UNMETERED LOAD GUIDELINE - DETERMINATION OF DEVICE LOAD AND ANNUAL ENERGY CONSUMPTION FOR UNMETERED DEVICE TYPES

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Version Release History

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Contents

1 Introduction

Unmetered market loads in the *National Electricity Market (NEM)* are classified as either, "controlled" or "other" *unmetered market loads*. The difference is that controlled *unmetered market loads* have control equipment that regulates the device *load* to a single value, e.g. street lights, whereas the other *unmetered market loads* have variable device *load* levels and variable operating cycles. Annual *energy* consumptions must be determined for other *unmetered market loads,* e.g. traffic lights.

The *NEM load table* consists of device *load* values or annual *energy* consumptions for devices that have been classified as *market loads*, as agreed between a *Minister* and *AEMO,* and can be used with *unmetered market connection points* within the *NEM*. These device *load* values are used in the algorithm that produces *calculated metering data* for *unmetered market loads*.

2 Purpose

The purpose of this Guideline is to provide industry with assistance in determining the device *load* or annual *energy* consumption of an *unmetered* device to support proposals to modify the *NEM load table*.

This Guideline however, does not limit the application of alternative methods to determine device *load* or annual *energy* consumption for *unmetered market loads*. Any such proposal will be assessed by *AEMO* on a case by case basis.

3 Application

This Unmetered Market Load Guideline applies to *NEM Registered Participants*, *Intending Participants* and interested parties concerned with the determination of device *load* or annual *energy* consumption for the purpose of including *unmetered market loads* in the *NEM load table.* It should be noted that, while *unmetered market load* devices (i.e. type 7 *loads*) appear in the *NEM load table,* the *unmetered loads* that are not included in the *NEM load table* are the subject of arrangements determined through consultation between LNSPs, FRMPs, interested parties and end-use customers.

The inclusion of an unmetered device load in the NEM load table is an agreement by industry to use that unmetered device load value when calculating metering data for the unmetered device. Publication of the unmetered device load value in the NEM load table is not an approval to use the unmetered device and does not replace any obligation for an interested party, proposing to add an unmetered device to the NEM load table, to obtain appropriate approvals related to performance acceptance and acceptance of use for the unmetered device from Approval Authorities.

AEMO will inform the applicant if it is determined that the device submitted for inclusion in the *NEM load table*:

- Does not meet the criteria for a category of *unmetered load* which has been agreed between a *Minister* and *AEMO* for use within the *NEM*; or
- Does not meet the criteria for an *unmetered market load* in accordance with Table S7.2.3.1, Item 5 of the *Rules*.

The applicant may make a further submission to have a device included in the *NEM load table* if the criteria above are subsequently met.

Figure 1 indicates the processes that are related to:

- Determining whether a device meets the criteria for an existing category of *unmetered load* which has been agreed between a *Minister* and *AEMO*.
- Determining whether a device meets the criteria to be an *unmetered market load*.
- Updating the *NEM load table*.

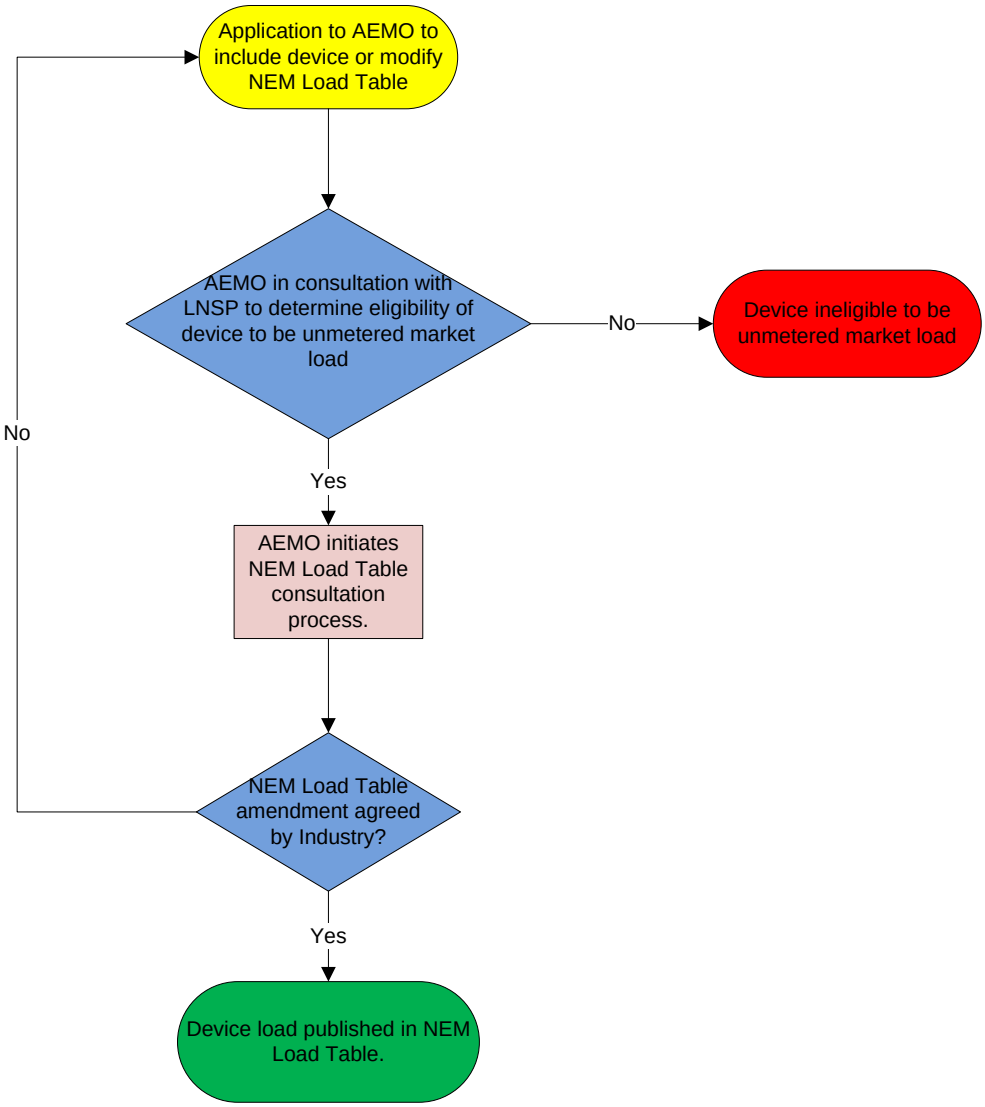

Figure 1: Unmetered Market Load Processes

4 Legal and Regulatory Framework

Clause 14.2.4(f) of the *metrology procedure*: Part B Metering Data Validation, Substitution and Estimation Procedure for Metering Types 1 – 7 requires *AEMO* to develop and publish a Guideline for the determination of the device *load* or annual *energy* consumption of a *NEM load table* device. Clause 14.2.4(f) also requires this Guideline to be prepared, revised and published by *AEMO* in accordance with the *Rules consultation procedures*.

This Guideline document satisfies the requirements of Clause 14.2.4(f) of the metrology procedure: Part B Metering Data Validation, Substitution and Estimation Procedure for Metering Types 1 – 7 and will provide the basis for a process to determine the device *load* or annual *energy* consumption for a *NEM load table* device.

5 Definitions

Words in this document that are shown in *italics* have the meaning specified in clause 1.7 of the *metrology procedure*: Part A National Electricity Market or, if they are not specified in that clause, they have the meaning specified in the *Rules*.

6 Related Documents

The Unmetered Market Load Guideline – Determination of Device Load and Annual Energy Consumption for Unmetered Device Types makes reference to:

Chapter 7 of the *Rules*

Chapter 10 of the *Rules*

metrology procedure: Part A National Electricity Market (MT_OP 1985)

metrology procedure: Part B Metering Data Validation, Substitution and Estimation Procedure for Metering Types 1 – 7 (MT_MA 1680)

AS 1158.6: 2010 Lighting for Roads and Public Spaces Part 6: Luminaires

IES LM-79 Electrical and Photometric Measurements of Solid-State Lighting Products

EVO 10000-1: 2012 IPMVP, Concepts and Options for Determining Energy and Water Savings Vol.1

7 Supporting information for NEM load table device types

The following information and tests to determine the device *load* or annual *energy* consumption for an *unmetered market load* would be considered by *AEMO* as meeting the objectives of Clause 14.2.4(g) of the *metrology procedure*: Part B Metering Data Validation, Substitution and Estimation Procedure for Metering Types 1 – 7 regarding the minimum requirements for documentation supporting the inclusion of devices in the *NEM load table*.

1. A unique description of the *unmetered* device detailing how the *unmetered* device (and, if applicable, any related control equipment) will be marked to ensure unique identification. If the *unmetered* device can have multiple electrical configurations or parameter settings, a description of the marking and the form of the marking that will uniquely identify the configuration or setting.
2. The nature of the device *load* or annual *energy* consumption measurement tests.
3. The device *load* or annual *energy* consumption of the *unmetered load* must be related to the normal and stabilised operating conditions for the *unmetered* device and include the *load* or *energy* consumption of the control equipment. (See Sections 10 and 11 for further *load* value and control equipment requirements).
4. Evidence that the controlled *unmetered market load* is predictable or evidence of the *load* cycle for other *unmetered market loads* must be submitted with the proposal to include or modify the *unmetered market load* in the *NEM load table*.
5. For other *unmetered market load* devices evidence must be submitted detailing the approach used to determine:
    - The actual or theoretical operating model from which the device operating cycle is derived;
    - The typical operating cycle used upon which the single operating cycle *energy* consumption is based and
    - The typical number of operating cycles expected in an annual period.
6. Evidence must be submitted, with the proposal to include or modify the *unmetered market load* in the *NEM load table,* that demonstrates that the controlled *unmetered market load* device proposed *load* or the proposed annual *energy* consumption for other *unmetered market loads* is a statistically relevant figure which can be used as the basis for calculating the energy consumption of the *unmetered* device.

    Unmetered device *load* test results that demonstrate statistical rigour, for *unmetered* devices that are to be added to the *NEM load table,* are to be based on device sample sizes where a 95% assurance (confidence level) that the mean device *load* or annual

energy consumption value of the sample is within +/- 2% (precision) of the true mean *load* or annual *energy* consumption value for the device can be established.

Unmetered device *load* test results based on a test sample size of up to 10 devices will be acceptable. The device *load* test sample size could be less than 10 if the proponent can provide reports or other evidence, from manufacturers etc., to substantiate the use of smaller sample sizes to support the confidence level and precision stated above.

7. Formal acceptance to use the *unmetered* device from at least one LNSP.
8. Formal confirmation supporting the installation of the *unmetered* device (e.g. a letter from the entity proposing to use the *unmetered* device).
9. Evidence that the proposed device *load* or annual *energy* consumption for the *unmetered* device was obtained from the tests conducted by the testing entity.
10. Test measurements must be conducted by a *NATA* accredited laboratory or an overseas equivalent. A test report from a test laboratory that is accredited with an organisation that is a signatory to the *ILAC* Mutual Recognition Agreement is considered by *AEMO* to be equivalent to a test report from a *NATA* accredited laboratory.
11. Test report results submitted to support the proposal to add or modify a *NEM load table* device type must include the following:
    - Brief details of the test apparatus.
    - Test date
    - Test measurement accuracy.
    - List relevant *Australian Standards* or International Standards against which the test measurements and test methodology were undertaken.
    - Brief description of the device conditioning to provide confidence that the tests reflect normal and stabilised operating conditions for the *unmetered* device.
    - Evidence that test sample size represents a statistically relevant sample under a relevant sampling standard.
    - Test measurement parameters for street lighting must include:
        - Test results are to be measured at a supply voltage of 250 V.
        - Lamp conditioning (not LED) – a minimum of 100 hours operation at 250 V to condition lamps. Lamps are allowed to cool down for at least 24 hours before commencement of load testing.
        - Input voltage – measured after a continuous 2 hour period of operation.
        - Running current – measured after a continuous 2 hour period of operation.
        - Power factor – measured at the same point in time as the running current.
        - Load (watts) – measured after a continuous 2 hour period of operation.
        - LED luminaires must be stabilized in accordance with IES LM-79 before input voltage, running current, power factor and load (watts) measurements are taken.

8 Determination of a single device load value for controlled unmetered loads

Controlled *unmetered market loads* have control equipment that switches the *unmetered* device on and off in accordance with an on/off table. This form of control regulates the device *load* to a single value that is obtained from test report information described in Section 7 above. The *load* for each device type must be the wattage for the device and associated control equipment.

This test report value for device *load* would be submitted with the proposal to include or modify a controlled *unmetered market load* in the *NEM load table*.

9 Determination of annual energy consumption for other unmetered loads

As other *unmetered market loads* do not have either a single device *load* value or an accurately defined switching arrangement, the *NEM metrology procedure* requires that the annual *energy* consumption is determined for these devices[1]. It is this annual *energy* consumption, expressed in Watt.hours, for an *unmetered* device and its associated control equipment that appears in the *NEM load table*. This annual *energy* consumption value is then converted into a single calculated device wattage value via the algorithm detailed in clause 14.2.4(a)(ii) of the *NEM metrology procedure*: Part B.

The following process is used to determine the annual *energy* consumption and is based on the principle that the *energy* profile of an unmetered *load* is predicable[2] over a 12 month cycle.

1. Determine the *energy* consumption of a device and its control equipment over a single operating cycle.
2. Determine the number of operating cycles over a 12 month period.
3. Calculate the product of *energy* consumption per cycle and the number of cycles performed over a year to determine the annual *energy* consumption for the device and its control equipment.

This determined annual *energy* consumption value for the *unmetered* device and its control equipment would be submitted with the proposal to include or modify the other *unmetered market load* in the *NEM load table*.

10 Load value

Customer billing and *NEM* settlement processes for *unmetered market loads* are based on *calculated metering data* values for 30 minute *trading intervals* where:

Energy consumed = (Device wattage) x (Number of Devices) x (Period load is switched on)/2

If the device wattage or *energy* consumption can be changed through the application of different electrical configurations or parameter settings, the actual *energy* consumed by the *unmetered* devices may differ greatly from the calculated *energy* consumption for the devices based on the device *load* or annual *energy* consumption values that have been established in the *NEM load table* for defined electrical configuration or parameter settings. The impact on *calculated metering data* will therefore compromise customer billing and *NEM* settlement processes.

The *NEM load table* values for *unmetered* device *load* and annual *energy* consumption are for the electrical configurations and setting parameters defined in the initial application to *AEMO* and as identified on the *unmetered* device. Another submission to *AEMO* must be made to establish a different *NEM load table* entry if any changes to the *unmetered* device electrical configurations or parameter settings are proposed.

[1] Clause 14.2.4(a)(ii) of the NEM Metrology Procedure: Part B

[2] A condition of a *load* being declared as *unmetered* is that the *load* pattern of an *unmetered load* is predictable – Table S7.2.3 Item 5 of the *Rules*.

11 Control equipment

A condition for including an *unmetered* device in the *NEM load table* is that the device is to be used exactly as it has been tested, i.e. the *load* test is to measure the combined device **and** control equipment *load*.

Where control equipment has not been included in the *load* test measurement, a clear statement indicating that device *load* tests were undertaken without control equipment and separate *load* test measurements for the control equipment (conducted by a *NATA* accredited laboratory or an overseas equivalent) must be provided. This *load* value for the control equipment will be applied to the *NEM load table* entry for the *unmetered* device.

12 Sampling

IES LM-79 is a methodology for the electrical and photometric measurement of solid-state lighting (SSL) products (i.e. LED products). The Annex to IES LM-79 explains how the measurement of SSL products differ from the measurement of traditional lamps and luminaires and that traditional test methods and the measurement of one sample is insufficient for SSL products. Therefore appropriate sampling and averaging of results is required for SSL products.

Based on the background information provided in IES LM-79, AEMO requires load test results that demonstrate statistical rigour are provided for LED street lighting devices that are to be added to the NEM Load Table. Load test results should be based on device sample sizes where we can be 95% sure (confidence level) that the mean load value of the sample is within +/- 2% (precision) of the true mean load value for the device population.

Sample size calculation, detailed below, is determined in accordance with the International Performance Measurement and Verification Protocol compiled by the Efficiency Valuation Organisation.

$$n = \frac{z^2 \times cv^2}{e^2}$$

Where

n Sample size.

z Standard normal distribution value at a specific confidence level (i.e. 1.96 for 95% confidence level).

e Desired level of precision (i.e. 0.02 or 2%).

cv Coefficient of variance, defined as the standard deviation of the readings divided by the mean. If no readings are available, the *cv* can be estimated initially as 0.5.

AEMO will accept load test results based on a test sample size of up to 10 devices. The load test sample size could be less than 10 if the proponent can provide reports or other evidence from manufacturers etc. to substantiate the use of smaller sample sizes to support the required confidence level and precision stated above.