type 7 metering installation and can be dimmed, are calculated in accordance with the following algorithm:

\[
\sum_{i=1}^{n}(k) \cdot (Device \ full \ wattage)_{i} \cdot (Device \ count \ for \ NMI)_{i} \cdot (Period \ full \ wattage \ switched \ on)_{j} \cdot (Trading \ interval)_{j} = \text{(Half-hourly metering data for full wattage trading interval j for NMI – in watt hours)} + \text{(Half-hourly metering data for dimmed wattage trading interval j for NMI – in watt hours)}
\]

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\[
\sum_{i}^{n}(k)(\text{Device dimmed wattage})_i \cdot \text{Device count for NMI}_i \cdot (\text{Period dimmed wattage on})_j \cdot \text{(Trading interval)}
\]

where:

\[i = \text{device type}\]
\[j = \text{trading interval}\]
\[k = \text{proportion of device attributable to that NMI}\]

Trading interval is period in minutes

Device full wattage is determined from the load table.
Device dimmed wattage is determined from the load table.
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.

14.6.3 Inventory Table

(a) For each NMI, a separate inventory table is required that identifies each device type which forms part of the NMI load and for each device type lists:

i. The device type;
ii. The form of on/off control – photoelectric cell control or timer control;
iii. If photoelectric cell control, sunset and sunrise times;
iv. If timer control, the on/off times for the controlling device;
v. If a 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 device across each respective NMI must be equal to 1;
vi. Number of such devices installed;
vii. 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. 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. Last change date – the date that record in the inventory table was most recently created or modified.

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

(c) Each responsible person 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-use customer.
(d) Each responsible person must use reasonable endeavours to update the inventory table, for the NMIs for which it is responsible, on at least a monthly basis for any additions, deletions and modifications to ensure that the accuracy requirements in clause 3.7.7 of Metrology Procedure: Part A are met. Such additions, deletions or modifications to the inventory table may only be made on a retrospective basis where:

i. Agreed by the responsible person and the affected Registered Participants; or
ii. Necessary to comply with clause 7.9.5 of the Rules.

(e) The responsible person must communicate any material changes to the inventory table to the affected Registered Participants.

(f) The responsible person must provide the inventory table to relevant Registered Participants when requested.

14.6.4 On/Off table

(a) The form of on/off control may be:

i. Photoelectric cell control; or
ii. Timer control.

14.6.5 Photoelectric cell control

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

i. Dimming on time = sunset time
ii. Dimming off time = sunrise time.

(b) The responsible person 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 clause 14.3.5(b), and Eastern Standard Time:

(c) The responsible person must ensure that the period that the load is operated at dimmed wattage during a trading interval and the period that the load is operated at full wattage during a trading interval are calculated as follows:

<table>
<thead>
<tr>
<th>Trading interval</th>
<th>Period load is switched on</th>
</tr>
</thead>
<tbody>
<tr>
<td>For the trading intervals commencing after sunset and finishing prior to sunrise</td>
<td>Period dimmed wattage is switched on = 1</td>
</tr>
<tr>
<td>For the trading intervals commencing after sunset and finishing prior to sunrise</td>
<td>Period full wattage is switched on = 1</td>
</tr>
<tr>
<td>For the trading interval during which the sunset occurs</td>
<td>(Period dimmed wattage switched on) = (End time of trading interval) − (Time of sunset) 30</td>
</tr>
<tr>
<td></td>
<td>(Period full wattage switched on) = 1 − [(End time of trading interval) − (Time of sunset)] 30</td>
</tr>
</tbody>
</table>
**Metrology Procedure: Part B**

| For the trading interval during which the sunrise occurs | (Period dimmed wattage switched on) = (Time of sunrise) – (Start time of trading interval) ÷ 30  
Period full wattage switched on = 1 – (Time of sunrise) – (Start time of trading interval) ÷ 30 |

(d) Should testing on the operation of photoelectric cells by an independent party, agreed to by the responsible person, affected Registered Participants, AEMO and relevant end-use customer, indicate that the on/off times for a device controlled by a photoelectric cell are influenced materially and consistently by other variables, then AEMO shall revise the metrology procedure accordingly.

14.6.6 Timer control

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

i. On time = ON time set on timer (dimming operation ON)  
ii. Off time = OFF time set on timer (dimming operation OFF)

(b) The responsible person must ensure that the period that the load is switched on during a trading interval is calculated as follows:

<table>
<thead>
<tr>
<th>Trading interval</th>
<th>Period load is switched on</th>
</tr>
</thead>
<tbody>
<tr>
<td>For the trading intervals commencing after on time and finishing prior to off time</td>
<td>Period dimmed wattage is switched on = 1</td>
</tr>
<tr>
<td>For the trading intervals commencing after off time and finishing prior to on time</td>
<td>Period full wattage is switched on = 1</td>
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</tbody>
</table>
| For the trading interval during which the on time occurs | (Period dimmed wattage switched on) = (End time of trading interval) – (On time) ÷ 30  
(Period full wattage switched on) = 1 – (End time of trading interval) – (On time) ÷ 30 |
| For the trading interval during which the off time occurs | (Period dimmed wattage switched on) = (Off time) – (Start time of trading interval) ÷ 30  
(Period full wattage switched on) = 1 – (Off time) – (Start time of trading interval) ÷ 30 |
15 SUBSTITUTION READS FOR TRANSFER

15.1 Application of clause 15

15.1.1 The requirements of clause 15.2 and 15.3 apply during a retailer of last resort event or where a participating jurisdiction has requested AEMO to undertake end-use customer transfers requiring metering data substitutions.

15.1.2 The requirements of clause 15.2 are applicable to all type 5 metering installations requiring the management of metering data substitutions and forward estimations for end-use customer transfer.

15.1.3 The requirements of clause 15.3 are applicable to all type 6 metering installations requiring the management of metering data substitutions and forward estimations for end-use customer transfer.

15.2 Type 5 metering installations

15.2.1 The Metering Data Provider must ensure the correct management of the NMI data stream status within MSATS for the connection points concerned that meets Jurisdictional requirements for settlements and profile preparation.

15.2.2 The Metering Data Provider must ensure that metering data is provided to the old financially responsible Market Participant up to the transfer date.

15.2.3 The Metering Data Provider must ensure that metering data is provided to the new financially responsible Market Participant from the transfer date which may include provision of a new forward estimation.

15.2.4 The Metering Data Provider must ensure forward estimations are undertaken in accordance with clause 3 of Metrology Procedure: Part B.

15.2.5 The Metering Data Provider may substitute the metering data up to the transfer date in order to facilitate end-use customer end billing. Notification to the Local Network Service Provider, Local Retailer, the old and new financially responsible Market Participant is via the metering data file, that has a format compliant with the Meter Data File Format Specification, with the following configuration:

(a) Utilise a reason code of “27”, with an entry in the free text field of “AEMO directed substitution”, and

(b) Utilise a transaction code of N.

15.2.6 The Metering Data Provider must ensure that all substituted metering data is replaced by actual metering data as per the normal manual meter reading processes.

15.3 Type 6 metering installations

15.3.1 The Metering Data Provider must ensure the correct management of the NMI data stream status within MSATS for the connection points concerned that meets Jurisdictional requirements for settlements and profile preparation.

15.3.2 The Metering Data Provider must ensure that metering data is provided to the old financially responsible Market Participant up to the transfer date.
15.3.3 The *Metering Data Provider* must provide the necessary type 6 substitution readings labelled with a 'Final' quality flag.

15.3.4 The *Metering Data Provider* must ensure that metering data is provided to the new financially responsible Market Participant from the transfer date which may include provision of a new forward estimation.

15.3.5 The *Metering Data Provider* must ensure forward estimations are undertaken in accordance with clause 4 of Metrology Procedure: Part B.

15.3.6 The *Metering Data Provider* must calculate the Final substitution reading value in accordance with clause 4 of Metrology Procedure: Part B.

15.3.7 The Metering Data Provider must notify the Local Network Service Provider, Local Retailer, the old and new financially responsible Market Participant for the connection point of the data substitution undertaken. Notification is via the metering data file, that has a format compliant with the Meter Data File Format Specification, with the following configuration:

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

(b) Utilise a transaction code of ‘N’.

15.3.8 The *Metering Data Provider* must validate the final substituted readings, recalculate and update the metering data values where:

(a) The final substitution is found to be greater than the actual metering data when next obtained; or

(b) Following consultation and agreement from the old and new financially responsible Market Participant, the Local Retailer and the Local Network Service Provider for the connection point a new agreed value as per clause 4.3.4 (Type 64) must be provided.