

# GUIDELINE FOR CLARIFICATION OF THE NATIONAL MEASUREMENT ACT

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| 1.3        | 1 August 2021  | Updated to amend outdated Rules references and correct administrative errors. |

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## 1. INTRODUCTION

### 1.1. Purpose and scope

This is the Guideline for Clarification of the National Measurement Act made under clause 7.16.8 of the NER (Guideline).

These Procedures have effect only for the purposes set out in the National Electricity Rules (NER). The NER and the National Electricity Law prevail over this Guideline to the extent of any inconsistency.

The purpose of this document is to facilitate the development of an industry view on the metrology framework required for electricity metering in Australia.

The National Measurement Act 1960 provides mandatory requirements for specified utility meters. The National Electricity Rules provide the metrological regulation in the National Electricity Market with the National Metrology Procedure defining the technical detail.

The Australian Energy Market Operator has the responsibility for the development of a single, national metrology framework. Australia's electricity network of the 21st Century requires new approaches to electrical metrology and will necessitate adjustments to the metrology framework.

This Guideline has now been updated to reflect the situation upon the lifting of the trade measurement exemption for electricity meters.

The purpose of this Guideline is to provide clarification of the requirements of the National Measurement Act in relation to its application on metering installations.

This Guideline applies to all existing and future metering installations that have been or will be registered under the National Electricity Rules (the Rules). The Guideline covers metering installations referred to in the Rules as types 1 to 7.

This version of the Guideline makes reference to those parts of the National Measurement Act that are currently in force. Those aspects of the Act that are not currently in force appear in *Italics* in this version of the Guideline.

Subsequent revisions of the Guideline will be released when changes to the Act or Regulation are made.

The Guideline covers the roles of the National Measurement Institute, Australia (NMIA), AEMO and the Jurisdictions in the administration of metering installations.

### 1.2. Definitions and interpretation

#### 1.2.1. Glossary

Terms defined in the National Electricity Law and the NER have the same meanings in this Guideline unless otherwise specified in this clause.

Terms defined in the NER are intended to be identified in this Guideline by italicising them, but failure to italicise a defined term does not affect its meaning.

The words, phrases and abbreviations in the table below have the meanings set out opposite them when used in these Procedures.

| Term | Definition                         |
|------|------------------------------------|
| Act  | the National Measurement Act, 1960 |

| Term                  | Definition   |
|-----------------------|--|
| measuring instrument  | a thing by means of which a measurement may be made, or a component of such a thing  |
| metering installation | the assembly of components and / or processes that are controlled for the purpose of metrology   |
| Metrology Procedure   | a document required by the Rules that contains information on the devices and processes that are to be used to measure, or determine by means other than a device, the flow of electricity in a power conductor, to convey the measured or determined data to other devices using communication link(s), to prepare data using devices or algorithms to form metering data and to provide access to the metering data from a telecommunication network |
| Regulations           | National Measurement Regulation, 1999 and National Trade Measurement Regulations, 2009   |
| Rules                 | the National Electricity Rules   |
| utility meter         | means a gas meter, electricity meter or water meter  |

### 1.2.2. Interpretation

These Procedures are subject to the principles of interpretation set out in Schedule 2 of the National Electricity Law.

### 1.3. Related documents

This Guideline has been developed with reference to the following information:

| Title   |
|---|
| National Measurement Act, 1960  |
| National Measurement Regulations, 1999                                      |
| National Trade Measurement Regulations, 2009                                |
| National Measurement Guidelines, 1999                                       |
| NMI M 6-1 Electricity Meters  |
| NITP 14 National Instrument Test Procedures for Utility Meters              |
| National Electricity Rules  |
| Other specific electricity utility related legislation of each jurisdiction |

## 2. RESPONSIBILITY

- The NMIA is responsible for the administration of the National Measurement Act and the Regulations (National Measurement Regulations and National Trade Measurement Regulations) made under the Act. It is also responsible for advising the Minister on matters relating to the administration of the Act and Regulations.
- AEMO is responsible for the performance of its Rules obligations associated with the measurement of electricity and the collection of metering data for the operation of the market. It is also responsible for the preparation and publication of Metrology Procedure for metering installation types 1 to 7. AEMO is also responsible for the administration of electricity metrology for matters not specifically covered in the Rules, Act and Regulations.

## 2.1. Documentation Responsibility

- AEMO is responsible for the update of this Guideline after consultation with the NMIA.
- The Australian Energy Market Operator (AEMO) has been appointed as the National Metrology Coordinator for Australia's National Electricity Market (NEM). AEMO is now responsible for the development of the national metrology framework and for the administration of the national Metrology Procedure. A Metrology Procedure describes how metering data is read, processed and delivered for use. A single, national Metrology Procedure was developed by AEMO to replace the various state based Metrology Procedures. This came into effect on 1 January 2007.
- The Ministerial Council on Energy (MCE) announced on 13 December 2007 that a consistent national minimum functionality for 'smart' meters will maximise their benefits to all stakeholders. MCE agreed to establish minimum 'smart' meter functionality in the National Electricity Rules (NER).

## 3. CLARIFICATION OF THE ACT AND REGULATIONS

The National Measurement Act:

- Establishes a framework for the regulation of measuring instruments used for trade.
- Requires measuring instruments used for trade to be pattern approved and verified.

The National Trade Measurement Regulations provide further detail on the application of the Act.

At present, Regulation 5.6 provides an exemption from compliance with the pattern approval and verification requirements in the Act for certain utility meters, including electricity meters.

### 3.1. The objectives of the Act are:

- To establish a national system of units and standards of measurement of physical quantities;
- To provide for the uniform use of those uniform units and standards of measurement throughout Australia;
- To co-ordinate the operation of the national system of measurement;
- To bring about the use of the metric system of measurement in Australia as the sole system of measurement of physical quantities; and
- To provide for a national system of trade measurement.

### 3.2. A brief summary of the Act (National Measurement Act 1960)

This section summarises some of the more pertinent sections of Part IV, which would come into effect with the exemption lifted for electricity meters.

#### 3.2.1. Meters must be verified and of an approved pattern

It is an:

- Offence to use a meter that is not verified (s18GA);
- Offence to install a meter that is not of an approved pattern (s18GB); and
- Offence to supply a meter that is not of an approved pattern (s18GC).

#### 3.2.2. Inaccurate use

It is an:

- Offence to use a meter in a way that gives inaccurate measurement or information (s18GD); and
- Offence to use or supply a meter that gives inaccurate measurement or information (s18GE).

### 3.2.3. **Obligation on repair of meter (s18GQ)**

If a meter is adjusted or repaired in a way that the metrological performance is affected, this must be performed by a utility meter verifier (i.e. verification), or the verification mark must be obliterated (i.e. no longer verified).

### 3.3. **Background material**

Section 7A of the Act provides for the establishment (through the use of the Regulations) of the Australian units of measurement for physical quantities. In regard to the National Electricity Market, electric current (amp), potential difference (volt) and power (watt) are identified as Australian legal units of measurement for electricity.

Section 12 of the Act requires contracts, etc. made for goods that are sold by measurement of a physical quantity to be made or entered by reference to Australian legal units of measurement of that physical quantity.

A Contract is formed under the Rules whereby market participants are required to pay AEMO settlement amounts. AEMO is required under the Rules to calculate the settlement amounts based on metering data. Metering data may be the data obtained from metering installations, processed data or substituted data.

The data obtained from metering installation types 1 to 5 is the measurement of a physical quantity. The data obtained from metering installation type 6 is a processed and substituted estimate of a measurement, although the measurement of physical quantities may be used to derive the estimate. The estimate is calculated, in accordance with the Metrology Procedure, by applying a net system load profile to the data producing data in trading intervals. The data obtained from a metering installation type 7 is derived from a calculated estimate of a physical quantity.

Where data from a metering installation type 7 or the processed or substituted data from a metering installation type 6 is used to calculate a settlement amount, the settlement amount is calculated on the basis of an estimate. Therefore the contract formed under the Rules for the market participant to pay AEMO the settlement amount is not covered by section 12 of the Act.

Section 10 of the Act requires, that where, for any legal purpose, it is necessary to ascertain whether a measurement of a physical quantity for which there are Australian legal units of measurement has been made or is being made in terms of those units, then the integrity of that measurement shall be ascertained by reference to appropriate standards of measurement, certified reference materials or certified measuring instruments.

Therefore if, for any legal purpose, it is necessary to ascertain whether a measurement of a physical quantity from metering installations types 1 to 5 has been made or is being made in terms of Australian legal units of measurement, the integrity of that measurement shall be ascertained by reference to appropriate standards of measurement. Similarly, any measurement of a physical quantity that is used to enable the derivation of processed or substituted data from a metering installation type 6 that has been made or is being made in terms of Australian legal units of measurement, the integrity of that measurement shall be ascertained by reference to an appropriate standard of measurement. These measurements include the following:

- Section 3(1) of the Act provides a definition for utility meter. This term is used to describe a measuring instrument that is either a gas meter, an electricity meter or a water meter;
- Section 20(1)(f) provides for the regulations to specify exemptions for classes of gas, electricity and water meters from the operation of Part IV of the Act;
- Part IV of the Act in relation to utility meters was given Royal Assent in April 1999;

- Regulation 5.6 in the National Trade Measurement Regulations 2009 exempts certain classes of electricity meters from section 4A of the Act (the exemption was previously located in the National Measurement Regulations); and
- Part IV of the Act contains requirements on the use of measuring instruments for trade (principally pattern approval and verification).

#### **4. CLARIFICATION OF THE REGULATION**

The National Measurement Regulations 1999 provide further details on the application of the Act.

Regulation 5 and Schedule 1 of the Regulations may prescribe Australian legal units of measurement of any physical quantity, these units being the sole legal units of measurement of those physical quantities, with the exception of certain additional units which have been prescribed for particular purposes. Electric current, potential difference and power are classified as sole legal units of measurement.

Regulation 72 allows the NMIA to appoint verifying and certifying authorities. A verifying authority is empowered to issue certificates under Regulation 13 that attest to the verification of a standard of measurement. Such a certificate is evidence of the matters stated in it and may be received as evidence in any court of law.

#### **5. PATTERN APPROVAL AND VERIFICATION**

##### **5.1. Pattern approval**

Pattern Approval: To ensure the design is appropriate and suitable for conditions of use. Accuracy under Influences and Disturbances.

Pattern approval is the process where a meter is tested and assessed for compliance with the pattern approval requirements.

It is applied to one meter that is submitted by the manufacturer, and the outcome is the approval of a type (design) of meter.

If successful, a certificate of approval is issued.

##### **5.1.1. Applicable instruments**

At present, the pattern approval specification is NMI M 6-1.

The goal is to harmonise where possible with international standards to facilitate trade. Once OIML R 46 is published, NMIA would move to adopt this in place of NMI M 6-1. This would involve consultation.

##### **5.1.2. NMI M6**

NMI M6 is published in two parts:

- NMI M 6-1 Electricity Meters: contains the requirements for pattern approval (and verification) for electricity meters; and
- NMI M 6-2 Test Report Format: clarifies the tests and results required.

Both parts are available for download: [www.measurement.gov.au/](http://www.measurement.gov.au/)  
[Select : PUBLICATIONS → Pattern Approval Requirements]

##### **5.2. Verification**

Verification is the process to verify that the meter operates within the maximum permissible errors when tested in accordance with the National Instrument Test Procedure (NITP 14).



Every individual meter is required to be verified prior to installation.

Appointed "Utility Meter Verifying Authorities" are to perform the verification.

### **5.2.1. Applicable instruments**

There are three documents that are particularly relevant for verification:

- NITP 14 National Instrument Test Procedures for utility meters;
- Certificate of approval; and
- NMI M 6-1.

### **5.2.2. NITP 14 National Instrument Test Procedures for utility meters**

NITP 14 specifies required verification tests for utility meter and includes that:

- Meters manufactured in Australia must be individually verified by a Utility Meter Verifier; and
- Imported meters "verified" overseas also need to be verified by a Utility Meter Verifier in Australia. These may be verified using batch sampling.

### **5.2.3. Certificate of approval**

NITP 14 specifies verification tests, but additional tests for verification may be specified on the certificate.

The tests specified in NITP 14 or the certificate is to be performed as defined in NMI M 6-1, unless otherwise specified.

### **5.2.4. Verification Tests**

Verification tests include, test for:

- Accuracy;
- Starting [batch testing permitted];
- Running with no load [batch testing permitted]; and
- Any additional tests specified on the certificate.

## **5.3. Subsequent verification**

For subsequent verification, use NITP 14. This is required when a meter is no longer verified, such as after repair or adjustment.

## **5.4. Reverification**

Reverification = periodic testing.

The term Reverification used in the context of the NMA refers to what the NEM understands as periodic (in-service) testing.

Section 4A of the National Measurement Act covers the applicability of the Act to utility meters. Section 4A(3) states that the Act and Regulations do not apply to the Reverification of utility meters used for trade.

## **5.5. Effect of changes on metrological performance**

Updates or changes to meter software may result in the requirement for a new pattern approval or subsequent Reverification. In principle, a meter will require Reverification if the software amendment affects the metrological performance of the meter.

## 5.6. Changes to meters installed

| Change   | Affects metrological performance?   |
|--|---|
| Calibration Adjustment   | Yes   |
| Any change that requires the breaking of the metrological seal | Yes   |
| Accuracy test (calibration without adjustment)                 | No  |
| Refurbishment  | Depends on details, but in general no if there are no adjustments or breaking of the metrological seal.   |
| Software update  | Depends on the change. NMIA acknowledges many software changes will not affect the metrological performance. For instance, changes related to data not directly related to active energy measurements (such as reactive energy, voltage) and changes related to how the meter implements communication are not expected to affect the metrological performance. |

## 5.7. Changes to approved patterns

Submitters (that is the party named on pattern approval certificates, typically manufacturers) are obliged to contact NMIA whenever there is any change to the approved pattern that affects the metrological performance.

| Change  | Affects metrological performance?  |
|---|--|
| Changes to the components of the meter related to making the measurement.   | Yes  |
| Changes to the design of the meter that would likely affect the performance of the meter under influences and disturbances such as temperature or electro-magnetic fields – such as significant redesign of circuit boards or other components. | Yes  |
| Minor or superficial changes to meter appearance or design.   | No   |
| Changes to metrological parameters or features such as rated currents, number of elements, or meter constant.   | Yes  |
| Software changes  | Depends on the change, but MMIA acknowledges many software changes will not affect the metrological performance. NMIA does not need to be advised of metrological changes, but must be where the changes are expected to have an impact on the metrological performance. |
| Changes to location or means of sealing the meter.  | Yes  |

## 5.8. Metrological seal

The metrological seal provides the means of ensuring that the metrological performance of the meter has not been modified or adjusted. So if the seal is broken, the meter can no longer be considered as verified.

A meter is required to be Reverified if the metrological seal is broken for any reason.

## 6. THE EXEMPTION

The Act requires measuring instruments used for trade to be pattern approved and verified. These measuring instruments in this case are electricity meters<sup>1</sup>.

### 6.1. What is the exemption?

*National Trade Measurement Regulations 2009*, Regulation 5.6, "Exempt utility meters":

- For the definition of *utility meter* in subsection 3(1) of the Act, the following classes of meters are exempted from the operation of section 4A of the Act:
  - (b) electricity meters installed before 1 January 2013;
  - (ba) electricity meters installed on or after 1 January 2013, other than electricity meters that measure less than 750 MWh of energy per year;

Part IV of the Act, "Using measuring instruments for trade", covers the requirements for use – pattern approval and verification.

The reason for the exemption was to allow for the legislation and infrastructure to be developed prior to enforcing it for utility meters.

### 6.2. Lifting the exemption

The consequence of lifting the exemption is that electricity meters in use for trade will need to comply with the requirements under the Act.

This applies to:

- Meters installed on or after the date the exemption is lifted; and
- Categories of meter for which the exemption is lifted.

The categories or classes of electricity meters for which the exemption is proposed to be lifted are all meters with an annual throughput of less than 750 MWh per year. This corresponds to installations types 4, 5 and 6.

The following aspects of electricity metering systems are not currently covered:

- Transformers; and
- Reactive energy measurement.

## 7. GRANDFATHERING

The following information relates to grandfathering:

- Grandfathering is the process of granting an approval for a meter type;
- It is being offered by NMIA as a transitional arrangement – recognising that significant numbers of non-approved meters may be held in stock;
- NMIA needs information of meter types and numbers; and
- Grandfathering has been extended to cover verifications of meters for meter types that have been grandfathered.

### 7.1. General issues clarified by NMIA

Meters that are of an approved type (that is, a pattern approval certificate has been issued for that meter type) remain as an approved type. For example, if a meter is of an approved type, and it is purchased today, that meter will continue to be considered as an approved type

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<sup>1</sup> Electricity meters are a subset of utility meters

regardless of changes in pattern approval requirements, reviews of the certificate of approval, or even upon cancellation of a certificate.

Reviews and cancellations only affect the manufacture of meters of that type. The only exception is if an approval certificate is "withdrawn", which would mean that all meters of that type are no longer considered to be approved. However, the option to withdraw a certificate would only be considered if a significant problem was identified and as a last resort – it is very rare.

## 7.2. Examples

| Question   | Answer   |
|--|--|
| I have installed meters (prior to the exemption being lifted) that are not of an approved pattern. Can they remain in service?   | YES. An exemption will remain for meters installed before the date the exemption is lifted.  |
| I have purchased meters prior to the exemption being lifted, that are not of an approved pattern, and are not yet installed (in stock/spares). Can they be installed as exempt meters? | NO. An exemption will remain only for meters installed before the date the exemption is lifted. However, NMIA has provision for grandfathering meters held in stock (see later). |
| I have an installed meter (not pattern approved). Can I relocate this meter after the exemption is lifted?   | YES. A meter that was installed prior to the exemption being lifted may be relocated. However, if it is tested and found to be inaccurate, it cannot be used.                    |
| Can a grandfathered meter be relocated?  | YES. (Unless adjusted or repaired...)  |
| Can a non-pattern approved meter be verified?  | NO. Only approved meters may be verified.  |
| Can I install a meter if the pattern approval certificate is expired / cancelled?  | YES. This only affects the continued manufacturer of meters of that type.  |

## 8. NEM METROLOGY FRAMEWORK

### 8.1. National Measurement Law

The relevant federal legislation is the *National Measurement Act 1960* (as amended). The administering body is the National Measurement Institute, Australia (abbreviated as NMIA to avoid confusion with a National Metering Identifier - *NMI*). Appendix A provides a short summary of how the national measurement system operates.

### 8.2. National Electricity Law

The relevant legislation is the National Electricity (South Australia) (New National Electricity Law) Amendment Act 2005 (as amended). The National Electricity Rules (NER) are made under Part 4 of this Act. All States and Territories participating in the NEM have enabling Acts which refer to the South Australia Act. The NER have the force of law. Chapter 7 of the NER provides the framework for metrology regulation in the NEM, with the NEM Metrology Procedure defining the technical detail.

### 8.3. Components of a National Metrology Framework

Separate components for a national metrology framework for electricity can be identified. The Metrology Procedure is developed under a metrology framework and provides a detailed account and technical description of how metering data is read, processed and delivered. In order to ensure that metering data from an electricity metering installation is accurate and reliable, there is a need to consider the meter, the installation, and the data collection services.

The following sets out the components of the proposed metrology framework for the NEM:

(a) Type Specification

Type Specification describes the technical specifications of the metering installation (e.g. specifications for meters, transformers). S7.4.6.1(f) of the National Electricity Rules requires that:

*Meters* must:

- (a) meet the requirements of relevant *Australian Standards* and International Standards which must be identified in the *metrology procedure*; and
- (b) have a valid pattern approval issued under the authority of the National Measurement Institute or, until relevant pattern approvals exist, a valid type test certificate.

(b) Type (or Pattern) Approval

Type approval is the process whereby an impartial body examines the type (design) of an instrument prototype against the national standard. This determines whether an instrument is capable of retaining its calibration over a range of environmental and operating conditions and ensures that the instrument is not capable of facilitating fraud. It comprises the testing and approval of one (or several) meter prototypes(s) to ensure that the design meets the requirements of the Type Specification. Thereafter, any number of production meters can be verified and installed on the basis of the approval.

To date the metrological control system of Part IV of the Act, including type approval, has not been mandated by the lifting of the exemption in the Regulations. However, manufacturers have routinely obtained type approval from the NMIA in the expectation that metrological controls will be introduced and in accordance with the National Electricity Rules.

(c) Conformity to type

Conformity to type is a market surveillance function that discourages the sale of sub-standard electricity meters and helps avoid disputation and transaction costs associated with inaccurate measurements from non-complying instruments.

A conformity to type program has not as yet been introduced for electricity meters in Australia. Such a program could be implemented by auditing of a meter manufacturer's quality system together with statistical monitoring of the quality of production electricity meters on a risk management basis. The latter would comprise a low level of sampling and testing of meters prior to installation.

(d) Verification

Verification is the calibration of individual meters against a reliable measurement standard in appropriate units of measurement.

Verification is conducted on electricity meters prior to installation. NMIA authorises other parties to verify meters. These parties could be the manufacturer or importer, but could also be the meter installer. The verification is conducted in accordance with a process approved by NMIA. This usually involves individual meter testing but may involve sample testing of each batch of meters in the case of imported meters that have been verified overseas.

The verification process would normally be carried out as the final stage of manufacture, or at a facility close to the manufacturer, by a service provider accredited by the NMIA. Industry would anticipate that laboratories with suitable NATA accreditation would be able to verify the calibration of metering equipment from the manufacturer.

(e) Technical Standards for Metering Installations

The technical standards for metering installations are specified in the NER and the Metrology Procedure authorised under the NER.

These standards establish seven types of metering installation. This includes the conditions under which a physical meter need not be installed, but rather the energy traded may be calculated (unmetered loads or type 7 metering installations).

The standards are broadly based on energy volumes, and include accuracy classes, testing arrangements, and data collection requirements.

(f) Metering Provision (Field Installation)

The NER require that the metering installation be provisioned, installed and maintained by a metering provider, and that AEMO establish accreditation processes for meter provision.

The NER also provide a process for the determination of Metering Coordinator, and require the Metering Coordinator to engage the Metering Provider.

(g) Data Collection

The NER provide that the Metering Coordinator (or AEMO for certain specialised sites) is responsible for the collection of metering data from the metering installation. AEMO has elected to accredit service providers to undertake this activity.

These service providers (called Metering Data Providers) are engaged to collect, validate, estimate and substitute data in accordance with the Metrology Procedure, and service level procedures.

(h) Audit of Service Providers

Metering Providers and Metering Data Providers are audited by AEMO in accordance with requirements within the NER.

(i) Re-verification and Maintenance Testing of Metering Installations

The installed measurement artefacts must undergo some form of re-verification of their calibration over their life. Similarly there is a need for ongoing maintenance of the overall metering installation.

The NER require the metering provider to undertake testing to a time based program (or in some cases to an alternative program approved by AEMO).

Common international practice in the electricity industry is to use a sample based system for meter types that are in service in significant numbers, and to use individual testing for installations where lower volumes of numbers are installed.

This is an area where there is a significant range of views as to the most efficient approach to re-verification and maintenance testing.

A particular problem is that the electricity industry is uncomfortable with the translation of conventional trade measurement practices to the re-verification of electricity meters.

(j) Enforcement

The enforcement regimes of the NEM and the National Measurement Act 1960 (NMA) are different and apply to different components of the metrology framework. The NMA applies to the initial components of the framework, namely pattern or type approval, conformity to type and initial verification that are designed to ensure that only good quality, accurate meters are

installed into service. The NMA and its regulations provides for legal penalties for non-conformance.

The NEM adopts the NMA requirements for the initial components of the metrology framework and in addition controls the remaining components to ensure acceptable performance of meters in-service. The NEM assumes that competitive forces will resolve many in-service issues, with accreditation removed from non-complying service providers, or contracts changed when service providers become uncompetitive.

## APPENDIX A. HOW AUSTRALIA'S MEASUREMENT SYSTEM WORKS

The national measurement system is a coherent formal system which ensures that measurements can be made on a consistent basis throughout the country. It ensures that practical measurements made by industry and the community are linked to the International System of units (SI units).

SI units were adopted by international agreement at the General Conference of Weights and Measures in 1960 and they form the basis of Australia's hierarchy of standards. SI base units of measurement, derived and supplementary units and combinations of these units are prescribed in the National Measurement Act as the sole legal units for the measurement of all physical quantities in Australia, with the exception of a few specific quantities which may still be measured in non-SI units. The National Measurement Institute, Australia (NMIA) is responsible for maintaining the National Measurement Act and for advising on its implementation.

Australia has a well-developed standards and conformance system which is made up of four national organisations which are complemented by trade measurement authorities and legal metrology authorities. The national organisations are:

- National Measurement Institute, Australia (NMIA) – responsible for establishing and maintaining Australia's measurement standards and legal metrology in particular including legal traceability of measurements made for trade or regulatory purposes;
- National Association of Testing Authorities, Australia – responsible for laboratory accreditation;
- Standards Australia – responsible for documentary standards; and
- Joint Accreditation System of Australia and New Zealand – responsible for certification of management systems, products and personnel.

The hierarchy of measurement standards (see diagram below) shows the chain of measurement standards between the SI units of measurement and measurements made for trade, regulation and commerce. It forms the basis for traceability of measurements whereby a measurement can be related back through the hierarchy of standards to the relevant base unit. The National Measurement Act requires NMIA or its agents to maintain such measurement standards necessary to provide means for measurements of physical quantities to be made in terms of the Australian legal units of measurement.

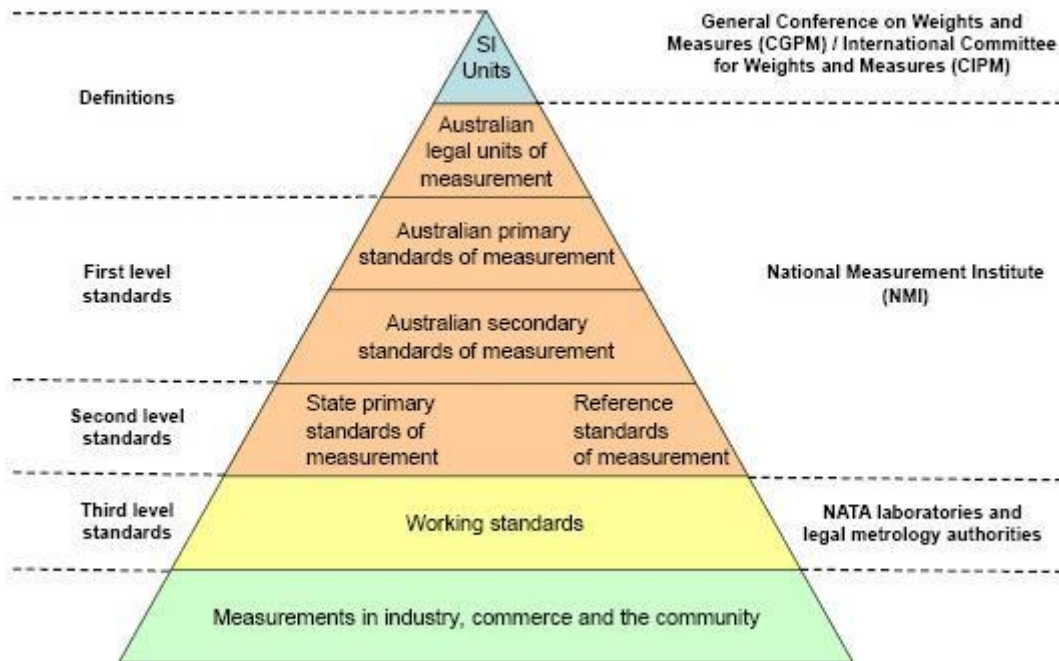
### First-level standards

Legal units of measurement have to be realised as tangible practical standards of measurement in order to be useful. NMIA is responsible for realising, maintaining and disseminating Australia's national physical standards.

NMIA maintains a national (or Australian primary) standard for each of the SI base units except the ampere and the mole (the ampere is derived from standards of voltage and resistance). NMIA also maintains Australian primary standards for a wide range of derived units including the electrical units of the volt, farad, and ohm.

The primary standards for the SI base units and derived units are not always easy to work with. For that reason, NMIA also holds Australian secondary standards (calibrated in terms of the primary standards) which are more convenient to use when calibrating lower-level standards or instruments.





**Second and third-level standards**

It would be impractical for NMIA to handle all of the measuring standards and instruments that require calibration in order to demonstrate traceability of measurement. Therefore NMIA calibrates higher accuracy standards held by government calibration laboratories and verifying authorities. These second-level laboratories calibrate a wide range of lower accuracy standards and measuring instruments used in industry and commerce.

International traceability is achieved by collaborating with both national measurement standards laboratories of other scientifically advanced nations and the International Bureau of Weights and Measures through intercomparisons of national standards. These intercomparisons provide confidence in the consistency of the international measurement system.

## **APPENDIX B. LEGAL FRAMEWORK**

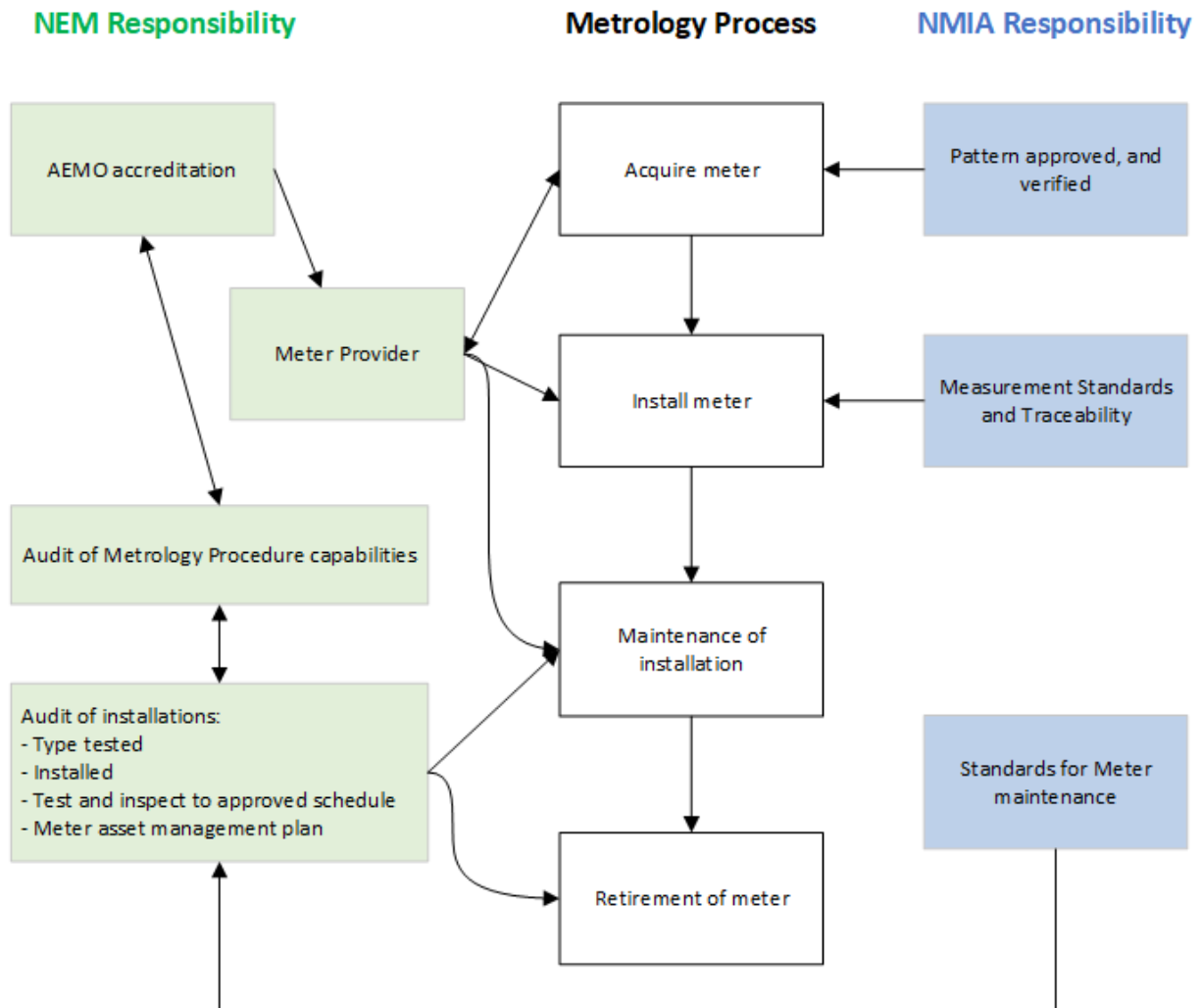
Legal metrology is a part of metrology relating to activities which result from statutory requirements. This includes establishing units of measurement, requirements for measuring instruments, methods of measurement, and their performance by competent bodies. Legal Metrology encompasses all legislative, administrative, and technical procedures which work to ensure measurement quality and credibility. Its focus is on the need for confidence and equity in measurements which directly concern the public, especially those measurements relating to efficiency in commerce, public health and safety, and environmental monitoring. With regard to measuring instruments, legal metrology specifies performance requirements, verification procedures, means for ensuring traceability to legally-defined measurement units, and guidelines for use.

Traceability in legal metrology is defined in Section 10 of the National Measurement Act 1960 and requires that a legally traceable measurement of a physical quantity may only be made by reference to specified standards, reference materials or measuring instruments or combinations thereof.

The Act also:

- Provides for regulations for type (pattern) approval of measuring instruments;
- Provides for regulations to specify the issue of particular certificates to demonstrate legal traceability; and
- Provides for the appointment of various authorities to issue evidential certificates.

## APPENDIX C. PROPOSED ELECTRICAL METROLOGY DIVISION OF RESPONSIBILITIES



Note: The Act does not require meters to be verified when they are purchased. This is often common practice, but all that the Act requires is that meters must be verified before being used for trade (probably equivalent to installation for an electricity meter).