

MSATS PROCEDURES

NATIONAL METERING IDENTIFIER

PREPARED BY: AEMO Markets
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DATE: ~~-28/-02/-2017~~

VERSION RELEASE HISTORY

Version	Effective Date	Summary of Changes
5	16/07/2006	<p>Added changes agreed as part of the CATS 2.4 MSATS Procedures: CATS Procedures Part 1 Principles and Obligations Version 2.4 that were missed from version 4. This includes the removal of the zero first character row from the consumption energy Data Suffix table.</p> <p>Added Amps to the Volts row of Table 1. Updated diagrams to a consistent format.</p> <p>Added diagrams of twin element interval meters at sections 12.4 and 12.5. Removed diagram of accumulation and interval metering at a site.</p> <p>Amendments to reflect changes developed as part of the Metrology Harmonisation project, including the development of the NEM Metrology Procedure.</p> <p>Relocated version history.</p> <p>Minor typographical amendments and corrections.</p>
5.1	August 2009	Update to AEMO format
6.0	01 Dec 2017	<p>Updated to incorporate changes resulting from:</p> <ul style="list-style-type: none"> National Electricity Amendment (Expanding competition in metering and related services) Rule 2015. No.12; National Electricity Amendment (Embedded Networks) Rule 2015 No. 15; and National Electricity Amendment (Meter Replacement Processes) Rule 2016 No. 2.

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1. INTRODUCTION

1.1. Purpose and Scope

This National Metering Identifier Procedure (**Procedure**) is an MSATS Procedure. It sets out the structure for *NMIs* to be used in the *NEM*, details Datastreams for each category of *metering installation* and addresses the matters contemplated in clauses 7.8.2(d)(2), and 7.8.2(ea) (eb) & (ec) of the NER.

The successful operation of the *NEM* relies on:

- positive identification of *connection points*;
- a verifiable linkage between *connection points*, *NMI Standing Data* and *metering data*; and
- an audit trail for *metering data* collection and processing.

The *NMI* is a unique identifier for each *connection point*, an index against which other essential data can be managed. It is crucial to the accurate management of End User registration and transfer, *connection point* change control and data aggregation and transfer.

1.2. Definitions and Interpretation

The Retail Electricity Market Procedures – Glossary and Framework:

- is incorporated into and forms part of this document; and
- should be read with this Procedure.

1.3. Related AEMO Documents

Title	Location
Retail Electricity Market Procedures – Glossary and Framework	http://aemo.com.au/Electricity/National-Electricity-Market-NEM/Retail-and-metering/Glossary-and-Framework
MSATS Procedures	http://aemo.com.au/Electricity/National-Electricity-Market-NEM/Retail-and-metering/Market-Settlement-and-Transfer-Solutions
Metrology Procedure Part A	http://aemo.com.au/Electricity/National-Electricity-Market-NEM/Retail-and-metering
NMI Allocation List	http://aemo.com.au/-/media/Files/PDF/NMI-Allocation-List-v8-December-2014.ashx

2. ALLOCATION AND ISSUE OF NMIS

2.1. NMI Allocation by AEMO

- NMIs* are allocated by AEMO for issue by LNSPs (for *connection points*) or ENMs (for *child connection points*) in accordance with this Procedure.
- Blocks of available *NMIs* are allocated to LNSPs by AEMO in accordance with the NMI Allocation List.
- Blocks of available *NMIs* are allocated and reserved for ENMs by AEMO.
- An ENM must apply to AEMO for a *NMI* prior to assuming responsibility for a *child connection point*. AEMO will issue a *NMI* to the ENM for that *child connection point*.
- AEMO may allocate blocks of *NMIs* to LNSPs and ENMs from any unused range.
- The range 5 XXX XXX XXX has been reserved for use in the gas industry.
- The range 9 XXX XXX XXX has been reserved as a “break-out” if it becomes necessary to move to an 11 character *NMI*.

2.2. Issue of NMIs by LNSPs and ENMs for Types 1-6 Metering Installations

- (a) For each new *connection point*, ~~or *child connection point* (as applicable)~~, the FRMP must apply to the relevant LNSP, ~~or ENM (as applicable)~~ for a *NMI* prior to assuming responsibility for the *connection point*, ~~or *child connection point* (as applicable)~~ and the LNSP, ~~or ENM (as applicable)~~ must issue a *NMI* to the FRMP for that *connection point*, ~~or *child connection point* (as applicable)~~, from the LNSP's allocated list, ~~(for a *connection point*), or as provided by AEMO (for a *child connection point*)~~.
- (b) For each new *child connection point* the FRMP must apply to the relevant ENM for a *NMI* prior to assuming responsibility for the *child connection point*, and the ENM must issue a *NMI* to the FRMP for that *child connection point* as provided by AEMO.
- (c) The LNSP or ENM (as applicable) must register the *NMI* for the *connection point* or *child connection point* (as applicable) in MSATS in accordance with the CATS and WIGS Procedures.

2.3. Allocation of NMIs for Type 7 Metering Installations

Schedule 7.4 of the NER and the Metrology Procedure: Part B establish the framework for type 7 metering installations.

2.3.1. Common Requirements across the NEM

- (a) Each type 7 metering installation applies to a unique combination of FRMP, End User, TNI, DLF, and LNSP.
- (b) The *NMI* may contain different agreed Unmetered Device loads or Unmetered Device types. One *NMI* is required for each type 7 metering installation. Individual Unmetered Device loads may be added to and removed from the *NMI* without the need to change the *NMI*.
- (c) For each TNI there will be one or more *NMIs* representing municipal lighting loads, and several other *NMIs* representing the various utilities who have Unmetered Device loads in the geographic area serviced by the TNI.
- (d) New *NMIs* must only be created where one or more Unmetered Device loads with a unique and previously unregistered set of attributes (FRMP, End User, TNI, DLF, LNSP) are to be put into service.
- (e) A *NMI* may be abolished if the Unmetered Device load is removed (e.g. street turned into park, and lighting removed) or the Unmetered Device load is transferred to another *NMI*. (E.g. due to network re-arrangements).
- (f) A change of one attribute (FRMP, TNI, DLF, LNSP), or a change of End User, will not of its own require an abolition of the *NMI*.
- (g) The NER and Metrology Procedure: Part B provide for the allocation of *NMIs* to broad classes of Unmetered Device connection points provided that certain attributes required for settlements remain unique.
AEMO expects that each LNSP has a procedure for the allocation of *NMIs* for Unmetered Device supplies, which will be available for review by the Jurisdiction or AEMO on request.
- (h) A procedure for the allocation of *NMIs* for street and public lighting across a geographic area must include the following steps:
 - (i) Define the geographic area supplied from a transmission node.
 - (ii) Subdivide the Unmetered Device supplies within this geographic area according to End Users. If necessary, sub-divide these Unmetered Device supplies to take account of variations of DLF that apply across the area.
 - (iii) If necessary, subdivide these Unmetered Device supplies according to FRMP.
- (i) When considering materiality, the LNSP may allocate streetlights by geographic area, or postcode, or by some other available grouping where the majority of that Unmetered Device load is supplied from a single transmission node.

- (j) Where *distribution* feeders are commonly supplied from one *transmission* node, but are regularly moved to another *transmission* node for maintenance or seasonal reasons, the Unmetered Device *NMI* can be recorded in MSATS against the *transmission* node through which the majority of the *energy* is delivered. This approach is supported by the fact that the calculation of *marginal loss factors* takes account of seasonal flows at *transmission* nodes, and that the *marginal loss factors* for adjacent TNIs where *load sharing* is possible are unlikely to be significantly different.

3. NMI STRUCTURE

- (a) Generally, the *NMI* is an all numeric, ten (10) character identifier. The key attributes of a *NMI* are:
- (i) The *NMI* must embody only numeric characters, except as explicitly provided in this Procedure, and must not contain spaces.
 - (ii) Where alphanumeric characters are allowed, the letters “O” and “I” are not permitted in order to avoid confusion with the numbers 0 and 1.
 - (iii) “W” is reserved as the fifth character of the allocated identifier for wholesale *transmission connection metering points* only. It may only be used if the *NMI* is allocated from an alphanumeric block.
 - (iv) Embedded characters or meanings must not be used in allocating *NMIs*.
- (b) The *NMI* may be used in conjunction with other identifiers or suffixes. These include:
- (i) The *NMI* Checksum, a single numeral used to assist with data validation when the *NMI* is manually entered into a computer system.
 - (ii) The *NMI* Datastream suffix used to identify a particular Datastream associated with a *connection point*.
- (c) The base *NMI* is ten characters. In some circumstances the *NMI* Checksum is appended to the *NMI* to form an eleven-character *NMI*, or the two-character *NMI* Datastream suffix may be appended to form a twelve-character *NMI*. The *NMI* Checksum is not used with the Datastream suffix because the Datastream suffix is intended for use only with electronic data transfer.
- (d) All *NMIs* issued for *connection points* which become contestable after 1 January 2001 are required to be all numeric.
- (e) The all-numeric requirement applies to the basic ten character *NMI*, and not to other suffixes used with the identifier.
- (f) *Connection points* that were contestable prior to 1 January 2001 were allocated with an alphanumeric *NMI*.
- (g) TNSPs may continue to allocate alphanumeric *NMIs* from *NMI* blocks supplied to them prior to 1 January 2001. Wholesale *connection points* (LR = POOL) will continue to have alphanumeric *NMIs* issued.

4. NMI REGISTERS

LNPs and ENMs must maintain a register of *NMIs* assigned by them to *connection points* or *child connection points*.

5. NMI CHECKSUM

- (a) To reduce the occurrence of incorrect transfers attributable to *NMI* data entry errors, a one digit *NMI* Checksum has been implemented.
- (b) Sample java code for an implementation of the *NMI* Checksum is provided in Appendix A. A general form of the algorithm used to create the *NMI* Checksum is:
- (i) Double the ASCII value of alternate digits beginning with the right-most digit.
 - (ii) Add the individual digits comprising the products obtained in sub-paragraph (i) to each of the unaffected ASCII value digits in the original number.
 - (iii) Find the next highest multiple of 10.

- (iv) The check digit is the value obtained in sub-paragraph (ii) subtracted from the value obtained in sub-paragraph (iii). If the result of this subtraction is 10, the check digit is 0.
- (c) **Appendix B** provides a worked example of the algorithm and a list of thirty *NMIs* with NMI Checksums calculated by the algorithm.
- (d) The NMI Checksum is always a numeric character.
- (e) The NMI Checksum is not mandatory when transferring NMI identified data electronically between Participants. It is focussed on applications where data entry occurs and there is a risk of character transposition, for example, from paper to electronic systems or through an interactive telephone service.
- (f) When publishing a *NMI* for End Users, the *NMI* will appear in its 11-character format, and the NMI Checksum will be the final character of the *NMI*.

6. DATASTREAM SUFFIX

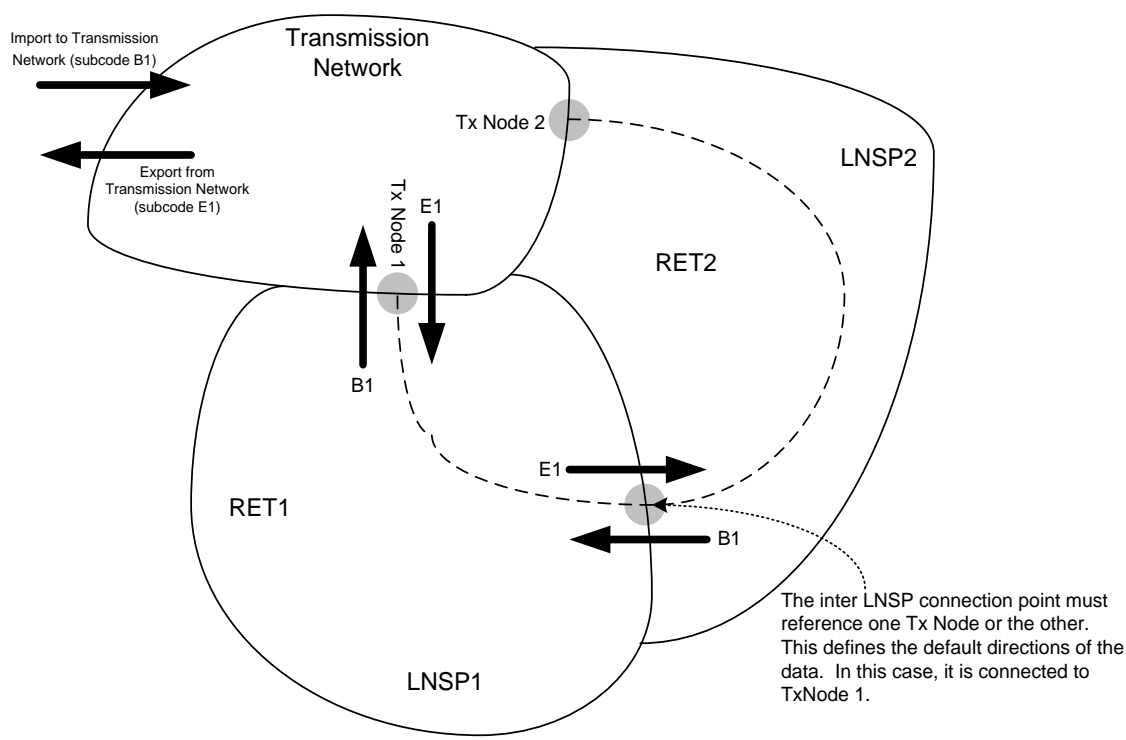
5.1.6.1. General

- (a) *Settlements* relies on the collection and delivery of large volumes of *metering data*. For any particular *connection point* there could be multiple *energy* measurement elements and data recorders with multiple channels. Accurate identification of Datastreams is essential. The Datastream suffix provides identification at the measurement element level for all Datastreams from the *connection point* identified by the *NMI*.
- (b) The Datastream suffix is a two-character identifier used in conjunction with a *NMI* to identify a particular Datastream. It allows differentiation of measurement quantities at a *metering point*, and differentiation of quantities between different measurement elements or registers at a *connection point*.
- (c) A twelve-character *NMI* identifies the *connection point* (first ten characters) and associated Datastream (Datastream suffix as the last two characters).
- (d) The Datastream suffix has retained alphanumeric characters, even when both characters are numerals, because an all numeric structure could not accommodate the variety of data types or number of *meters* that could be required for a *connection point*.
- (e) The Datastream suffix is only used between Participants, and is not used in conjunction with the NMI Checksum. The Datastream suffix allows Participants to identify data at a sub-*connection point* level and to identify the individual sources of *metering data* to maintain necessary audit trails.

6.2. Energy Direction Flows

The following conventions are used in the *NEM*:

- (a) All flows are specified by reference to their direction to or from the *market*. Hence:
 - (i) All *energy* from the *market* is considered export (i.e. *energy* consumed by an End User is export) (**Export**).
 - (ii) All *energy* into the *market* is considered import (i.e. the *energy* generated into the *market* is import) (**Import**).
- (b) AEMO shall define the import and export *energy* flows for *interconnectors* on a case-by-case basis.
- (c) For the purposes of MSATS, 'Net' *energy* is derived as: $\text{Net} = \text{Export} - \text{Import}$
 - (i) Hence, the net *energy* for *generation* is negative (in a net quantity) and an End User's *energy* is positive (in a net quantity).
 - (ii) For Accumulation Meter Datastreams, this means that the *energy* values for import (*generation*) must be negative in the MDM Data File.



The same convention is used for kvarh, i.e.:

kvarh supplied to an End User are export kvarh; and

kvarh received from an End User are import kvarhs.

6.7. DATASTREAM SUFFIX FOR INTERVAL METERING DATA

- Interval metering data* may be sourced from *metering installations* type 1 to 5 or 7. *Metering data* from a type 6 *metering installation* that has been transformed through a profiling algorithm into TIs is also identified as *interval metering data*.
- Interval metering data* is identified in the Datastream suffix by a first character that is alpha [A to H, J to N, P to Z].
- Identifiers in the 'Master' column in Table 1 are those normally used in the *NEM*. Where a *check meter* is required (type 1 & 2 *metering installations*), identifiers from the 'Check' column are used for the *check meter*. Where the data from the 'Master' and 'Check' *metering installations* has been averaged in accordance with the *NER*, the 'Ave' column identifiers are used. Where only the difference between import and export is required, the 'Net' column identifiers are used.

Net Data Will Be Accepted. Net is $N = (E-B)$.

Table 1 Datastream Suffixes for Interval Metering Data

	First character				Second character
	Ave	Master	Check	Net	
IMPORT kWh	A	B	C	N	Meter numbers or measuring elements are to be 1-9 then A-H, J-N, P-Z
EXPORT kWh	D	E	F		
IMPORT kvarh	J	K	L	X	
EXPORT kvarh	P	Q	R		
KVAh	S	T	U		

	First character			Second character
Power Factor pF		G		
Q Metering Qh		H	Y	
Par Metering parh		M	W	
VOLTS (or V ² h) or Amps (A ² h)		V	Z	

- (d) Where a *meter* has multiple measurement elements, the convention for the population of the second character of the Datastream Suffix is:
- (i) Increment the second character by one if the first character is the same. For example, use E1 and E2 if both elements are export kWh, and B1 and B2 if they are both import kWh.
 - (ii) Use the same second character if the first character is different. For example, use E1 and B1 if they are export kWh and import kWh respectively.

Examples:

2727000011 E2 relates to Export kWh data from either meter no.2 (single element) or element 2 of meter no.1 (twin element) pertaining to the *connection point* with the *NMI* of 2727000011. Refer 11.4 and 11.5 for diagrammatic examples.

TTTTW00015 B1 relates to Import kWh *interval metering data* from meter no.1 pertaining to a wholesale *connection point* with the *NMI* of TTTTW00015.

6.1.7.1. Datastream Suffix for Accumulated Metering Data

- (a) If the first character of the Datastream suffix is numeric [1 to 9] the attached data is *accumulated metering data* from a type 6 *metering installation*.
- (b) The Datastreams identified by characters 1 to 6 are active energy (kWh). Datastreams identified with 7, 8, or 9 are as defined by the LNSP or the ENM (as applicable).

Table 2 Datastream Suffixes for Accumulated Metering Data

First Character	Second Character
1	First Datastream
2	Second Datastream
3	Third Datastream
4	First controlled load Datastream
5	Second controlled load Datastream
6	Third controlled load Datastream
7	First LNSP/ENM defined Datastream
8	Second LNSP/ENM defined Datastream
9	Third LNSP/ENM defined Datastream

Examples:

8877886644 1A relates to consumption energy data from meter A (the 10th meter at the *metering installation*), register 1 applicable to a *connection point* with the *NMI* of 8877886644.

8866448877 43 relates to consumption energy data from a controlled circuit register in the 3rd meter at the installation, the data pertaining to a *connection point* with the *NMI* of 8866448877.

6.2.7.2. Wholesale Connection Points

- (a) A wholesale *connection point* is a *connection point* where:
 LR = POOL* (where the "*" is a wildcard for the region)

- (b) For a wholesale *connection point* a *NMI* must be assigned to each individual physical or logical metering point that contributes to the wholesale *connection point*. This requirement is to facilitate a drill down to Datastreams where AEMO is obliged to audit or otherwise investigate *energy flows* for a wholesale *connection point*.
- (c) AEMO assigns the *NMIs* for *regulated interconnectors*.
- (d) When the *metering point* doesn't align with the physical *connection point*, the *NMI* for the *connection point* is used to identify a logical *metering point*. Each *metering point* that contributes to the logical *metering point* must be assigned a separate *NMI*. The TNSP is responsible for determining the algorithm used to relate the logical *metering point* for a physical connection to the *metering point(s)* that contribute data for the physical connection.
- (e) Any Participant intending to apply a logical *meter* to a *connection point* must contact AEMO's Registration Desk to seek approval prior to entering any data into MSATS.

7.8. CONNECTION POINTS WITH CHECK METERING

- (a) For *connection points* with a type 1 *metering installation*, the *NMI* must be assigned to every averaged *energy flow* pertaining to each *connection point*.
- (b) A type 1 *metering installation* requires a duplication of metering, voltage and current sources in accordance with the NER. The Datastreams from one *metering installation* are designated 'Master' and from the other *metering installation* are designated 'Check'.¹
- (c) When both Datastreams are from measurement systems of identical accuracy standards, the NER require that the *energy* Datastream submitted for *settlements* be the average of the values from the master *meter* and *check meters*. In this case the Datastream suffixes will have an initial character A (import) or D (export) or N (net).
- (d) If the *check meter* is of a lower accuracy standard than the *metering installation*, only the 'Master'¹ Datastream is submitted, in which case the Datastream suffixes will have an initial character B (import) or E (export) or N (net).
- (e) The NER requires that a type 2 *metering installation* has partial *check metering*. The obligations for partial *check metering* can be met by a *check meter*, in which case the Datastreams will be identified as for a type 1 *metering installation*.
- (f) Alternatively, the arrangement of a partial *check metering* may be as agreed between AEMO and the MC. In a partial *check metering* scheme each Datastream used needs to be separately identified. It is possible that a number of *NMIs* will be used in a partial *check metering* scheme to identify logical metering points, and a particular meter and instrument transformer combination may be a component of more than one partial *check meter*. The actual arrangements will be part of the scheme submitted by the MC to AEMO for approval.

8.9. NMI RULES

8.1.9.1. NMI Allocation and Verification

- (a) All *NMIs* must be allocated to End User *connection points* by LNSPs or ENMs (as applicable) and:
 - (i) The LNSP must verify that the *NMI* is correctly associated with the TNI in MSATS.
 - (ii) The ENM must verify that the *NMI* is correctly associated with the correct *embedded network* and Parent *NMI*, and have the same TNI Code as the Parent *NMI* in MSATS.
- (b) When an *Embedded Generator* registers as a *Market Generator* and AEMO determines that a *virtual transmission node* is required for the *Embedded Generator*, AEMO will provide an appropriate TNI to the LNSP and the LNSP must assign this TNI to the *Embedded Generator connection point*.
- (c) When a *Generator* with one or more *generating units* within an *embedded network* registers as a *Market Generator* in respect of those *generating units* and AEMO determines that a *virtual*

¹ Refer to Table 1.

transmission node is required for those *generating units*, AEMO will provide the appropriate TNI to the ENM and the ENM must assign this TNI to the *Generator Child NMIs*.

8.2.9.2. NMI Extinction~~Decommissioning~~

- (a) A ~~NMI in the metering register must be~~ recorded as ~~extinct~~~~de-commissioned~~ in the metering register only when:
- (i) a *connection point* is abolished;
 - (ii) the *connection point* changes from the LV to the HV side of the service *transformer*;
 - (iii) a *child connection point* becomes directly connected to the LNSP's *network*;
 - (iv) a *connection point* directly connected to the LNSP's *network* becomes an off-market *embedded network* connection;
 - (v) a *connection point* directly connected to the LNSP's *network* becomes a *child connection point*; or
 - (vi) the physical location of a *connection point* changes.
- (b) The only circumstance where a NMI may be re-used is w~~hen a NMI is~~ allocated to a builder's temporary *supply is used*, ~~the same NMI may be re-used~~ for the permanent *supply* once construction is completed, provided:
- (i) the final *supply* arrangements have the same effective *connection* arrangement to the local *network*; and
 - (ii) the temporary *supply* is abolished when the permanent *supply connection* is energised.
 - ~~(ii) — Both the temporary and permamnet *supply* are not concurrently in service.~~
- (c) Subject to section 9.2(a) and (b), a *NMI* must not be recorded as ~~extinct~~~~de-commissioned~~ on the metering register for any of the following reasons:
- (i) a change of End User;
 - (ii) a reconstruction of the End User *supply* connection (e.g. overhead moving to underground) in which the two services are not concurrently operational;
 - (iii) a consolidation of *meters* (e.g. 3 *meters* → 2 *meters*) or a relocation of the *meter* enclosure without changes being made to the location of the measurement *transformers*;
 - (iv) changes to Participant IT systems, including ENM and LNSP *NMI* allocation systems;
 - (v) changes to Network Tariffs;
 - (vi) changes to LNSP *network* boundaries; and
 - (vii) changes to the identity~~Role~~ of the ~~LNSP or~~ ENM.

8.3.9.3. Utilisation of NMI for AEMO Data

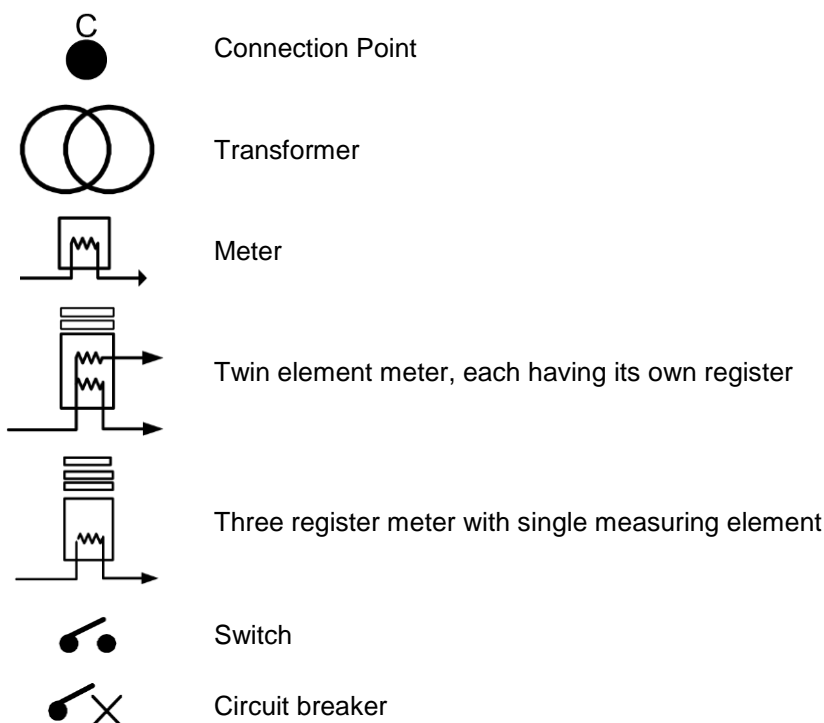
8.4.9.4. Data Delivery to AEMO (MSATS System)

- (a) *Metering data* is always provided on an individual *NMI* Datastream basis.
- (b) Interval m~~A~~*Metering data* is always provided as net *energy* flow to MSATS.²

² See section 13.6.1 for details of the conventions for the direction of *energy* flows.

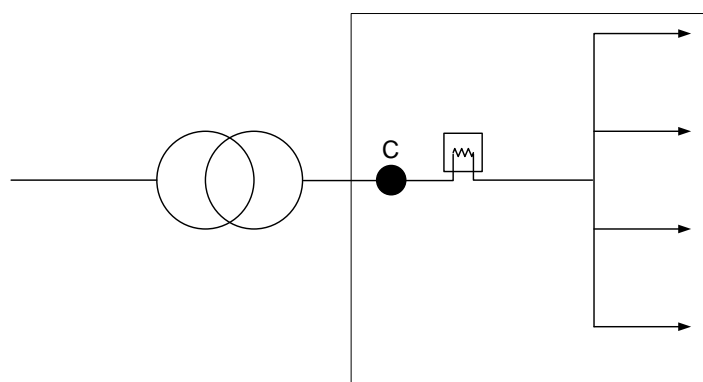
APPENDIX A. EXAMPLES OF NMI APPLICATION – INTERVAL METERING DATA

Key to symbols used in ~~sections 11~~ [Appendix A](#) and [Appendix B12](#):



A.1 One End User metered on the secondary side of transformer

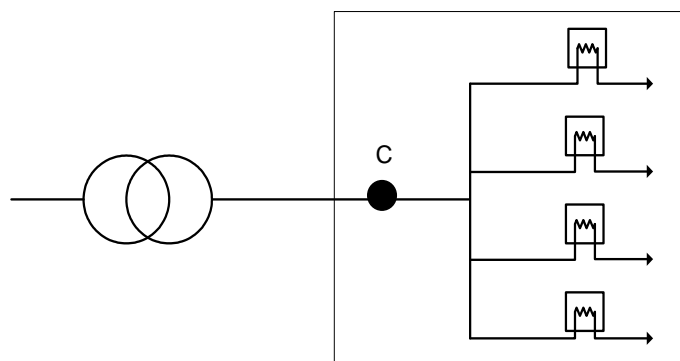
- One *connection point*
- One End User
- One *meter/measurement element*
- One *NMI*



- Allocated NMI: 2424242424
- Identity of interrogated *metering data*: 2424242424 E1

A.2 One End User, multiple metered on the secondary side of transformer

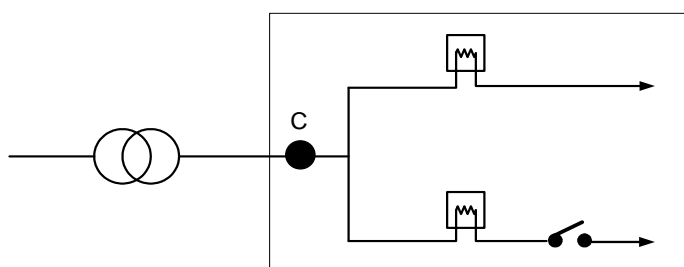
- One *connection point*
- One End User
- Four *meters/measurement elements*
- One *NMI*



- Allocated *NMI*: 3131313131
- Identity of individual interrogated *metering data*:
 3131313131 E1
 3131313131 E2
 3131313131 E3
 3131313131 E4

A.3 One End User, previously two tariff metering, e.g. general supply & off-peak on secondary side of transformer

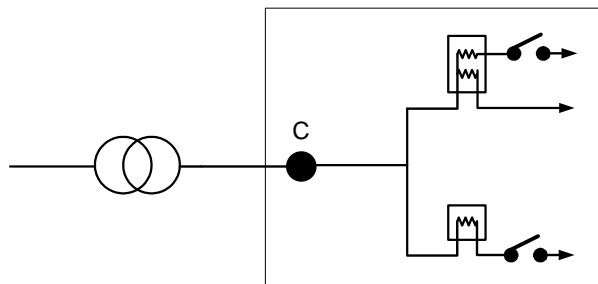
- One *connection point*
- One End User
- Two *meters/measurement elements*
- One *meter* with a load control device
- One *NMI*



- Allocated *NMI*: 5656565656
- Identity of individual interrogated *metering data*:
 5656565656 E1
 5656565656 E2

A.4 One End User, two controlled loads, one twin element meter

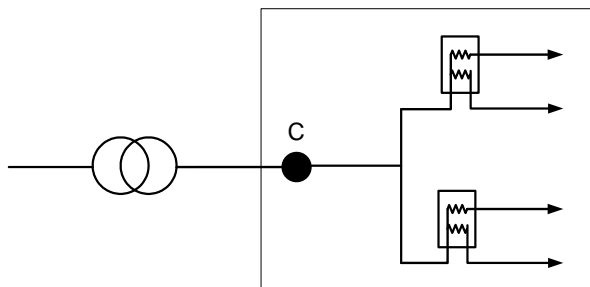
- One *connection point*
- One End User
- Two *meters*: one twin element with a Controlled Load and one single element with a Controlled Load
- One *NMI*



- Allocated *NMI*: 5656565656
- Identity of individual interrogated *metering data*:
 5656565656 E1
 5656565656 E2
 5656565656 E3

A.5 One End User, two twin element meters

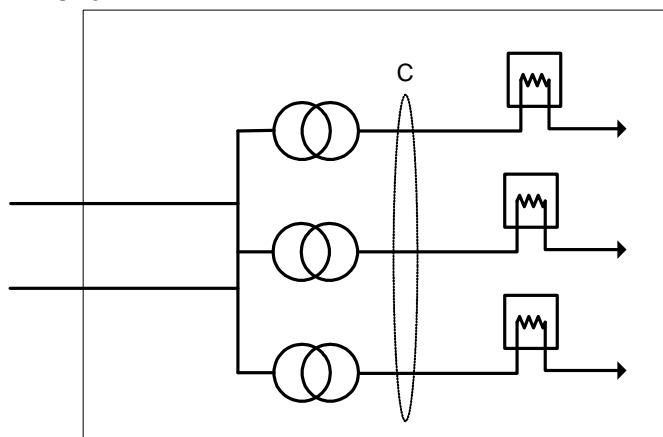
- One *connection point*
- One End User
- Two twin element *meters*
- One *NMI*



- Allocated *NMI*: 5656565659
- Identity of individual interrogated *metering data*:
 5656565659 E1
 5656565659 E2
 5656565659 E3
 5656565659 E4

A.6 One End User, multiple meters on secondary side of multiple transformers in the same substation building an LV switchboard in common switchroom

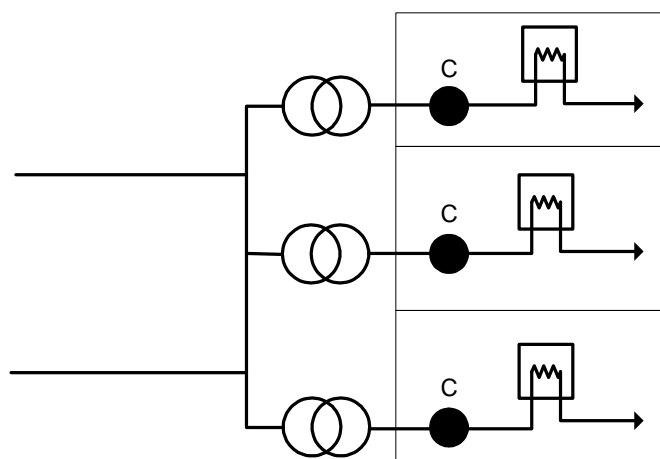
- One *connection point*
- One End User
- Three *meters/measurement elements*
- One *NMI*



- Allocated *NMI*: 5656565656
- Identity of individual interrogated *metering data*:
 5656565656 E1
 5656565656 E2
 5656565656 E3

A.7 Three End Users, metered on secondary side of multiple transformers in the same substation building

- Three *connection points*
- Three End Users
- One *meter/measurement element* per connection point
- Three *NMIs*

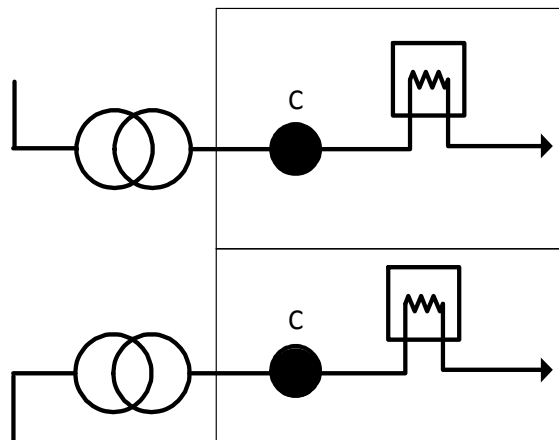


- Allocated *NMIs*:
 5656565656
 5656565657
 5656565658

- Identity of individual interrogated *metering data*:
 5656565656 E1
 5656565657 E1
 5656565658 E1

A.8 One End User, two separate HV supplies to two separate substations, both metered on secondary side of the transformers

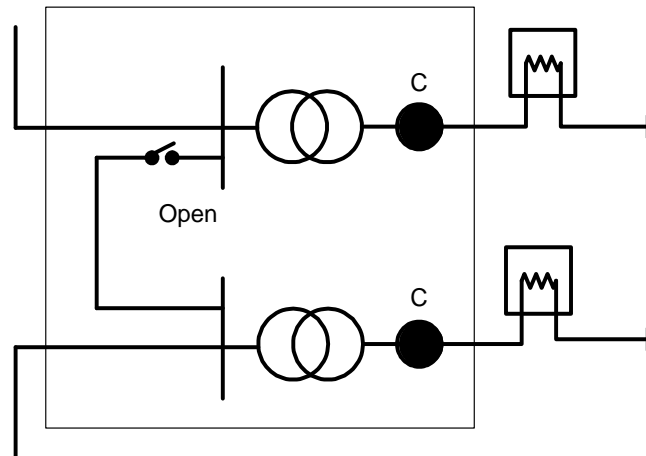
- Two LV *connection points*
- One End User
- One *meter*/measurement element per *connection point*
- Two *NMIs*



- Allocated *NMIs*:
 5656565656
 5656565657
- Identity of individual interrogated *metering data*:
 5656565656 E1
 5656565657 E1

A.9 One End User, two separate substations adjacent to each other or one single substation with two separate transformers in a single substation, with a “normally open” point separating the HV supplies into two sources

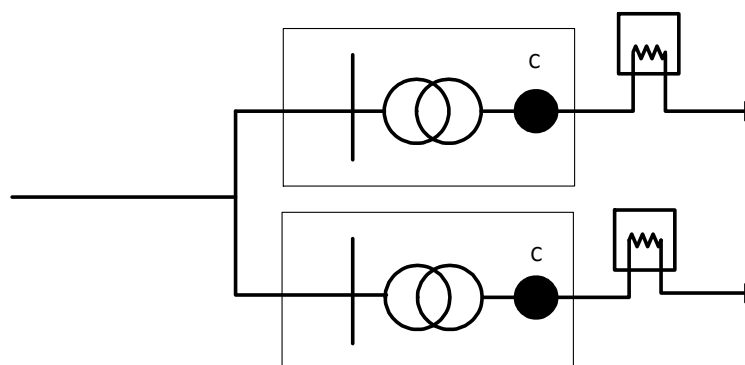
- Two *connection points*
- One End User
- One meter/measurement element per *connection point*
- Two *NMIs*



- Allocated *NMIs*:
5656565656
5656565657
- Identity of individual interrogated *metering data*:
5656565656 E1
5656565657 E1

A.10 One End User, two separate substations adjacent to each other or one single substation with two separate transformers, with the HV supply originating from a single source

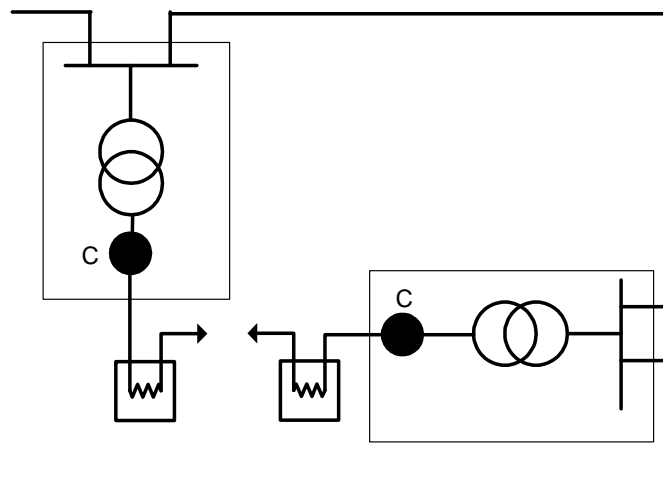
- Two *connection points*
- One End User
- One *meter*/measurement element per *connection point*
- Two *NMIs*



- Allocated *NMIs*: 5656565656
5656565657
- Identity of individual interrogated *metering data*: 5656565656 E1
5656565657 E1

A.11 One End User, two separate substations not adjacent to each other but on same premises

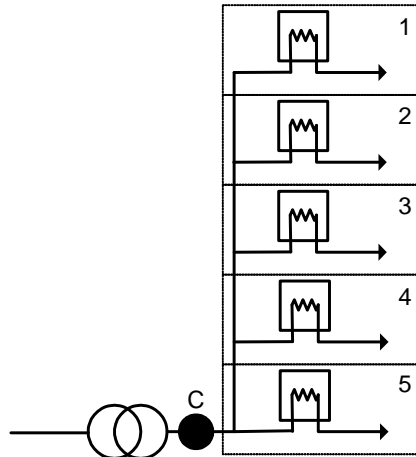
- Two *connection points*
- One End User
- One *meter/measurement element* per *connection point*
- Two *NMIs*



- Allocated *NMIs*: 5656565656
5656565657
- Identity of individual interrogated *metering data*: 5656565656 E1
5656565657 E1

A.12 Multiple End Users, High rise building

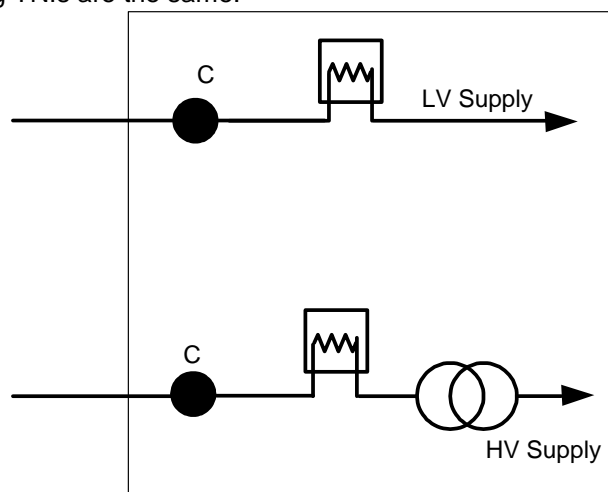
- Multiple *connection points*, with all deemed to be at physical *connection point c* in the diagram.
- Five individually metered End Users
- One *meter/measurement element* per *connection point*
- Five *NMIs*



- Allocated *NMIs*:
 5656567801
 5656987652
 5656000043
 5656000044
 5656000045
- Identity of individual interrogated *metering data*:
 5656567801 E1
 5656987652 E1
 5656000043 E1
 5656000044 E1
 5656000045 E1

A.13 One End User with multiple supply points

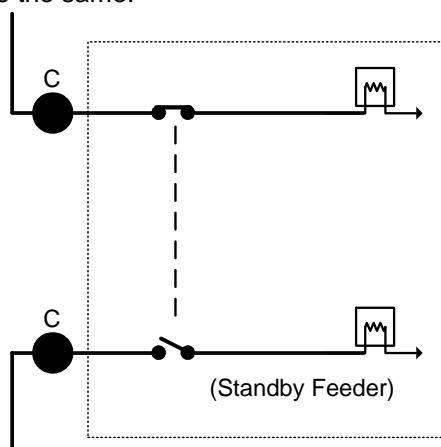
- Two *connection points*
- One End User
- One *meter/measurement element per connection point*
- Two *NMIs*.
- There are two separate *connection points*, therefore, two separate *NMIs* irrespective of whether the DLFs and supplying TNIs are the same.



- Allocated *NMIs*:
8899778999
8899123456
- Identity of interrogated *metering data*:
8899778999 E1
8899123456 E1

A.14 One End User with Standby Supply

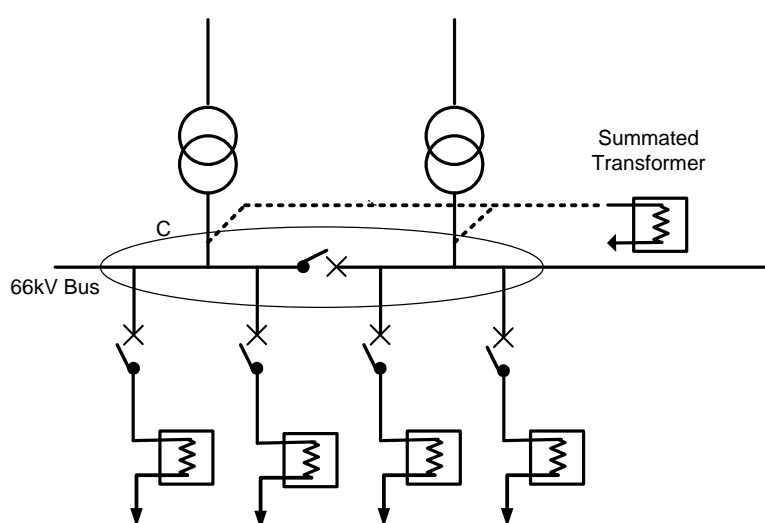
- Two *connection points*
- One End User
- One *meter/measurement element per connection point*
- Two *NMIs*
- There are two separate *connection points*, therefore, two separate *NMIs* irrespective of whether the DLFs and supplying TNIs are the same.



- Allocated *NMIs*: 5656333322
5656444441
- Identity of interrogated *metering data* is: 5656333322 E1
5656444441 E1

A.15 One End User or Participant, Wholesale Metering at Transmission Node

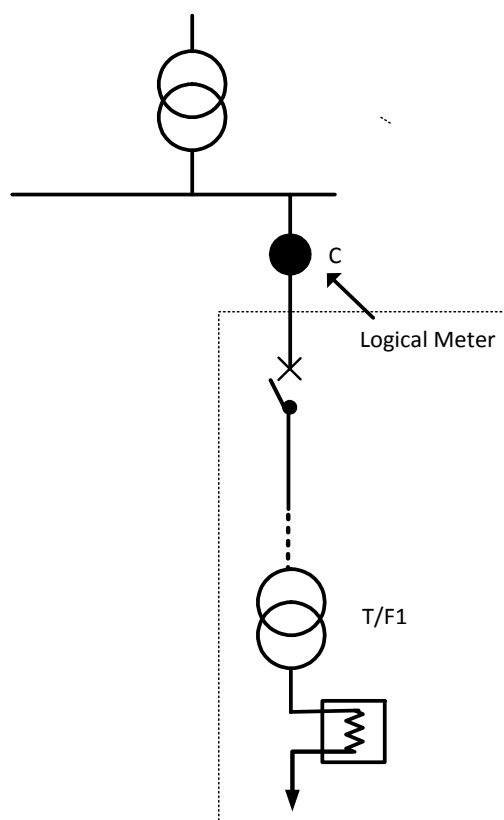
- One *connection point*
- One End User or Participant
- Five *meters* (one *meter/measurement element* per *metering point*, with summated *transformer check metering*). Four of the *meters* are official *billing meters*, the other *meter* is for data checking and validation purposes.
- Five *NMIs*



- Allocated *NMIs*: VVVVW00001
VVVVW00002
VVVVW00003
VVVVW00004
VVVVW00005
- Identity of individual interrogated *metering data*: VVVVW00001 E1
VVVVW00002 E1
VVVVW00003 E1
VVVVW00004 E1
VVVVW00005 F1

A.16 One End User or Participant, Wholesale Metering at Transmission Node

- One *connection point*
- One End User or Participant
- One physical *meter/measurement* element installed at different location to the wholesale boundary *connection point*.
- One logical *meter/measurement* element. The logical *meter* corrects the physical *meter* for *transmission line* and *transformer (T/F1)* losses.
- Two *NMIs*. Only the logical *meter* is recorded against the *connection point* in MSATS.



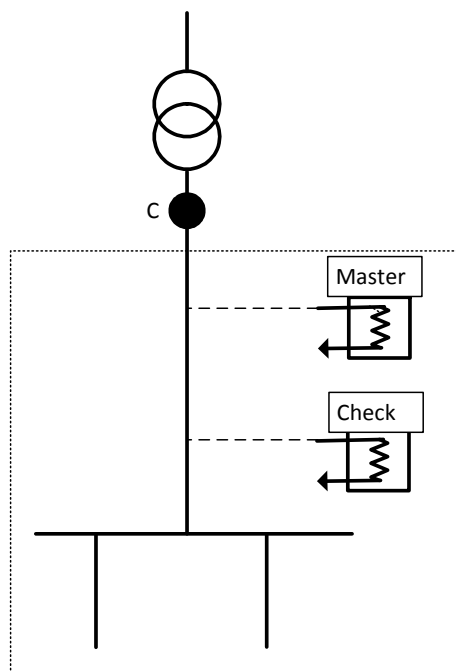
- Allocated *NMIs*:
TTTTW00001
TTTTWL0002
- Identity of individual interrogated *metering data*:
TTTTW00001 E1
TTTTWL0002 E1

The audit trail of the logical *meter* is maintained through the algorithm and its reference to *metering data* from the physical *meter*.

The use of a logical *meter* must be approved by AEMO.

A.17 One End User, Wholesale Metering at Transmission Node

- One *connection point*. This is a type1 *metering installation* at a wholesale boundary point.
- One End User
- Two *meters/measurement* elements
- One *NMI*. The *NMI* is assigned to the *metering point*.

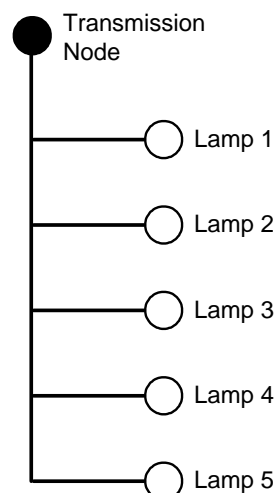


- Allocated *NMI*: TTDDW00015
- Identity of individual interrogated *metering data*:

Master meter (Import)	TTDDW00015 B1
Check meter (Import)	TTDDW00015 C1

A.18 Street Lighting (Type 7 Metering Installation)

- Multiple unmetered connections, one *market connection point*.
- One End User.
- One type 7 *metering installation*.
- One *NMI*.
- All lamps are supplied from a single *transmission* node.
- All lamps have the same TNI, DLF, FRMP and LNSP.

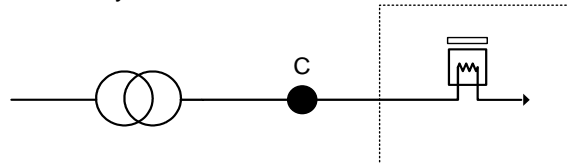


- Allocated *NMI*: 5555565656
- Identity of individual interrogated *metering data*: 5555565656 E1

APPENDIX B. EXAMPLES OF NMI APPLICATION – ACCUMULATED ENERGY DATA

B.1 Single Meter with Single Datastream

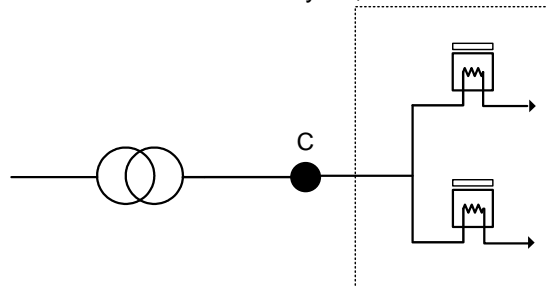
- Only one Datastream available, identified by 11. Only one Datastream, denoted by first character 1, and only one *meter* denoted by second character 1.



- Allocated *NMI*: 5656565656
- Identity of individual interrogated *metering data*: 5656565656 11

B.2 Two Meters each with Single Datastream

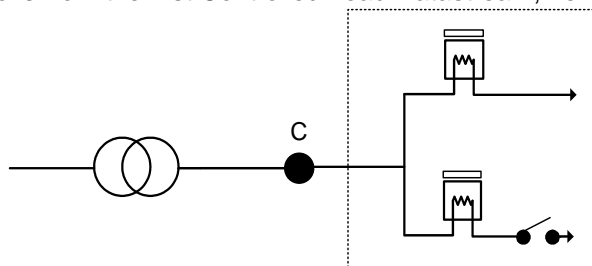
- The Datastream from the first *meter* is identified by 11, and from the second *meter* by 12.



- Allocated *NMI*: 5656565656
- Identity of individual interrogated *metering data*:
5656565656 11
5656565656 12

B.3 Two Meter Installation, One Meter Recording Consumption for a Controlled Load

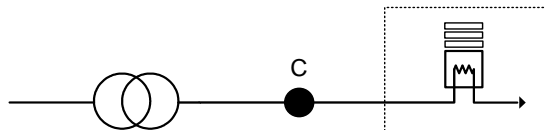
- The data for *meter* one is from the first Datastream, hence suffix 11.
- The data for *meter* two is from the first Controlled Load Datastream, hence suffix 42.



- Allocated *NMI*: 5656565656
- Identity of individual interrogated *metering data*:
5656565656 11
5656565656 42

B.4 Three Datastream, One Meter with Single Measurement Element

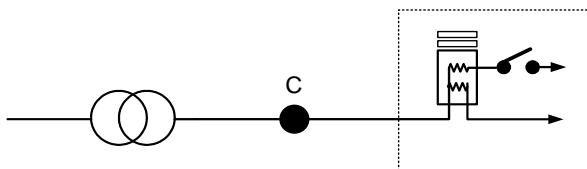
- The *meter* has a three-rate Datastream (high, shoulder, and low rates). As there is only one *meter*, each of the suffixes will have the final character set to 1 to denote that the *metering data* has originated from the same *meter*.
- Each Datastream is numbered as the reader loads *metering data* from them – for a mechanical three-rate Datastream, from top to bottom, or left to right, and for an electronic Datastream in the order in which they scroll.



- Allocated *NMI*: 5656565656
- Identity of individual interrogated *metering data*:
 5656565656 11
 5656565656 21
 5656565656 31

B.5 Multi-function Meter

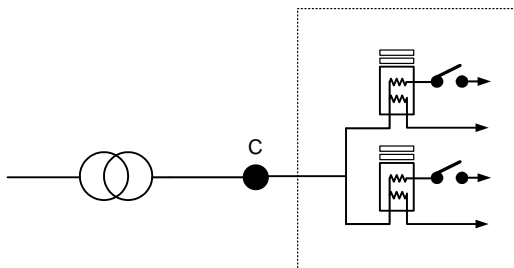
- Multi-function *meter* with two measurement elements.
- Each measurement element has a single *energy* Datastream, which requires two data suffixes. As there is only one *meter*, each of the suffixes will have the final character set to 1 to denote that the *metering data* has originated from the same *meter*. The Controlled Load data will be denoted by a 41 as originating from the first Controlled Load Datastream, and the continuous circuit will be denoted by 11.



- Allocated *NMI*: 5656565656
- Identity of individual interrogated *metering data*:
 5656565656 11
 5656565656 41

B.6 Two Multi-function Meters

- Two multi-function *meters* where the controlled circuits have the same switching control.

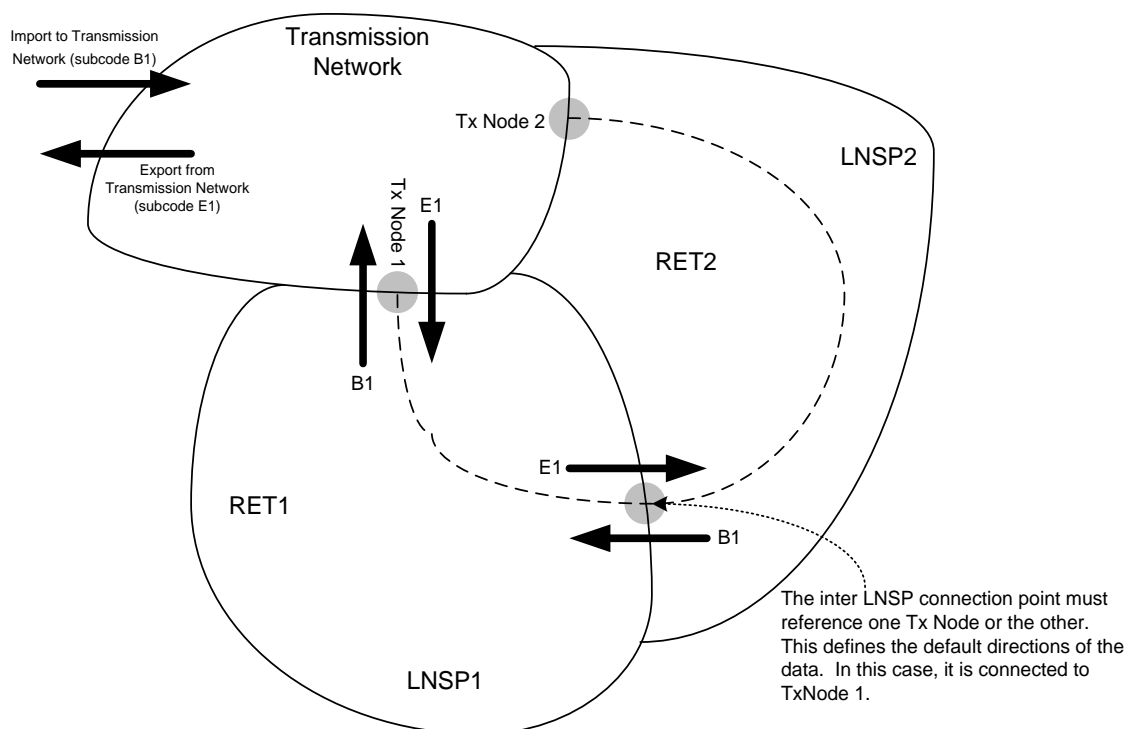


- Allocated *NMI*: 5656565656
- Identity of individual interrogated *metering data* (*meter 1*):
 5656565656 11
 5656565656 41
- Identity of individual interrogated *metering data* (*meter 2*):
 5656565656 12
 5656565656 42

9.1. ENERGY DIRECTION FLOWS

The following conventions are used in the NEM:

- (a) All flows are specified by reference to their direction to or from the market. Hence:
 - (i) All energy from the market is considered export (i.e. energy consumed by an End User is export) (**Export**).
 - (ii)(i) All energy into the market is considered import (i.e. the energy generated into the market is import) (**Import**).
- (b) AEMO shall define the import and export energy flows for interconnectors on a case by case basis.
- (c) For the purposes of MSATS, 'Net' energy is derived as: $\text{Net} = \text{Export} - \text{Import}$
 - (i) Hence, the net energy for generation is negative (in a net quantity) and an End User's energy is positive (in a net quantity).
 - (ii)(i) For Accumulation Meter Datastreams, this means that the energy values for import (generation) must be negative in the MDM Data File.



The same convention is used for kvarh, i.e.:

kvarh supplied to an End User are export kvarh; and
 kvarh received from an End User are import kvarhs.

~~10.1. ALLOCATION OF NMIS FOR TYPE 7 METERING INSTALLATIONS~~

~~Schedule 7.4 of the NER and the Metrology Procedure: Part B establish the framework for type 7 metering installations.~~

~~10.1.1.1. Common Requirements across the NEM~~

- ~~(a)(i) Each type 7 metering installation applies to a unique combination of FRMP, End User, TNI, DLF, and LNSP.~~
- ~~(b)(i) The NMI may contain different agreed Unmetered Device loads or Unmetered Device types. One NMI is required for each type 7 metering installation. Individual Unmetered Device loads may be added to and removed from the NMI without the need to change the NMI.~~
- ~~(c)(i) For each TNI there will be one or more NMIs representing municipal lighting loads, and several other NMIs representing the various utilities who have Unmetered Device loads in the geographic area serviced by the TNI.~~
- ~~(d)(i) New NMIs must only be created where one or more Unmetered Device loads with a unique and previously unregistered set of attributes (FRMP, End User, TNI, DLF, LNSP) are to be put into service.~~
- ~~(e)(i) A NMI may be abolished if the Unmetered Device load is removed (e.g. street turned into park, and lighting removed) or the Unmetered Device load is transferred to another NMI. (E.g. due to network re-arrangements).~~
- ~~(f)(i) A change of one attribute (FRMP, TNI, DLF, LNSP), or a change of End User, will not of its own require an abolition of the NMI.~~
- ~~(g)(i) The NER and Metrology Procedure: Part B provide for the allocation of NMIs to broad classes of Unmetered Device connection points provided that certain attributes required for settlements remain unique.~~
~~AEMO expects that each LNSP has a procedure for the allocation of NMIs for Unmetered Device supplies, which will be available for review by the Jurisdiction or AEMO on request.~~
- ~~(h)(i) A procedure for the allocation of NMIs for street and public lighting across a geographic area must include the following steps:~~
 - ~~(i) Define the geographic area supplied from a transmission node.~~
 - ~~(ii)(i) Subdivide the Unmetered Device supplies within this geographic area according to End Users. If necessary, sub-divide these Unmetered Device supplies to take account of variations of DLF that apply across the area.~~
 - ~~(iii)(i) If necessary, subdivide these Unmetered Device supplies according to FRMP.~~
- ~~(i) When considering materiality, the LNSP may allocate streetlights by geographic area, or postcode, or by some other available grouping where the majority of that Unmetered Device load is supplied from a single transmission node.~~
- ~~(j)(i) Where distribution feeders are commonly supplied from one transmission node, but are regularly moved to another transmission node for maintenance or seasonal reasons, the Unmetered Device NMI can be recorded in MSATS against the transmission node through which the majority of the energy is delivered. This approach is supported by the fact that the calculation of marginal loss factors takes account of seasonal flows at transmission nodes, and that the marginal loss factors for adjacent TNIs where load sharing is possible are unlikely to be significantly different.~~

APPENDIX C. SAMPLE JAVA CODE FOR NMI CHECKSUM

```

/**
 * Calculates a LUHN-10.
 * <PRE>
 * 1. Double the value of alternate digits beginning with the rightmost digit
 * 2. Add the individual digits comprising the products obtained in step 1 to
 *    each of the unaffected digits in the original number.
 * 3. Find the next highest multiple of 10
 * 4. The check digit is the value obtained in step 2 subtracted from the value
 *    obtained in step 3.
 * 5. END
 * </PRE>
 */
public class LUHN10
{
    /**
     * Value to indicate we have not calculated the luhn yet.
     */
    private static final int NULL_VALUE = -1;

    /**
     * Buffer holding the sequence of digits to use in the calculation.
     */
    private StringBuffer _buffer;

    /**
     * The cached value for the luhn.
     */
    private int _luhn;

    /**
     * Constructor.
     */
    public LUHN10()
    {
        reset();
    }

    /**
     * Resets the calculator to its initial values.
     */
    public void reset()
    {
        _buffer = new StringBuffer();
        _luhn = NULL_VALUE;
    }

    /**
     * Updates the LUHN-10 with specified digit.
     */
    public void update(char d)
    {
        // Append the character
        _buffer.append(d);

        // And, reset the cached luhn
        _luhn = NULL_VALUE;
    }
}

```

```
/**
 * Returns the current LUHN-10 value.
 */
public int getValue()
{
    if (_luhn == NULL_VALUE)
    {
        int v = 0;
        boolean multiply = true;
        for (int i = _buffer.length(); i > 0; i--)
        {
            int d = (int)_buffer.charAt(i - 1);

            if (multiply)
            {
                d *= 2;
            }
            multiply = !multiply;

            while (d > 0)
            {
                v += d % 10;
                d /= 10;
            }
        }
        _luhn = (10 - (v % 10)) % 10;
    }
    return _luhn;
}

public static void main(String[] args)
{
    if (args.length == 0)
    {
        System.out.println("USAGE: LUHN10 nmi");
    }
    else
    {
        LUHN10 luhn = new LUHN10();

        String nmi = args[0];

        for (int j = 0; j < nmi.length(); j++)
        {
            luhn.update(Character.toUpperCase(nmi.charAt(j)));
        }

        System.out.println(nmi + "/" + luhn.getValue());
    }
}
```

APPENDIX D. EXAMPLE OF NMI CHECKSUM CALCULATIONS

This Appendix contains a worked example of the NMI Checksum calculation. An alphanumeric *NMI* is used in the example to illustrate the algorithm's ability to handle all characters that have an ASCII equivalent.

The logic of the algorithm can be summarised as:

Process each character in the *NMI* individually, starting with the right most. For each character:

- (a) Convert the character to its ASCII value
- (b) For the right most character and every second character reading left, double the ASCII value obtained in Step (a).
- (c) Add the individual digits of the ASCII value to a register holding the total added value for the NMI Checksum.

Subtract the total added value register from the next highest multiple of 10. If the result is 10, the checksum is 0, otherwise the result is the NMI Checksum.

The *NMI* for the following worked example is: 1234C6789A

Step 1. Initialise variables used by the process.

Double_This_Char

is a boolean that indicates whether the character currently being processed should be doubled.

Char

is the character currently being processed as it appears in the *NMI*.

ASCII_Char

is the ASCII value of Char

Total

is the running sum of the digits generated by the algorithm.

NMI Checksum

is the final result. At the start of the process:

Double_This_Char = True

because the right most character, and then every second character, is doubled by the algorithm.

Total = 0

Checksum = NULL

Step 2. Read the *NMI* character by character, starting with the right most character.

Char = A

Step 3. Convert the character to its ASCII value.

ASCII_Char = 65

Step 4. Double the ASCII value if the character is the right most of the *NMI* or an alternate.

ASCII_Char = 130

Double_This_Char = Not Double_This_Char

Step 5. Add the individual digits of the ASCII value to the Total After.

Total = Total + 1 + 3 + 0 (i.e. Total = 4)

Performing steps 2 to 5 for each character in our example *NMI* gives the following results:

Table 3 Example NMI Results

Character	Total Before	ASCII Value	Double?	Doubled Value	Total After
A	0	65	Y	130	4 (0+1+3+0)
9	4	57	N	57	16 (4+5+7)
8	16	56	Y	112	20 (16+1+1+2)
7	20	55	N	55	30 (20+5+5)
6	30	54	Y	108	39 (30+1+0+8)
C	39	67	N	67	52 (39+6+7)
4	52	52	Y	104	57 (52+1+0+4)
3	57	51	N	51	63 (57+5+1)
2	63	50	Y	100	64 (63+1+0+0)
1	64	49	N	49	77 (64+4+9)

The value of 'Total After' processing the *NMI* is 77.

The next highest multiple of 10 is 80.

Checksum = 80 – 77 = 3.

Further examples: NMIs and Associated Checksums

The following thirty NMI Checksums were calculated by AEMO from the *NMI*s listed in Table 4. The *NMI*s and NMI Checksums are provided to assist Participants in checking their implementation of the NMI Checksum algorithm.

Table 4 NMIs and NMI Checksums

NMI	NMI Checksum	NMI	NMI Checksum
2001985732	8	QAAAVZZZZZ	3
2001985733	6	QCDWW00010	2
3075621875	8	SMVEW00085	8
3075621876	6	VAAA000065	7
4316854005	9	VAAA000066	5
4316854006	7	VAAA000067	2
6305888444	6	VAAASTY576	8
6350888444	2	VCCCX00009	1
7001888333	8	VEEEX00009	1
7102000001	7	VKTS786150	2
NAAAMYS582	6	VKTS867150	5
NBBBX11110	0	VKTS871650	7
NBBBX11111	8	VKTS876105	7
NCCC519495	5	VKTS876150	3
NGGG000055	4	VKTS876510	8