Metrology Procedure for Metering Installations on the Western Power Network

Date: May 2015
# Contents

1 General .................................................................................................................................5
   1.1 Purpose ..........................................................................................................................5
   1.2 Scope .............................................................................................................................5
   1.3 Commencement ..............................................................................................................6
   1.4 Definitions ......................................................................................................................6

2 Provision of Metering Installations .....................................................................................11
   2.1 Installation of Meters ....................................................................................................11
   2.2 Metering Installation Components ...............................................................................11
   2.3 Maintenance of Metering Installations .........................................................................12

3 Energy Data ..........................................................................................................................14
   3.1 Energy Data Collection ...............................................................................................14
   3.2 Energy Data Collection Schedule ...............................................................................14
   3.3 Storage and Transfer of Energy Data ...........................................................................15
   3.4 Validation of Energy Data ............................................................................................15
   3.5 Estimation and Substitution of Energy Data ................................................................16
   3.6 Access to Energy Data .................................................................................................18

4 Data Quality ........................................................................................................................19
   4.1 Energy Data Verification Requests ...............................................................................19
   4.2 Test and Audit Requests ..............................................................................................19

5 Components of Types 1-6 Metering Installations – Meter Provision ....................................21

6 Metering installation Types 1 - 5 – Validation ....................................................................37
   6.1 Requirement to Validate ...............................................................................................37
   6.2 Validation of energy data from Types 1-5 Metering Installations with Check Metering ..........................................................................................................................37
   6.3 Validation of energy data from Types 1 - 5 Metering Installations with Partial Check Metering ..........................................................................................................................40
   6.4 Validation of energy data from Types 1 - 5 Metering Installations without Check Metering ..........................................................................................................................42

7 Metering installation Types 1 - 5 – Accumulation, Substitution and Estimation ..................45
   7.1 Requirement to Accumulate Energy Data to Trading Intervals ......................................45
   7.2 Requirement to Provide Substituted or Estimated Energy Data ....................................45
   7.3 Accumulation of data to trading intervals ....................................................................46
   7.4 Substitution and Estimation Types for Metering installation Types 1-4 .......................47
   7.5 Substitution and Estimation Types for Metering installation Type 5 .............................49

8 Metering installation Type 6 – Validation, Substitution and Estimation ...............................52
   8.1 Requirement to Validate Meter Readings .....................................................................52
   8.2 Requirement to Produce Substituted or Estimated Energy Data ...................................52
   8.3 Western Power Obligations .........................................................................................52
   8.4 Substitution and Estimation Types ...............................................................................52

9 Metering Installations Type 7 – Validation, Substitution and Estimation ...............................55
   9.1 Requirements to Validate .............................................................................................55
   9.2 Type 7 Substitution Rules ............................................................................................55
   9.3 Substitution and Estimation Types ...............................................................................56
9.4 Validation for Type 7 – Registration Process ........................................56
9.5 Validation of Type 7 Metering Data .........................................................56

10 Metering Alarms .......................................................................................58
10.1 Validation of interval metering data alarms for installation Types 1 - 5 ...58
10.2 Metering Installation Types 1 - 5 Metering Data Alarm definitions .......59

Appendix 1 – Default Metering Installation Settings .....................................60
Interval Duration ............................................................................................60
Time zone ........................................................................................................60
Channels ..........................................................................................................60
Table 1: NMI Suffixes for consumption metered data ....................................60
Table 2: NMI Suffixes for interval metered data .............................................60

Appendix 2 – Meter Compliance Testing and Sampling Plan ...........................62

1 Introduction .................................................................................................64
1.1 Purpose .....................................................................................................64
1.2 Provisions in the Electricity Industry (Metering) Code 2012 .................64
1.3 Provisions in the Metrology Procedure ................................................64

2 Sample Selection ........................................................................................64

3 Determination of populations ....................................................................64

4 Determination of sample size ....................................................................65
4.1 Random selection of sample ..................................................................66

5 Sampling Accuracy Method ........................................................................66

6 Sample Testing ...........................................................................................66
6.1 Measurement points for accuracy testing ..............................................67

7 Performance characteristics .........................................................................67
7.1 Anti-creep function (Running at no-load) - induction meters ...............67
7.2 Operation of register or display ..............................................................67

8 Assessment of Results ...............................................................................68

9 Redefining Populations ..............................................................................68

10 On-going Compliance Testing .................................................................68

11 Determining Population Failure ...............................................................69
1 General

1.1 Purpose

1.1.1 The purpose of this Metrology Procedure is to provide guidance:

a) to the responsible person on the correct provision, installation and maintenance of metering installations in line with the principles of the Code

b) to interested third parties on the requirements for metering within the Western Power network

1.2 Scope

1.2.1 This Metrology Procedure provides information on devices and methods used by Western Power to:

a) measure, or determine by means other than a device, electricity produced and consumed at a metering point

b) convey the measured or determined information to other devices using communications links

c) prepare the information using devices or methods to form energy data

d) provide access to the energy data from a telecommunications network

e) specify the minimum requirements for meters and metering installations

f) specify the procedures for estimating, substituting and validating energy data under the Code

g) provide for the sampling and testing of meters for the purposes of and in accordance with clause 3.11A(1) of the Code

h) define the rights of access to energy data in the metering installation

i) define the procedures for auditing of metering installations

1.2.2 The Metrology Procedure:

a) applies to code participants and Western Power in relation to the load and/or generation at each connection point on the network

b) sets out those obligations and duties that are imposed on Western Power with regards to energy data provision by the Code and market rules

c) covers the full extent of a metering installation, from the metering point at one extreme to the boundary of the telecommunications network at the other extreme. It includes connection of the metering installation to the telecommunications network

1.2.3 It should be noted that the Metrology Procedure presents the minimum requirements and does not preclude a meter supplier, or Western Power from deploying products or developing processes that exceed or complement the requirements described herein, provided that such features are compatible with the requirements of the Metrology
Procedure. For example, the deployment of meters with enhanced technology features or the future provision of interval meters for connection points with low annual consumption.

1.3 Commencement

1.3.1 The date of publication of the Metrology Procedure is 10 days following approval by the Authority.

1.3.2 This Metrology Procedure comes into operation 3 months after the date of publication.

1.4 Definitions

Words in this Metrology Procedure shown in italics have the following meaning:

<table>
<thead>
<tr>
<th>Phrase/term</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>access arrangement</td>
<td>has the meaning given to it in the Electricity Networks (Access) Code 2004</td>
</tr>
<tr>
<td>access contract</td>
<td>means an agreement between Western Power and a person for the person to have ‘access’ (as defined in section 103 of the Act) to ‘services’ (as defined in section 103 of the Act) on a network.</td>
</tr>
<tr>
<td>accumulated energy data</td>
<td>is to be expressed as a measure of energy over time, and means a measurement (including an estimated or substituted measurement) of the production or consumption of electricity at a metering point, which is accumulated for a period longer than a trading interval.</td>
</tr>
<tr>
<td>accumulated energy register</td>
<td>means the visible indication displayed on an accumulation meter, or the memory location within the meter, that records accumulated energy data.</td>
</tr>
<tr>
<td>accumulation meter</td>
<td>means a meter that measures accumulated energy data and records it in one or more accumulated energy registers.</td>
</tr>
<tr>
<td>Act</td>
<td>means the Electricity Industry Act 2004 (WA).</td>
</tr>
<tr>
<td>active energy</td>
<td>means a measure of electricity, being the time integral of the product of voltage and the in-phase component of electric current flow across a metering point expressed in Watt hours (Wh) and/or multiples thereof.</td>
</tr>
<tr>
<td>apparent energy</td>
<td>means a measure of electricity, being the time integral of the product of voltage and the electric current flow across a metering point expressed in Volt Amp hours (Vah) and or multiples thereof.</td>
</tr>
<tr>
<td>AS</td>
<td>followed by a designation means a standard so designated published by Standards Australia Limited and current as at the Code commencement date.</td>
</tr>
<tr>
<td>attachment point</td>
<td>means a point on the network at which network assets are connected to assets owned by another person.</td>
</tr>
<tr>
<td>Authority</td>
<td>means the Economic Regulation Authority established under the Economic Regulation Authority Act 2003 (WA).</td>
</tr>
<tr>
<td>average daily consumption</td>
<td>for a metering point is to be expressed in energy units per day, and means a measurement (including an estimated or substituted measurement) of electricity production or consumption over a period at the metering point, divided by the number of days in the period.</td>
</tr>
<tr>
<td>business day</td>
<td>means any day that is not a Saturday, a Sunday or a public holiday throughout Western Australia.</td>
</tr>
<tr>
<td>check meter</td>
<td>means a meter that meets the requirements of clause 3.13 of the Code and is used as a secondary source of energy data.</td>
</tr>
<tr>
<td>checksum</td>
<td>means a single digit numeric identifier that is calculated to reduce the frequency of NMI data entry errors.</td>
</tr>
<tr>
<td>Phrase/term</td>
<td>Meaning</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Code of Conduct</td>
<td>means the Code of Conduct for the Supply of Electricity to Small Use Customers</td>
</tr>
<tr>
<td>code participant</td>
<td>has the same definition in the Code.</td>
</tr>
<tr>
<td>Communication Rules</td>
<td>means, in relation to Western Power’s network and subject to clause 6.7 of the Code, a document governing the communication of information and data between code participants, which has been published under clause 6.19A of the Code.</td>
</tr>
<tr>
<td></td>
<td>(Note: The “communication rules” incorporate and largely comprise the suite of technical documents known as the “build pack”.)</td>
</tr>
<tr>
<td>communications link</td>
<td>means all communications devices and methods which comply with the Code so as to enable a meter of a metering point to be read from a remote location (being a location not at the premises where the meter is situated) that lie:</td>
</tr>
<tr>
<td></td>
<td>a) between the data logger and the telecommunications network (if the data logger is internal to the device containing the measurement elements); and</td>
</tr>
<tr>
<td></td>
<td>b) between the meter and the data logger and between data logger and the telecommunications network (if the data logger is external to the device containing the measurement elements but is located at the same site); and</td>
</tr>
<tr>
<td></td>
<td>c) between the meter and the telecommunications network (if the data logger is not located at the same site as the device containing the measurement elements).</td>
</tr>
<tr>
<td>connection point</td>
<td>has the same meaning in this Metrology Procedure as the meaning given to it in the Code.</td>
</tr>
<tr>
<td>current transformer or</td>
<td>means a transformer for use with meters and protection devices in which the electric current in the secondary winding is, within prescribed error limits, proportional to and in phase with the electric current in the primary winding.</td>
</tr>
<tr>
<td>“CT”</td>
<td></td>
</tr>
<tr>
<td>current</td>
<td>in connection with the flow of electricity, means the flow of electricity in a conductor.</td>
</tr>
<tr>
<td>customer</td>
<td>has the meaning given in section 3 of the Act.</td>
</tr>
<tr>
<td>data</td>
<td>means energy data or standing data.</td>
</tr>
<tr>
<td>data logger</td>
<td>means a metering installation database, metering database or a device that collects electronic signals from a measurement element and records interval energy data.</td>
</tr>
<tr>
<td>data stream</td>
<td>means a stream of energy data or metering data associated with a metering point, as represented by an NMI and a NMI suffix. A NMI can have multiple data streams.</td>
</tr>
<tr>
<td>demand</td>
<td>is the power requirement in a period expressed in kW. (E.g. if the consumption in a period is 1kWh and the period under consideration is half an hour long then the demand is 2kW)</td>
</tr>
<tr>
<td>distribution system</td>
<td>has the meaning given to it in the Act.</td>
</tr>
<tr>
<td>electricity</td>
<td>has the meaning given to it in the Act.</td>
</tr>
<tr>
<td>electronic</td>
<td>in relation to connection with a meter, means the transfer of information into or out of the meter by way of a telecommunications network for the delivery of energy data or pulsing signals or other widely accepted communications protocols used for the transfer of data between computerised equipment.</td>
</tr>
<tr>
<td>energy data services</td>
<td>means the services related to the determination, processing or storage of energy data.</td>
</tr>
<tr>
<td>energy data</td>
<td>means interval energy data or accumulated energy data.</td>
</tr>
<tr>
<td>energy</td>
<td>means active energy and/or reactive energy.</td>
</tr>
<tr>
<td>energy units</td>
<td>means Wh, VAh or VARh as appropriate.</td>
</tr>
<tr>
<td>Phrase/term</td>
<td>Meaning</td>
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<tr>
<td>---------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>enhanced technology</td>
<td>in relation to a metering installation, means evolving technologies that provide the metering installation with advanced features over and above the standard specified for installations of Type 1-6.</td>
</tr>
<tr>
<td>entry point</td>
<td>means a single, indivisible (except as allowed under the Applications and Queuing Policy) point, that for purposes under the access arrangement involving the transfer of electricity, is deemed to consist of a single attachment point, connected or to be connected to a user’s connection point, with a single revenue meter (regardless of the actual configuration of network assets making up the entry point), at which electricity is more likely to be transferred into the network than out of the network.</td>
</tr>
<tr>
<td>estimate</td>
<td>means an estimate calculation of energy data electricity production or consumption at a metering point for a period which is not yet scheduled to be read, such calculation being made in compliance with the schedules to this Metrology Procedure.</td>
</tr>
<tr>
<td>exit point</td>
<td>means a single, indivisible (except as allowed under the applications and queuing policy) point, that for purposes under the access arrangement involving the transfer of electricity, is deemed to consist of a single attachment point, connected or to be connected to a user’s connection point, with a single revenue meter (regardless of the actual configuration of network assets making up the entry point), at which electricity is more likely to be transferred out of the network than into the network.</td>
</tr>
<tr>
<td>general purpose</td>
<td>means the term applied by the National Measurement Institute constituted under Part 3 of the National Measurement Act to refer to the classification of a meter.</td>
</tr>
<tr>
<td>generator</td>
<td>means a person who generates electricity and who holds a generation licence issued by the Authority.</td>
</tr>
<tr>
<td>good electricity</td>
<td>means the exercise of that degree of skill, diligence, prudence and foresight that a skilled and experienced person would reasonably and ordinarily exercise under comparable conditions and circumstances consistent with applicable written laws and statutory instruments and applicable recognised codes, standards and guidelines.</td>
</tr>
<tr>
<td>good electricity</td>
<td>means the exercise of that degree of skill, diligence, prudence and foresight that a skilled and experienced person would reasonably and ordinarily exercise under comparable conditions and circumstances consistent with applicable written laws and statutory instruments and applicable recognised codes, standards and guidelines.</td>
</tr>
<tr>
<td>IEC</td>
<td>means the International Electrotechnical Commission.</td>
</tr>
<tr>
<td>instrument</td>
<td>means a CT or a VT.</td>
</tr>
<tr>
<td>transformer</td>
<td></td>
</tr>
<tr>
<td>interval energy data</td>
<td>is to be expressed in energy units or multiples thereof, and means a measurement (including an estimated or substituted measurement) of the production or consumption of electricity production or consumption at a metering point which is accumulated for each trading interval, or such sub-interval as has been previously agreed between Western Power and a relevant code participant.</td>
</tr>
<tr>
<td>interval meter</td>
<td>means a meter that measures interval energy data and records it in a data logger.</td>
</tr>
<tr>
<td>ISO</td>
<td>means the International Standards Organisation.</td>
</tr>
<tr>
<td>load</td>
<td>means the amount of electrical power energy transferred out of a network at a connection point at a specified time or across a specified period.</td>
</tr>
<tr>
<td>market generator</td>
<td>means a rule participant registered as a market generator under Chapter 2 of the market rules.</td>
</tr>
<tr>
<td>market rules</td>
<td>has the meaning given to it in the Act.</td>
</tr>
<tr>
<td>market</td>
<td>means the wholesale electricity market established under Part 9 of the Act.</td>
</tr>
<tr>
<td>Phrase/term</td>
<td>Meaning</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>measurement element</td>
<td>means an energy measuring component of a <em>meter</em> which converts <em>electricity</em> into either or both of:</td>
</tr>
<tr>
<td></td>
<td>a) an <em>electronic</em> signal; and</td>
</tr>
<tr>
<td></td>
<td>b) a mechanically recorded electrical measurement.</td>
</tr>
<tr>
<td>meter</td>
<td>a device which measures and records the production or consumption of electrical <em>energy</em> or <em>electricity</em> production or consumption.</td>
</tr>
<tr>
<td>metering data agent</td>
<td>means <em>Western Power</em> as appointed under clause 5.29(a) of the <em>Code</em>.</td>
</tr>
<tr>
<td>metering data alarms and statuses</td>
<td>means where interval capable <em>metering installations</em> assign specific alarms to the data channel and or the <em>interval metering data</em>.</td>
</tr>
<tr>
<td>meter reading period</td>
<td>for past dates, is the period between the date of a <em>meter</em> reading and the date of the previous <em>meter</em> reading.</td>
</tr>
<tr>
<td></td>
<td>for future dates, is the period between the scheduled date of a <em>meter</em> reading and the previous scheduled or actual <em>meter</em> read.</td>
</tr>
<tr>
<td>metering database</td>
<td>means a database containing the <em>registry</em> and <em>energy data</em>.</td>
</tr>
<tr>
<td>metering equipment</td>
<td>means one or more parts of a <em>metering installation</em>.</td>
</tr>
<tr>
<td>metering installation</td>
<td>means the equipment, processes and arrangements for the purpose of metrology which lie between:</td>
</tr>
<tr>
<td></td>
<td>at one boundary, either:</td>
</tr>
<tr>
<td></td>
<td>a) for a <em>connection point</em> of Type 1 to 6 — the <em>metering point</em>; or</td>
</tr>
<tr>
<td></td>
<td>b) for a <em>connection point</em> of Type 7 — the <em>connection point</em>; and</td>
</tr>
<tr>
<td></td>
<td>at the other boundary, either:</td>
</tr>
<tr>
<td></td>
<td>a) if a telecommunications network is used for the delivery of <em>energy data</em> from the <em>connection point</em> or <em>metering point</em> — the point of connection to the telecommunications network; or</td>
</tr>
<tr>
<td></td>
<td>b) if there is no such telecommunications network — the interface port of either the <em>meter</em> or <em>data logger</em> or both.</td>
</tr>
<tr>
<td>metering point</td>
<td>means</td>
</tr>
<tr>
<td></td>
<td>a) for Types 1-6, the point at which electricity is measured by a <em>revenue meter</em></td>
</tr>
<tr>
<td></td>
<td>b) for a Type 7 <em>meter</em>, the <em>connection point</em>.</td>
</tr>
<tr>
<td>metering service</td>
<td>means activities that are performed by or on behalf of <em>Western Power</em> or its <em>metering data agent</em> and are related to the provision of <em>metering installations</em>, <em>standing data</em> and <em>energy data</em>.</td>
</tr>
<tr>
<td>Metrology Procedure</td>
<td>means this document, the Metrology Procedure for Metering Installations on the Western Power Network.</td>
</tr>
<tr>
<td>National Measurement Act</td>
<td>means the National Measurement Act 1960 (Cth) and any regulations made under that Act.</td>
</tr>
<tr>
<td>National Metering Identifier or “NMI”</td>
<td>means the reference number required by the <em>Code</em>, which uniquely identifies a <em>connection point</em> and which is issued under the Western Australian NMI Allocation Procedures.</td>
</tr>
<tr>
<td>NEM12</td>
<td>means the file format established for the dissemination and transfer of <em>interval energy data</em> in the Australian National Electricity Market.</td>
</tr>
<tr>
<td>NEM13</td>
<td>Means the file format established for the dissemination and transfer of basic <em>energy data</em> in the Australian National Electricity Market.</td>
</tr>
<tr>
<td>network</td>
<td>means the <em>transmission system</em> and <em>distribution system</em> operated by <em>Western Power</em>.</td>
</tr>
<tr>
<td>power factor</td>
<td>means the ratio of the <em>active energy</em> to the <em>apparent energy</em> at a <em>metering point</em>.</td>
</tr>
</tbody>
</table>
reactive energy means a measure in volt-ampère reactive hours (VARh) of the alternating exchange of stored energy in inductors and capacitors, which is the time-integral of the product of voltage and the out-of-phase component of electric current flow across a metering point.

registered metering installation provider means a person registered by Western Power in accordance with the registration process to undertake some or all of the activities relating to the installation of metering installations, and who has not been deregistered under the registration process.

registration process means the approved registration process established by Western Power and approved by the Authority under the provisions of the Code.

registry means a registry containing standing data in accordance with the Code.

responsible person means the person who has responsibility for the provision of a metering installation for a particular connection point.

retailer means a person who holds a retail licence or integrated regional licence issued by the Authority.

revenue meter means the meter that is used for obtaining the primary source of energy data.

rule participant means a member of the class of persons as set out in clause 2.28.1 of the Market Rules.

SCADA means Supervisory Control and Data Acquisition.

scheduled meter reading means a reading taken anytime between one working day ahead of, and two working days after, the scheduled meter reading date.

service level agreement means a written agreement that sets out the terms and conditions under which Western Power must provide metering services to a user, whether or not that agreement also contains other provisions governing the parties' rights, liabilities and obligations.

standing data means the periodically updated information about a connection point that is maintained in accordance with the Code and the associated Communication Rules.

substitute means the substitution of energy data obtained, or scheduled to be obtained, from an actual meter reading with energy data determined in accordance with the data substitution procedures defined in clause 4.4 under the circumstances described in the Code.

supply means the delivery of electricity.

trading interval means a 30 minute period ending on the hour (WST) or on the half hour and, where identified by a time, means the 30 minute period ending at that time.

transfer in relation to a customer, has the meaning given to it in section 1.3 of the Electricity Industry Customer Transfer Code 2004.

transformer means a plant or device that reduces or increases alternating voltage or electric current.

transmission system has the meaning given to it in the Act.

user [in respect of a connection point] means a person who has an access contract in respect of the connection point for the transfer of electricity at the connection point.

validation means validation in accordance with this Metrology Procedure.

voltage means the electric force or electric potential between two points that gives rise to an electric current.

voltage transformer or "VT" means a transformer for use with meters and protection devices in which the voltage across the secondary terminals is, within prescribed error limits, proportional to and in phase with the voltage across the primary terminals.

Western Power means Electricity Networks Corporation (t/a Western Power).
2 Provision of Metering Installations

2.1 Installation of Meters

2.1.1 Western Power will ensure that when each meter and associated data logger (where the data logger is located at the metering point) is installed, it is checked to ensure that:

   a) it complies with the relevant requirements of section 5 of this document and it has the optical port, communications port, and/or visual display which can be readily accessed for meter reading

   b) the CT cores of revenue metering installations must not be used for any purpose other than revenue metering and check metering as per clauses 3.12(1)(a) and 3.12(1)(b) of the Code

   c) the CT cores of Types 1 and 2 check metering installations must not be used for other purposes subject to clause 3.12 (1) (a) of the Code, unless with the written approval of Western Power

   d) if only one set of VT secondary winding is provided for a Type 1 or 2 revenue and check metering installation, then the voltage supplies to both metering installations must be separately fused subject to clause 3.12(1)(d) of the Code

2.1.2 Where prepayment meters are installed:

   a) they will be treated where reasonably possible as Type 6 accumulation meters

   b) they will be operated and maintained in accordance with good electricity industry practice

   c) they will comply with the technical requirements in Part 9 of the Code of Conduct

2.2 Metering Installation Components

2.2.1 The requirements in this clause are applicable to Types 1 – 6 metering installations.

2.2.2 Western Power will ensure that the components, characteristics and requirements for meter provision for Type 1 – 6 metering installations are in accordance with section 5.

2.2.3 The meter internal real time clock must be referenced to Australian Western Standard TIME (AWST) and maintained within an absolute error of:

   - Type 1. ±5 seconds.
   - Type 2. ±7 seconds.
   - Type 3 ±10 seconds.
   - Types 4 – 5 ± 20 seconds.

2.2.4 Western Power will make a determination of the metering installation type based on the historic or anticipated annual consumption and peak load at the connection point, as agreed with the retailer. If the retailer and Western Power cannot agree on the type of installation, then subject to clauses 3.9(3A) and 5.1 of the Code, Western Power may make the determination on the matter.

2.2.5 An increase in annual or peak consumption that, in the opinion of Western Power, places the connection point into a higher type will result in a meter upgrade. Where annual consumption has decreased with time no meter change is necessary.
2.2.6 Where a Type 6 meter is capable of recording both interval energy data and accumulated energy data, it will be treated as an accumulation meter, unless otherwise agreed between Western Power and the retailer.

2.2.7 Where a metering installation includes a Type 5 meter that is read as an accumulation meter, the meter will not be replaced by or, reconfigured to, an interval-read meter without the agreement of the retailer, except:
   a) where another retailer has requested an interval survey, at which point it will be necessary to permanently convert the meter to an interval-read meter, or
   b) where the connection point is due to transfer to another retailer, under which circumstances it may be necessary to replace or reprogram the meter to interval-read a few days prior to the formal transfer

2.2.8 The metering database must permit collection of data within the timeframes specified in the relevant service level agreement at a level of availability of at least 99% per annum if the metering installation does not have a communications link. Where the metering installation does have a communications link, the metering database must permit collection of data within the timeframes specified in the relevant service level agreement and at a level of availability of 95% for the communications link and 99% for the remainder of the metering installation.

2.3 Maintenance of Metering Installations

2.3.1 Testing and Inspection of Meters
   2.3.1.1 Western Power will ensure that meters on its network are sampled and tested in accordance with AS1284.13. Details of how Western Power conducts its sampling and testing are found in Appendix 2 - Meter Compliance Testing and Sampling Plan.
   2.3.1.2 Western Power will ensure that its meters meet the specifications and/or guidelines outlined by the National Measurement Institute under the National Measurement Act.

2.3.2 Maintenance of Metering Installations
   2.3.2.1 Where Western Power identifies that a component of a metering installation is not performing in accordance with the Code, the meter specifications, or in accordance with good electricity industry practice, the component will be repaired or replaced.
   2.3.2.2 Notwithstanding section 2.3.2.1, if Western Power identifies any performance issues with wiring, fuses, or modems that form part of a metering installation, those components must be repaired or replaced in accordance with good electricity industry practice.
   2.3.2.3 A code participant who becomes aware of an outage or malfunction of a metering installation or any of its components must advise Western Power as soon as practicable.

2.3.3 Enhanced Technology Features
   2.3.3.1 Where reasonably requested by a code participant, Western Power will provide enhanced technology features in a metering installation in accordance with clause 3.20(1) of the Code.
2.3.3.2 *Metering installations* with enhanced technology features will only be used where they meet or exceed the standards required for Type 1-6 *metering installations* that would otherwise be used at the *connection point* under consideration.

2.3.3.3 Where a *meter* includes enhanced features associated with a *meter* of a more advanced type, the normal provisions of the original type of *meter* apply for all aspects other than the enhanced feature.

2.3.3.4 Notwithstanding section 2.3.3.3, a *meter* will be reported as a different type within the *metering database* where this is necessary to support the enhanced technology feature.

2.3.3.5 Where bi-directional capability is required for the *metering installation*, *Western Power*, in accordance with clause 3.3C of the *Code*, must ensure the net electricity production and consumption is separately measured and recorded by the *meter*.

### 2.3.4 Replacement

2.3.4.1 Where a population of *meters* has been sampled and tested in accordance with section 2.3.1.1 and deemed to have failed, *Western Power* will remove and replace all *meters* within that population in accordance with the requirements of the *Code*. 
3 Energy Data

3.1 Energy Data Collection

3.1.1 Western Power collects energy data from metering installations by the following methods:
   a) Manual meter read.
   b) Remote meter read (via a communications link).
   c) Customer supplied meter read.

3.1.2 Western Power must for each meter on its network, at least once in any 12 month period undertake a meter reading that provides an actual value that passes the validation process as per clause 5.4 of the Code. A copy of the meter reading schedule can be found on Western Power’s website.

3.1.3 Western Power will ensure that for Type 1-4 metering installations, interval energy data will be collected on a monthly basis in accordance with the relevant service level agreement, or by agreement with the relevant retailer.

3.1.4 Western Power will ensure that for Type 5 metering installations, interval energy data will be collected on a monthly basis or in accordance with the relevant service level agreement.

3.1.5 Western Power will ensure that for Type 6 metering installations, energy data will be collected on a monthly or bi-monthly basis or in accordance with the relevant service level agreement, as agreed between Western Power and the retailer at the time of installation.

3.1.6 Western Power will ensure that for Type 7 metering installations, energy data is calculated, validated and substituted in accordance with the Code.

3.1.7 Where a Type 6 metering installation is capable of recording both interval and accumulated energy data, it will be treated as an accumulation meter, unless otherwise agreed between Western Power and the retailer.

3.1.8 Where energy data for Type 1-5 metering installations is gathered at a frequency greater than a trading interval it will be aggregated into trading intervals as per clause 3.16(3A) of the Code.

3.1.9 Where Western Power receives a request from a customer to provide energy data or standing data, Western Power will provide such energy data or standing data in accordance with clauses 5.17 and 5.17A of the Code. Further requirements may be expressed in other enhancements such as clause 10.7 of the Code of Conduct.

3.1.10 Western Power will maintain a disaster recovery plan for the metering database, in accordance with clause 4.1(3) of the Code to ensure that following an event causing loss of access to energy data, code participants regain access to energy data within 2 business days.

3.2 Energy Data Collection Schedule

3.2.1 Western Power will ensure that a schedule is developed and maintained to determine the scheduled dates for reading each metering installation in accordance with clauses 5.3 and 5.4 of the Code, or such time specified in the applicable service level agreement.
3.2.2 Where Western Power chooses to gather and issue energy data more frequently than the published meter reading schedule, the retailer will only be charged for reading in accordance with the published meter reading schedule or in accordance with the applicable service level agreement.

3.2.3 Notwithstanding sections 3.1.3 and 3.1.4, Western Power and the code participant may choose, by agreement, to disseminate the energy data for metering installation Types 1-5 more frequently. Under these circumstances the published meter reading schedule, substitution and other deadlines will not be affected.

3.2.4 Western Power and a retailer can agree other reading frequencies for specific meters or classes of meters, as documented in a service level agreement.

3.2.5 Western Power will accept requests for special meter reads outside the published schedule in accordance with the provisions of the Communication Rules or the Code, and will respond to valid requests within the response times specified in the applicable service level agreement.

3.3 Storage and Transfer of Energy Data

3.3.1 Western Power will ensure that energy data is collected from a meter or a meter’s associated data logger and this energy data is transferred to the relevant metering database, no later than 2 business days after the scheduled reading date for that metering installation, or within the time frame specified in the applicable service level agreement.

3.3.2 Where energy data is collected from a meter or meter’s associated data logger by a user this energy data must be provided to Western Power no more than 2 business days after collecting or receiving the data, or within the time frame specified in the applicable service level agreement.

3.3.3 Where a check meter is installed which is of the same precision as the revenue meter, Western Power may calculate and pass to market the average of the check and revenue meter reading for active and reactive channels to be used for billing and settlement purposes, unless otherwise agreed between Western Power and the retailer.

3.3.4 After conducting a meter reading and obtaining energy data for a metering point, Western Power will provide access to that energy data to the user for the metering point and the IMO in accordance with clauses 5.6 and 5.7 of the Code and in accordance with the Communication Rules.

3.3.5 Following a successful meter read or, substitution or estimation of energy data, the metering database will store the energy data for a period of at least 13 months in a readily accessible online format and for a further period of 5 years and 11 months in archive that is accessible independently of the format in which the data is stored.

3.3.6 The format of the energy data must be in accordance with the Communication Rules.

3.3.7 Energy data (actual, substituted or estimated) is required by Western Power by data stream for all trading intervals (that is, 48 intervals per 24 hour period) within the timeframe outlined in the Code or the applicable service level agreement.

3.4 Validation of Energy Data

3.4.1 Western Power validates energy data collected from Type 1-5 metering installations in accordance with section 6- Metering Installation Types 1 - 5 — Validation.
3.4.2 *Western Power* validates *energy data* collected from *Type 6 metering installations* in accordance with section 8 - Metering Installation Type 6 – Validation, Substitution and Estimation.

3.4.3 Where the *energy data* fails validation under sections 3.4.1 or 3.4.2, *Western Power* will:

a) manually correct the reading if the correct reading can be determined, or
b) re-read the *meter* if no correction has been possible and the *meter* can be re-read prior to the applicable deadline for the dissemination of *energy data* as documented in the published *meter* reading schedule, or
c) substitute the reading in accordance with the applicable substitution or estimation rules for the *meter installation* type

3.4.4 Where the *energy data* fails validation under sections 3.4.1 or 3.4.2, *Western Power* may review the validation failures to determine the cause of any apparently lost or erroneous *energy data*. Where *Western Power* believes the error is due to a *metering installation* fault identified as:

a) the *meter* performing outside of its design specification, then the *meter installation* may be tested either onsite or in the *Western Power* meter laboratory to determine the cause of the validation failure, or
b) the *metering installation* being defective, then the *metering installation* may be repaired or replaced in accordance with the *Code* or applicable *service level agreement*, or
c) a fault associated with the measurement of data, *Western Power* may, acting in accordance with the *Code* or *good electricity industry practice*, make corrections or adjustments to the *energy data*

3.5 *Estimation and Substitution of Energy Data*

3.5.1 *Western Power* estimates or substitutes *energy data* from *Type 1-5 metering installations* in accordance with section 7 - Metering Installation Types 1 - 5 – Accumulation, Substitution and Estimation, where:

a) *Western Power* has elected to perform substitution under section 3.4.3 c), or
b) *Western Power* has elected to perform estimation under section 3.5.6, or
c) there has been a failure of the *metering equipment*; or
d) an inspection or test on the *metering equipment* has established that the measurement uncertainty exceeds the specified standard for that class of *meter*; or
e) it has not been possible to obtain a reading from the *meter*

3.5.2 *Western Power* estimates or substitutes *energy data* from *Type 6 metering installations* in accordance with section 8 - Metering Installation Type 6 – Validation, Substitution and Estimation, where:

a) *Western Power* has elected to perform substitution or estimation under section 3.4.3 c), or
b) *Western Power* has elected to perform estimation under section 3.5.6, or
c) there has been a failure of the *metering equipment*, or
d) an inspection or test on the *metering equipment* has established that the measurement uncertainty exceeds the specified standard for that class of *meter*, or
e) it has not been possible to obtain a reading from the meter.

3.5.3 Western Power calculates energy data for Type 7 metering installations by way of substitution in accordance with Appendix 3, clause A3.7(5) of the Code – substitution method 74.

3.5.4 Nothing in this Metrology Procedure requires Western Power to modify or change Type 7 meter consumption calculations agreed between Western Power and Synergy on 16 May 2013. Type 7 meter consumption calculations will continue to be made by the methods and systems in place, and agreed, on that date. The agreed method is substitution method 74 under the Metering Code and this Metrology Procedure.

The metering installation and metering database associated with each Type 7 meter are the systems in use as at 16 May 2013, or unless as otherwise agreed between Synergy with customers with Type 7 metering installations and Western Power.

3.5.5 Street lighting and all UMS installations are classified as Type 7 connection points and the energy data is estimated using the following calculations:

<table>
<thead>
<tr>
<th>Street Lighting</th>
<th>kW x hours of operation x number of applicable billing days x number of assets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In addition, the following daily charges apply:</td>
</tr>
<tr>
<td></td>
<td>• Fixed charge x number of assets</td>
</tr>
<tr>
<td></td>
<td>• Daily asset type charge x number of asset types</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unmetered Supply (UMS) LSEC Powerwatch lighting &amp; various</th>
<th>kW x hours of operation x number of applicable billing days x number of assets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In addition, the following daily charge applies:</td>
</tr>
<tr>
<td></td>
<td>• Fixed charge x number of assets</td>
</tr>
</tbody>
</table>

Note: For the purpose of this calculation, kW means kilowatts, being a unit of power equal to 1,000 watts, Hours of Operation means hours a day, Billing Days means the number of days in the bill, typically the current calendar month.

Western Power will ensure that for Type 7 metering installations, energy data will be calculated on a monthly or bi-monthly basis in accordance with the Communication Rules Build Pack and specifically, the Streetlights and UMS Data CSV File Specification documents included within the Build Pack.

The communication rules incorporate and largely comprise the suite of technical documents known as the Build Pack, which is published on the Western Power website at:


3.5.6 Where energy data is required for market settlement purposes and a reading is not scheduled for the meter prior to the end of the settlement period, Western Power may estimate the energy data for the period under consideration.

3.5.7 Where the energy data substituted or estimated in accordance with section 3.5.1 pertains to an energy data channel of a meter for which reactive energy data is recorded in addition to an active energy channel, then both channels must be substituted or estimated as a set to ensure consistency and the availability of correct power factors.
3.5.8 Where any of the alarm status descriptions listed in section 10 occur, the *energy data* may be substituted except where the reported status is determined to be incorrect by *Western Power*. Where an incorrect error condition has been detected, *Western Power* may consult with the *retailer* over the correct course of action or apply procedures in line with this *Metrology Procedure or good electricity industry practice*.

3.5.9 Where an alarm outlined in section 10 is triggered by the meter, regardless of whether it requires substitution of *energy data*, which is not caused by a *metering installation* fault but which can be compensated for by an adjustment to the *metering installation*, the *metering installation* may be reset, reprogrammed or otherwise adjusted as applicable, within the period defined in the applicable *service level agreement for meter repairs*, unless *Western Power* is satisfied that the alarm condition triggered will not recur.

3.5.10 Substituted *energy data* may be marked as a final *substitute* when no further updates are possible. For the avoidance of doubt, it is not necessary to issue a final *substitute* for any particular reading.

3.5.11 Where it is necessary to *substitute* a *meter* reading because of an inability to access the *meter*, a reason code will be supplied in accordance with the *NEM12 and NEM13 meter data file format specification* and in accordance with Appendix 3 of the *Code*.

### 3.6 Access to Energy Data

3.6.1 *Western Power* provides access to *energy data* to a *code participant* for each *connection point* at which the *code participant* supplies, generates or purchases *electricity* and has an *access contract* with *Western Power*.

3.6.2 Where *Western Power* receives a request from a *user's customer* or *third party* to provide *energy data* or *standing data*, *Western Power* will provide such *data* in accordance with clause 5.17A of the *Code*.

3.6.3 Where a *communications link* is installed for a *metering installation*, *Western Power* will provide a read-only password and connection details to the *code participants* who have access under section 3.6.1.

3.6.4 *Western Power* ensures that access to a *metering installation* and the *metering database* is secured from unauthorised access in line with clauses 4.8(4)(a) and 4.8(4)(b) of the *Code* and in line with *good electricity industry practice*.

3.6.5 The only persons entitled to have local access and/or remote access, using a read only password provided by *Western Power*, to the *energy data* from a *metering installation* are a *user* who is a *retailer* or *generator* of the *connection point* with which the *metering installation* is associated.
4 Data Quality

4.1 Energy Data Verification Requests

4.1.1 Where a code participant requests verification of energy data under clause 5.20(3) of the Code by using its Energy Data Verification Request Form, Western Power will use all reasonable endeavours to verify the energy data in accordance with this procedure by repeating any tests applicable to the metering installation type.

4.1.2 In accordance with section 4.1.1, Western Power will perform the validation process applicable to the metering installation that is the subject of the verification request in order to verify the energy data.

4.1.3 In accordance with clause 5.20(4)(b) of the Code, Western Power will make the results of the test described in section 4.2 available to the code participant as soon as practicable but no later than 5 business days after receiving the Energy Data Verification Request Form, or in accordance with the applicable service level agreement.

4.2 Test and Audit Requests

4.2.1 Where a code participant reasonably requests a test or audit of:
   a) the accuracy of the metering installation, or
   b) the energy data from the metering installation, or
   c) the standing data for the metering installation,
      Western Power will conduct a test or audit in accordance with the request.

4.2.2 Where Western Power receives a request to assess the accuracy of the metering installation pursuant to section 4.2.1(a), the metering installation, or components thereof will be tested in accordance with clause 3.9 of the Code to ensure the metering installation or component tested meets the applicable accuracy requirements.

4.2.3 Where Western Power receives a request to test or audit the energy data or standing data pursuant to sections 4.2.1(b) or 4.2.1(c), Western Power may:
   a) repeat any validation that has been performed in alignment with this Metrology Procedure
   b) ensure that metering data alarms and data statuses are reported in alignment with this Metrology Procedure
   c) ensure that aggregation of quarter-hourly data to half-hourly data has been performed in alignment with this Metrology Procedure, and/or
   d) ensure that substitution and/or estimation has been performed in alignment with this Metrology Procedure

4.2.4 Western Power will make the results of the test or audit described in section 4.2.1 available to the code participant in accordance with clause 5.20(4) of the Code or as specified in the applicable service level agreement.

4.2.5 Where errors are detected during the test or audit that are inconsistent with the requirements of the Code, Western Power will advise the code participant the errors detected, and possible duration of the existence of errors.
4.2.6 Where errors are detected during the test or audit that are inconsistent with the requirements of the Code, Western Power will restore the accuracy of the metering installation in accordance with the applicable service level agreement.

4.2.7 Where errors are detected during the test or audit that are inconsistent with the requirements of the Code, Western Power may make corrections to the lost or erroneous energy data up to 12 months based on a test or audit, to minimise adjustments to the final settlement account.

4.2.8 When performing a test or audit pursuant to sections 4.2.1(b) or 4.2.1(c), and there is a discrepancy between:

   a) energy data stored in the meter or meter’s associated data logger; and
   b) energy data stored in the metering database in respect of the respective meter or meter/associated data logger;

the energy data stored in the meter or meter’s associated data logger is prima facie evidence of the amount of electricity supplied to that metering point.

4.2.9 When performing a test or audit pursuant to sections 4.2.1(b) or 4.2.1(c), if there is a discrepancy between the energy data or standing data held in the metering database and the physical inventory, the physical inventory is prima facie evidence of the actual data.

4.2.10 When performing a test or audit pursuant to sections 4.2.1(b) or 4.2.1(c), if there is a discrepancy between energy data determined during the testing process and the energy data values stored in the metering database, the energy data determined during testing shall be prima facie evidence of the amount of electricity pertaining to the affected metering point.

4.2.11 If requested by a code participant to undertake a test or audit of energy data or standing data for a metering installation, Western Power will, prior to any test being undertaken, provide an estimate of the costs of, or associated with that test, where the test does not fall within the scope of the applicable service level agreement.

4.2.12 Where a test or audit undertaken in accordance with section 4.2.1 reveals a non-compliance with the Code, Western Power will not charge the code participant for conducting the test or audit.

4.2.13 Where a code participant requests a metering point to be tested, the meter will be tested at Base load current (Full load test) and 10% Base load current (Light load test). Western Power will use the result of the Full load test and the Light load test to calculate the Weighted Average Error for the meter. The meter will be deemed defective if the result of applying the Weighted Average Error equation exceeds the accuracy limit of the meter under test. The equation used is:

\[
WA \text{ error} \, (\%) = \frac{(4 \times \text{Full Load}) + \text{Light Load}}{5}
\]

Where:

- **WA error** is the percentage Weighted Average Error for the meter [overall meter error] at time of test,
- **Full Load** is the percentage full load error of meter at time of test,
- **Light Load** is the percentage light load error of meter at time of test.
## 5 Components of Types 1-6 Metering Installations – Meter Provision

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Metering equipment components</th>
<th>Metering equipment characteristics</th>
<th>Requirement</th>
<th>Code Reference (if relevant)</th>
<th>Applicable Metering installation Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>Connection point</td>
<td>Metering Point</td>
<td>Electricity flowing through the connection point is to be greater than 1,000 GWh per annum.</td>
<td>Appendix 1 Table 3</td>
<td>Type 1</td>
</tr>
<tr>
<td>5.2</td>
<td></td>
<td></td>
<td>Electricity flowing through the connection point is to be greater than 100 GWh but less than 1,000 GWh per annum.</td>
<td>Appendix 1 Table 3</td>
<td>Type 2</td>
</tr>
<tr>
<td>5.3</td>
<td></td>
<td></td>
<td>Electricity flowing through the connection point is to be greater than 0.75 GWh but less than 100 MWh per annum.</td>
<td>Appendix 1 Table 3</td>
<td>Type 3</td>
</tr>
<tr>
<td>5.4</td>
<td></td>
<td></td>
<td>Electricity flowing through the connection point is to be greater than 300 MWh but less than 750 MWh per annum.</td>
<td>Appendix 1 Table 3</td>
<td>Type 4</td>
</tr>
<tr>
<td>5.5</td>
<td></td>
<td></td>
<td>Electricity flowing through the connection point is to be greater than 50 MWh but less than 300 MWh per annum.</td>
<td>Appendix 1 Table 3</td>
<td>Type 5</td>
</tr>
<tr>
<td>5.6</td>
<td></td>
<td></td>
<td>Electricity flowing through the connection point is to be less than 50 MWh per annum.</td>
<td>Appendix 1 Table 3</td>
<td>Type 6</td>
</tr>
<tr>
<td>5.7</td>
<td>Metering installation</td>
<td></td>
<td>A metering point must have both a revenue meter and a check meter.</td>
<td>clause 3.13 Table 1</td>
<td>Type 1</td>
</tr>
<tr>
<td>5.8</td>
<td></td>
<td></td>
<td>A metering point must have, a revenue meter installation and either a partial check meter or a check meter.</td>
<td>clause 3.13 Table 1</td>
<td>Type 2</td>
</tr>
<tr>
<td>5.9</td>
<td></td>
<td></td>
<td>No check meter required.</td>
<td>clause 3.13 Table 1</td>
<td>Type 3 - 6</td>
</tr>
<tr>
<td>5.10</td>
<td></td>
<td></td>
<td>The metering point is to be located as close as practicable to the connection point.</td>
<td>clause 3.5(4)</td>
<td>Type 1 - 6</td>
</tr>
<tr>
<td>5.11</td>
<td></td>
<td></td>
<td>The meter is to be mounted on an appropriately constructed panel.</td>
<td>clause 3.5</td>
<td>Type 1 - 6</td>
</tr>
<tr>
<td>5.12</td>
<td>Overall accuracy</td>
<td></td>
<td>Overall accuracy for a metering installation shall be no greater than 0.5% for active energy and 1.0% for reactive energy.</td>
<td>Appendix 1 Table 3</td>
<td>Type 1</td>
</tr>
<tr>
<td>5.13</td>
<td></td>
<td></td>
<td>Overall accuracy for a metering installation shall be no greater than 1.0% for active energy</td>
<td>Appendix 1</td>
<td>Type 2</td>
</tr>
<tr>
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<tr>
<td>5.14</td>
<td>Overall accuracy for a metering installation shall be no greater than 1.5% for active energy and 3.0% for reactive energy.</td>
<td>Appendix 1 Table 3 Type 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.15</td>
<td>Overall accuracy for a metering installation shall be no greater than 1.5% for active energy.</td>
<td>Appendix 1 Table 3 Type 4 - 6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.16</td>
<td>High voltage connection points with an annual consumption of less than 750 MWh per annum must meet the accuracy requirements for a Type 3 metering installation.</td>
<td>Type 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.17</td>
<td>Testing facilities</td>
<td>Suitable isolation facilities must be provided to facilitate testing and calibration of the metering installation.</td>
<td>clause 3.12(3) Type 1 - 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.18</td>
<td>Check metering</td>
<td>If a separate check meter is required, the check meter must not exceed twice the error level permitted under the Code for the revenue meter for the metering point.</td>
<td>clause 3.13(4) Type 1 - 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.19</td>
<td>Check metering must use separate current transformer cores and separately fused voltage transformer secondary circuits preferably from separate secondary windings.</td>
<td>clause 3.13(2) Type 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.20</td>
<td>Partial check metering may be supplied from secondary circuits used for other purposes.</td>
<td>clause 3.13(3)(a) Type 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.21</td>
<td>Where the check metering duplicates the revenue metering and accuracy level, the average of the two validated data sets may be used to determine the energy measurement.</td>
<td>clause 3.13(5) Type 1 - 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.22</td>
<td>Instrument transformer</td>
<td>Current transformer</td>
<td>The accuracy of the current transformer is to be in accordance with class 0.2.</td>
<td>Appendix 1 Table 3 Type 1</td>
<td></td>
</tr>
<tr>
<td>5.23</td>
<td>The accuracy of the current transformer is to be in accordance with class 0.5.</td>
<td>Appendix 1 Table 3 Type 2 - 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.24</td>
<td>The current transformer core and secondary wiring associated with the revenue meter may not be used for other purposes.</td>
<td>clause 3.12(1)(a) &amp; (b) Type 1 - 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.25</td>
<td>New current transformers must meet the relevant requirements of AS60044.1 and must also comply with any applicable specifications or guidelines (including any transitional arrangements) specified by the National Measurement Institute under the National Measurement Act.</td>
<td>clause 3.12(2) Type 1 - 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.26</td>
<td>Current transformers in service at the Code commencement date that do not comply with</td>
<td>clause Type 1 - 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Section</td>
<td>Element</td>
<td>Description</td>
<td>Requirement</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td>-------------</td>
<td>-------------</td>
<td>-----------</td>
<td></td>
</tr>
<tr>
<td>5.27</td>
<td>Voltage transformer</td>
<td>The accuracy of the <strong>voltage transformer</strong> is to be in accordance with class 0.2.</td>
<td>Appendix 1 Table 3</td>
<td>Type 1</td>
<td></td>
</tr>
<tr>
<td>5.28</td>
<td>Voltage transformer</td>
<td>The accuracy of the <strong>voltage transformer</strong> is to be in accordance with class 0.5.</td>
<td>Appendix 1 Table 3</td>
<td>Type 2-3</td>
<td></td>
</tr>
<tr>
<td>5.29</td>
<td>Voltage transformer</td>
<td>If separate secondary windings are not provided, then the <strong>voltage supply</strong> to each <strong>metering installation</strong> must be separately fused and located in an accessible position as near as practical to the <strong>voltage transformer</strong> secondary winding.</td>
<td>Clause 3.12(1)(d)</td>
<td>Type 1-3</td>
<td></td>
</tr>
<tr>
<td>5.30</td>
<td>Voltage transformer</td>
<td>New <strong>voltage transformers</strong> must meet the relevant requirements of AS60044.2 and must also comply with any applicable specifications or guidelines (including any transitional arrangements) specified by the National Measurement Institute under the National Measurements Act.</td>
<td>Clause 3.12(2)</td>
<td>Type 1-3</td>
<td></td>
</tr>
<tr>
<td>5.31</td>
<td>Voltage transformer</td>
<td><strong>Voltage transformers</strong> in service at the <strong>Code</strong> commencement date that do not comply with the accuracy requirements are acceptable providing the overall accuracy of the installation meets <strong>Code</strong> requirements for the applicable type <strong>metering installation</strong>.</td>
<td>Clause 3.14(3)</td>
<td>Type 1-3</td>
<td></td>
</tr>
<tr>
<td>5.32</td>
<td>Secondary wiring</td>
<td>Separate secondary windings should be provided for each <strong>metering installation</strong>.</td>
<td></td>
<td>Type 1-5</td>
<td></td>
</tr>
<tr>
<td>5.33</td>
<td>Secondary wiring</td>
<td>Secondary wiring must be by the most direct route and the number of terminations and links must be kept to a minimum.</td>
<td>Clause 3.12(1)(f)</td>
<td>Type 1-3</td>
<td></td>
</tr>
<tr>
<td>5.34</td>
<td></td>
<td>• <strong>2.5 mm²</strong> cable is required for <strong>current transformer</strong> secondary wiring.</td>
<td></td>
<td>Type 1-6</td>
<td></td>
</tr>
<tr>
<td>5.35</td>
<td></td>
<td>• <strong>1.5 mm²</strong> cable is required for <strong>voltage transformer</strong> secondary wiring.</td>
<td></td>
<td>Type 1-4</td>
<td></td>
</tr>
<tr>
<td>5.36</td>
<td></td>
<td>The incidence and magnitude of burden changes on any secondary winding supplying the <strong>metering installation</strong> must be kept to a minimum.</td>
<td>Clause 3.9(3)</td>
<td>Type 1-6</td>
<td></td>
</tr>
<tr>
<td>5.37</td>
<td>Performance</td>
<td><strong>Metering data</strong> is required for all <strong>trading intervals</strong> within the time agreed with the relevant <strong>retailers</strong> at a level of availability of at least 99% per annum for <strong>instrument transformers</strong>.</td>
<td>Clause 3.11(1)(a)</td>
<td>Type 1-6</td>
<td></td>
</tr>
<tr>
<td>5.38</td>
<td>Outages</td>
<td>If an outage or malfunction occurs to an <strong>instrument transformer</strong>, repairs must be made as soon as practicable, and in any event within the period specified within the relevant <strong>service level agreement</strong>.</td>
<td>Clause 3.11(2)</td>
<td>Type 1-6</td>
<td></td>
</tr>
<tr>
<td>5.39</td>
<td>Measurement element</td>
<td><strong>Meters</strong> must meet the relevant requirements of AS1284 and must also comply with any applicable specifications or guidelines (including any transitional arrangements) specified</td>
<td>Clause 3.1</td>
<td>Type 1-6</td>
<td></td>
</tr>
</tbody>
</table>
5.40 If metering class VTs and CTs are in-service at the Code commencement date whose accuracy does not meet Code requirements then Western Power must either, or both, install meters of a higher class of accuracy and apply accuracy calibration factors within the meter to compensate for the transformer errors.

clause 3.14(3) Type 1 - 5

5.41 For whole current installations, meters that are in-service at the Code commencement date whose accuracy does not meet Code requirements, then Western Power must replace the meters.

clause 3.14 Type 4 -6

5.42 Meters must separately measure bidirectional electricity flows at the metering point and must record:
(a) the net electricity production transferred into the network that exceeds electricity consumption, and
(b) the net electricity consumption transferred out of the network that exceeds electricity production.

clause 3.16(1)(b) clause 3.3C Type 1 - 6

5.43 **Accuracy**
The accuracy of the active and reactive measurement elements is to be class 0.2 and class 0.5 respectively.

Appendix 1 Table 3 Type 1

5.44 The accuracy of the active and reactive measurement elements is to be class 0.5 and class 1.0 respectively.

Appendix 1 Table 3 Type 2

5.45 The accuracy of the active and reactive measurement elements is to be class 0.5, 1.0 and class 2.0 respectively.

Appendix 1 Table 3 Type 3

5.46 The accuracy of the active element is to be class 0.5 and 1.0.

Appendix 1 Table 3 Type 4 - 5

5.47 The accuracy of the meter class is to be general purpose.

Appendix 1 Table 3 Type 6

5.48 **Visible display**
To be provided on a device and to display as a minimum the accumulated total active energy measured by that metering installation.

clause 3.2(1) Type 1 - 6

5.49 **Location**
The metering point is located as close as practicable to the connection point.

clause 3.5(4) Type 1 - 6

5.50 **Security**
The measurement element must be secure and associated links, circuits and information storage and processing systems must be secured by means of seals or other devices approved by Western Power.

clause 3.8 Type 1 - 6

5.51 **Storage**
The measuring device must store active and, if required, reactive energy data in a data logger.

clause 3.5(2) Appendix 1 Type 1 - 3
<table>
<thead>
<tr>
<th>5.52</th>
<th>Access to data</th>
<th>Access to the visible display is to be provided without unreasonable restriction.</th>
<th>clause 3.2(1) Type 1 - 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.53</td>
<td>Access to data</td>
<td>Access to the electronic signal from the measurement element is secured. Relays or electronic buffers to prevent accidental or malicious damage to the meter must isolate interfaces to customer equipment.</td>
<td>clause 3.23 Type 1 - 6</td>
</tr>
<tr>
<td>5.54</td>
<td>Access to data</td>
<td>Access to the electronic signal for use in evolving technologies is to be discussed with Western Power.</td>
<td>clause 3.20 Type 1 - 6</td>
</tr>
<tr>
<td>5.55</td>
<td>Alteration to the original stored data in a meter is not permitted except during on-site accuracy testing and calibration of a metering installation.</td>
<td>clause 5.21(12) Type 1 - 6</td>
<td></td>
</tr>
<tr>
<td>5.56</td>
<td>Outages</td>
<td>If an outage or malfunction occurs to a measurement element or associated secondary wiring, repairs must be made within the period specified in the relevant service level agreement.</td>
<td>clause 3.11(2) Type 1 - 6</td>
</tr>
<tr>
<td>5.57</td>
<td>Data logger</td>
<td>The data logger is to be electrically connected to the measurement element by secure means.</td>
<td>Type 1 - 5</td>
</tr>
<tr>
<td>5.58</td>
<td>Data logger</td>
<td>Any programmable settings available within a metering installation, data logger or any peripheral device, which may affect the resolution of displayed or stored data, must meet the relevant requirements of AS1284 and must comply with any applicable specifications or guidelines (including any transitional arrangements) specified by the National Measurement Institute under the National Measurement Act.</td>
<td>clause 3.10 Type 1 - 5</td>
</tr>
<tr>
<td>5.59</td>
<td>Location</td>
<td>The data logger may be located within the same housing as the measurement element or in a separate housing.</td>
<td>clause 1.3 Type 1 - 5</td>
</tr>
<tr>
<td>5.60</td>
<td>Location</td>
<td>The data logger may be located at the same site as the measurement element or at a remote site.</td>
<td>clause 1.3 Type 1 - 5</td>
</tr>
<tr>
<td>5.61</td>
<td>Security</td>
<td>The data logger is to be secure and associated links, circuits and information storage and processing systems are to be secured by means of seals or other devices approved by Western Power.</td>
<td>clause 3.8 Type 1 - 5</td>
</tr>
<tr>
<td>5.62</td>
<td>Processing of data</td>
<td>Data relating to the amount of active energy and reactive energy passing through a connection point must be collated in trading intervals or sub-multiples of a trading interval within the metering installation.</td>
<td>clause 3.16(3) Type 1 - 5</td>
</tr>
<tr>
<td>5.63</td>
<td>Accuracy</td>
<td>The data logger clock is to be referenced to Australian Western Standard Time and maintained to a standard of: Type 1: ±5 seconds, Type 2: ±7 seconds, Type 3 ±10 seconds, Types 4 – 5 ± 20 seconds.</td>
<td>Appendix 1 Table 3 Type 1 - 5</td>
</tr>
<tr>
<td>5.64</td>
<td>Storage</td>
<td>The data logger is to have the capability of storing energy data for a period of at least 35 years.</td>
<td>clause 3.17 Type 1 - 5</td>
</tr>
<tr>
<td>Section</td>
<td>Description</td>
<td>Details</td>
<td></td>
</tr>
<tr>
<td>---------</td>
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<td></td>
</tr>
<tr>
<td>5.65</td>
<td>Western Power must retain energy data in its metering database for each metering point on its network for the periods specified in clause 4.9 of the Code.</td>
<td>clause 4.9 Type 1 - 6</td>
<td></td>
</tr>
<tr>
<td>5.67</td>
<td>Performance</td>
<td>Energy data is required for all trading intervals at a level of availability of at least 99% per annum.</td>
<td></td>
</tr>
<tr>
<td>5.68</td>
<td>Outages</td>
<td>If an outage or malfunction occurs to a data logger, repairs must be made within the period specified in the relevant service level agreement.</td>
<td></td>
</tr>
<tr>
<td>5.69</td>
<td>Communication link</td>
<td>The electronic connection between the data logger and the telecommunications network boundary is classified as a communications link.</td>
<td></td>
</tr>
<tr>
<td>5.70</td>
<td>Equipment</td>
<td>A communications link may consist of a telephone line, network connection, modem or any future communication technology, with an isolation device that is connected to the meter. This communications link facilitates the downloading of interval energy data through a radio communication system, telecommunications network and other communication systems to connect it to Western Power’s metering database system.</td>
<td></td>
</tr>
<tr>
<td>5.73</td>
<td>Modem</td>
<td>A modem is used to connect the metering installation to the telecommunications network at a data logger or metering database.</td>
<td></td>
</tr>
<tr>
<td>5.74</td>
<td>Security</td>
<td>The communication link is to be secure and associated links, circuits and information storage and processing systems are to be secured by means of seals or other devices approved by Western Power.</td>
<td></td>
</tr>
<tr>
<td>5.75</td>
<td>Access to data</td>
<td>The metering installation must be capable of remote electronic access.</td>
<td></td>
</tr>
<tr>
<td>5.76</td>
<td></td>
<td>The metering installation must be capable of local electronic access.</td>
<td></td>
</tr>
<tr>
<td>5.77</td>
<td></td>
<td>To be provided on a device and to display as a minimum the accumulated total active energy measured by that metering installation.</td>
<td></td>
</tr>
<tr>
<td>5.78</td>
<td></td>
<td>The data held in the metering installation is to be protected from direct or remote electronic access by suitable password and security controls.</td>
<td></td>
</tr>
<tr>
<td>5.79</td>
<td>Performance</td>
<td>Energy data is required for all trading intervals at a level of availability of at least 95% per annum.</td>
<td></td>
</tr>
<tr>
<td>5.80</td>
<td>Outages</td>
<td>If an outage or malfunction occurs to a communications link, repairs must be made in accordance with the applicable service level agreement.</td>
<td></td>
</tr>
</tbody>
</table>
### 5.81 Testing and inspection

<table>
<thead>
<tr>
<th>Purchase of metering equipment</th>
</tr>
</thead>
</table>

All Western Power meters must comply with the National Measurement Act and in addition:

- All new purchased **current transformers** must comply with AS60044.1.
- All new purchased **voltage transformers** must comply with AS60044.2.
- All new purchased **meters** must comply with AS1284.
- All new purchased **meters** must comply with the relevant specifications of the National Measurements Institute’s M6.

| clause 3.1 | Type 1 - 6 |

### 5.82

Appropriate test certificates are to be kept by the equipment owner.

| Type 1 - 6 |

### 5.83 Testing of metering equipment

<table>
<thead>
<tr>
<th>Metering equipment will be tested to the following class accuracy and with less than the following uncertainties:</th>
</tr>
</thead>
</table>

- **Class 0.2 CT & VT** 0.05%, 0.05Crad
- **Class 0.2 Wh meter** 0.05/cosφ%
- **Class 0.5 varh meter** 0.2/sinφ%

| Appendix 1 Table 3 | Type 1 |

### 5.84

The uncertainties associated with testing of the components of the **metering installation** may be carried out as follows:

- **CT/VT** in laboratory 0.05%, 0.05Crad
- **Meter Wh in laboratory** 0.05/cosφ%
- **Meter Wh in field** 0.1/cosφ%
- **Meter varh in laboratory** 0.2/sinφ%
- **Meter varh in field** 0.3/sinφ%

### 5.85

The maximum periods between sample testing are to be:

- **CT & VT** - 10 years
- **Burden tests** - When changes are made
- **Meters** - 2 years

Refer to Appendix 2

### 5.86 Metering Installation overall accuracy requirements;

| Appendix 1 | Type 1 |
- At unity *power factor*
  - Energy Rated Load
  - 10% 50% 100%
  - Active 0.7% 0.5% 0.5%

- At 0.866 lagging *power factor*
  - Energy Rated Load
  - 10% 50% 100%
  - Active 0.7% 0.5% 0.5%
  - Reactive 1.4% 1.0% 1.0%

- At 0.5 lagging *power factor*
  - Energy Rated Load
  - 10% 50% 100%
  - Active n/a 0.5% n/a
  - Reactive n/a 1.0% n/a

- At zero *power factor*
  - Energy Rated Load
  - 10% 50% 100%
  - Reactive 1.4% 1.0% 1.0%

The above measurements are referenced to 25°C.

Method of calculating the overall error is the vector sum of the errors of each component parts, that is, \( a + b + c \), where:

- \( a \) = the error of *voltage transformer* and wiring
- \( b \) = the error of the *current transformer* and wiring
- \( c \) = the error of the meter

*energy data for Type 1 metering installations* is usually based on watthour (*active energy*). Where reactive energy is required the *metering installation* must also satisfy the requirements for varhour in this *Metrology Procedure*.

<table>
<thead>
<tr>
<th>Energy Rated Load</th>
<th>10%</th>
<th>50%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>0.7%</td>
<td>0.5%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Reactive</td>
<td>1.4%</td>
<td>1.0%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Active</td>
<td>n/a</td>
<td>0.5%</td>
<td>n/a</td>
</tr>
<tr>
<td>Reactive</td>
<td>n/a</td>
<td>1.0%</td>
<td>n/a</td>
</tr>
<tr>
<td>Reactive</td>
<td>1.4%</td>
<td>1.0%</td>
<td>1.0%</td>
</tr>
</tbody>
</table>
5.87  |  **Metering equipment** will be tested to the following class accuracy and with less than the following uncertainties:
- Class 0.5 CT & VT 0.1%, 0.1% Crad
- Class 0.5 Wh *meter* 0.1/cosΦ%
- Class 1.0 varh *meter* 0.3/sinΦ%

5.88  |  The uncertainties associated with testing of the components of the *metering installation* may be carried out as follows:
- CT/VT in laboratory 0.1%, 0.1 Crad
- *Meter* Wh in laboratory 0.1/cosΦ%
- *Meter* Wh in field 0.2/cosΦ%
- *Meter* varh in laboratory +0.3/sinΦ%
- *Meter* Wh in field +0.4/sinΦ%

5.89  |  The maximum periods between sample testing are to be:
- CT & VT - 10 years
- Burden tests - When changes are made
- *meters* - 4 years

5.90  |  **Metering Installation overall accuracy requirements;**
- At unity *power factor*
  - Energy Rated Load
  - 10% 50% 100%
  - Active 1.4% 1.0% 1.0%
- At 0.866 lagging *power factor*
  - Energy Rated Load
  - 10% 50% 100%
  - Active 1.4% 1.0% 1.0%
  - Reactive 2.8% 2.0% 2.0%
• At 0.5 lagging power factor
  Energy Rated Load
  10% 50% 100%
  Active n/a 1.0% n/a
  Reactive n/a 2.0% n/a
• At zero power factor
  Energy Rated Load
  10% 50% 100%
  Reactive 2.8% 2.0% 2.0%

The above measurements are referenced to 25°C

Method of calculating the overall error is the vector sum of the errors of each component parts, that is, \( a + b + c \), where:

- \( a \) = the error of voltage transformer and wiring
- \( b \) = the error of the current transformer and wiring
- \( c \) = the error of the meter

5.91

**Metering equipment** will be tested to the following class accuracy and with less that the following uncertainties:

- Class 0.5 CT & VT 0.1% .01 Crad
- Class 1.0 Wh meter 0.2/cos\( \Phi \)%
- Class 2.0 varh meter 0.4/sin\( \Phi \)%

5.92

The uncertainties associated with testing of the components of the *metering installation* may be carried out as follows:

- CT/VT in laboratory \( \pm 0.1\% \)
- *Meter* Wh in laboratory \(+0.2/cos\( \Phi \)%\)
- *Meter* Wh in field \(+0.3/cos\( \Phi \)%\)
- *Meter* varh in laboratory \(+0.4/sin\( \Phi \)%\)
- *Meter* Wh in field \(+0.5/sin\( \Phi \)%\)
5.93 The maximum periods between sample testing are to be:
- CT & VT - 10 years
- Burden tests - When changes are made
- Meters - 5 years

5.94 Metering Installation overall accuracy requirements;
- At unity power factor
  Energy Rated Load
  10% 50% 100%
  Active 2.0% 1.5% 1.5%
- At 0.866 lagging power factor
  Energy Rated Load
  10% 50% 100%
  Active 2.0% 1.5% 1.5%
  Reactive 4.0% 3.0% 3.0%
- At 0.5 lagging power factor
  Energy Rated Load
  10% 50% 100%
  Active n/a 1.5% n/a
  Reactive n/a 3.0% n/a
- At zero power factor
  Energy Rated Load
  10% 50% 100%
  Reactive 4.0% 3.0% 3.0%

The above measurements are referenced to 25ºC
Method of calculating the overall error is the vector sum of the errors of each component part, that is, A+B+C, where:

Appendix 1 Table 6
| 5.95 | **A** = the error of voltage transformer and wiring  
| **B** = the error of the current transformer and wiring  
| **C** = the error of the meter |

**Metering equipment** will be tested to the following class accuracy and with less that the following uncertainties:
- Class 0.5 CT 0.1%, 0.5 Crad
- Class 1.0 Wh meter 0.2/cosΦ%
- General Purpose meter 0.3/cosΦ%

**5.96**

The uncertainties associated with testing of the components of the metering installation may be carried out as follows:
- CT in laboratory 0.1%
- CT in field 0.2%
- Meter Wh in laboratory 0.2/cosΦ%
- Meter Wh in field 0.3/cosΦ%

**5.97**

The maximum periods between sample tests are to be:
- CT & VT - 10 years
- Burden tests - When changes are made
- Meters - 5 years
- Whole current (direct connected) General Purpose meter - 7 years

**5.98**

Metering Installation overall accuracy requirements:
- At unity power factor
  - Energy Rated Load
  - 10% 50% 100%
  - Active 2.0% 1.5% 1.5%
- At 0.866 lagging power factor
  - Energy Rated Load

**Type 4 - 6**

Appendix 1 Table 7
| 5.99 | The CTs will be tested to the required class accuracy with less than + 0.1 % uncertainty. The testing of the CTs in the metering installation is carried out as follows: |
| 5.100 | The CT connected meters will be tested to the required class accuracy with less than 0.2/cosφ% uncertainty. |
| 5.101 | The uncertainty associated with testing of the CT connected meters in the metering installation is carried out as follows: |
| 5.102 | The direct connected meters purchased must be tested to the required class accuracy with less than 0.3/cosφ% uncertainty. |
| 5.103 | The uncertainty associated with testing of the whole current connected meters in the metering installation is carried out as follows: |
| 5.104 | The accuracy of the measurement element is to be in accordance with class 1.5 for General Purpose watt hour meters as per AS1284 or in accordance with class 1.0 as per AS1284 or IEC1036 standards. | Type 4 - 6 |
| 5.105 | The metering equipment purchased must be tested to the following class accuracy and with less that the following uncertainties:  
  - General Purpose meter 0.3/cosΦ% | Type 6 |
| 5.106 | The uncertainties associated with testing of the components of the metering installation may be carried out as follows:  
  - Meter Wh in laboratory 0.2/cosΦ %  
  - Meter Wh in field 0.3/cosΦ % | Type 6 |
| 5.107 | The maximum periods between sample tests are to be:  
  - Whole current (direct connected) meter is to be tested in accordance with AS1284.13 and Western Power’s Meter Compliance Testing and Sampling Plan. | Type 6 |
<p>| 5.108 | Testing of the components of the metering installation will be conducted in accordance with AS1284.13 and Western Power’s Meter Compliance Testing and Sampling Plan. | Type 1 - 6 |
| 5.109 | Where practicable, current transformer and voltage transformer tests are based on good electricity industry practice and relevant applicable Australian Standards. | Type 1 - 6 |
| 5.110 | Other affected parties may witness the tests on request. clause 5.21(3) | Type 1 - 6 |
| 5.111 | The test results must be provided as soon as practicable to the requesting code participant. | Type 1 - 6 |
| 5.112 | All reference/calibrated equipment shall be tested to ensure full traceability to Australian national measurement standards through verifying authorities or directly referenced to the National Measurement Laboratory. | Type 1 - 6 |
| 5.113 | The calculations of accuracy based on test results, are to include all reference standard errors. | Type 1 - 6 |
| 5.114 | Inspections of metering equipment | An &quot;estimate of testing uncertainties&quot; must be calculated in accordance with the ISO &quot;Guide to the Expression of Uncertainty for Measurement&quot;. | Type 1 - 6 |
| 5.115 | Inspections of metering equipment | The testing and inspection requirements must be in accordance with AS 1284.13 and Western Power’s Meter Compliance Testing and Sampling Plan. | Type 1 - 6 |
| 5.116 | Inspections of metering equipment | A typical inspection must include: check the seals; compare the pulse counts; compare the direct readings of meters, verify meter parameters and physical connections, verify current transformer ratios by comparison. | Type 1 - 6 |
| 5.117 | Actions in event of non-compliance | If the accuracy of metering installation types 1, 2 &amp; 3 do not comply with the requirements of the Code, the affected parties must be advised as soon as practicable of the errors detected and the possible duration of the existence of errors. Western Power will ensure the restoration of the accuracy of the metering installation in accordance with electricity industry best practice or the applicable service level agreement. | clause 5.21(11) |
| 5.118 | Actions in event of non-compliance | If the accuracy of the metering installation does not comply with the requirements of the Code, the retailer must be advised as soon as practicable of the errors detected and the possible duration of the existence of errors, and arrange for the accuracy of the metering installation to be restored in a time frame agreed with the retailer in accordance with the applicable service level agreement. | clause 5.21(11) |
| 5.119 | Actions in event of non-compliance | If a test or audit of the metering installation demonstrates an error of measurement of less than those detailed in the meter management plan, no substitution of readings is required unless in Western Power’s opinion a particular party would be significantly affected if no substitution was made. | Type 1 - 6 |
| 5.120 | Actions in event of non-compliance | If a metering installation test, inspection or audit demonstrates errors in excess of those prescribed, meter accounts shall be determined in accordance with Section 65 of the Energy Operators (Powers) Act 1979, which specifies that where the time at which those errors arose is not known, the error is deemed to have occurred at a time half way between the time of the most recent test or inspection which demonstrated that the metering installations, or the meter family to which the meter of the meter installation belongs, complied with the relevant accuracy requirement and the time when the error was detected. | Type 1 - 4 |
| 5.121 | Actions in event of non-compliance | If a metering installation test, inspection or audit demonstrates errors in excess of those prescribed and the time at which those errors arose is not known, the error is deemed to have occurred at a time half way between the time of the most recent test or inspection which demonstrated that the metering installations, or the meter family to which the meter of the meter installation belongs, complied with the relevant accuracy requirement and the time when the error was detected. | Type 5 - 7 |</p>
<table>
<thead>
<tr>
<th>Clause</th>
<th>Management, maintenance and auditing</th>
<th>Installation and maintenance</th>
<th><strong>Western Power</strong> must ensure that any <strong>metering equipment</strong> installed is suitable for the range of operating conditions to which it will be exposed (e.g. temperature; impulse levels), and operates within the defined limits for that equipment.</th>
<th>clause 3.5(3)(c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.123</td>
<td>Supporting information</td>
<td>Suitable supporting information, including drawings, if applicable, detailing the <strong>metering installation</strong>, must be available for maintenance and auditing purposes. This information shall be stored in an appropriate depository managed by <strong>Western Power</strong>.</td>
<td></td>
<td>clause 3.12(4)</td>
</tr>
<tr>
<td>5.124</td>
<td>Security controls</td>
<td>Provide and maintain the security controls of a <strong>metering installation</strong>.</td>
<td></td>
<td>clause 3.8</td>
</tr>
<tr>
<td>5.125</td>
<td></td>
<td>The <strong>energy data</strong> held in the <strong>metering installation</strong> is to be protected from direct local or remote electronic access by suitable password and security controls.</td>
<td></td>
<td>clause 4.8(4)(a)</td>
</tr>
<tr>
<td>5.126</td>
<td></td>
<td><strong>Western Power</strong> must keep records of electronic access passwords secure.</td>
<td></td>
<td>clause 4.8(5)(b)</td>
</tr>
<tr>
<td>5.127</td>
<td></td>
<td><strong>Energy data, standing data</strong> and passwords are confidential and are to be treated as confidential information.</td>
<td></td>
<td>clause 7.4(1)</td>
</tr>
<tr>
<td>5.128</td>
<td></td>
<td>A <strong>Registered Metering installation Provider</strong> must be accredited by and registered with <strong>Western Power</strong> under a registration scheme approved by the <strong>Authority</strong>, and only for the type of work the Registered Metering installation Provider is qualified to provide.</td>
<td></td>
<td>clause 6.9</td>
</tr>
<tr>
<td>5.129</td>
<td></td>
<td>Where relevant, Registered Metering installation Providers, who wish to apply for categories of Registered Metering installation Provider accreditation of metering installations, must be able to exhibit, to the reasonable satisfaction of <strong>Western Power</strong>, the relevant capabilities.</td>
<td></td>
<td>clause 6.9</td>
</tr>
</tbody>
</table>
6  

**Metering Installation Types 1 - 5 – Validation**

6.1  
**Requirement to Validate**

6.1.1  The *energy data* from Types 1-5 *metering installations* is required to be validated, in accordance with this section.

6.2  
**Validation of energy data from Types 1-5 Metering Installations with Check Metering**

6.2.1  The following checks apply to *energy data* from all *metering installations* of Types 1-5 which have full *check metering*. Where discrepancies are identified between the revenue, check and SCADA validation due to inherent SCADA lower accuracies and technical losses, these discrepancies and validation errors may not be substituted and/or replaced.

   a)  The *energy data* must agree with the check *meter* reading to within the uncertainty limits of both *meters*. I.e.

   \[
   \frac{|R - C'|}{R + C'} \times 100 \leq |\Delta RC|
   \]

   Where

   - $|R-C'|$ means the absolute value of $R-C'$.
   - $R$ is the *revenue meter* reading for the *data stream*, expressed in *energy units*.
   - $C'$ is the associated *check meter* reading, expressed in *energy units*, and adjusted for known losses or systemic errors such as *transformer losses*.
   - $\Delta RC$ is the maximum discrepancy between the revenue and check *meter* expressed as a percentage and with a maximum value of 1%.

   b)  Where the *energy data* is associated with a *market generator* then it must be validated against *SCADA data* as follows:

   1. *Western Power* must construct a *validation* algorithm that will facilitate comparison of interval *data* on a per interval basis.

   2. *Western Power* must construct an appropriate *validation* algorithm as the *SCADA data* may be derived from a different measurement point, be of different interval collection and/or have a different base unit of measurement (e.g. power not *energy value*) with allowances for a larger error of measurement.

   3. *Western Power* is only required to undertake *validation* of metering *data* against the *SCADA data* on the primary *data channel*, e.g. only 'B' for *generators* and 'E' channel *validation* for *loads* if applicable.

   4. *Western Power* may conduct an analysis of the historical metering *data* for each *connection point* to ascertain what percent error differences between metering *data* and *SCADA data* is considered acceptable. *Western Power* may use this information to refine *validation* algorithms where applicable. Where discrepancies are identified between revenue
and SCADA validation due to inherent SCADA lower accuracies and technical losses, higher percentage error differences may occur and result in specifically assigned error percentages per connection point.

SCADA Data Algorithm to validate Metering Data:

\[
\frac{|R - S'|}{(R + S')/2} \times 100 \leq |\Delta RS|
\]

Where

- \( |R-S'| \) means the absolute value of R-S'.
- \( R \) is the revenue meter reading for the data stream, expressed in energy units.
- \( S' \) is the associated check meter reading, converted to energy units, and adjusted for known losses or systemic errors such as transformer losses.
- \( \Delta RS \) is the maximum discrepancy between the revenue and check meter expressed as a percentage.

c) Check all interval meter data against nominated maximum value. The value must be less than the registered maximum value of Wh, Varh or VAh for the metering installation data stream. Maximum Varh checks may be performed as follows:

1. For CT metering installations the maximum value is to be initially defined by the applied CT ratio. However, the actual value may exceed the registered maximum value of the CT due to the ability of the CT to be able to accommodate loads in excess of their maximum capacity (i.e. 200%). Where this occurs, Western Power may deem the energy flow as true and correct. When determining data flows on a per installation basis, the maximum value may be increased to cater for situations where it has been confirmed that the CT is overloaded on a short term basis.

2. For whole current meters the maximum value is to be set to the rating of the meter.

d) Western Power and the user will agree to either:

1. Check the metered value is greater than the registered minimum value for the metering installations, or

2. Check that the number of intervals with zero data is less than a specified number over a period of time that is deemed practicable and in alignment with good electricity industry practice.

e) If an interval has a null value then the reading for that interval will be rejected, placed into exception for review, or substituted.

f) If the meter has registered significant meter alarms over the period since the last successful read, the energy data for the affected intervals may be validated and placed into exception for review pending an assessment of the significance of the alarm. The list of alarms that will be processed is provided in Section 10.

g) Where apparent, reactive and active energy are all available, these must be checked for consistency. i.e.
\[
\frac{|(A^2 + R^2) - W^2|}{\left(\frac{(|A^2 + R^2| + |W^2|)}{2}\right)} \times 100 \leq |\Delta ARW| 
\]

Where,

- \(|(A^2 + R^2) - W^2|\) means the absolute value of \((A^2 + R^2) - W^2\).
- \(A\) is the data stream reading for active energy.
- \(R\) is the data stream reading for reactive energy.
- \(W\) is the data stream reading for apparent energy.
- \(\Delta ARW\) is the maximum discrepancy in the apparent energy, expressed as a percentage and with a maximum value of 1%.

h) The sum of the interval data readings must agree with the accumulated total for the meter for active and reactive energy data streams. i.e.

\[
\frac{\left|\sum_{i=1}^{n} R_i - A'\right|}{\left(\frac{\sum_{i=1}^{n} R_i + A'}{2}\right)} \times 100 \leq |\Delta RA| 
\]

Where,

- \(|\sum_{i=1}^{n} R_i + A'|\) means the absolute value of \(\sum_{i=1}^{n} R_i + A'\).
- \(R_i\) is the data stream reading for interval \(i\), expressed in energy units.
- \(n\) is the total number of intervals in the period.
- \(A'\) is the reading from the associated accumulated energy registers, adjusted for any known systemic error.
- \(\Delta RA\) is the maximum discrepancy between the sum of the interval readings and the accumulation register expressed as a percentage and with a maximum value of 1%.
6.3 Validation of energy data from Types 1 - 5 Metering Installations with Partial Check Metering

6.3.1 The following checks apply to energy data from all metering installations of Types 1-5 which have partial check metering.

a) The energy data must agree with the check meter reading to within the uncertainty limits of both meters. \[\left(\frac{|R - C'|}{(R + C')/2}\right) \times 100 \leq |\Delta RC|\]

Where

- \(|R-C'|\) means the absolute value of R-C'.
- \(R\) is the revenue meter data stream reading, expressed in energy units.
- \(C'\) is the associated check meter reading, expressed in energy units, and adjusted for known losses or systemic errors such as transformer losses.
- \(\Delta RC\) is the maximum discrepancy between the revenue and check meter expressed as a percentage and with a maximum value of 1%.

b) Where the energy data is associated with a market generator then it must be validated against SCADA data.

\[\left(\frac{|R - S'|}{(R + S')/2}\right) \times 100 \leq |\Delta RS|\]

Where

- \(|R-S'|\) means the absolute value of R-S'.
- \(R\) is the revenue meter reading for the data stream, expressed in energy units.
- \(S'\) is the associated check meter reading, converted to energy units, and adjusted for known losses or systemic errors such as transformer losses.
- \(\Delta RS\) is the maximum discrepancy between the revenue and check meter expressed as a percentage.

c) Check all interval meter data against nominated maximum value. The value must be less than the registered maximum value of Wh, Varh or VAh for the metering installation data stream. Maximum Varh checks may be performed as follows:

1. For CT metering installations the maximum value is to be initially defined by the applied CT ratio. However, the actual value may exceed the registered maximum value of the CT due to the ability of the CT to be able to accommodate loads in excess of their maximum capacity (i.e. 200%). Where this occurs, Western Power may deem the energy flow as true and correct. When determining data flows on a per installation basis, the maximum value may be increased to cater for situations where it has been confirmed that the CT is overloaded on a short term basis.

Page 40 of 69
2. For whole current meters the maximum value is to be set to the maximum ampere rating of the meter.

d) Western Power and the user will agree to either:
   1. Check the metered value is greater than the registered minimum value for the metering installations, or
   2. Check that the number of intervals with zero data is less than a specified number over a period of time that is deemed practicable in alignment with good electricity industry practice.

e) If an interval has a null value then the reading for that interval will be rejected, placed in exception for review or substituted.

f) If the meter has registered significant meter alarms over the period since the last successful read, the energy data for the affected intervals may be validated and placed into exception for review pending an assessment of the significance of the alarm. The list of alarms that will be processed is provided in Section 10.

g) The sum of the active and reactive interval energy data readings must agree with the accumulated total for the meter, i.e.

\[
\frac{\left\{ \sum_{i=1}^{n} R_i \right\} - A'}{\sum_{i=1}^{n} R_i + A'} \times 100 \leq |\Delta RA|
\]

Where,

- \( |\left\{ \sum_{i=1}^{n} R_i \right\} - A'| \) means the absolute value of \( \left\{ \sum_{i=1}^{n} R_i \right\} - A' \).
- \( R_i \) is the data stream reading for interval \( i \).
- \( n \) is the total number of intervals in the period.
- \( A' \) is the reading from the associated accumulated energy registers, adjusted for any known systemic error.
- \( \Delta RA \) is the maximum discrepancy between the sum of the interval readings and the accumulation register expressed as a percentage and with a maximum value of 1%.

h) Where apparent, reactive and active energy are all available, these must be checked for consistency, i.e.
\[ \frac{\left| A^2 + R^2 - W^2 \right|}{2} \times 100 \leq |\Delta ARW| \]

Where,

- \( | \left( A^2 + R^2 \right) - W^2 | \) means the absolute value of \( A^2 + R^2 - W^2 \)
- A is the data stream reading for active energy.
- R is the data stream reading for reactive energy.
- W is the data stream reading for apparent energy.
- \( \Delta ARW \) is the maximum discrepancy in the apparent energy, expressed as a percentage and with a maximum value of 1%.

### 6.4 Validation of energy data from Types 1 - 5 Metering Installations without Check Metering

#### 6.4.1

The following checks apply to energy data from all metering installations of Types 1-5 which have no check metering:

a) Check all interval meter data against nominated maximum value. The value must be less than the registered maximum value of Wh, Varh or VAh for the metering installation. Maximum Varh checks may be performed as follows:

1. For CT metering installations the maximum value is to be initially defined by the applied CT ratio. However, the actual value may exceed the registered maximum value of the CT due to the ability of the CT to accommodate loads in excess of their maximum capacity (i.e. 200%). Where this occurs, Western Power may deem the energy flow as true and correct. When determining data flows on a per installation basis, the maximum value may be increased to cater for situations where it has been confirmed that the CT is overloaded on a short term basis.

2. For whole current meters the maximum value is to be set to the maximum ampere rating of the meter.

b) Western Power and user will agree to either:

1. Check the metered value is greater than the registered minimum value for the metering installations, or

2. Check that the number of intervals with zero data is less than a specified number over a period of time that is deemed practicable in alignment with good electricity industry practice.

c) If an interval has a null value then the reading for that interval will be rejected, placed into an exception for review or substituted.

d) If the meter has registered significant meter alarms over the period since the last successful read, the energy data for the affected intervals may be validated.
and placed into exception for review pending an assessment of the significance of the alarm. The list of alarms that will be processed is provided in Section 10.

e) The sum of the interval energy data readings must agree with the accumulated total for the meter for active energy and reactive energy data streams, i.e.

\[
\frac{\left( \sum_{i=1}^{n} R_i \right) - A'}{\left( \frac{\sum_{i=1}^{n} R_i + A'}{2} \right)} \times 100 \leq |\Delta RA|
\]

Where,

\[ |\left( \sum_{i=1}^{n} R_i \right) - A'| \text{ means the absolute value of } \left( \sum_{i=1}^{n} R_i \right) - A'. \]

\[ R_i \text{ is the data stream reading for interval } i. \]

\[ n \text{ is the total number of intervals in the period.} \]

\[ A' \text{ is the reading from the associated accumulated energy registers, adjusted for any known systemic error.} \]

\[ \Delta RA \text{ is the maximum discrepancy between the sum of the interval readings and the accumulation register expressed as a percentage and with a maximum value of 1%}. \]

f) Where apparent, reactive and active energy are all available, these must be checked for consistency, i.e.

\[
\frac{\left( A^2 + R^2 \right) - W^2}{\left( \frac{\left( A^2 + R^2 \right) + W^2}{2} \right)} \times 100 \leq |\Delta ARW|
\]

Where,

\[ |\left( A^2 + R^2 \right) - W^2 | \text{ means the absolute value of } \left( A^2 + R^2 \right) - W^2. \]

\[ A \text{ is the data stream reading for active energy.} \]

\[ R \text{ is the data stream reading for reactive energy.} \]

\[ W \text{ is the data stream reading for apparent energy.} \]
\( \Delta ARW \) is the maximum discrepancy in the apparent energy, expressed as a percentage and with a maximum value of 1%.
7 Metering installation Types 1 - 5 – Accumulation, Substitution and Estimation

7.1 Requirement to Accumulate Energy Data to Trading Intervals

7.1.1 Where energy data is recorded in fifteen-minute intervals this must be accumulated to half-hourly values to coincide with the trading interval in accordance with section 7.3.

7.2 Requirement to Provide Substituted or Estimated Energy Data

7.2.1 When energy data is required to be substituted or estimated Western Power will use the following substitution methods:

a) 11, 12, 13, 14, 15, 16, 17 and 18 for metering installation Types 1-4.

b) 51, 52, 53, 54, 55 and 56 for Type 5 metering installations.

c) 61, 62, 63, 64, 65 for Type 6 metering installations.

d) 71, 72, 73, 74 for Type 7 metering installations.

7.2.2 For connection points classed as generators:

a) Western Power may directly undertake method 11, 12 or 13 substitutions as a consequence of missing or erroneous metering data that has failed validation.

b) Western Power may undertake method 16 and 18 substitutions (agreed/alternate method) following consultation and agreement with the generator participant to ensure that the substituted data is an accurate reflection of the energy intervals concerned.

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

7.2.3 Western Power must not perform substitution of method 18, 55, 56, 64 and 74 without the prior agreement of the affected parties.

7.2.4 Western Power will notify affected code participants where substituted energy data is used via the quality flag in the data file format.

7.2.5 Western Power will notify affected code participants of the method of substitution used via the method flag in the data file format.

7.2.6 Western Power will notify affected code participants of errors and alarms associated with the energy data via the reason code as listed in Section 10 in the data file format.

7.2.7 Where one or more of the readings making up the interval energy data in accordance with section 3.1.8 has failed validation and been substituted, this will be reflected in the reason code, quality flags, and, where relevant, method flags of the interval energy data reported under section 7.2.5. The alarm status will be reported in accordance with Section 10.

7.2.8 Western Power must ensure that for all substitution methods, substituted energy data is based on an actual meter reading, and is not based on energy data that has previously been estimated or substituted.

7.2.9 Where a substitution method requires the use of historical data, the data source for historical data shall be data stream specific rather than meter specific.
### 7.3 Accumulation of data to trading intervals

#### 7.3.1 The formulae used for converting fifteen-minute interval readings to half-hourly interval readings are as listed in the following table:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Half-Hourly (HH) Consumption</td>
<td>HH Consumption at interval ( i+1 ) = sum (Consumption at Quarter-Hourly (QH) interval ( i ), Consumption at QH interval ( i+1 ))</td>
</tr>
<tr>
<td></td>
<td>(I.e. Add the reading values (kWh) of the two adjacent QH intervals to form the HH Consumption for the HH interval. For example, QQ Consumption @ 00:15 = 20 kWh QQ Consumption @ 00:30 = 50 kWh then HH Consumption @ 00:30 = 70 kWh)</td>
</tr>
<tr>
<td>HH Demand</td>
<td>HH Demand can be determined when data for HH Consumption is present HH Demand in kW at interval ( i+1 ) = HH Consumption in kWh at interval ( i+1 ) x 2</td>
</tr>
<tr>
<td>HH Reactive Energy</td>
<td>HH Reactive Energy at interval ( i+1 ) = sum (Reactive Energy at QH interval ( i ), Reactive Energy at QH interval ( i+1 ))</td>
</tr>
<tr>
<td></td>
<td>(I.e. Add the reading values (kVARh) of the two adjacent QH intervals to form the HH Reactive Energy for the HH interval. For example , QQ Reactive Energy @ 00:15 = 20 kVARh QQ Reactive Energy @ 00:30 = 50 kVARh then HH Consumption @ 00:30 = 70 kVARh)</td>
</tr>
<tr>
<td>HH Apparent Energy</td>
<td>HH Apparent Energy at interval ( i+1 ) is not calculated from quarter-hourly readings but is derived when data for HH Consumption and HH Reactive Energy are present. HH Apparent Energy in kVAh at interval ( i+1 ) = ( \sqrt{HH} ) Consumption^2 + HH Reactive Energy^2</td>
</tr>
</tbody>
</table>
Variable | Formula
---|---
| The units of Consumption = kWh
| The units of Reactive Energy = kVArh

**Power Factor**

*Power Factor* can only be determined when *data* for HH Consumption and HH Apparent Energy are present.

\[
\text{Power Factor} = \frac{\text{HH Consumption in kWh}}{\text{HH Apparent Energy in kVArh}}
\]

The Power Factor should be 0 and 1 inclusive.

---

### 7.4 Substitution and Estimation Methods for *Metering Installation* Types 1-4

#### 7.4.1 Substitution Method 11

*Interval energy data* obtained from another *meter* at the same measurement point for the same interval *data* periods as that being substituted for may be used for substitution purposes, e.g. installations where revenue and check *meters* are installed.

Method 11 substitutions also include the use of *data* from similar *meters* where the *load* profile of the second *meter* is a good match to the *load* profile of the *meter* for which substitutions are being made, e.g. where *meters* are installed on each end of a transmission line where the difference due to line losses can be accurately determined; or where *meters* are installed on parallel feeders where *supply* is ‘to’ and ‘from’ common buses and line impedances are similar.

#### 7.4.2 Substitution Method 12

*Data* values may be calculated for an unknown feed to a node based on the other known *energy* flows to or from that node.

#### 7.4.3 Substitution Method 13

*Data* from an *energy* management system or *SCADA data* shall only be used for substitution purposes where the *data* originates from a similar measurement point to the *meter* for which substitutions are being made.

*Data* from an *energy* management system or *SCADA data* may be *data* which is inferior in accuracy or resolution and which is in a dissimilar format to the *energy data*, (e.g. 30 Min. *demand values*). Where necessary the *data* will be adjusted in both magnitude and form in order that the substitution is of an acceptable quality.

#### 7.4.4 Substitution Method 14

Where *data* substitution methods 11, 12, and 13 cannot be carried out, *Western Power* may *substitute* the missing *data* using the “Nearest Equivalent Day” or “Like Day” method, as detailed in the table below.
METHOD 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>

Substitutions for ‘Like Day’ to be as detailed above, unless:

1) If no readings are available on the first listed day, then the next listed preferred day is to be used,
2) The substitution day was a public holiday, in which case the most recent Sunday is to be used,
3) The substitution day was not a public holiday and the ‘Like Day’ is a public holiday, the substitution ‘Like Day’ to be used must be the most recent business day.

♦♦ Occurring in the week preceding that in which the substitution day occurs.
♦ Occurring in the same week as the substitution day

7.4.5 Substitution Method 15

Where data substitution methods 11, 12, and 13 cannot be carried out, Western Power may substitute the missing data using the “Nearest Equivalent Day” or “Like Day” method, as detailed in the table below.

METHOD 15

The intervals to be substituted will be plugged using an average of each interval from the proceeding 4 weeks, or part thereof.

This averaging technique may be applied in the following ways:

1) The averaged intervals are simply ‘plugged’ into the intervals requiring substitution, or
2) The averaged intervals are used to provide the profile for the intervals requiring to be ‘plugged’ to a predetermined number of pulses for the total substitution period.

However if data is required to be substituted for a public holiday then the most recent available Sunday will be used.

7.4.6 Substitution Method 16

Where data substitution is required for any period greater than 7 days, consideration, consultation and agreement may take place between the affected parties to resolve any abnormal equivalent days that may be applicable. In the interests of practicality, Western Power may use other substitution methods without consultation for periods greater than 7 days in alignment with good electricity industry practice. Where a code participant identifies discrepancies in the substitution method used, it may request Western Power to resolve those discrepancies or request an alternative substitution method is used.
Method 16 substitutions are:

i. *Data* substitutions of any format for periods greater than 7 days that are based on an agreement between all the affected parties.

ii. Changes to existing substitutions for any period that are carried out where the affected parties have directed that as a result of site or *customer* specific information, the original substitutions are in error.

7.4.7 Substitution Method 17

*Data* substitutions for periods up to, but not exceeding 2 hours, may be carried out by simple linear interpolation.

7.4.8 Substitution Method 18

This substitution method covers the situation where an alternate method of substitution has been agreed with the *code participant*, the applicable *user* and Western Power. This may be a globally applied method or a site specific method where an adjusted profile is used to take into account local conditions which affect consumption (e.g. local holiday, not energised *connection point* or *customer* shutdown), or where alternate *data* may be able to be used for quality checks and minor adjustments of an estimated profile such as using *meter register data*.

a) Not Energised *Metering Points*

For *metering points* that are active but in the status of “Not Energised”, Western Power will apply a *substitute* reading of zero for any day(s) the *metering point* has “Not Energised” status. Substitution method 18, in conjunction with the appropriate reason code will be provided by *Western Power*.

7.5 Substitution and Estimation Methods for *Metering Installation* Type 5

7.5.1 Substitution Method 51

This method is known as the “Previous Year” Method. *Western Power* substitutes the missing *data* by using the “Nearest Equivalent Day” or “Like Day” method, as detailed in the table below.

<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 ♦♦ Monday ♦</td>
</tr>
<tr>
<td>Tuesday</td>
<td>Tuesday ♦♦ Wednesday ♦♦ Tuesday ♦ Wednesday ♦</td>
</tr>
<tr>
<td>Wednesday</td>
<td>Wednesday ♦♦ Tuesday ♦♦ Thursday ♦♦ Wednesday ♦ ♦ Tuesday ♦</td>
</tr>
<tr>
<td>Thursday</td>
<td>Thursday ♦♦ Wednesday ♦♦ Tuesday ♦♦ Thursday ♦ ♦ Wednesday ♦ ♦ Tuesday ♦</td>
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<td>Friday</td>
<td>Friday ♦♦ Friday ♦</td>
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<tr>
<td>Saturday</td>
<td>Saturday ♦♦ Saturday ♦</td>
</tr>
<tr>
<td>Sunday</td>
<td>Sunday ♦♦ Sunday ♦</td>
</tr>
</tbody>
</table>

Substitutions for ‘Like Day’ to be as detailed above, unless:

1. If no readings are available on the first listed day, then the next listed preferred day is to be
7.5.2 Substitution Method 52

This method is known as the Previous Meter Reading Method. Western Power substitutes the missing data by using the “Nearest Equivalent Day” or “Like Day” method, as detailed in the table below.

<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 ♦♦ 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>

Substitutions for ‘Like Day’ to be as detailed above, unless:

1. If no readings are available on the first listed day, then the next listed preferred day is to be used.
2. The substitution day was a public holiday, the most recent Sunday is to be used.
3. The substitution day was not a public holiday and the ‘Like Day’ is a public holiday, the substitution ‘Like Day’ to be used must be the most recent business day.

♦♦ Occurring in the last whole week of the previous meter reading period.
♦ Occurring in the week preceding the last whole week of the previous meter reading period.

7.5.3 Substitution Method 53

Where data substitution is required for any period greater than 7 days, consideration, consultation and agreement must take place between the affected parties to resolve any abnormal equivalent days that may be applicable. In the interests of practicality, Western Power may use other substitution methods without consultation for periods greater than 7 days in alignment with good electricity industry practice. Where a code participant identifies discrepancies in the substitution method used, it may request Western Power to resolve those discrepancies or request an alternative substitution method is used.
Method 53 substitutions are:

i. *data* substitutions of any format for periods greater than 7 days that are based on an agreement between all the affected parties;

ii. changes to existing substitutions for any period that are carried out where the affected parties have directed that as a result of site or *customer* specific information, the original substitutions are in error.

7.5.4 Substitution Method 54

*Data* substitutions for periods up to, but not exceeding 2 hours, may be carried out by simple linear interpolation.

7.5.5 Substitution Method 55

This substitution method covers the situation where an alternate method of substitution has been agreed with the *code participant*, the applicable *user* and *Western Power*. This may be a globally applied method or a site specific 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 *data* may be used for quality checks and minor adjustments of an *estimated* profile such as using *meter register* *data*.

a) Not Energised Metering Points

For *metering points* that are active but in the status of “Not Energised”, *Western Power* will apply a *substitute* reading of zero for any day(s) the *metering point* has “Not Energised” status. Substitution method 55, in conjunction with the appropriate reason code will be provided by *Western Power*.

7.5.6 Substitution Method 56

This substitution method covers the situation where a substitution for *interval energy data* is required for a period prior to the first *meter* read. The *data* substitution must be done by a method agreed to by *Western Power* and the relevant *code participant*. 
8 **Metering Installation** Type 6 – Validation, Substitution and Estimation

8.1 **Requirement to Validate Meter Readings**

8.1.1 *Actual meter* readings will be required to be validated in accordance with section 3.4.2. The **validation** rules that will be applied to the **energy data** read from the **meter** of a Type 6 **metering installation** are:

   a) **Energy data** value is numeric.
   b) **Energy data** value is greater than or equal to the minimum value specified for that **meter**.
   c) **Energy data** value is less than or equal to the maximum value specified for that **meter**.
   d) **Meter** read date > previous **meter** read date.
   e) **Meter** read value is not missing (null) for any Type 6 **meter**.
   f) Dial capacity, rollover and decimal point check. A register will be deemed to have failed a rollover check where the calculated value from a rollover exceeds 50% of the register capacity.

8.2 **Requirement to Produce Substituted or Estimated Energy Data**

8.2.1 In accordance with section 3.4.3 c), **energy data** for a Type 6 **metering installation** may be required to be substituted or estimated.

8.3 **Western Power Obligations**

8.3.1 When the **energy data** is required to be substituted or estimated, **Western Power** may use substitution methods 61, 62, 63, 64 or 65, as defined in section 8.4.

8.3.2 **Western Power** will notify affected **code participants** where substituted **energy data** is used via the status flag in the **data** file format.

8.3.3 **Western Power** will as far as reasonably practicable, ensure that for all substitution types for Type 6 **metering installations**, substituted **energy data** is not based on **energy data** that has previously been estimated or substituted.

8.3.4 **Western Power** may substitute or estimate readings in conjunction with an actual read to determine the point of reference to enable calculation of the **average daily consumption** for a new substitution reading. **Western Power** may apply an actual read as a reference point for substitution to ensure any substitution applied is not based on a prior substituted or estimated reading.

8.3.5 Where a substitution method requires the use of historical **data**, the **data** source for historical **data** shall be **data** specific rather than **meter** specific.

8.4 **Substitution and Estimation Methods**

8.4.1 Substitution/Estimation method 61 – “Previous Year” Method
a) Value = \(\text{Average daily consumption from same, or similar, meter read period last year } \times \text{Number of days required to be substituted}\)

b) *Western Power* may establish additional internal procedures to reflect a more accurate assessment of the customer’s consumption.

8.4.2 Substitution/Estimation Method 62 – Previous Meter Reading Method

a) Value = \(\text{Average daily consumption from previous meter read period } \times \text{Number of days required to be substituted}\)

b) Where the *scheduled meter reading* frequency is less frequent than monthly, substitution method 62 is to be used only when the consumption data from the same, or similar, meter read period last year is not available.

c) *Western Power* may define additional internal procedures to reflect a more accurate assessment of the customer’s consumption.

8.4.3 Substitution/Estimation Method 63 – Customer Class Method

a) Value = \(\text{Average daily consumption for the same customer class with the same type of usage for this period } \times \text{Number of days required to be substituted}\)

b) Substitution method 63 is to be used only when the consumption data from the same, or similar, meter read period last year and the consumption data from the previous meter read period are not available.

c) *Customer* classes for substitution method 63 are:

i. Residential.

ii. Non-Residential.

iii. Farm.

iv. Public Lighting, or

v. As defined in the latest *Communication Rules* Build Pack or other approved metering documentation.

c) The usage types for substitution method 63 are:

i. Peak.

ii. Off-peak, or

iii. As appropriate to the metering configuration.

d) *Western Power* may define additional internal procedures to reflect a more accurate assessment of the customer’s consumption.

8.4.4 Substitution/Estimation Method 64 – Agreed Method

a) The *code participant*, the applicable *user* and *Western Power* may agree to use another method of substitution (which may be a modification of an existing substitution method) where none of the existing substitution methods are applicable.

b) The specifics of this substitution method may involve a globally applied method or a site-specific method.

c) The *code participant*, applicable *user* and *Western Power* may agree to use a globally applied substitution method in advance of its application.
d) The code participant, applicable user and Western Power may agree to amend a site-specific substitution method upon receipt of more accurate information relating to the site.

e) For metering points that are active but in the status of “Not Energised”, Western Power will apply a substituted reading that will equal zero consumption for any day(s) the metering point has “Not Energised” status. Substitution method 64, in conjunction with the appropriate reason code will be provided by Western Power.

f) For metering points that contain bi-directional flows, Western Power will apply a substitute reading that will equal zero generation over the schedule reading period for the import channels. Export channels will be substituted in accordance with section 8.4 of the Metrology Procedure. Western Power, under clause 5.24(4) of the Code, must consider a reasonable request from a retailer to replace a substituted value for bi-directional flows for an import channel, as outlined in clauses 5.22(5)(a) and (c) of the Code.

8.4.5 Substitution/Estimation Method 65 – Estimation by Average Daily Consumption

a) Value = Average daily consumption × Number of days required to be substituted.

b) Substitution method 65 is to be used only when the consumption from the same, or similar, meter read period last year and the consumption from the previous meter read period are not available.

c) The average daily consumption is a configurable attribute of the load, as agreed with the retailer.
9 Metering Installations Type 7 – Validation, Substitution and Estimation

9.1 Requirements to Validate

9.1.1 The substitution and estimation types detailed in clauses A3.6 and A3.7 of Appendix 3 of the Code are to be undertaken by Western Power for the calculation, substitution and delivery of metering data from a metering installation Type 7.

9.1.2 Nothing in this Metrology Procedure requires Western Power to modify or change Type 7 meter consumption calculations agreed between Western Power and Synergy on 16 May 2013. Type 7 meter consumption calculations will continue to be made by the methods and systems in place, and agreed, on that date. The agreed method is substitution method 74 under the Metering Code and this Metrology Procedure.

The metering installation and metering database associated with each Type 7 meter are the systems in use as at 16 May 2013, or unless as otherwise agreed between Synergy with customers with Type 7 metering installations and Western Power.

9.2 Type 7 Substitution Rules

9.2.1 Western Power must carry out all metering data substitutions and estimations in accordance with this Metrology Procedure.

9.2.2 Western Power 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.

9.2.3 Western Power must ensure that all metering data substitutions and estimations are based on calculated metering data and not on any previous substitutions.

9.2.4 Western Power must base calculated metering data for Type 7 metering installations in accordance with the Communication Rules Build Pack and specifically the Streetlights and UMS Data CSV File Specification documents, as outlined in section 3.5.5:

   a) Where the specification has not been updated for the period concerned, calculated metering data must be based on the most recent available information and provided as an estimated value.
   b) Where the specification is correct for the period concerned, the calculated metering data must be provided as an actual value.
   c) Where the specification in (b) above has a subsequent update for the period concerned, the calculated metering data must be provided as a substituted value.

9.2.5 Subject to clause A3.7 of Appendix 3 of the Code, Western Power may apply substitution and estimation methods 71, 72, 73, or 74.

9.2.6 Western Power must notify the retailer for the connection point of any calculated metering data substitution within 2 business days of the calculated metering data substitution being carried out. Notification is achieved via the participant metering data file as detailed in accordance with the Communication Rules Build Pack and specifically the Streetlights and UMS Data CSV File Specification documents.

9.2.7 Western Power may flag all calculated metering data substitutions as final (F).
9.3 Substitution and Estimation Methods

9.3.1 Method 71 - Recalculation

*Western Power* must *substitute* calculated metering *data* with the calculated metering *data* obtained by a recalculation based on the current specification in accordance with the *Communication Rules* Build Pack and specifically the Streetlights and UMS Data CSV File Specification documents.

9.3.2 Method 72 - Revised Specification

Where the error in the calculated metering *data* is due to errors in the specification outlined in the *Communication Rules* Build Pack or the UMS Data CSV File Specification documents *Western Power* 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.

9.3.3 Method 73 - Revised Algorithm

Where the error in the calculated metering *data* is due to an error in the algorithm, *Western Power* must *substitute* the most recent calculated metering *data* for which there was no error.

9.3.4 Method 74 - Agreed Method

*Western Power* has agreed this method of calculating metering *data* substitution (which may be a modification of an existing substitution type), in accordance with the *Communication Rules* Build Pack and specifically the Streetlights and UMS Data CSV File Specification documents.

9.4 Validation for Type 7 – Registration Process

9.4.1 *Western Power* must validate the calculated metering *data* on registration of all Type 7 metered sites to verify consistency with the specifications in accordance with the *Communication Rules* Build Pack and specifically the Streetlights and UMS Data CSV File Specification documents.

9.5 Validation of Type 7 Metering Data

9.5.1 *Western Power* 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 greater than or equal to zero.

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

   - 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 specifications in accordance with the *Communication Rules* Build Pack and specifically the Streetlights and UMS Data CSV File Specification documents.

e) Check against a nominated minimum value or alternatively a "zero" check which tests for an acceptable number of zero interval values over a period of time that
is deemed practicable in alignment with good electricity industry practice and this Metrology Procedure.

f) Calculated metering *data* date is greater than the previous calculated metering *data* date.
10 Metering Alarms

10.1 Validation of interval metering data alarms for metering installation Types 1 - 5

10.1.1 Western Power must validate interval metering data against significant metering data alarms when these are provided in the meter, as per the Code, the following alarms:

- Power Outage/Failure.
- Alarm/Error – i.e VT or phase failure.
- Overflow of Channel Data (Pulse overflow).
- CRC Error/Checksum error.
- Time Reset (Time Tolerance).

a) Where a metering installation Types 1 -5 assigns alarms to the meter data channel or the interval reading status, Western Power may process the alarm along with the metering data as part of the required validation process.

b) As a minimum Western Power must have systems and processes in place that capture metering data alarms.

c) Western Power must retain all metering data alarms as part of the data audit trail.

d) For instances where interval data was found to be corrupted, Western Power may provide replacement data in alignment with the Code and good electricity industry practice and with this Metrology Procedure.

e) Western Power may apply processes where data alarms may take precedence of certain types based on a priority. Channel Status codes may be deemed more serious than interval status codes and may take priority however substitution may take priority over an alarm raised in the meter.
## 10.2 Metering Installation Types 1 - 5 Metering Data Alarm definitions

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
<th>Definition</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Failure (Power Outage)</td>
<td>PO</td>
<td>This status occurs when the <em>meter</em> detects loss of power. During the <em>meter data</em> retrieval process, collection system, flags each load profile interval value between the AC Power Down and AC Power Up events with a Power Outage status bit.</td>
<td>Interval Status</td>
</tr>
<tr>
<td>Alarm/Error</td>
<td>LR</td>
<td>This status is based on the <em>meter</em> manufacturer's documentation of alarm conditions. It can reflect a field device channel status such as power drop on a phase, harmonics, or a field device interval status such as program malfunction or test mode.</td>
<td>Channel Status</td>
</tr>
<tr>
<td>Over Flow of Channel Data</td>
<td>OV</td>
<td>This status indicates that the actual demand value collected from the <em>meter</em> was beyond the range of the Demand High/Low Limits.</td>
<td>Channel Status</td>
</tr>
<tr>
<td>CRC Checksum Error</td>
<td>CR</td>
<td>This status occurs during an internal status check or an internal read/write function within the <em>meter</em>. This error condition is dependent on the <em>meter</em> hardware.</td>
<td>Interval Status</td>
</tr>
<tr>
<td>Time Reset occurred</td>
<td>TR</td>
<td>This status occurs when any time change, including DST, occurs in the <em>meter</em>.</td>
<td>Interval Status</td>
</tr>
</tbody>
</table>
Appendix 1 – Default Metering Installation Settings

Interval Duration

Within the Western Power network all interval meters are configured to record energy data at either 15 minute intervals or 30 minute intervals. When recorded in 15 minute intervals these are aggregated within the metering systems to 30 minute trading intervals.

Time zone

All daily quantities are based on 24-hour days and the Australian Western Standard Time (AWST).

Channels

The following table shows the channels and associated NMI suffixes provided by default for each type of metering installation based on the NMI allocation procedure. Other channels can be configured upon request providing they are supported by the installed meter.

Table 1: NMI Suffixes for Consumption metered data

<table>
<thead>
<tr>
<th>NMI Suffix (1)</th>
<th>Description</th>
<th>Register Use</th>
<th>Second Character</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Register Unspecified (placeholder)</td>
<td></td>
<td>Meter numbers or measuring elements are to be 1-9 then A-Z</td>
</tr>
<tr>
<td>1</td>
<td>First Register</td>
<td>007 (Anytime)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Second Register</td>
<td>010 (Peak)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Third Register</td>
<td>020 (Off Peak)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>First LNSP defined register</td>
<td>030 (High Shoulder)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Second LNSP defined register</td>
<td>040 (Low Shoulder)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Third LNSP defined register</td>
<td>AMD (Maximum Monthly Demand)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Fourth LNSP defined register</td>
<td>CMD (Cumulative Demand)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Fifth LNSP defined register</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: NMI Suffixes for interval metered data

<table>
<thead>
<tr>
<th>First Character</th>
<th>AVE</th>
<th>MASTER</th>
<th>CHECK</th>
<th>NET</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMPORT kWh</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>N</td>
</tr>
<tr>
<td>EXPORT kWh</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>IMPORT kvarh</td>
<td>J</td>
<td>K</td>
<td>L</td>
<td>X</td>
</tr>
<tr>
<td>EXPORT kvarh</td>
<td>P</td>
<td>Q</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>KVAh</td>
<td>S</td>
<td>T</td>
<td>U</td>
<td></td>
</tr>
<tr>
<td>Power Factor pF</td>
<td></td>
<td>G</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q Metering Qh</td>
<td></td>
<td>H</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Par Metering parh</td>
<td></td>
<td>M</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>VOLTS (or V2h)</td>
<td></td>
<td>V</td>
<td>Z</td>
<td></td>
</tr>
</tbody>
</table>

Note: Import kWh is net electricity generated at site and fed into the network, while export kWh is electricity provided from the network to the site.
Remarks:

- The B, E, K and Q will be the norm in the WA market (instead of N and X).
- The I and O are not used as second character in the NMI Suffix.

**Measurement Type:**
This field is on the meter supply point and is included in the standing data to market. The field summarises the registers defined on the meter, and should therefore be maintained automatically as a result of changes to the registers on the meter, resulting in one of the following measurement types:

- **EB** Bi-directional *energy* only
- **E** Uni-directional *energy* only
- **EQ** Uni-directional *energy* + reactive
- **EBQK** Bi-directional *energy* + reactive
Appendix 2 – Meter Compliance Testing and Sampling Plan

Meter Compliance Testing and Sampling Plan

First issue: March 2014

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# Table of contents

1 Introduction .............................................................................................................. 64
   1.1 Guidelines Purpose...................................................................................... 64
   1.2 Provisions in the Electricity Industry (Metering) Code 2012 ......................... 64
   1.3 Provisions in the Metrology Procedure ....................................................... 64

2 Sample Selection .................................................................................................... 64

3 Determination of populations ............................................................................... 64

4 Determination of sample size ............................................................................. 65
   4.1 Random selection of sample ........................................................................ 66

5 Sampling Accuracy Method ................................................................................ 66

6 Sample Testing ..................................................................................................... 66
   6.1 Measurement points for accuracy testing ..................................................... 67

7 Performance characteristics ............................................................................... 67
   7.1 Anti-creep function (Running at no-load) - induction meters ......................... 67
   7.2 Operation of register or display .................................................................... 67

8 Assessment of Results ........................................................................................ 68

9 Redefining Populations ....................................................................................... 68

10 On-going Compliance Testing .......................................................................... 68

11 Determining Population Failure ......................................................................... 69
1 Introduction

1.1 Purpose
The purpose of the plan is to provide guidelines and information to Western Power personnel about the sampling and testing methodologies used to determine whether meters on the Western Power network are operating within the allowable prescribed margin of error.

Clause 3.11A (Accuracy of metering installations) of the Electricity Industry (Metering) Code 2012 (Code) requires Western Power to ensure the revenue meters are sampled and tested for accuracy in accordance with AS1284.13.

1.3 Provisions in the Metrology Procedure
Section 2.3.1 of the Metrology Procedure for Metering Installations on the Western Power Network specifies the requirement to sample and test the meters in accordance with AS1284.13 and to comply with specifications and guidelines of the National Measurement Institute under the National Measurement Act.

2 Sample Selection
The metrological performance of the electricity revenue meter population will be assessed by the use of statistical sampling in accordance with AS1284.13. Statistical sampling provides an objective, acceptable methodology to determine the sample size for the population.

The sample is randomly selected from the population so that each meter making up the population group has the same chance of selection and the probability of selection is known. The result can then be statistically evaluated, objectively interpreted and precision and reliability calculated.

3 Determination of populations
In accordance with AS1284.13, the populations for the purposes of sampling are determined on the basis of:

- Meter manufacturer.
- Design or pattern (meter) type.

The resulting population of meters grouped by manufacturer and/or design/pattern type allows Western Power to identify the appropriate meter accuracy class against which the population is assessed.

Western Power assigns each meter pattern a code that identifies both the manufacturer and type. Details of when a meter is placed in service together with location details are held in Western Power’s Metering Business System (MBS).

The volume of meters that make up a population is obtained from MBS. MBS is integrated to produce, as a minimum, the following details for each meter:

- Meter type.
- Meter number.
- National Metering Identifier.
- Location/address.
Date installed\(^1\).

The details, by meter type, are provided in electronic spreadsheet format. From these spreadsheets the volume of meters that make up the populations are determined. A population is comprised of meters that have been assigned the same meter prefix by the supply authority, for example a Landis & Gyr meter type EM1000 has been assigned a meter prefix of 0200. The meter prefix is followed by a six digit serial number. New meter prefixes are assigned when the manufacturer has made changes to the pattern of the meter.

When determining a population, Western Power may arrange meters in sub-populations according to any of the characteristics in accordance with AS1284.13.

The sample size is based on the number of meters that make up the population.

4 **Determination of sample size**

In accordance with AS1284.13, the number of meters that make-up the sample when sampling by attributes and variables is given in Table 1 below.

<table>
<thead>
<tr>
<th>Number of meters in Population</th>
<th>Sample Size – Attributes</th>
<th>Number of Meters in Population</th>
<th>Sample Size – Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 – 8</td>
<td>2</td>
<td>2 – 8</td>
<td>3</td>
</tr>
<tr>
<td>9 – 15</td>
<td>3</td>
<td>9 – 15</td>
<td>3</td>
</tr>
<tr>
<td>16 – 25</td>
<td>5</td>
<td>16 – 25</td>
<td>4</td>
</tr>
<tr>
<td>26 – 50</td>
<td>8</td>
<td>26 – 50</td>
<td>5</td>
</tr>
<tr>
<td>51 – 90</td>
<td>13</td>
<td>51 – 90</td>
<td>7</td>
</tr>
<tr>
<td>91 – 150</td>
<td>20</td>
<td>91 – 150</td>
<td>10</td>
</tr>
<tr>
<td>151 – 280</td>
<td>32</td>
<td>151 – 280</td>
<td>15</td>
</tr>
<tr>
<td>281 – 500</td>
<td>50</td>
<td>281 – 400</td>
<td>20</td>
</tr>
<tr>
<td>501 – 1 200</td>
<td>80</td>
<td>401 – 500</td>
<td>25</td>
</tr>
<tr>
<td>1 201 – 3 200</td>
<td>125</td>
<td>501 – 1200</td>
<td>35</td>
</tr>
<tr>
<td>3 201 – 10 000</td>
<td>200</td>
<td>1201 – 3 200</td>
<td>50</td>
</tr>
<tr>
<td>10 001 – 35 000</td>
<td>315</td>
<td>3201 – 10 000</td>
<td>75</td>
</tr>
<tr>
<td>35 001 – 150 000</td>
<td>500</td>
<td>10 001 – 35 000</td>
<td>100</td>
</tr>
<tr>
<td>150 001 – 500 000</td>
<td>800</td>
<td>35 001 – 150 000</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150 001 – 500 000</td>
<td>200</td>
</tr>
</tbody>
</table>

Table 1 Sample sizes

Population numbers in excess of 500,000 meters shall be sub-divided into smaller groups and the sample sizes determined accordingly.

\(^1\) Note installation dates prior to the introduction of MBS in 2005 have been transferred into MBS from Western Power’s previous metering database CIS
4.1 Random selection of sample

In accordance with AS1284.13 the meters that are to make up the sample selection are chosen at random from each of the populations. A programming script has been developed by Western Power’s Information and Communication Technology function that provides the randomly selected sample meters for each identified meter population. The actual number of meters that comprise the samples may be increased by a minimum of 10% above the required sample number given in Table 1 to allow for the replacement of faulty or damaged meters.

5 Sampling Accuracy Method

In accordance with AS1284.13, Western Power conducts testing of meters by using either one of two methods described under the standard.

Sampling by attributes is an inspection method whereby for each of the test points the meter either ‘passes’ or ‘fails’ to meet the limits of the meter accuracy class. The number of fails are counted and compared to the requirements detailed in the standard.

Sampling by variables is an inspection method which consists of measuring a quantitative characteristic for each item of a population or a sample taken from this population. This method requires a successful test for normality, and can be completed with a smaller sample size, although is more complex.

Western Power adheres to the appropriate testing sequence as outlined within AS1284.13 for each testing method.

6 Sample Testing

In accordance with AS1284.13, meters are tested either on site, or in the Western Power Meter Laboratory. All work is carried out by suitably trained metering officers, who will carry out the testing in accordance with the requirements of the Metrology Procedure for Metering Installations on the Western Power Network. Approximately 1% of the sample size may be removed for additional testing in the Western Power laboratory.

Western Power ensures the equipment used to determine accuracy and performance characteristics of the population sample holds certificates of calibration that are traceable to National Standards.

Before testing takes place, meters from the population sample are inspected for signs of damage or interference. Meters that show signs of damage are replaced with a suitable new meter. The field officer will report any damage or interference to a field inspector from Western Power’s Metering Services function if a meter shows signs of tampering, and the meter may be omitted from the population.
6.1 Measurement points for accuracy testing

Table 2 details the load test points for accuracy testing of each meter configuration. For poly-phase meters, the accuracy figures relate to balanced currents.

<table>
<thead>
<tr>
<th>Category of Meter</th>
<th>Test Points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Light Load</td>
</tr>
<tr>
<td>Direct-connected single-phase</td>
<td>0.1 I_b</td>
</tr>
<tr>
<td></td>
<td>(p.f. = 1)</td>
</tr>
<tr>
<td>Direct-connected poly-phase</td>
<td>0.1 I_b</td>
</tr>
<tr>
<td></td>
<td>(p.f. = 1)</td>
</tr>
<tr>
<td>Transformer – connected</td>
<td>0.05 I_n</td>
</tr>
<tr>
<td></td>
<td>(p.f. = 1)</td>
</tr>
</tbody>
</table>

Table 2 Accuracy measurement points

I_b = Basic current

Value of current with which the performance of a direct-connected meter is fixed

I_n = Rated current

Value of current with which the performance of a Current Transformer is fixed

7 Performance characteristics

In addition to determining the level of accuracy as outlined in section 6.1, meters will be tested in accordance with AS1284.13 for compliance of:

- Anti-creep Function (Running at no-load) [induction meters only].
- Operation of the register or display.

7.1 Anti-creep function (Running at no-load) - induction meters

Western Power will test the anti-creep function on induction meters using the most appropriate method as outlined in AS1284.13, depending on whether the meter is being tested in the field, or in the laboratory.

7.2 Operation of register or display

In accordance with AS1284.13, Western Power will test the operation of the register or display by passing energy through the meter until the fastest moving drum or pointer can be read with sufficient accuracy to enable the meter constant to be verified with an acceptable level of confidence. During the testing of the register or display operation, Western Power will verify that the relationship between the meter constant and the indication on the display complies with the marking on the nameplate. The test is carried out by applying a known load over a precise time period, and in the case of:

Induction Meters

Provide the test equipment with a ‘Start’ reading of the dial register and an ‘End’ reading of the same register at the conclusion of the check.
Electronic Meters

Provide the test equipment with a ‘Start’ reading of the All-time register and an ‘End’ reading of the same register at the conclusion of the check.

The test equipment will indicate the percentage error of the register check.

8 Assessment of Results

In accordance with AS1284.13, accuracy testing will be carried out on each meter at the “test points” outlined in Table 2.

For each test point (e.g. full load and light load) applicable to the population, the calculated error of the meter will be recorded onto a spreadsheet.

The result of each meter test is documented and totals collated to allow assessment of the metrological performance of the sample against the maximum pass-fail levels specified by AS1284.13 and in accordance with the method being employed to test the sample.

The results of the sample testing are measured against each of the criteria elements outlined in Table 3 below. Western Power may choose to redefine a population if the sample test results do not meet the desired level of accuracy in accordance with Table 3.

<table>
<thead>
<tr>
<th>Meter Accuracy Class</th>
<th>Criteria 1</th>
<th>Criteria 2</th>
<th>Criteria 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Upper and Lower error of sample</td>
<td>Compliance Testing Period</td>
<td>Upper and Lower error of sample</td>
</tr>
<tr>
<td>General Purpose</td>
<td>±2.0%</td>
<td>7 years</td>
<td>±2.5%</td>
</tr>
<tr>
<td>Class 1</td>
<td>±1.5%</td>
<td>5 years</td>
<td>±2.0%</td>
</tr>
<tr>
<td>Class 0.5</td>
<td>±0.75%</td>
<td>4 years</td>
<td>±1.0%</td>
</tr>
<tr>
<td>Class 0.2</td>
<td>±0.3%</td>
<td>2 years</td>
<td>±0.4%</td>
</tr>
</tbody>
</table>

Table 3: Ongoing In-Service Compliance Period for Induction and Electronic Meters

At the completion of accuracy testing the meters will undergo the following tests which are also recorded as a pass or fail condition on the spreadsheet:

- Anti-creep functionality tests.
- Register/display accuracy check.

9 Redefining Populations

If a testing sample does not achieve the required pass level in accordance with AS1284.13, the population from which the sample was taken may be redefined into an alternate population, or sub population in accordance with AS1284.13.

Where the sample was tested for accuracy using attributes, in accordance with AS1284.13, the variables method of testing for accuracy may be employed. Conversely, where the sample was tested for accuracy using variables, in accordance with AS1284.13, the attributes method of testing for accuracy may be employed.

10 On-going Compliance Testing

Once the results of the population have been determined, and the population has achieved an acceptable pass rate in accordance with the requirements of AS1284.13, the meters that comprise the population shall be left in-service for the periods specified in Table 3 according to
the result. Table 3 outlines the on-going compliance period for populations that meet the requirements. The meter population will be re-tested prior to the expiry of the length of time outlined in the table for the respective accuracy class.

11 Determining Population Failure

Where the option to redefine a population, or substituting the method used to test a sample for accuracy in accordance with AS1284.13, has resulted in the population not achieving the required pass levels in accordance with AS1284.13, Western Power may deem that the population has failed.

If Western Power determines that the cost of redefining a population and the subsequent testing of that population (and the probability that the meters will fail the new testing) outweighs the cost of replacing the specific population, Western Power may deem that the population has failed.

The Complex Metering and Laboratory Team Leader will provide a report to the Metering Services Manager outlining the test results and analysis of any failed meter population.

Where a population is deemed to have failed compliance testing under AS1284.13, Western Power will ensure it complies with the Code requirements when removing or replacing any failed meter population.

Additionally, when Western Power, acting in accordance with good electricity industry practice, is unable to complete a removal or replacement program within the prescribed timeframe, it must request the Economic Regulation Authority to provide an extension of the time to complete the removal or replacement of the failed meters in accordance with clause 3.11A(3) of the Code.