Guidelines on Advanced Metering Infrastructure

Version 3.1

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Version control

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1.0	22 February 2008	Board approved guidelines.
1.0	5 May 2008	Initial publication on the Commission's website.
2.0	28 January 2009	Updated into the Commission's new format, substantive content remains unchanged.
3.0	10 February 2010	Proposed revisions as a result of developments in AMI technology and the monitoring by the Commission.
3.1	1 November 2010	Updated for transition to Electricity Authority.

Disclaimer

These guidelines set out recommendations relating to the introduction of new technology for metering and the supporting infrastructure. The guidelines also outline participants' obligations for situations where new meters are installed for new and existing consumers.

The advanced metering guidelines are not legally binding, rather are intended to be advisory. In line with its objective to persuade and promote rather than regulate,[1] the Electricity Authority (Authority) recommends that the guidelines be followed.

These guidelines need to be read in conjunction with the Electricity Industry Participation Code 2010, (which is binding on all electricity participants including retailers, data administrators, distributors, embedded network owners, metering equipment owners, and test houses) and the Advanced Metering Policy.

The general approach set out in these Guidelines in no way reduces the requirement upon participants to know and comply with their obligations under the Code. Neither should it be interpreted as reflecting the Authority's view on Code.

Although the Authority has taken every care in the preparation of the content of these Guidelines, the Authority offers no warranty (express or implied) as to the accuracy, completeness, or legality of that content. The Authority is not liable or responsible to any persons for direct or indirect loss or damage that may result from the action or failure to act by any person in reliance on the Guidelines.

The publishing of these Guidelines does not place any obligation on the Authority to follow any interpretation contained in them when carrying out any of its functions under the Electricity Industry Act 2010.

[1] Paragraph 2 of the Government Policy Statement (GPS) on Electricity Governance, May 2009.

Glossary of abbreviations and terms

AMI	Advanced Metering Infrastructure
AMI systems owner	Person who owns any one or more of the components that comprise an AMI system
Authority	Electricity Authority
Code	Electricity Industry Participation Code 2010
CPE	customer premises equipment
GA	general accumulation
GPS	Government Policy Statement on Electricity Governance
HAN	home area network
HH	half-hourly
kW	kilowatt
MA	master accumulation
NHHDA	non half-hourly data aggregator
NZ	New Zealand
NZDST	New Zealand Daylight Savings Time
NZST	New Zealand Standard Time
TOU	Time of Use

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Introduction

1. Electricity meters measure the flow of electricity, and are the primary source of information used in the settlement of the wholesale electricity market and in the monthly invoicing of nearly two million electricity consumer connections.[2]

2. Until recently, meters were simple measuring and recording devices that could only provide basic data on electricity consumption on a periodic basis,[3] and could not show changes and trends of consumption within the meter reading period.

3. New metering technology is developing rapidly, and systems with advanced features are becoming increasingly available. As electricity industry participants consider making investments in these new metering infrastructures, attention must be given to supporting New Zealand's wider national energy objectives and consumer interests, along with those of the electricity sector.

Advanced metering systems

4. Advanced metering systems are electronic meters that measure electricity, record consumption and meter event information electronically, have two way communications, can be remotely read, and may have the following attributes:

   (a) remote connection and disconnection;

   (b) tamper detection;

   (c) outage detection;

   (d) quality of supply monitoring;

   (e) demand limiting;

   (f) communications interface to a range of devices—e.g. in-property display, direct load control equipment, link to a computer in the premises (perhaps via the internet – or perhaps the communications interface enables more external communication beyond the electricity industry);

   (g) export metering where applicable;

   (h) registers and meter functionality that may be reprogrammable for time period or demand limiting; and/or

   (i) provide information on electricity supply parameters[4].

[2] These are usually called installation control points (ICPs).

[3] Depending on the meter read cycle, these periods could range between one and four months.

[4] Electricity supply parameters include voltage, current, sag/surges, brown outs, etc.

5. Advanced metering systems should assist to:

   (a) provide regular and accurate meter readings, eliminate estimated bills and provide flexible billing options;

   (b) reduce network non technical losses by decreasing the incidence of theft or fraud and vacant premises consumption;

   (c) reduce costs to generate and deliver electricity;

   (d) improve the reliability of the overall electricity network by providing relevant network information;

   (e) minimise barriers to competition in both generation and retail;

   (f) provide increased and relevant information to electricity users to assist in promoting the efficient use of electricity and enable consumers to make their own decisions on cost conservation;

   (g) contribute to the Government's energy and conservation policy objectives;

   (h) provide a platform for future energy-focused innovation;

   (i) provide an increased accuracy in the settlement process, allowing retailers to optimise their contracted positions against consumer load; and

   (j) share infrastructure with other utility providers.

6. To realise these high-level outcomes, the Authority believes that advanced metering systems installed in New Zealand should share certain common characteristics, such as:

   (a) open access (operated to allow multiple parties to concurrently offer services across a single party's metering infrastructure);

   (b) wider localised load control capability (extending load control to other than traditionally controlled loads and allowing load or demand reduction aggregation to encourage demand-side participation in the electricity market);

   (c) consumer information availability (removing barriers to help electricity consumers better understand their electricity usage patterns and pricing options); and

   (d) metering information availability as agreed by users of the metering installation (remote communications to allow regular and accurate reading of meters, network, and supply parameters).

Specific advanced meter infrastructure system requirements

7. The various parties wishing to use an Advanced Metering Infrastructure (AMI) system should be provided access through a common services access interface. The details of how this occurs can be left up to the service user wanting access and the AMI systems owner. It is possible different service users may require different interchange protocols, and these could be offered by the AMI systems owner. The guiding principle should be that no mechanism should be used to frustrate the process of accessing platform features or services, and that the net outcome will be that all service users will experience materially equal treatment.

8. Proprietary systems can bring the advantages of a tightly managed environment resulting in higher security. This approach also permits AMI systems to locate the necessary functionality at the best points within the system to optimise performance for their chosen combination of platform technologies and communication links.

9. All communication links, whether internal to the AMI system technology or provided by an external third party (via contract to the AMI systems owner) are treated as *inside* the proprietary portion of the AMI boundary. It is possible that some AMI systems may choose to locate the services access interface physically at the customer premises equipment (CPE), rather than via a back-office system, but this does not change the principle of providing appropriate access to the set of services offered by the AMI system.

10. In the case of the installation of an advanced meter where:

    (a) the premises has not previously had an advanced meter installed:

        (i) the distributor and the retailer should be consulted by the AMI systems provider on the required functionality, terms of use, and interface formats required. No party should unreasonably withhold agreement; and

        (ii) this consultation should include discussion on potential future usage, integration of the ripple receiver into the meter, extension of controllable load, etc;

    (b) the premises already has an advanced meter installed that is to be replaced:

        (i) advanced meters should only be replaced if a functionality or price reason exists. Where a retailer or distributor wishes to contract with only one AMI systems provider, that AMI systems provider should lease the use of advanced meters from alternative AMI systems providers and exchange information directly with those AMI system providers' back-office system rather than replace advanced meters;

(ii) all users of the AMI system should be consulted by the AMI systems provider and agree on the functionality and data access price for the replacement system. The replacement system should meet all agreed functionality. Where agreement cannot be reached with all users, then the system should not be replaced. No party should unreasonably withhold agreement; and

(iii) arrangements should be made with the owner of the advanced meter that is to be replaced for the final reading, removal, and return of the device to its owner.

11. The Authority's policy is that the following should be the minimum requirements for AMI systems established in New Zealand (NZ):

(a) one metrology element complying with relevant NZ metering standards for the load served;

(b) the meter should record half-hourly consumption or generation information;

(c) one master accumulation (MA) register for all units consumed on site which is never reset and is read as part of a meter reading sequence;

(d) a minimum of six general accumulation (GA) registers which may start and stop their accumulation at programmable times to at least 30 minute resolution and coincident with the half-hour meter data logging boundaries. This functionality may be provided within the meter’s CPE or at another location (such as the back-office system) within the AMI system;

(e) ability to securely store, transport and process metering and other data relevant to services offered, and in accordance with the Code where it applies;

(f) a means of controlling the existing hot water cylinder load currently (or previously) attached to a ripple control relay or similar load control device in the premises;

(g) provide a services access interface for users to receive from, and send communication into, the AMI system. This communication should use either formats required under the Code, or Electricity Information Exchange Protocols, or should these not be available, commonly used industry protocols (such as XML, or already existing data swapping file formats) through which all authorised service users can access the services provided via the AMI system on equal terms;

(h) services access should be secure to ensure that unauthorised access to both the system, and to files transmitted from the AMI system to users, is prevented. Transmission of information between AMI system owners, and between an AMI system owner and a user of the AMI system, should use an industry standard secure communication methodology;

(i) maintain a time-stamped event log, available to both service users and system auditors as appropriate, to capture critical AMI system parameters or state changes that could impact, directly or indirectly, on metering data or financial accounting accuracy, as well as outage and power quality information;

(j) provide ability to meter both import and export power on sites where this is formally contracted between the energy retailer and their customer;

(k) sufficient memory, processing and communication capability to ensure that the devices can be remotely reprogrammed to handle future applications, without requiring replacement of the meter during its financial or technical life cycle; and

(l) interoperability with other utilities' advanced meters that may wish to share the infrastructure, e.g. water and gas traders.

Terms, conditions and pricing of services

12. Advanced metering infrastructure owners and operators should have standard terms and conditions, and price schedule of charges for the use of common attributes on their systems.

13. Where a user requests an enhanced service level or development of the advanced metering system infrastructure, the cost of this may be subject to terms, conditions and/or individual pricing as negotiated between the parties.

14. The terms, conditions and price for use of the same attributes should apply to all users.

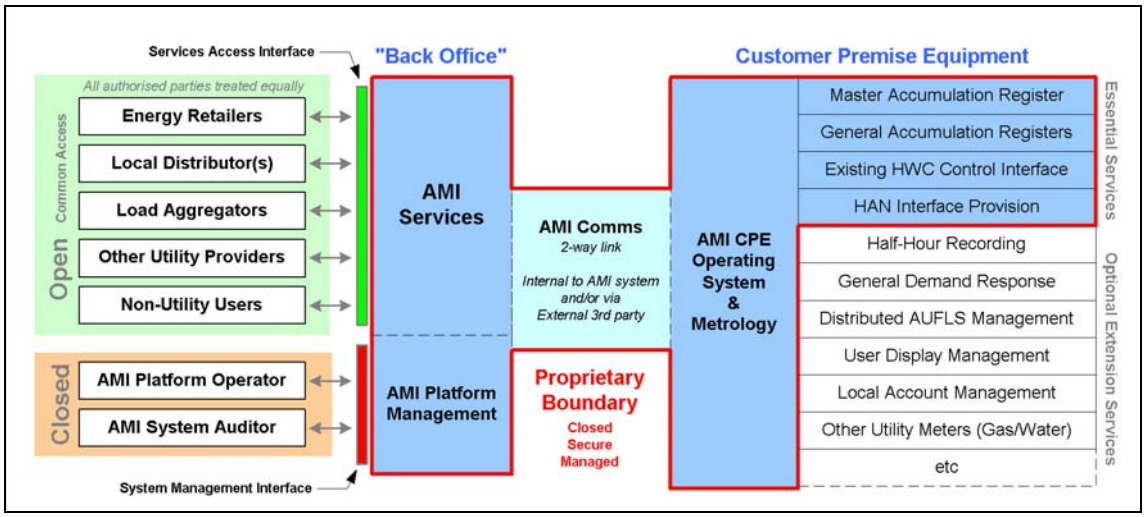
Metrology

15. Metrology is the portion of an electricity meter which measures the flow of electrical energy. It is governed by well established standards and AMI providers will be expected to comply with these relevant standards as set out in Part 10 of the Code.

16. The metrology section may offer several different metering elements to allow simultaneous measurement on separate circuits, but the Authority's view is that the minimum requirement should be only for one element.

17. Any changes to the metrology section of an AMI meter will require the re-certification of each meter so changed (Part 10 of the Code).

Figure 1: Defining Open AMI Infrastructure - The Encapsulation Model



18. The system interface, as shown above, defines the boundary from which the AMI system will be certified as a metering installation by an approved test house.

Measurement data recording

19. Data available at the output stage of the metrology section of an AMI meter should be available in two forms:

    (a) Meter register information:

        (i) as value over time (e.g. kilowatt (kW), volts, amps or other suitable units) for each flow direction; and

        (ii) as a running integrated total in a MA register which is never reset.

    (b) Meter event log information:

        (i) The AMI system should offer a service which permits users to obtain snapshot date and time stamped views of both the instantaneous and running total values at predefined times of the user's choosing or on threshold being exceeded (e.g. power on/off, voltage max and min, current max, etc). These snapshots can be returned inside the system to become available at the services access interface at an agreed future time. Some systems may be able to provide such a service in near real time so that the users experience the results with minimal real time delay.

Changes to firmware via communications system

20. AMI systems are expected to either have or to evolve an ability to remotely alter executable code within the CPE as part of introducing and managing new services over time. Portions of the new service functionality may need to reside within the CPE for optimum performance. Regardless of whether changes to executable code are made locally (via a site visit) or remotely as described, the functionality of the previously certified CPE will have been altered, potentially compromising its certification status.

21. It is desirable to determine a process by which such executable code alterations might be made without making any subsequent recertification overly onerous. It is suggested the following principles be applied to this process:

    (a) no changes be permitted to any hardware or software component of the metrology section of an AMI meter without full re-certification of each meter so altered (the instantaneous load and MA registers being used as the demarcation point of the outer boundary of the metrology unit);

    (b) alterations of any hardware or software component of the AMI CPE other than those within the metrology section shall be permitted provided the changes have been fully tested and approved in a sample AMI CPE device of identical configuration (including full range parameter cycling) under the normal type certification process by an approved test house (ATH);

    (c) the AMI systems owner has an ATH approved and certified process in place to deploy the changes across the system, including the capability to rollback to the previous version should this be required; and

    (d) all code components capable of being altered can be identified (via a suitable version number) and that all before and after version numbers are logged during code alterations. These records are to be retained for the life of the AMI system.

22. These principles will need to be developed in a robust process for all parties to be comfortable that the results can be trusted.

Meter reading

23. The AMI system should provide a minimum of six GA registers, half-hour volume registers for each flow direction, and an event log. Each meter reading should collect all meter register and event log information from the last read, and store this within the AMI system back-office. Meter read frequency should be sufficient to meet the requirements of users, and ensure that all data is captured by the read process prior to the data being overwritten or reset. Also refer to data storage discussed further below.

24. GA registers will allow the service user to accumulate energy usage data during previously defined time periods. These registers may be reset if desired once the data they contain has been securely retrieved and is available via the services access interface.

25. Interval registers should be available that will record the volume of electricity conveyed in trading periods. These registers should not be reset but should be over-written on a first in first out basis. This means that the oldest entry is the one that should be deleted first.

26. Event logs collect static or time based information abut the meter or measured parameters. The event log should not be reset, but should operate on a first on/first off basis.

27. The service user should be able to set (either itself or via the platform operator) the times and/or dates at which t GA registers start and stop recording. GA registers should provide time of use (TOU) functionality and be capable of being started and stopped repeatedly either daily or weekly, with resolution that allows them to be aligned with the industry standard 30 minute boundaries.

28. TOU registers used for data collection for profile based wholesale settlement should only be changed after an auditable and approved process has been followed.

Management of load control

Management of existing hot water loads

29. Installation of AMI devices should honour the control of hot water loads.

30. Premises where AMI CPE is installed should be left in a state where active control of the hot water load is provided by some means. This may be through a feature in the AMI CPE itself (such as an internal load control switch) or it may be achieved by leaving the existing ripple control relay (or other existing load control device) in place.

31. Where the hot water control is built into the AMI CPE, there can be advantages such as:

    (a) operating times of the ripple receiver (and hence reception signal strength monitoring) can be logged within the event log;

    (b) the response channel can be remotely reprogrammed; and

    (c) where limited ripple signal strength occurs, the AMI communications could, in addition, signal the requirement to reduce load and interrupt the controlled load.

Management of general demand response

32. In general, consumption behaviour can be controlled either directly (by switching loads using controlled contacts, or using home area networks (HAN)[5] connected to switching devices) or indirectly by TOU pricing signals. One key outcome of the deployment of AMI systems is the ability to enhance both of these areas.

[5] HAN could be provided as either power line carrier (PLC) or radio.

33. Retailers could make cost reflective TOU product offerings available via AMI, such as controlling additional loads for the customer (or provide the customer the tools to do this for themselves) by shifting various appliances away from higher cost periods.

34. AMI systems should have the capability to allow such new services to be developed and introduced.

Management of additional load control potential

35. Providing a suitable HAN or in home display interface would enable management of additional appliances within the customer's premises to evolve over time.

36. Depending on the regional electricity network characteristics, controlling these devices as a function of the electricity network frequency may be economic and may result in additional load shedding capability being made available to the reserves market.

37. AMI systems can promote the management of additional appliances by facilitating access to suitable loads for load aggregators, providing the required functionality and enabling/logging the availability and response of such loads.

Data security: access, storage, and transportation

Data access

38. Access to all services (including the data available from a service) should be provided by the AMI systems owner via the services access interface. This is system specific, and the AMI systems owner should provide any protocol conversion required.

39. Interfaces should be available that use either formats required under the Code, or Electricity Information Exchange Protocols, or should these not be available, commonly used industry protocols (such as XML, or already existing data swapping file formats) through which all authorised service users can access the services provided via the AMI system on equal terms.

40. Interfaces should be available for each user type, e.g. retailer for electricity, water or gas, distributor, etc.

Data storage

41. The GA registers service may be provided either in the CPE or via a summation service in the AMI system back-office.

42. The volume data for all registers, and the event logs should be capable of being physically retained in the CPE for a period longer than at least twice the expected data retrieval interval or 15 days (whichever is the greater) to provide some protection in case of problems with communication links.

43. Raw meter data storage within the AMI system back-office must comply with the requirements of the Code.

44. It is expected that, as information stored for other critical aspects of the AMI system may have an impact on settlement, the storage timeframe of such data (such as event log, audit logs, etc) should be the same as raw meter data. The key data elements expected to be available are listed in Appendix A.

Data security and transportation

45. The AMI systems owner should be responsible for maintaining processes to ensure the robustness and integrity of all data being moved and stored within their system and compliance with the requirements of the Code. These processes may be subject to periodic audit by the Authority[6].

46. The consequences of lost or damaged data should be agreed between the service user and the AMI systems owner as part of their normal commercial terms.

47. Data intended for reconciliation or billing purposes needs to be moved from the back-office systems to the reconciliation or billing calculation point under a secure and auditable process that complies with the requirements of the Code. Once the process has verified that a successful transfer has been completed, and the data is securely stored in an AMI central database and accessible by the service user, the GA registers within the CPE only may be reset as desired. (Note the records within the back-office system must remain intact regardless of the reset within the CPE, and the MA register within the back-office and the CPE should not be reset at any time.)

48. Non-volatile random access memory (commonly referred to as RAM) or battery backup should be used within the advanced meter to sustain the operating program, registers and event logs over power outages or disconnections. It is preferable that, on power up of the device after a power outage, the advanced meter initiates a response to the back-office software.

Provision for HAN interface

49. AMI systems are expected to make provision for a suitable HAN interface of their choosing[7], to allow NZ to take advantage of the emergence of worldwide standards in this area.

50. It is anticipated that the rate of change in this area will see such standards evolve naturally over the next few years. This is an area where an industry working group may add value by centralising information on worldwide trends for emerging candidate standards and protocols.

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[6] This is not a current requirement under the Code. However, the ability to perform an audit will be proposed as part of the review of Part 10 of the Code.

[7] HAN could be provided as either power line carrier (PLC) or radio.

51. The provision of this HAN interface capability should not interfere with, or allow any device that may connect via the HAN in future to interfere with, the certification of the metrology section of the meter, or any of the data accumulation registers or meters data transport pathways.

52. Connection of the HAN should not require replacement of the meter, should not reduce the integrity of the metering installation, and should be a simple plug connection or radio connection process.

Provision for customer displays

53. Customer displays are desirable, but not seen as essential. Depending on the AMI system, these may take the form of specialised screens within the premises, or may use existing terminals such as PCs or mobile phones.

54. The links to customer displays are therefore a function of the system design philosophy and may not necessarily involve a direct connection between the AMI CPE and the chosen display.

55. Register displays should be available to consumers and as a minimum should enable consumers to view instantaneous consumption, consumption over preset periods, prices applicable at the time, and enable customers to validate consumption and invoices, without the requirement of specialised screens or existing terminals.

Premises disconnections and reconnections

56. Where the AMI has provision for remote disconnection, provision should be made for ensuring that credit control operation is consistent with the Authority's “Guideline on arrangements to assist low income and vulnerable consumers” and the Model Domestic Contract.

57. Remote restoration of supply to occupied premises has the potential to be dangerous if an unsafe situation exists that might be visible or known to the consumer.

58. Reconnection should be remotely enabled by the retailer but require consumer intervention to complete the reconnect cycle. In the case of restoration of power following a network event, supply may be made available as soon as supply is restored on the network.

59. If an advanced meter receives a disconnection command for any reason, the CPE should request authorisation from the back-office system to disconnect. The following business rules should apply:

    (a) if the back-office system has confirmed the disconnection, it will proceed;

    (b) if there is no response from the back-office to the CPE as a result of the request for authorisation within a period of four hours, then the CPE should proceed with the disconnection;

(c) if the CPE is acting as a prepay meter, the authority to disconnect should take account of any credit in the back-office processes that the CPE has not recognised; and

(d) if the CPE is not a prepay meter, and the back-office has not requested a disconnection, the disconnection should not occur, and the back-office should register a system security alert.

Prepayment

60. It is expected that applications will evolve which converge pre- and post-payment into a single service continuum. Where the master copy of the customer account resides within the system will be a commercial and technical decision, for agreement between the energy retailer and the AMI systems owner.

61. AMI systems should be able to be remotely configured between pre- and post-payment operation.

Parameter setting

62. Parameters are generally variables which control the behaviour of a service or the operation of the AMI system. Parameters fall into two main groups: service related and platform related. For example, the start time for a GA register is a service parameter, whereas the system time is a platform parameter.

63. Service users and AMI systems owners should agree the parameters for a service and secure processes established to ensure they can only be altered with specific and appropriate authorisation.

64. Both initial setting and subsequent changes to parameters should be date and time stamped in the event log. Verification of the value of any parameter should be able to be undertaken without undue delay, preferably on-line, via either the service access interface or the system management interface as appropriate (see Figure 1).

65. Parameters need to be range validated (to guard against illegal values being set which may cause problems). The process for type testing and approving the AMI CPE device (meter) should check how the system handles both legal (expected) and illegal (unexpected) values for all CPE parameters.

66. Once type approved, parameters may be altered by agreement between service users and AMI systems owner and in accordance with approved processes.

67. System time needs to be given special consideration and must be managed in accordance with the Code. Two levels of time synchronisation need to be managed by an AMI system:

    (a) the accuracy with which the AMI system clock tracks with respect to the external time standard (New Zealand Standard Time (NZST) or New Zealand Daylight Savings Time (NZDST) as appropriate); and

    (b) the accuracy with which the individual CPE clocks track the AMI system clock.

68. Changes to time, either at AMI system level or CPE level, should be recorded in a log file.

Event log recording

69. Event or measured parameter recording should comprise two types, those related to the operation of the system, and those involving measurements. These recordings should be recorded and time stamped in the event log within the CPE. The AMI system should allow real time event alerts to be sent from the meter to the AMI system back-office should a pre-programmed threshold occur, e.g. power restore or low voltage.

70. AMI systems should maintain a history record of key events in the event log. This should encompass any changes to the systems which have the potential to affect the accuracy or resolution of the services offered through the systems.

71. Such events could occur at any point in a system, from the AMI services access interface to the CPE (and possibly beyond via a local area network HAN interface), and may include correcting time drift, altering GA register time boundaries, power outage information including a power restoration response, load management response, and updating meter multipliers.

72. Event and measured parameter recording should include such issues as power off and on times, voltage, current, use of load control or other events required by users of the AMI system.

Multiple load control systems

73. Where more than one operator has the ability to control load at a premises or on a network, the operation of load control should be in accordance with the Model Use of System Agreement and/or bilateral agreements where relevant.

Safety

74. A change to existing metering installations in order to install AMI equipment has the potential to expose dangerous wiring at consumers' premises. Contractors should be advised that they have an obligation to report such situations and operate in accordance with the Electricity Regulations 1997.

75. Any issues related to wiring on a consumer's premises should be communicated to the current retailer for that ICP by the AMI systems provider.

Sources of information

76. The Code can be found on the Authority's website at: http://www.ea.govt.nz/act-code-regs/code-regs/the-code

77. Model contracts can be found on the Authority's website at: http://www.ea.govt/our-work/programmes/market/consumer-rights-policy/model-arrangements

78. The Guideline on arrangements to assist low income and vulnerable consumers can be found on the Authority's website at: http://www.ea.govt.nz/our-work/programmes/market/consumer-rights-policy/low-income-development

79. If you require further assistance, please contact the market administrator:

    Electricity Authority
    PO Box 10041
    Wellington
    Attention: Market Administrator

    Telephone: 04 460 8860
    Fax: 04 460 8879
    Email: retailoperations@ea.govt.nz

Appendix A Advanced metering attributes

A.1 The following is the recommended advanced meter infrastructure system minimum attributes list.

Area	Function	Recommendation
Back-office	1. Time correction records.	Essential. Track in event log (also see 52).
	2. Meter event logs.	Essential. Track in event log (also see 46 and 53).
	3. Power loss and restore logs.	Essential. Track in event log (also see 23).
	4. Collection of raw meter data in accordance with the Code.	Essential.
	5. Code certification as half-hourly (HH) or non half-hourly data aggregator (NHHDA) as applicable to metering information.	Essential.
Installation	6. Installed and certified by an approved test house.	Essential. No change to metrology section without re-certification (also see 49).
	7. Dust proof.	Essential. Compliant with relevant IEC standards.
	8. Installed in a dry situation.	Essential. Follow good industry installation practices.
	9. Complies with Part 10 of the Code.	Essential.
	10. Assess wiring condition before installing.	Essential. Notify premises owner of options.
	11. Ensure load control contacts are capacity and short circuit protected.	Essential. Compliant with relevant IEC standards.
Data retention	12. Data can be moved securely from CPE to the back-office system in accordance with the Code.	Essential.
	13. CPE to have non-volatile memory or battery backup + management plan.	Essential.
	14. System as a whole must comply with metrology, data handling, and data retention requirements in the Code.	Essential.

Area	Function	Recommendation
	15. Sufficient capacity to include the addition of future services such as shared infrastructure with other utilities.	Essential.
Load control	16. Remote total disconnection.	Optional. Case-by-case specific.
	17. Disconnection devices must not disconnect the neutral.	Essential. Disconnecting meter neutral has safety concerns and is not acceptable.
	18. Lifeline disconnection.	Essential. AMI system must support industry processes.
	19. Capacity control capability.	Highly desirable.
	20. User programming of capacity control via internal display.	Optional.
	21. Confirmation of main and discretionary load control switches.	Essential where these are fitted. Note that main disconnection contacts should use an acknowledgment process prior to disconnecting.
	22. Remote connect/disconnect with push button consumer final connect.	Optional.
	23. Automatic under frequency load control.	Optional. Desirable where cost effective.
Detection	24. Real time outage detection.	Optional (also see 3).
	25. Tamper detection, phase neutral imbalance, meter open etc.	Essential.
Volume registers	26. Programmable number of accumulating registers.	Essential. Minimum of six recommended.
	27. Half-hour consumption information.	Essential.
	28. Hosting of read output of other metering devices.	Essential where these are used as shared infrastructure.
	29. Remote display of accumulating registers used in settlement.	Optional.
	30. Meter display of accumulating registers used in settlement.	Essential. Total units used in settlement period should be displayed. Further breakdown optional.

Area	Function	Recommendation
	31. Import/export measurement functionality.	Optional. Case-by-case specific.
	32. Reverse power (export) indication.	Essential
Remote display	33. Ability to set user programmable automatic price rate, budget $, or capacity business rules to allow the meter to control load.	Optional. AMI system should have capability to support introduction of such customer applications over time.
	34. Manual over-ride of user programmable automatic price or capacity business rules.	Optional.
	35. Display of peak, average use, current use for the day in consumed $ and kWh.	Optional.
	36. Ability to show consumption trends either via the display or internet.	Optional. AMI system should have capability to support introduction of such customer applications over time.
	37. Show current retailer's phone number.	Optional.
Price registers	38. Remotely programmable price information/registers.	Essential for prepay, otherwise optional.
	39. Remote display of pricing registers.	Optional.
	40. Meter display of pricing registers.	Optional.
	41. Remote pricing plan management.	Optional.
	42. Display of consumption value in $.	Optional. However, encouraged as useful for assisting customer understanding.
	43. Display of price specials.	Optional.
Meter reading	44. Routine read (scheduled).	Essential. In accordance with Part 15 of the Code.
	45. Back-office triggers a special read (unscheduled).	Essential. Available without undue delay.
	46. Precision of reads.	Essential. In accordance with relevant provisions of the Code.

Area	Function	Recommendation
	47. Meter event triggers a special read	Essential for the agreed functionality and may include events such as tamper, or preset thresholds for instantaneous event log events such as low voltage or high current.
Operation	48. Power off/restore flag.	Essential. Track in a CPE event log (also see 3).
	49. Supply capacity control.	Optional. Case-by-case specific.
	50. External load control capability.	Essential. Must ensure site has active control of existing hot water load. Control of other loads desirable but optional.
	51. Programming for measurement within the meter separated from the programming ability for cumulative registers and other load control or added value functionality.	Essential. No change to metrology section without re-certification. Changes to non-metrology sections may be permitted after sample CPE devices recertified and with suitable control processes in place, incl. rollback (also see 6). Results subject to audit (also see 58).
	52. Low frequency load shed capability.	Optional. Desirable where cost effective.
	53. Sufficient memory and processing capability to allow the addition of future services including power quality monitoring and reporting, capacity control, and home area networks.	Essential (see also 15) without requiring meter replacement.
Prepay/Postpay	54. Remote switch from prepayment/post payment capable.	Optional. Local management of customer account on case-by-case basis should be possible after enabling (or adding) suitable application code in CPE.
Operation	55. Time synchronisation from back-office software in accordance with the Code.	Essential (also see 1).

Area	Function	Recommendation
	56. Non remote programmable multipliers.	Essential. Meter multipliers can be located anywhere within AMI system provided robust change management processes are implemented and results are logged for audit purposes. Multiplier values should be available via Services Access Interface.
	57. Common protocol with other meters.	Essential. AMI system will be open, but not necessarily at CPE. All service users have access to AMI system features on equal terms. AMI systems owners to ensure data exchange protocols are not a barrier to using their AMI system (also see 60).
Technical	58. Available as 1, 2 or 3 phase direct connected.	Essential. Tailored to premises.
	59. Available as current transformer connected.	Optional. Case-by-case basis.
	60. Internal watch dog on critical components.	Essential. System design should follow established electronic design best practice.
	61. On site connectable/programmable.	Essential. On site reprogammability feature optional. Same recertification procedures will apply whether remotely or locally reprogrammed (also see 48).
	62. Password protected in accordance with Schedule 10.2 security requirements for inbound communications.	Essential. Data security requirements in accordance with Code.
	63. Common data read protocol.	Desirable. AMI systems owners need to ensure data access is not a barrier to use (also see 54).
Connections to other devices	64. Home Area Network (HAN)	Optional. However, ability to add and support a suitable HAN interface is required without requiring a meter change.
	65. Remote control manual override.	Optional.

Area	Function	Recommendation
	66.Connectability to external controllers.	Desirable. Essential for hot water control.
	67.Connectability to/from other meters.	Essential. This is the capability to provide shared infrastructure for other utility providers.