



Metering And Data Exchange Code

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METERING AND DATA EXCHANGE CODE

MDEC.1 Introduction

All Active and Reactive Power entering or exiting the Transmission System and Distribution Systems of Licensed Operators shall be metered using one or more Metering Systems. Electricity delivered to Consumer premises shall also be metered.

Similarly all Water exiting Production Facilities' sites must be metered and recorded using one or more Water Meters or Water Metering Systems.

The metering of all such quantities and flows is required for a variety of purposes, including;

- i) for the purpose of establishing a record of electrical quantities entering or exiting the systems of a Licensed Transmission System Operator and Licensed Distribution System Operators;
- ii) for the purpose of establishing the quantities of electricity delivered to Consumer premises;
- iii) for the purpose of establishing a record of the quantities of water exiting Production Facilities;
- iv) for calculating amounts to be paid in accordance with agreements between Persons to whom this code applies;
- v) for certain contractual purposes between Persons to whom this code applies;
- vi) for the provision of data to the Regulatory Authority in connection with the monitoring and enforcement of Licences, the Sector Law and related matters, including the calculation and establishment of cost reflective tariffs and the monitoring of the electricity supply market;
- vii) for the purpose of establishing compliance with the Grid Code by those Persons who are bound by it; and
- viii) such other purposes as may be expedient or requisite from time to time in connection with matters contemplated by the Sector Law and/or under this Grid Code.

The requirements of this Metering and Data Exchange Code (MDEC) are complimentary to the metering and data exchange requirements of agreements between Persons to whom this code applies.

References in MDEC to Meter Owner include Meters and Metering Systems used by Persons under any agreement with a third party.



MDEC.2 Objectives

The objectives of the Metering and Data Exchange Code are to establish;

- The standards to be met in the provision, location, installation, operation and maintenance of Metering Systems;
- The standards to be met by those bound by MDEC in relation to all matters associated with Metering Systems;
- The responsibilities of each Person bound by MDEC in relation to ownership and management of Metering Systems and Meters and the provision and use of Meter data; and
- The responsibilities of all Persons bound by MDEC in relation to the storage of Meter data.

It is important that all relevant Persons may prepare, calculate, assess and validate invoices between such Persons with a view to their prompt settlement, having available to them all necessary Meter data of reliable quality and accuracy for those purposes at the times at which they require the same.

MDEC.3 Scope

The Metering and Data Exchange Code applies to OETC and;

- PWP;
- PAEW;
- Power Producers;
- Licensed Distributors;
- Licensed Suppliers;
- International Interconnected Parties;
- Internally Interconnected Parties;
- Directly Connected Consumers; and
- RAEC if Connected to the Total System.

MDEC is concerned with the Metering Systems and related Meters and Meter data associated with Production Facilities, the Systems of Licensed Transmission System Operators, Distribution System Operators, and Meters to final Consumers.

MDEC.4 General

Metering Systems and Meters shall be established, metering shall take place and Meter data shall be recorded, checked and exchanged between Persons bound by this code and then stored, sufficient to ensure that all such Persons are able to prepare and calculate, assess and validate and, keep appropriate records concerning and where appropriate, challenge, invoices as listed below, on a prompt, comprehensive and accurate basis.

Meter data shall be permanently recorded and stored for these purposes in accordance with other provisions of MDEC. If a contract between relevant Persons has additional requirements for Metering Systems or in relation to Meters, those requirements shall, so long as they do not prevent compliance with MDEC, apply in addition to MDEC.

At each Electrical and Water Delivery Point, Meters and/or Metering Systems shall be installed, operated and maintained and metering shall take place sufficient for all



purposes of this code. The Delivery Points shall be at the ownership boundary and shall be set out in each Connection Agreement.

OETC, Licensed Distributors, Licensed Suppliers and Users shall each respectively take all reasonable steps to ensure that each relevant Metering System is located as close as is reasonably practicable to the Delivery Point at each Connection Point, particularly where Metering Systems are required for settlement purposes or other purposes set out in MDEC.

The actual location of a Metering System is referred to as the “Actual Metering Point”. This may be different from the Delivery Point established pursuant to the relevant Connection Agreement. Where the Actual Metering Point is not coincident with the Delivery Point, compensation shall be provided for power transformer and/or line losses so that the overall accuracy requirement at the Delivery Point is met.

Each CDGenset shall have a Metering System to measure Capacity and Output. Each Production Facility that produces water shall have a Metering System to measure the Capacity and Output of water production units at the Production Facility.

MDEC.4.1 Meter and Metering System ownership

The term, Meter Owner, also relates to Meters and Metering Systems used by Persons under any agreement with a third party.

The Meter Owner shall be responsible for all aspects of ownership, purchase, maintenance, calibration and testing unless stated otherwise in MDEC.

Meter ownership shall be determined as follows;

- Power Producers shall own and be responsible for electricity Metering Systems for entry/exit to/from OETC busbars;
- Power Producers shall own and be responsible for electricity Metering Systems between the Production Facility and Licensed Distributor busbars located on the Production Facility site whether or not there is another User connected to the busbars;
- Power Producers shall own and be responsible for the Water Metering Systems where the Production Facility is connected to PAEW’s system;
- OETC shall own and be responsible for the Metering Systems at a substation with a single Licensed Distributor;
- Where ownership by a single party of a complete Metering System at a substation is not possible, ownership shall be as follows;
 - VTs shall be owned by the owner of the busbar or circuit to which the VT is Connected;
 - CTs shall be owned by the owner of the circuit of which the CT is installed;
 - Cabling associated with the VTs and CTs shall be owned by the Measurement Transformer owners up to the local junction box, thereafter the cabling shall be part of the general substation cabling owned by the substation site owner;
 - Meters and the Meter cubicles on which Meters are located shall be owned by the substation site owner;
 - The substation site owner shall have overall responsibility for the specification, maintenance, calibration and testing of the Metering Systems on the site;



- For Metering Systems that meter electricity flows between Licensed Distributors, the owner of the Metering System shall be the owner of the site or site on which the Measurement Transformers are located; and
- The ownership and responsibility for Metering Systems between OETC or Licensed Distributors and Consumers shall be as determined in the Connection Agreement or other agreement between the parties.

MDEC.5 Electricity Meters

MDEC.5.1 General

All Meters and Metering Systems procured, installed, operated and maintained for the purposes of this code shall be sufficient for all purposes of this code such that the standards to be met in relation to those Meters and Metering Systems, metering and the recording and exchange of Meter data set out in this code are met.

Each Meter and Metering System shall comply with the all provisions of this code, including those as to the standards of accuracy and calibration to be achieved in Metering Systems.

All data communications equipment required for the purposes of this code and forming part of or associated with any Meter or Metering System shall perform to the relevant International Telecommunications Union (ITU) standards and recommendations for data transmission over telecommunication systems, or such other communication protocols as the Metering and Data Exchange Code Review Panel may specify.

MDEC.5.2 Meter, CT and VT requirements

MDEC.5.2.1. Equipment required

MDEC.5.2.1.1 Meters

For Connections greater than or equal to 20 MVA, Metering Systems shall include main and check Meter equipment both having the same levels of accuracy and functionality.

Main Meters and check Meters shall be installed, operated and maintained so as to comply at all relevant times with the standards and accuracy classes indicated in Appendix A.

For Connections to consumers, Metering Systems shall be in accordance with Appendix B.

For each Delivery Point, a Metering System shall be installed, operated and maintained to measure the following parameters;

- i) Entry and exit Active Energy; and
- ii) Entry and exit Reactive Energy

The Meter Owner shall configure active Energy Meters such that the number of measuring elements is equal to or one less than the number of primary system conductors. These include the neutral and/or earth conductor where system configurations enable the flow of energy in such conductors.

All Meters shall be labelled by the Meter Owner or otherwise be readily identifiable in accordance with Appendix C.



The Metering Systems shall meter quantities on a continuous basis and the information shall be displayed on a non-volatile Meter Register. The Meter Registers shall not pass through zero more than once within the normal meter reading cycle.

Where main Meters and check Meters are provided with Outstations, the Outstations shall provide two outputs per measured quantity. The Outstations shall enable Meter data to be interrogated locally and at a later date for Meter data to be provided remotely over communications channels.

Where Meters provide Meter data to Outstations external to the Meter, the Outstations shall provide two outputs per measured quantity.

The Meter Owner shall provide Test terminals for main Meters and check Meters to facilitate on-site tests. These terminals shall be in close proximity to the Meters and shall be capable of providing suitable means for accessing current and voltage signals, injecting test quantities, connecting test Meters, and replacing Meters without a circuit outage.

MDEC.5.2.1.2 Current transformers

The Plant Owner shall provide current transformers in accordance with the standards and accuracy classes indicated in Appendix A – A3.

Where main Meters and check Meters are required, the Plant Owner shall provide two sets of current transformers. The current transformers supplying main Meters, the current transformer windings and cables connecting such windings to main Meters shall be dedicated for such purposes and such cables and connections shall be securely sealed.

The current transformers supplying check Meters may be used for other purposes provided that overall accuracy requirements are met. Evidence of the additional Burden imposed by such purposes shall be made available for inspection by relevant parties.

The additional Burden shall not be modified without prior agreement from relevant parties and evidence of the value of the modified additional Burden shall be available for inspection by relevant parties. The total Burden on each current transformer shall not exceed the rated Burden of such current transformer.

Current transformer test certificates showing errors at the overall working Burden or at Burdens which allow the error at working Burden to be calculated shall be made available by the Plant Owner for inspection by the relevant parties.

MDEC.5.2.1.3 Voltage transformers

The Plant Owner shall provide voltage transformers in accordance with standards and accuracy classes indicated in Appendix A – A3.

Where main Meters and check Meters are required the Plant Owner shall provide two voltage transformers or one voltage transformer with two or more secondary windings.

The voltage transformer winding supplying main Meters shall be dedicated to that purpose and such windings and connections shall be securely sealed.

The voltage transformer secondary winding supplying check Meters may be used for other purposes provided the overall Burden and accuracy requirements are met and evidence of the additional Burden imposed by such purposes is available for inspection by the relevant parties.

The additional Burden shall not be modified without prior argument from the relevant parties and evidence of the value of such additional Burden shall be available for



inspection by the relevant parties. The total Burden on each voltage transformer shall not exceed the rated Burden of such voltage transformer.

Voltage transformer test certificates showing errors at the overall working Burden or at Burdens that allow the error at working Burden to be calculated shall, wherever possible, be available by the Plant Owner for inspection by relevant parties.

Separately fused voltage transformer supplies shall be provided by the Plant Owner for the main Meter, the check Meter, and any additional Burden. The fuses shall be located as close to the voltage transformer as possible.

MDEC.5.2.2. Accuracy requirements

MDEC.5.2.2.1 Overall accuracy

The accuracy of the various items of measuring equipment comprising Meters and Metering Systems shall conform to the relevant IEC standards current at the time that the User's Connection Agreement is signed. Standards relevant to this code are listed in Appendix A – A1 and A2.

Accuracy requirements for the purpose of this code are defined by circuit Capacity, rated in MVA. Circuit Capacity shall be determined by the lowest rated primary plant of the circuit (i.e. transformer, line, etc) and must be based on the primary plant maximum continuous ratings. The rating and accuracy requirements of Metering Systems shall anticipate future uprating of the primary plant.

Where relevant standards change from time to time, the Metering and Data Exchange Code Review Panel will review such changes and recommend to the Regulatory Authority the extent to which any such changes should be implemented.

MDEC.5.2.2.2 Compensation for power transformer or Line losses

Where the Actual Metering Point is not coincident with the Delivery Point, compensation shall be provided for power transformer and/or line losses so that the overall accuracy requirement at the Delivery Point is met. The compensation may be applied locally within the Metering System or remotely. Compensation factors and their justification shall be established in accordance with Good Industry Practice and must be recorded in the Meter Registration System.

MDEC.5.2.2.3 Compensation for Measurement Transformer error

Errors arising from the Measurement Transformers and associated leads to the Meters that affect the overall accuracy shall be compensated such that the overall accuracy requirement is met. Values of the compensation factors and their justification including test certificates shall be established in accordance with Good Industry Practice and recorded in the Meter Registration System and shall be available for inspection by relevant parties.

MDEC.5.2.3. Meter approval and certification

Meters used in accordance with this code shall be approved Meter types. The Grid Code Review Panel shall maintain a list of approved Meter types that shall be made available on request. The Grid Code Review Panel shall also be responsible for type approval of Meters to ensure compliance with the provisions of this code in accordance with Good Industry Practice.

The Grid Code Review Panel will issue Meter Certificates to PWP, the relevant Meter Owner and the Regulatory Authority in accordance with Good Industry Practice to



confirm that Meters and Metering Systems comply with the requirements of this code. Meter Owners shall provide certification and other documentation as required to the Grid Code Review Panel to enable the Grid Code Review Panel to carry out this responsibility. Meter Certificates shall be issued for specified time spans and the duration may differ for different Meter types.

MDEC.5.2.4. Operation and maintenance

Metering Systems shall be operated and maintained in accordance with the manufacturer's recommendations or as otherwise necessary for the Meter Owner to comply with its obligations under this code.

The Consumer representatives of each Licensed Distributor shall be responsible for providing Consumers supplied at LV with the Meter requirements applicable to Consumer Metering Systems.

MDEC.5.3 Metering System Calibration and testing

MDEC.5.3.1. Initial Calibration

All new Meters shall undergo relevant certification tests in accordance with Good Industry Practice.

All initial calibration of Meters shall be performed in a recognised test facility (including any Meter manufacturer's works). These tests shall be performed in accordance with the relevant IEC standards and shall confirm that Meter accuracy is within the limits stated in Appendix A – A2. A uniquely identifiable calibration record shall be provided by the recognised test facility before the Connection is made live.

The Meter Owner will apply a certification seal following initial calibration. The Meter Owner must maintain this seal intact in order for the Meter to retain certified status. No Person bound by this code shall break the seal unless properly authorised to do so. The Meter Owner is responsible for ensuring that Meter certification is carried out for compliance with the provisions of this code.

Meters removed from service must be re-certified before reconnection for use under this code.

New voltage transformers and current transformers shall be calibrated prior to installation on site. Meter Owners shall provide manufacturers' test certificates to OETC for inclusion in the Meter Registration System to show compliance with the accuracy classes.

MDEC.5.3.2. Commissioning

Commissioning tests shall be carried out on all new Metering Systems providing Meter data before the Connection is made live and in accordance with Good Industry Practice. Commissioning tests shall also be carried out before reconnection where a replacement Metering System is fitted as part of an existing Metering System. No Connection or reconnection shall be permitted unless the tests are passed.

Following commissioning, the Meter Owner shall provide such evidence that relevant parties may require to confirm that a Metering System meets the requirements of this code.

All Meters, current transformers and voltage transformers shall be tested by the respective Owner for accuracy in accordance with Good Industry Practice at initial commissioning before the Connection is made live, as indicated in Appendix D. Appendix D sets out the tests and checks that as a minimum shall be included in a commissioning programme.



MDEC.5.3.3. Periodic Calibration and testing

MDEC.5.3.3.1 General

Periodic Calibration of Metering Systems shall be undertaken by the Meter Owners to ensure that the requirements of this code are met at all relevant times.

Periodic calibration of Meters shall be performed in a recognised test facility (including any Meter manufacturer's works) or by competent persons using standard Meters certified by a recognised authority. Accuracy Tests shall be performed in accordance with the relevant IEC standards and shall confirm that Meter accuracy is within the limits stated in Appendix A. The calibration record shall be uniquely identifiable, retained in a safe place and the significant details (Identification Number, date, names and status of authorised testing persons and accuracy results) recorded in the Meter Registration System.

Periodic Calibration of all Meters other than Active Energy class 0.2S may be performed on site provided that the percentage error limits associated with the accuracy classes given in Appendix A are met.

Periodic Calibration of class 0.2S Active Energy Meters and other Meters not meeting the error limits as described above, shall be performed in a recognised test facility (including any Meter manufacturer's works).

Meters shall also be tested outside of the prescribed intervals stated in MDEC.5.3.3.2 below if the main Meters and check Meters diverge by more than 1.5 times the prescribed limit of error associated with the accuracy classes given in Appendix A.

Complete and accurate records of Accuracy Tests, work carried out and pertinent data to confirm successful testing/calibration in accordance with the requirements of this code shall be kept by the Meter Owner and promptly registered in the Meter Registration System where appropriate.

MDEC.5.3.3.2 Frequency of testing

Electromechanical Meters shall be Calibrated and refurbished as necessary at intervals not exceeding ten years.

Active Energy Meters of accuracy class 0.5 shall have on-site Accuracy Tests performed at intervals not exceeding 5 years.

On-site Accuracy Tests are not required for all other types of electromechanical Meters.

For electronic Meters;

At least one of each type of electronic Meter owned by each Meter Owner shall be calibrated in any 5-year period. A minimum of 20% of the total of each type of Meter on-circuit with a Meter Owner shall be calibrated in an evenly phased programme over a 10-year period.

Where the main Meters and check Meters employed on a circuit are of the same manufacture and type (and are thus likely to have similar failure characteristics), on-site Accuracy Tests shall be performed at intervals not exceeding 5 years for Active Energy Meters and intervals not exceeding ten years for Reactive Energy Meters.

Where the main Meters and check Meters employed on a circuit are of a different manufacture or type, no on-site Accuracy Tests are required.

Where only a main Active Energy Meter is employed on a circuit, on-site Accuracy Tests shall be performed at intervals not exceeding five years.

Where only a main Reactive Energy Meter is employed, on-site Accuracy Tests shall be performed at intervals not exceeding ten years.



Periodic testing of Measurement Transformers is not required.

The testing intervals may be modified by the Metering and Data Exchange Code Review Panel.

MDEC.5.3.3.3 Suspected Metering errors

If any item of a Metering System is suspected of performing incorrectly, any affected party may request the Meter Owner to carry out Accuracy Tests in accordance with Good Industry Practice to confirm correct operation and accuracy. The Meter Owner shall carry out any test so requested. The party requesting the Accuracy Test shall bear the reasonable costs of such testing if the Meter is found to be operating within the prescribed limits of error, otherwise the cost of the Accuracy Test shall be borne by the Meter Owner. All affected parties shall be given 24 hours notice of such tests and be invited to witness the tests. Accuracy Test results shall be made available promptly and in writing to the affected parties.

Certified test equipment and reference standards (all traceable to recognised national or international standards) shall be used in such tests and if, by agreement, it is deemed necessary, an approved independent laboratory may be employed.

Where a Accuracy Test indicates that an error exceeds the limits of error associated with the accuracy classes given in Appendix A, the errors shall be recorded before promptly adjusting, repairing or renewing the Metering System (or part thereof) or replacing defective components. In such cases substitute Meter data shall be provided in accordance with PWP's/Licensed Distributors'/Licensed Suppliers' procedures.

The Metering System shall be restored to service and proved to be operating within the prescribed limits of accuracy as soon as is reasonably practicable. Upon the completion, examination, maintenance, repair, recalibration or replacement of any component in the Metering System, the Metering System shall be sealed.

MDEC.5.4 Meter and data security and registration

MDEC.5.4.1. Meter access and sealing

All Metering Systems and associated communications equipment shall be located in secure metering cabinets located in an area that is readily accessible, free from obstructions and well lit by artificial light. The cabinets shall include as a minimum, effective protection from moisture and dust ingress and from physical damage, including vibration. Appropriate temperature controls shall be provided. The cabinets must be lockable and capable of being sealed to prevent unauthorised access.

Meter Owners and the relevant parties, as appropriate, shall jointly seal the Metering System that shall include data collection equipment and associated modems and telephone links. Only the Meter Owner's personnel shall break such seals. All other affected parties shall be given at least forty-eight (48) hours' advance notice of the breaking of seals on any part of the Metering System. No such notice will be necessary when the breaking of a seal is necessitated by the occurrence of an Emergency.

Neither party shall tamper or otherwise interfere with any part of the Metering System in any way. Where it is established that the Metering System has been tampered or interfered with, then until such tampering or interference has been rectified either;

- (a) the quantity measured or recorded shall be that measured or recorded by any other relevant installed Metering System; or
- (b) if there is no other relevant Metering System or it is established to have been tampered or interfered with, the quantity shall be agreed by the parties, or, in



the absence of such agreement, either party shall be entitled to refer the matter to an Expert for determination.

If the Meter Owner is not the Person who owns or controls the land on which the Meter or Metering System is situated, that Person (if bound by this code) shall grant the Meter Owner and all other Persons who require the same for the purposes of this code sufficient rights of access for metering purposes and for the purposes of testing calibration, operation and maintenance and replacement of the Meter and Metering System.

Where any Person requires right of access or to deal in some other way with a Meter or Metering System for the purposes of this code, all such necessary rights shall be granted by the Person with the power to grant them if that Person is bound by this code. All such rights shall be set down in the relevant Connection Agreement where this is practicable.

The right of access provided for in this code includes the right to bring onto such a party's property any vehicles, plant, machinery and maintenance or other materials as shall be reasonably necessary for the purposes of performance of obligations under this code.

Each party shall ensure that all reasonable arrangements and provisions are made and/or revised from time to time as and when necessary or desirable in accordance with Good Industry Practice to facilitate the safe exercise of any right of access.

MDEC.5.4.2. Meter records

The Meter Owner shall label all Meters with a unique identification number from lists maintained by OETC.

Each Meter Owner shall ensure that complete and accurate records are maintained of the calibration and operation of Metering System. These records shall include but not be limited to the dates and results of any tests, readings, adjustments or inspection carried out and the dates on which any seal was applied or broken. The reasons for any seal being broken and the Persons, and their affiliations, attending any such tests, readings, inspections or sealings shall be recorded.

Meter Owners shall ensure that the pertinent data (Appendix E) is provided promptly to OETC for entry into the Meter Registration System. Such data shall be kept up to date. They shall also provide any other Metering System data requested by other involved parties.

MDEC.5.4.3. Meter registration

Metering Systems shall be registered in a central database, the Meter Registration System, which is to be operated and maintained by OETC in accordance with Good Industry Practice. The purpose of the Meter Registration System is to provide a complete, accurate and up to date central database of all Meter data and to ensure an auditable trail to demonstrate compliance with this code. The Meter Registration System shall contain, as a minimum, specific information at each Actual Metering Point as indicated in Appendix E.

All Users are responsible for ensuring that data relating to all changes to Users' Metering Systems including any changes to the types of data set out in Appendix E and any site de-energisations or disconnections are promptly reported in writing, to the Meter Registration System. Any other information regarding each metering point as may be reasonably required by the involved parties.



The Meter Registration System shall maintain the specified information for a minimum of seven years after the replacement or disconnection of a Meter.

Any data held in the Meter Registration System (a) shall be the intellectual property of OETC and (b) may be freely accessed by;

- The Meter Owner;
- The Regulatory Authority;
- OETC; and
- PWP.

Any User but with access limited to that equipment directly associated with the Metering System of that User.

MDEC.6 Water Meters

MDEC.6.1 General

All Water Meters and Water Metering Systems procured, installed, operated and maintained for the purposes of this code shall be sufficient for all purposes of this code such that the standards to be met in relation to those Water Meters and Water Metering Systems, metering and the recording and exchange of Meter data set out in this code are met.

Each Water Meter and Water Metering System shall comply with the all provisions of this code, including those as to the standards of accuracy and calibration to be achieved in Metering Systems.

All data communications equipment required for the purposes of this code and forming part of or associated with any Meter or Metering System shall perform to the relevant International Telecommunications Union (ITU) standards and recommendations for data transmission over telecommunication systems.

The relevant Connection Agreement may provide for site-specific isolation or other requirements in accordance with established Good Industry Practice and in particular, to comply with the requirements of any telecommunications service providers.

MDEC.6.2 Water Meter requirements

Water Metering Systems shall include main Water Meter equipment and check Water Meter equipment in series with a means of removing each Meter without affecting the operation of the other. Both Meters shall have at all relevant times the same levels of accuracy and functionality.

Water Meters shall include a pulsed output providing instantaneous and integrated flow readings and shall be equipped with battery back up power supplies for 24 hours operation.

All Water Meters and/or Water Metering Systems shall comply with the technical requirements specified in Appendix F.

Water Metering Systems shall meter the quantities on a continuous basis and the information shall be displayed on a non-volatile Meter Register. The Meter Registers shall not pass through to zero more than once within the normal reading cycle.

The Water Meter Owner shall provide Water Metering Systems with Outstations that shall provide two outputs per measured quantity. The Outstations shall enable Water



Meter data to be interrogated locally and at a later date for Water Meter data to be provided remotely over communications channels.

MDEC.6.2.1. Accuracy requirements

The Meter accuracy over the normal operating range shall not be more than $\pm 0.20\%$ of full-scale reading.

MDEC.6.2.2. Meter approval and certification

Water Meters used in accordance with this code shall be approved Water Meter types. The Grid Code Review Panel shall maintain a list of approved Water Meter types that shall be made available on request. The Grid Code Review Panel shall also be responsible for type approval of Water Meters to ensure compliance with the provisions of this code in accordance with Good Industry Practice.

The Grid Code Review Panel will issue Meter Certificates to the Water Meter Owner and the Regulatory Authority in accordance with Good Industry Practice to confirm that Water Meters and Water Metering System comply with the requirements of this code. Water Meter Owners shall provide certification and other documentation as required to the Grid Code Review Panel to enable the Grid Code Review Panel to carry out this responsibility. Meter Certificates shall be issued for specified time spans and the duration may differ for different Water Meter types.

MDEC.6.2.3. Operation and maintenance

Water Metering System shall be operated and maintained in accordance with the manufacturer's recommendations or as otherwise necessary for the Water Meter Owner to comply with its obligations under this code.

MDEC.6.3 Water Metering System Calibration and testing

MDEC.6.3.1. Initial Calibration

The Water Meter Owner will apply a certification seal following initial calibration. The Water Meter Owner must maintain this seal intact in order for the Meter to retain certified status. No Person bound by this code shall break the seal unless properly authorised to do so. The Water Meter Owner is responsible for ensuring that Meter certification is carried out for compliance with the provisions of this code.

All new Water Metering Systems shall undergo relevant certification tests in accordance with Good Industry Practice.

All initial calibration of Water Meters shall be performed in a recognised test facility (including any Meter manufacturer's works). These tests shall be performed in accordance with the relevant IEC standards. A uniquely identifiable calibration record shall be provided by the recognised test facility before the Meter enters service.

The Water Meter Owner will apply a certification seal following initial calibration. The Water Meter Owner must maintain this seal intact in order for the Meter to retain certified status. No Person bound by this code shall break the seal unless properly authorised to do so. The Water Meter Owner is responsible for ensuring that Meter certification is carried out for compliance with the provisions of this code.

Water Meters removed from service must be re-certified before reconnection for use under this code.



MDEC.6.3.2. Commissioning

Commissioning tests shall be carried out on all new Water Metering Systems to ensure Meter data can be provided before the Connection is placed into service and in accordance with Good Industry Practice. Commissioning tests shall also be carried out before reconnection where a replacement Water Metering System is fitted as part of an existing Water Metering System. No Connection or reconnection shall be permitted unless the tests are passed.

Following commissioning, the Water Meter Owner shall provide such evidence that the relevant parties may require to confirm that the Water Metering System meets the requirements of this code.

MDEC.6.3.3. Periodic Calibration and testing

MDEC.6.3.3.1 General

Periodic Calibration of all Water Meters shall be undertaken by the Meter Owners to ensure that the requirements of this code are met at all relevant times. The calibration of Meters shall be performed in a recognised test facility (including any Meter manufacturer's works). The tests shall be performed in accordance with the relevant ISO standards and shall confirm that Meter accuracy is within the limits stated in MDEC.6.2.1. The calibration record shall be uniquely identifiable, retained in a safe place and the significant details (Identification Number, date, names and status of authorised testing persons and accuracy results) recorded in the Meter Registration System.

Meter Owners shall test in accordance with Good Industry Practice all Water Meters at specified intervals for accuracy to verify that operation is within the limits of accuracy given in MDEC.6.2.1.

The testing intervals are shown in MDEC.6.3.3.2 below but may be modified by the Water Metering System Review Panel. Water Meters shall also be tested if the main Water Meter and check Water Meter in a Water Metering System diverge by more than 1.5 times the limit of error associated with the accuracy given in MDEC.6.2.1.

Complete and accurate records of tests, work carried out and pertinent data to confirm successful testing/calibration in accordance with the requirements of this Code shall be kept by the Water Meter Owner and promptly registered in the Water Meter Registration System where appropriate in accordance with Good Industry Practice.

MDEC.6.3.3.2 Timing of Water Meter tests

All Water Meters shall be re-calibrated at intervals not exceeding 2 years.

MDEC.6.3.3.3 Suspected metering errors

If any item of a Water Metering System is suspected of performing incorrectly, any affected party may request the Water Meter Owner to carry out Accuracy Tests in accordance with Good Industry Practice to confirm correct operation and accuracy. The Meter Owner shall carry out any Accuracy Test so requested. The party requesting the Accuracy Test shall bear the reasonable costs of such testing if the Water Meter is found to be operating within the prescribed limits of error, otherwise the cost of the test shall be borne by the Water Meter Owner. All affected parties shall be given 24 hours notice of such tests and be invited to witness the tests. Accuracy Test results shall be made available promptly and in writing to the affected parties.

Certified test equipment and reference standards (all traceable to recognised national or international standards) shall be used in such tests and if, by agreement, it is deemed necessary, an approved independent laboratory may be employed.



Where a Accuracy Test indicates that an error exceeds the limits of error associated with the accuracy given in this code, then these errors shall be recorded before promptly adjusting, repairing or renewing the Water Metering System (or part thereof) or replacing defective components. In such cases substitute Meter data shall be provided in accordance with procedures agreed by the Metering and Data Exchange Code Review Panel.

The Water Metering System shall be restored to service and proved to be operating within the prescribed limits of accuracy as soon as is reasonably practicable. Upon the completion, examination, maintenance, repair, recalibration or replacement of any component in the Water Metering System in accordance with Good Industry Practice, the Water Metering System shall be sealed.

MDEC.6.4 Water Meter and data security and registration

MDEC.6.4.1. Water Meter access and sealing

All Water Metering Systems and associated communications equipment shall be located in a secure metering cabinet located in an area that is readily accessible, free from obstructions and well lit by artificial light. The cabinets shall include as a minimum, effective protection from moisture and dust ingress and from physical damage, including vibration. Appropriate temperature and humidity controls shall be provided. The cabinets must be lockable and capable of being sealed to prevent unauthorised access.

Water Meter Owners and PAEW as appropriate shall jointly seal the Water Metering System including data collection equipment and associated modems and telephone links. Only the Water Meter Owner's personnel shall break such seals. All other affected parties shall be given at least forty-eight (48) hours' advance notice of the breaking of seals on any part of the Water Metering System. No such notice will be necessary when the breaking of a seal is necessitated by the occurrence of an Emergency.

Neither party shall tamper or otherwise interfere with any part of the Water Metering System in any way. Where it is established that the Water Metering System has been tampered or interfered with, then until such tampering or interference has been rectified either;

- (a) the quantity measured or recorded shall be that measured or recorded by any other relevant installed Water Metering System; or
- (b) if there is no other relevant Water Metering System or it is established to have been tampered or interfered with, the quantity shall be agreed by the parties, or, in the absence of such agreement, either party shall be entitled to refer the matter to an Expert for determination.

If the Water Meter Owner is not the Person who owns or controls the land on which the Water Meter or Water Metering System is situated, that Person (if bound by this code) shall grant the Water Meter Owner and all other Persons who require the same for the purposes of this code sufficient rights of access for Water Metering System purposes and for the purposes of testing calibration, operation and maintenance, replacement, etc. of the Water Meter and Water Metering System.

Where any Person requires right of access or to deal in some other way with a Water Meter or Water Metering System for the purposes of this code, all such necessary rights shall be granted by the Person with the power to grant them if that Person is bound by this code. All such rights shall be set down in the relevant Water Connection Agreement where this is practicable.



Each party shall ensure that all reasonable arrangements and provisions are made and/or revised from time to time as and when necessary or desirable in accordance with Good Industry Practice to facilitate the safe exercise of any right of access.

MDEC.6.4.2. Water Meter records

Water Meter Owners shall label all Water Meters with a unique identification number from lists maintained by PWP.

Each Water Meter Owner shall ensure that complete and accurate records are maintained of the calibration and operation of Water Metering System. These records shall include but not be limited to the dates and results of any tests, readings, adjustments or inspection carried out and the dates on which any seal was applied or broken. The reasons for any seal being broken and the Persons, and their affiliations, attending any such tests, readings, inspections or sealings shall be recorded.

Water Meter Owners shall ensure that the pertinent data (Appendix E) is provided promptly to PWP for entry into the Water Meter Registration System. Such data shall be kept up to date. They shall also provide any other Water Metering System data requested by PAEW or PWP.

MDEC.6.4.3. Water Meter registration

Water Metering Systems shall be registered in a central database, the Water Meter Registration System, which is to be operated and maintained by PWP in accordance with Good Industry Practice. The purpose of the Water Meter Registration System is to provide a complete accurate and up to date central database of all Water Meter data and to ensure an auditable trail to demonstrate compliance with this code. The Water Meter Registration System shall contain, as a minimum, specific information at each Water Delivery Point as indicated in Appendix E.

All Users are responsible for ensuring that data relating to all changes to a Water Metering System including any changes to the types of data set out in Appendix E. Any other information regarding each Water Delivery Point as may be reasonably required by PAEW and PWP shall be recorded in the Water Meter Registration System.

The Water Meter Registration System shall maintain the specified information for a minimum of seven years after the replacement or disconnection of a Water Meter.

Any data held in the Water Meter Registration System (a) shall be the intellectual property of PWP and (b) may be freely accessed by;

- i) The Water Meter Owner;
- ii) The Regulatory Authority;
- iii) PAEW; and
- iv) PWP.

MDEC.7 Data Exchange

MDEC.7.1 General

Meter data covered by this code is required by Persons to prepare and calculate invoices and to assess, verify and where appropriate, challenge invoices. Meter data is also required for accounting and record keeping purposes.



Meters and/or Metering Systems shall be installed, operated and maintained and metering shall take place sufficient for all purposes of this code at each Electrical Delivery Point and Water Delivery Point.

The Delivery Points shall be at the ownership boundary and shall be set out in a relevant Connection Agreement.

Meter Owners shall in good faith, and in accordance with Good Industry Practice conduct such metering operations as may be necessary to produce and record complete and accurate Meter data. Meter Owners shall provide Meter data to other Persons bound by this code in accordance with the following provisions of this code.

Where this code requires data to be exchanged between such Persons or invoices to pass between them supported by Meter data, Meter Owners shall undertake Meter reading at the times required by this code. If no time is specified for Meter reading to take place, Meter reading shall take place as close in time as possible to the time required in relation to the relevant invoice or Meter data flow specified in this code. All Meter data shall include the time or times at which Meter reading took place.

Where Meter data is required for the purpose of this code or relevant contracts referred to in this code, the Meter data shall be provided by making accurate readings of the relevant Meter or Meters, accurately recording the Meter data arising from those readings and supplying that Meter data to other Persons in accordance with the requirements of this code

MDEC.7.2 Data exchange requirements and flows

The principal transactions and agreements to which the data exchange requirements of this code apply are listed below;

- a) Payments by PWP to Power Producers and Internally Interconnected Parties for Capacity and Output of Production Facilities and Ancillary Services (PPAs & PWPAs);
- b) Payments between PWP and International Interconnected Parties for Active Energy transfers across an International Interconnection (Import/Export Contracts);
- c) Payments by Licensed Suppliers to PWP for bulk purchases of Active Energy (Bulk Supply Agreement);
- d) Payments by PAEW to PWP for bulk purchases of Desalinated water (Bulk Supply Agreement);
- e) Payments by relevant Persons to PWP for purchases of demineralised water (demineralised water contracts);
- f) Payments by Licensed Suppliers acting as agent for the PWP to Internally Interconnected Parties for Active Energy (Agency Contracts);
- g) Payments by Directly Connected Consumers to Licensed Suppliers for Active Energy (Supply Contracts);
- h) Payments by OETC to providers of Ancillary Services (Ancillary Service Agreements);
- i) Payments by Power Producers to a Licensed Transmission System Operator or Licensed Distributor for Connection to its System (Connection Agreements); and
- j) Payments by Licensed Suppliers to a Licensed Transmission System Operator or Licensed Distributor for Use of System (Use of System Agreements).



This code also covers the technical requirements of metering at Consumer premises and the storage of the associated Meter data, although the contractual arrangements and data exchange requirements of such metering are outside the scope of this code.

The data that must be exchanged between the various Persons to satisfy the conditions of the agreements listed above are shown in Appendix H. All data exchanges shall be in the English language.

The table shows;

- In column A - The data item;
- In column B - The person who is obliged to conduct metering as the producer of the data;
- In column C - The Person who is obliged to send the data to the recipient of the data;
- In column D - The recipient of the data.

MDEC.7.3 Meter data validation and quality checks

Meter data shall be collected, validated and aggregated as required for the proper functioning of invoicing in accordance with the relevant parties.

In cases where Meter data is not available due to a failure of the main Meter or its associated equipment such as CT, VT, cabling or protection devices, or in cases where the main Meter has been proven to have operated outside the prescribed limits of error, the Meter data obtained from the check Meter shall be admissible.

In cases where check Meters are not provided, estimated or substitute Meter data will be used as required in accordance with procedures agreed between the relevant parties.

MDEC.7.4 Meter data communications system

Local or remote communications provided in connection with any Metering System shall conform to the requirements of this section, MDEC.7.4.

Meters may be provided with either integral or separate Local Outstations. Any Local Outstations must be capable of being connected to and interrogated by Remote Instations at a central location, such as the OETC Load Dispatch Centre (LDC). The Remote Instations would read the Meter data at the specified time and frequency.

Any Meter Communications System would be independent from the operational SCADA data systems in order to avoid potential conflicts of interfacing and protocol. However, new communication routes using fibre optic cables and digital PLC communications have been installed over all main transmission routes to serve the SCADA system. These communication routes have adequate capacity and provide duplicate routes to all major substations and Production facilities and would be used also for the communication of Meter data.

The Meter Communication System would be a duplex system, wherever possible, i.e., each LDC Remote Instation shall be able to interrogate both the main Meter and check Meter Outstations over either of two communication routes.

MDEC.7.4.1. Local Outstations

Any Local Outstation that is installed (whether internal or external) shall have facilities to enable Meter data to be interrogated locally and for the required Meter data to be provided to Remote Instations. Separate ports shall be used for local and remote interrogations wherever possible.



The interrogation ports shall be opto-coupler ports with a serial protocol such as IEC Standard 61107 or equivalent as agreed by the Metering and Data Exchange Code Review Panel. The local interrogation port shall be capable of use for commissioning, maintenance and fault finding, time setting, in addition to the transfer of Meter data and alarms. A series of security levels and coding facilities shall be provided so that only authorised Persons limit access to data and other features.

Local Outstations may perform some processing of data.

The Local Outstation data shall conform to a format and protocol specified by relevant parties.

Facilities shall be provided to select a relevant demand period from one of the following values; 60, 30, 15, and 10 minutes with, in each case, one demand period ending on the hour.

A secure power supply shall be provided to each Local Outstation system with separate fusing for each Local Outstation.

Where a Local Outstation system uses a separate modem the modem shall be provided with a secure supply, separately fused. Alternatively, line or battery powered modem types may be used.

The Local Outstations shall provide an alarm output signal at a manned point in the event of a supply failure.

Meter data together with alarm indications, and Local Outstation time and date shall be capable of being transferred on request during the interrogation process.

In the event of an Local Outstation failure, any partial Demand Values, data associated with an Local Outstation supply failure and/or restoration, and zero Demand Values associated with an Local Outstation supply failure, shall be marked so that a future interrogation can identify them.

Local interrogation units may be used by authorised Users to interrogate the Local Outstations for the purposes of commissioning, maintenance/fault finding and when necessary the retrieval of stored Meter data.

MDEC.7.4.2. Remote Instations

Remote Instations if provided, shall be computer-based systems that collect or receive Meter data on a routine basis from Local Outstations.

The broad specification for the Remote Instations shall be similar to those for Local Outstations outlined above. The Remote Instations shall be fitted with separate ports for local and remote interrogations. The local interrogation port would be capable of use for commissioning, maintenance and fault finding and time setting. A series of security levels and coding facilities will be provided to limit access to data and other features to authorised Persons only.

Remote Instations shall be capable of collecting all Meter data by daily interrogation or other time interval to be specified. It should however, be possible to repeat collections of Meter data at any time throughout the Local Outstation data storage period.

One pair of Remote Instations shall be located at the LDC to communicate directly with all Local Outstations. Such Remote Instations at the LDC shall interface with the LDC computers to enable required calculations to be carried out and data to be presented within LDC.



MDEC.7.4.3. Communications

All data communications equipment shall conform to the relevant International Telecommunications Union (ITU) standards and recommendations for data transmission over telecommunications systems.

Interrogation of Local Outstations shall be possible using any of the following media, as specified by relevant parties;

- public switched telephone networks;
- radio data networks;
- private network of a Licensed Transmission System Operator;
- mains signalling / power line carrier channels/fibre optic channels; and
- low power radio.

In addition the relevant parties may specify other media and the format and protocol of any Meter data provided that such other media is consistent with the requirements of this code.

Error checking facilities shall be included in all communication facilities between Local Outstations and Remote Instations.

MDEC.7.5 Data display and storage

MDEC.7.5.1. Registers

The Metering Systems shall Meter the quantities on a continuous 24 hour basis and the data shall be displayed on a non-volatile Meter Register. The language of displays shall be English.

Where Meters provide Meter data to Local Outstations external to the Meter, the Local Outstations shall provide two outputs per measured quantity.

Where a separate Local Outstation is used, cumulative register values shall be provided in the Local Outstation that can be set to match and increment with the Meter Registers.

MDEC.7.5.2. Storage

Any Local Outstations provided shall have the capability to store all Meter data collected by the respective Meters including alarms and other functions for relevant parties for two (2) complete calendar months.

All Users responsible for providing Meter data in accordance with this code shall retain a copy of the data in electronic format in accordance with Table 7.1. The format of data to be stored shall be agreed by the Metering and Data Exchange Code Review Panel but shall include the following essential parameters; time period, Meter Identification number and Meter readings.

OETC shall maintain a log in the form of electronic storage of digital data of all data from all Metering Systems and Local Outstations and the associated data received from relevant parties for at least ten (10)] complete operational years other than the Meter data for sales between Licensed Suppliers and final Consumers.

OETC and Users shall ensure that back-up copies of data in electronic format are made in accordance with Table 7.1. All back up copies shall be made promptly at the end of the period or immediately following completion of the data set.

**Table 7.1 Data storage by OETC and Users**

Data	Frequency of back up	Place of storage	Retained for	Comment
Current day's working data; (1)	End of each working day;	On site;	One complete week;	Each day's back up stored separately;
Current week's working data; (1)	Each Thursday at the end of working day;	One copy at User site; One copy at another site;	One complete month;	Each week's back up stored separately;
Current month's working data; (1)	Each month at the end of the last working day;	One copy at User site; One copy at OETC;	One complete year;	
Each month of finalised data;	First working day of following month;	One copy at User site; One copy at OETC;	Five Financial Years;	Finalised means all settlements agreed;
One Financial Year's set of finalised data;		One copy at OETC; One copy at another site;	Ten Financial Years;	

Notes:

- (1) The period of a day, a week or a month will depend on locally agreed arrangements
- (2) Current period, i.e., day, etc, means all work undertaken in that period including new data and changes to existing data.

Providers of Meter data shall be provided promptly with a copy at no cost, in electronic or paper format, as agreed in writing with OETC, of current working data relevant to its transactions by giving 24 hours notice to OETC.

Any User shall be provided promptly with a copy, in electronic or paper format, as agreed in writing with OETC, of selected archived data relevant to its transactions by giving 24 hours notice to OETC. OETC shall agree with the Regulatory Authority a scale of charges for the supply of such data and any limitations on the supply of such data to individual Users.

Licensed Suppliers shall maintain records of Meter data associated with final Consumers in accordance with Table 7.2. Most of such Meter data will be read and recorded manually. The records shall be transcribed to electronic format. All back up copies shall be made promptly at the end of the individual periods or immediately following completion of the data set whichever is sooner.

**Table 7.2 Data storage by Licensed Suppliers**

Data	Manual readings		Electronic record		
	Place of storage	Retained for	Frequency of back up	Place of storage	Retained for
Current month's working data;	On site;	One year;	Daily;	On site;	One complete year;
Each month of finalised data;	On site;	Two years;	Weekly;	One copy on site; One copy at another site;	Five Financial Years;
One Financial Year's set of finalised data;	On site;	Ten Years;	Annually;	One copy on site; One copy at another site;	Ten Financial Years;

Notes:

- (1) The term site in this table means the site or offices of a Licensed Supplier
- (2) Current period, i.e., day, etc, means all work undertaken in that period including new data and changes to existing data.

The providers of Meter data referred to in Table 7.2 shall be provided promptly with a copy at no cost, in electronic or paper format, as agreed in writing with the Licensed Supplier, of current working data relevant to its transactions by giving 24 hours notice to the Licensed Supplier.

Any User shall be provided promptly with a copy, in electronic or paper format, as agreed in writing with the Licensed Supplier, of selected archived data relevant to its transactions by giving 24 hours notice to the Licensed Supplier. The Licensed Supplier shall agree with the Regulatory Authority a scale of charges for the supply of such data and any limitations on the supply of such data to individual Users.

MDEC.8 Meter and Data Exchange Code Review

MDEC.8.1 Electricity Meter and Data Exchange Code Review

MDEC.8.1.1. Electricity Meter and Data Exchange Code Review management

A Metering and Data Exchange Code Review Panel shall be established for the purposes of reviewing and updating the Metering and Data Exchange Code excluding those parts of the MDEC that refer to Water Meters. The Grid Code Review Panel will review all recommendations and guidance proposed by this panel. If the Grid Code Review Panel supports the recommendations, they will be passed to the Regulatory Authority for approval. Otherwise, the recommendations will be returned to the Metering and Data Exchange Panel with comments for further consideration.

OETC shall have overall responsibility for the management of the Metering and Data Exchange Code.



MDEC.8.1.2. Electricity Meter and Data Exchange Code Review Panel

The Metering and Data Exchange Code Review Panel shall carry out the following functions;

- i) generally review, discuss and develop the Metering and Data Exchange Code and its implementation with particular reference to electricity Metering and all data exchange;
- ii) review and discuss proposals for amendments to the Metering and Data Exchange Code which OETC, the Regulatory Authority or any party with Metering Systems or Meters may submit for consideration by the Metering and Data Exchange Panel from time to time;
- iii) discuss changes necessary to the Metering and Data Exchange Code arising from unforeseen circumstances referred to it by relevant parties;
- iv) publish recommendations and ensure that User consultation upon such recommendations has occurred through Metering and Data Exchange Review Panel members; and
- v) issue guidance in relation to the Metering and Data Exchange Code and its implementation, performance and interpretation when asked to by any party with Metering Systems or Meters

MDEC.8.1.2.1 Membership

The Panel shall consist of;

- i) a Chairman and up to 2 members appointed by OETC;
- ii) 1 Person appointed by the Regulatory Authority;
- iii) 1 Person representing each Licensed Distributor;
- iv) 1 Person representing each Licensed Supplier;
- v) 1 Person appointed by PWP;
- vi) 1 Person (rotated between Power Producers) representing all Power Producers each having Power Facilities with a total Registered Capacity of 100 MW or less;
- vii) 1 Person (rotated between Power Producers) representing Power Producers each having Power Facilities with a total Registered Capacity exceeding 100 MW;
- viii) 1 Person representing Internally Connected parties; and
- ix) 1 Person representing Consumers with Demand greater than 5 MW.

MDEC.8.1.2.2 Rules

The Metering and Data Exchange Code Review Panel shall establish its own rules and procedures relating to the conduct of its business and shall comply with them at all times. The rules shall be submitted to the Grid Code Review Panel for review and then to the Regulatory Authority for approval.

MDEC.8.1.2.3 Amendments to the code

Relevant parties shall submit all proposed amendments and comments concerning the Metering and Data Exchange Code to OETC for consideration by the Metering and Data Exchange Code Review Panel. OETC shall also notify in writing all Users that are likely to be materially affected by proposed amendments to the Metering and Data Exchange Code.



All proposed amendments to the Metering and Data Exchange Code must be reviewed by the Metering and Data Exchange Code Review Panel and shall be submitted to the Grid Code Review Panel for review and then to the Regulatory Authority for approval.

MDEC.8.2 Water Meter System review

MDEC.8.2.1. Water Meter System review management

A Water Metering System Review Panel will be established for the purposes of reviewing and updating the parts of the Metering and Data Exchange Code referring to Water Meters. All recommendations and guidance proposed by this panel will be passed to the Metering and Data Exchange Code Review Panel for approval.

PWP shall have the overall responsibility for the management of the Water Metering parts of the Meter and Data Exchange Code.

MDEC.8.2.2. Water Metering System Review Panel

A Water Metering System Review Panel shall be established which shall be a standing body to carry out the following functions;

- i) review proposals for amendments to those parts of the Metering and Data Exchange Code applicable to Water Metering Systems or Water Meters that any party with such systems may wish to submit to PWP for consideration by the Panel from time to time;
- ii) make recommendations for amendments to those parts of the Metering and Data Exchange Code that refer to Water Metering Systems or Water Meters;
- iii) issue guidance in relation to those parts of the Metering and Data Exchange Code that refer to Water Metering Systems or Water Meters and their implementation, performance and interpretation if requested by any party with Water Metering Systems or Water Meters; and
- iv) consider changes proposed to those parts of the Metering and Data Exchange Code that refer to Water Metering Systems or Water Meters arising from unforeseen circumstances referred to it.

MDEC.8.2.2.1 Membership

The Panel shall consist of;

- i) a Chairman and one other person appointed by PWP;
- ii) 1 Person appointed by the Regulatory Authority;
- iii) 1 Person appointed by PAEW; and
- iv) 2 Persons (rotated between Power Producers) representing all Power Producers with Water Production capability.

MDEC.8.2.2.2 Rules

The Water Metering System Review Panel shall establish its own rules and procedures relating to the conduct of its business and shall comply with them at all times. The rules shall be submitted to the Metering and Data Exchange Code Review Panel for review and then to the Regulatory Authority for approval.



MDEC.8.2.2.3 Amendments

Relevant parties shall submit all proposed amendments and comments those parts of the Metering and Data Exchange Code that refer to Water Metering Systems or Water Meters to PWP for consideration by the Water Metering Systems Review Panel. PWP shall also notify in writing all Users that are likely to be materially affected by proposed amendments to those parts of the Metering and Data Exchange Code that refer to Water Metering Systems or Water Meters.

All proposed relevant amendments to the Metering and Data Exchange Code must be reviewed by the Water Metering Systems Review Panel and shall be submitted to the Grid Code Review Panel for review and then to the Regulatory Authority for approval.



Appendices

APPENDIX A Accuracy of Metering System

APPENDIX B Metering Systems for Consumer Connections

APPENDIX C Labelling of Meters

APPENDIX D Commissioning Tests

APPENDIX E Meter Registration Data

APPENDIX F Water Meter Technical Requirements

APPENDIX G Locations of Metering Systems

APPENDIX H Data Flow Tables



Appendix A Accuracy of Metering System

A.1 Standards

The following standards are among those related to this code;

IEC Standard 60687 – Alternating current static watt-hour meters for active energy (classes 0.2 S and 0.5 S);

IEC Standard 61036 - Alternating current static watt-hour meters for active energy (classes 1 and 2);

IEC Standard 60521 – Alternating current watt-hour meters (classes 0.5, 1 and 2);

IEC Standard 61268 – Alternating current static var-hour meters for reactive energy (classes 2 and 3);

IEC Standard 60044 Part 1 – Current transformers;

IEC Standard 60044 Part 2 – Voltage transformers;

IEC Standard 60044 Part 3 – Combined transformers;

IEC Standard 61107 – Data exchange for meter reading – direct local data exchange;

All Metering Systems and Meters shall comply with the relevant standards current at the time that the User's Connection Agreement is signed.

Where relevant standards change from time to time, the Metering and Data Exchange Code Review Panel will review such changes and recommend to the Regulatory Authority the extent to which any such changes should be implemented.

A.2 Overall accuracy requirements

For the measurement and Metering of Active Energy, Reactive Energy, Active Power and Demand, Metering System shall be tested and calibrated to operate within the overall limits of error set out in Table A -1, after taking due account of CT and VT errors and the resistance of cabling or circuit protection. Calibration equipment shall be traceable to a recognised national or international standard.

**Table A-1 : Overall accuracy of Metering System**

Condition	Limits of error at stated Power Factor for Active Power and Energy measurement				
Current expressed as a percentage of rated measuring current	Power Factor	Limits of error for Connections			
		>100 MVA	>20–100 MVA	>1–20 MVA	<=1 MVA
120% to 10% inclusive	1	±0.5%	±1.0%	±1.5%	±1.5%
Below 10% to 5%	1	±0.7%	±1.5%	±2.0%	±2.5%
Below 5% to 1%	1	±1.5%	±2.5%		
120% to 10% inclusive	0.5 lag	±1.0%	±2.0%	±2.5%	±2.5%
120% to 10% inclusive	0.8 lead	±1.0%	±2.0%	±2.5%	±2.5%
Condition	Limits of error for Reactive Power and Energy at stated Power Factor				
Current expressed as a percentage of rated measuring current	Power Factor	Limits of error for Connections			
		>100 MVA	>20–100 MVA	>1–20 MVA	<=1 MVA
120% to 10% inclusive	0	±4.0%	±4.0%	±4.0%	±4.0%
120% to 20% inclusive	0.866 lag	±5.0%	±5.0%	±5.0%	±5.0%
120% to 20% inclusive	0.866 lead	±5.0%	±5.0%	±5.0%	±5.0%



A.3 Metering System accuracy classes

The accuracy class or equivalent, is based on the MVA Capacity of the Connection and shall as a minimum be as follows;

Table A-2: Equipment accuracy classes

Equipment type	Equipment accuracy class for Connections			
	>100 MVA	>20–100 MVA	>1–20 MVA	≤1 MVA
Current transformers (Note 1)	0.2S	0.2S	0.5	0.5
Voltage transformers (Note 2)	0.2	0.5	1	1
Active Energy and Power Meters (Note 3)	0.2S	0.5S/0.5	1	2
Reactive Energy and Power Meters	2	2	2	2

Note 1: Current transformers shall meet the class accuracy requirements irrespective of CT secondary ratings.

Note 2: OES14 specifies Class 1 accuracy to BS 3941/IEC186 for VTs used at 11kV

Note 3: A Meter accuracy class of 0.5 may be used where energy transfers to be measured by the entry/exit Meter during normal operating conditions is such that the metered current will be above 5% of the rated measuring current for periods equivalent to 10% or greater per annum (excluding periods of zero current).

A.4 Service connections

Kilowatthour Meters for service Connections shall conform to IEC Standard 60521 as set out in the following Table A3. These requirements are in accordance with OES as shown in the table.

Table A3: Kilowatthour Meters for service Connections

Type	Voltage	Current	Accuracy	OES Number
Single phase	240v	20 – 100A	Class 2	22A
Three phase, Direct Connected	415v, 3 phase, 4 wire	50A, 100A	Class 2	22B
Three phase, With current transformers	415v, 3 phase, 4 wire	200A, 300A, 400A	Class 2	22C

Appendix B Metering Systems for Consumer Connections

This Appendix is concerned with the Metering System requirements of Consumers and applies to all Consumers. Direct Connected Consumers are those Connected to the Transmission System. Other Consumers will be Connected to the Distribution System at 33kV, 11kV or LV, the Connection voltage generally being a function of the size of the Consumer Demand.

The Metering Systems that shall be applied to the different sizes of Consumer Connections are given in Table B1.

Table B1 Metering System requirements

Cat.	Connection size MW ¹	Meters required				Check Energy Meters required
		KWh	KVarh	Maximum Demand		
				KW	KVar	
1.	>5MW	Yes	Yes	Yes	Yes	Yes
2.	>1MW to 5MW	Yes	Yes	Yes	Yes	No
3.	>500kW to 1MW	Yes	Yes	Yes	No	No
4.	>100 kW to 500kW	Yes	Yes	Yes	No	No
5.	# 100kW	Yes	No	No	No	No

The Metering Systems shall be in accordance with the requirements of the MDEC.5 except as determined by the conditions in Table C1 and those that follow;

- i) Local Outstations (internal or external) shall be provided for category 1 Connections only;
- ii) Separate test terminals for accessing current and voltage signals, injecting test quantities and connecting test Meters shall be provided for categories 1 and 2 Connections only;
- iii) Meters for category 5 Connections may be accepted based on sample inspection and certification by manufacturers;
- iv) Meters for category 5 Connections shall be re-Calibrated at least once every ten years; and
- v) The requirements of MDEC.6 for access, sealing and Registration shall be met for all categories of Connections.

The Licensed Distributor companies' Consumer representatives shall provide appropriate summaries of the Metering requirements applicable to Consumer Metering.

¹ The appropriateness of the size categories need confirmation by MHEW



Appendix C Labelling of Meters

C.1 General

Each Meter shall be allocated a unique Meter identification number that will be given by OETC and recorded in the Meter Registration System.

The number shall be marked permanently on the Meter in a position that is clearly visible under all normal viewing of the Meter.

The number will be quoted on all records arising from and related to the Meter including Meter readings.

Test blocks and other related Metering equipment shall be clearly identified with the Metering System with which they are associated.

C.2 Entry and exit labelling

The following standard method of labelling meters, test blocks, etc; based on the definitions for entry and exit shall be incorporated. The required labelling shall be as follows.

Active Energy

Meters or Meter Registers shall be labelled

“Entry” for all Active Energy Flows normally entering the Transmission System, and

“Exit” for all Active Energy Flows normally leaving or exiting the Transmission System,

Reactive Energy

Within the context of this code the relationship between Active Energy and Reactive Energy can be best established by means of the Power Factor. The following table gives the relationship;

Table C.1: Reactive Energy entry/exit convention

Flow of Active Energy	Power Factor	Flow of Reactive Energy
Entry	Lagging	Entry
Entry	Leading	Exit
Entry	Unity	zero
Exit	Lagging	Exit
Exit	Leading	Entry
Exit	Unity	zero

Meters or Meter Registers for registering entry Reactive Energy shall be labelled “Entry” and those for registering exit Reactive Energy shall be labelled “Exit”.



Appendix D Commissioning tests

This Appendix sets out the tests and checks that shall be included in the Metering Systems commissioning programme. Metering System shall in addition have basic tests carried out on earthing, insulation, together with all other tests that would normally be conducted in accordance with Good Industry Practice.

D.1 Measurement Transformers

For all installations with new/replaced Measurement Transformers the Meter Owner shall ensure that from site tests and inspections the following are confirmed and recorded;

1. Details of the installed units, including serial numbers, rating, accuracy classes, ratio(s);
2. CT ratio and polarity for selected tap; and
3. VT ratio and phasing for each winding.

For installations with existing Measurement Transformers the Meter Owner shall ensure that, wherever practically possible, 1, 2 and 3 above are implemented, but as a minimum must confirm and record VT and CT ratios. If it is not possible to confirm the CT ratio on site, the reason must be recorded on the commissioning record and details must be obtained from any relevant party.

D.2 Measurement Transformer leads and burdens

For all installations the Meter Owner shall wherever practically possible;

1. Confirm that the VT and CT connections are correct;
2. Confirm that the VT and CT Burden ratings are not exceeded; and
3. Determine and record the value of any Burdens (including any Burdens not associated with Metering Systems or Meters) necessary to provide evidence of the overall metering accuracy.

D.3 Metering

D.3.1 General tests and checks

The following may be performed on-site or elsewhere (e.g. factory, meter test station, laboratory, etc).

1. Record the Metering System details required by the Meter Registration System.
2. Confirm that the VT/CT ratios applied to the Meter(s) agree with the site Measurement Transformer ratios.
3. Confirm correct operation of Meter test terminal blocks where these are fitted (e.g. CT/VT operated metering).
4. Check that all cabling and wiring of the new or modified installation is correct.
5. Confirm that Meter registers advance (and that output pulses are produced for meters which are linked to separate Outstations) for entry and where appropriate exit flow directions. Confirm Meter operation separately for each phase current and for normal polyphase current operation.
6. Where separate Outstations are used confirm the Meter to Outstation channel allocations and that the Meter units per pulse values or equivalent data are correct.



7. Confirm that the local interrogation facility (Meter or Outstation) and local display etc operate correctly.

D.3.2 Site tests

The following tests shall be performed on site;

1. Check any site cabling, wiring, connections not previously checked under clauses D.1, D.2 and D.3.1 above;
2. Confirm that Meter/Outstation is set to UTC (Oman time) within +/- 5 seconds;
3. Check that the voltage and the phase rotation of the measurement supply at the Meter terminals are correct;
4. Record Meter start readings (including date and time of readings);
5. Wherever practically possible, a primary prevailing load test (or where necessary a Primary injection test) shall be performed which confirms that the Meter(s) is registering the correct primary energy values and that the overall installation and operation of the metering installation are correct;
6. Where for practical or safety reasons (5) is not possible then the reason shall be recorded on the commissioning record and a secondary prevailing load or injection test shall be performed to confirm that the Meter registration is correct including, where applicable, any Meter VT/CT ratios. In such cases the VT/CT ratios shall have been determined separately as detailed under D.1, Measurement Transformers, above;
7. Record values of the Meter(s)/Outstation(s) displayed or stored Meter data (at a minimum one complete half-hour unless otherwise approved by the Metering and Data Exchange Code Review Panel) value with the associated date and time of the reading) on the commissioning record;
8. Confirm the operation of Metering System alarms (not data alarm or flags in the transmitted data); and
9. Confirm from Meter Owner that accuracy certificates exist for the Meters.



Appendix E Meter Registration data

The Meter Registration Systems are the Meter database that holds Meter data for both electricity and water Metering System installations.

Data in the Meter Registration Systems shall be treated as confidential and only relevant Meter data shall be released to the appropriate party.

Meter data to be contained in the Meter Registration Systems shall include, but is not limited to the following;

- (a) A unique meter identification number;
- (b) Connection Point and Metering point reference details for both Delivery Point and Actual Metering Point, including;
 - i) location and reference details (i.e. drawing numbers);
 - ii) participant details at the Connection Point;
 - iii) site identification nomenclature;
 - iv) Meter Owner; and
 - v) loss compensation calculation details where Actual Metering Point and Delivery Point differ.
- (c) Main and check Meter installation details, including;
 - vi) serial numbers;
 - i) metering installation identification name;
 - ii) Meter types and models;
 - iii) instrument transformer ratios (available and connected);
 - iv) test and calibration programme details; test results and reference test certificates for Meters and Measurement Transformers;
 - v) asset management plan and testing schedule;
 - vi) calibration tables, where applied to achieve Meter installation accuracy; and
 - vii) any Meter summation scheme values and multipliers.
- (d) data register coding details;
- (e) data communication details (when communication systems are used);
- (f) telephone number for access to data;
- (g) communication equipment type and serial numbers;
- (h) communication protocol details or references;
- (i) data conversion details;
- (j) User identifications and access rights;
- (k) data validation and substitution processes agreed between affected parties, including;
 - i) algorithm;
 - ii) data comparison technique;
 - iii) processing and alarms (i.e. voltage source limits, phase-angle limits);
 - iv) check metering compensation details.



Appendix F Water Meter technical requirements

F.1 General

The Water Metering Systems shall include main Meters and check Meters each with sensors and converter units/Outstations. The Outstations may be integral with the converter units. The sensor shall be sited in or above the water being measured.

The Outstations shall provide two outputs per measured quantity and shall enable Water Meter data to be interrogated locally and at a later date for Water Meter data to be provided remotely over communications channels.

Converter units/Outstations shall provide, by means of the local interrogation port, facilities for configuring the instrumentation system. It shall provide a local LCD display of the measured parameter, programming facilities and fault annunciation. The circuit boards shall comply with BS 6221 (IEC 60326).

The Water Metering System and associated communications equipment shall be located in a secure metering cabinet located in an area that is readily accessible, free from obstructions and well lit by artificial light. The cabinets shall include as a minimum, effective protection from moisture and dust ingress and from physical damage, including vibration. Appropriate temperature controls shall be provided. The cabinets must be lockable and capable of being sealed to prevent unauthorised access

The Water Metering Systems shall be resistant to corrosion for the lifetime of the works. Materials, which are exposed to the Desalinated Water, shall not corrode. In all cases materials shall be chosen that are compatible and that no chemical or electrochemical actions are present other than those intended. Support systems and housings for instrumentation devices mounted close to water pipes shall be non-metallic.

All Water Metering Systems shall function within the limits of their normal performance specification over the temperature range -20° to 50°C at a relative humidity of between 10% and 90%.

The Meter cabinet and any associated Metering Systems shall be rated IP 55 indoors and IP 65 outdoors as a minimum. Where an instrumentation device is located below the flood level it shall be rated to IP 68 (submersible). Cable connections to Metering Systems shall not reduce the IP rating of the device.

Instrumentation systems shall be designed such that failure of the system shall not result in damage to plant or result in the development of a hazardous situation.

F.2 Flow meters

Each flow Metering System shall comply with BS EN ISO 6817 and comprise a flow sensor mounted in the pipeline and a separate signal converter.

Where electromagnetic flow Meters are used, they shall be of the pulsed dc type with automatic zero error averaging and low power consumption.

The system accuracy over the normal operating range shall not be more than $\pm 0.2\%$ of full-scale reading.

Flow sensors shall comprise a Meter tube assembly containing all necessary electrodes, housing and terminations. Water Meter tubes shall be made from a non-magnetic material lined with an inert substance suitable for the medium and flanged. The lining material shall extend from the bore of the tube to fully cover the raised face of the tube flanges. There shall be no protruding parts to restrict the flow.



Water Meter tubes installed in areas susceptible to flooding shall be environmentally protected to IP 68 and shall be suitable for continual submergence at the likely depth of any flood water. Where potting compounds are used to achieve this performance it shall not prevent disconnection of the sensor cabling.

The flow Meter converter shall provide the following facilities;

- adjustment of flow range according to size of flow sensor
- independent 4 to 20 mA output proportional to flow rate and a 24 V dc pulse output suitable for an integration counter drive
- manual adjustment of pulsed and current output response time
- failure of the flow Meter shall cause the output to be driven down scale
- means of testing the converter electronics shall be an integral part of the converter design.



Appendix G Locations of Metering Systems

Metering Systems must be installed at each Delivery Point at the ownership boundaries of the Systems of the various parties, as follows.

- 1 Between a Licensed Transmission System; and
 - Power Producers;
 - Licensed Distributors;
 - Externally Interconnected Parties;
 - Internal Interconnected Parties; and
 - Directly Connected Consumers.
- 2 Between the Systems of Licensed Distributors; and
 - Embedded Power Producers and Autogenerators;
 - International Interconnected Parties where interconnections exist;
 - Internal Interconnected Parties, where interconnections exist; and
 - Consumers.
- 3 Between the Production Facilities of Power and Water Producers and PAEW.

The Delivery Points shall be at the ownership boundary and shall be specified in each Connection Agreement or Electrical Connection and Use of System Agreement.

The actual location of a Metering System is referred to as the “Actual Metering Point”. This may be different from the Delivery Point established pursuant to the relevant Connection Agreement.

OETC, Licensed Distributors, Licensed Suppliers and Users shall each respectively take all reasonable steps to ensure that each relevant Metering System is located as close as is reasonably practicable to the Delivery Point at each Connection Point.



Appendix H Data exchange tables

See notes at foot of table.

Data Item	Data		
	Provider	Sender	Receiver
A	B	C	D
Data exchange relating to PWPAs and PPAs			
MW	Meter Owner	Power Producer	PWP
MWh	Meter Owner	Power Producer	PWP
Water Production	Meter Owner	Power Producer	PWP/PAEW
Data Exchange relating Bulk Supply Agreement			
MWh	Meter Owner	Meter Owner	PWP
Mvarh	Meter Owner	Meter Owner	PWP
Water Production	Meter Owner	Meter Owner	PWP/ PAEW
Data Exchange relating to Supply Contracts			
MW	Meter Owner	Meter Owner	Licensed Supplier
MWh	Meter Owner	Meter Owner	Licensed Supplier
Mvarh	Meter Owner	Meter Owner	Licensed Supplier
Data Exchange relating to Agency Contracts			
MW	Meter Owner	Meter Owner	Licensed Suppliers /PWP
MWh	Meter Owner	Meter Owner	Licensed Suppliers /PWP
Data exchange relating to Import and Export Contracts			
MW	Meter Owner	Meter Owner	PWP
MWh	Meter Owner	Meter Owner	PWP
Data exchange relating to Transmission and Distribution Use of System Agreements			
MW	Meter Owner	Meter Owner	OETC/ Licensed Distributor
MWh	Meter Owner	Meter Owner	OETC/ Licensed Distributor
Mvarh	Meter Owner	Meter Owner	OETC/ Licensed Distributor

Notes

- 1 All Meter data in the above table is required for invoices
- 2 Electronic formats shall be used for data collection and for data transmission
- 3 The frequency of all measurements will be hourly
- 4 The frequency of sending all measurements will be monthly