# Advanced Metering Policy

## Version 1.1

# Version control

| Version | Date amended | Comments |
|---|---|---|
| 1.0 | 20 February 2008 | |
| 1.1 | 1 November 2010 | Updated for transition to the Electricity Authority |

# Glossary of abbreviations and terms

| | |
|---|---|
| **AMI** | Advanced Meter Infrastructure |
| **Authority** | Electricity Authority |
| **Code** | Electricity Industry Participation Code 2010 |
| **CPE** | Customer Premise Equipment |
| **EIEP** | Electricity Information Exchange Protocols |
| **GA** | General Accumulation Register |
| **GPS** | Government Policy Statement on Electricity Governance |
| **HAN** | Home Area Network |
| **HH** | Half Hour |
| **ICP** | Installation Control Point |
| **MA** | Master Accumulation Register |
| **Meter** | Metering Installation certified in accordance with the Code |
| **NHH** | Non Half Hour |
| **NZ** | New Zealand |
| **RM** | Reconciliation Manager |
| **TOU** | Time of Use |

# Contents

# Key Points Summary

1. The Electricity Authority (Authority) views Advanced Meter Infrastructure (AMI) systems as an important enabler to further the Government Policy Statement on Electricity Governance ((GPS), see paragraph 26)). In particular, AMI systems have the potential to significantly increase demand-side participation in the electricity market.

2. This paper outlines the strategic drivers for AMI systems in New Zealand (NZ), together with the policy areas that the Authority has identified through an extensive consultation process with the NZ electricity industry over a two-year period.

3. The Load Management project initially dealt with the existing capability and value of controllable load. It was always envisaged that technology would be an enabler of achieving the inherent value. As a precursor to the technology phase of the project, a discussion paper on AMI was produced for industry consultation.

4. Based on this industry consultation, the Authority has concluded that open access to AMI systems is necessary to prevent them from becoming barriers to competition. This paper discusses a concept model showing how this could be achieved while retaining the pragmatic benefits of proprietary AMI systems.

5. AMI system operators could provide a “services access interface”, via which the services they offer can be accessed equally by all users. A separate management interface is proposed for AMI operations and auditing. If AMI operators wished to offer services across their own system, they could do so on the same terms as all other system users.

6. Policy areas identified and further developed in this paper include:

   (a) support for the GPS;

   (b) open operation of AMI systems;

   (c) communications and interface protocols;

   (d) metrology and meter reading;

   (e) management of load control;

   (f) data security, access, storage, and transportation;

   (g) provision of customer displays and home area network interface;

   (h) premises disconnection/reconnection and prepayment; and

   (i) supply to remote areas.

7. The next stage of this process is for the Authority to work through the policy areas to determine whether any changes to the Electricity Industry Participation Code 2010 (Code) would be needed to enable their smooth introduction.

# Purpose of this Report

8. This document outlines the strategic drivers and policy areas the Authority has identified via industry consultation as critically important to the successful introduction of AMI systems in NZ.

9. This document should be read in conjunction with the accompanying “Guidelines for advanced meter infrastructure” which provides further details on the individual policy areas.

10. This policy 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 the Code.

11. The Advanced Metering Policy is not legally binding, rather is intended to be advisory. In line with its objective to persuade and promote rather than regulate[1], the Authority recommends that the policy be followed.

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

# Background

## Strategic drivers for advanced metering

12. The Authority has, as part of its principal objectives, ensuring the efficient provision and use of electricity. One important element of this is the contribution that the demand side can make in positively shaping electricity consumption behaviour in NZ.

13. Traditionally, electricity users have largely been passive acceptors of the prevailing price, unable to practically participate in moderating consumption during high cost periods due to both lack of suitable metering technology and inadequate information flows.

14. The demand-side of the electricity sector can be managed either directly (by remotely turning loads on and off, as is currently done with water heaters) or indirectly by varying prices in time to stimulate demand response to price signals. While NZ has mainly used direct load control, both these approaches are very important and each is expected to have a continuing role in the management of the NZ electricity system. One key outcome of the deployment of AMI systems is the ability to enhance both of these areas.

15. The limitations imposed by earlier generations of non-communicating meters are expected to progressively disappear with the spread of AMI systems. This potentially opens the way to demand-side participation in the electricity market. By providing more cost reflective pricing options, supply side industry participants will be able to effectively empower much larger numbers of electricity users and assist them to make more informed purchasing decisions closer to real time. This, in turn, has the potential to moderate consumption during periods of high demand, leading to continuing downward pressure on generation, transmission and distribution costs. In addition, savings can be achieved through remote meter reading, enhanced data management and remote disconnection and connection of vacant premises.

16. The ability to obtain more real time information from the metering systems means that settlement can occur more accurately and consumers can receive more accurate invoices with the elimination of estimates. The availability of remote meter reads also allows retailers to better control their exposure through vacant property consumption.

17. With the continued use of direct load control, enhanced by AMI features aimed at extracting more value from balancing the direct and indirect approaches to load management, the Authority expects these new AMIs to deliver considerable benefits for NZ over time as they become established. These benefits are further examined in Appendix B.

# Objectives and benefits

18. The objectives of introducing this Advanced Meter Policy and the associated guidelines are as follows:

    (a) to encourage the deployment of advanced metering in NZ to assist the aims of the GPS;

    (b) to encourage industry participants to establish advanced metering systems as open and accessible infrastructures to allow multiple service provider access; and

    (c) to encourage systems, as they become available, to offer an appropriate minimum set of features to encourage the development of meaningful and effective pricing and load control services over the long term.

19. The benefits to NZ if this policy and the guidelines are followed would be:

    (a) progressively increased demand side participation in the electricity market;

    (b) more cost reflective pricing from all electricity supply side participants;

    (c) increased security of supply due to more sophisticated emergency response capability distributed throughout the system;

    (d) increased standardisation of systems and data interchange over time;

    (e) improved accuracy of market settlement;

    (f) increased transparency in electricity end use leading to more efficient utilisation; and

    (g) downward pressure on operating costs.

# Methodology and approach

20. In general, this policy adopts a flexible and hands-off approach. The Authority considers that AMI system designers and operators should be allowed to find the best technical and economic means to deliver the outcomes sought. The policy areas identified, and the associated guidelines that have resulted, are intended to assist platform operators in the task of establishing and operating their advanced meter infrastructure to best support the strategic objectives and hence maximising the likelihood they will give rise to the benefits sought over time.

21. The Authority considers a metering system to be “advanced” when it includes, along with the normal metrology (measurement) function, both load control and two-way remote communication capability as a minimum. Further, the Authority feels that such systems should not be operated in such a way as to impose barriers to competition.

22. The Authority believes it would be too restrictive to suggest a preferred standard. Adopting such an approach may appear to give short term establishment gains, but the medium to long term performance of the resulting infrastructure may well prove sub-optimal and inflexible. Standardising too early in the process may be counterproductive, stifling innovation.

23. Policy areas are further expanded (identifying suggested minimum features for inclusion in the AMI systems) in the accompanying “Guidelines for advanced meter infrastructure”.

# Policy areas

24. The following policy areas have been identified as critical to the successful long-term implementation of advanced metering for NZ.

## Support for GPS

25. **Policy:** The Authority would like AMI systems established in NZ to have features which support the GPS.

26. According to paragraph 64 of the GPS pursue the Authority should "promote and facilitate the efficient use of electricity by end users. It should pursue this objective in multiple and mutually-reinforcing ways, including:

    - by providing financial incentives for investment in electricity efficiency where it is cost-effective to do so and in response to market failures and barriers
    - by promoting cost-reflective pricing
    - by seeking innovative ways to enable residential and other consumers to respond to pricing incentives to use electricity more efficiently
    - by facilitating the progressive introduction of advanced/smart meters for consumers, through publishing technical guidelines, and reporting on the need for regulations by December 2009
    - by encouraging and facilitating demand-side participation in the wholesale, distribution and retail markets, and
    - by promoting the efficient use of load management.”

27. Further, AMI system should not be operated in such a way as to impose barriers to competition. To this end, the following definition of an “Open AMI System” is suggested:

    - An open AMI system is one where all parties who meet reasonable minimum access criteria are permitted access to the same set of system features provided through a common services access interface.

## Pricing of services

28. **Policy:** Advanced metering system owners and operators:

    - should provide open access to their systems to all users of advanced metering infrastructure features; and
    - should not discriminate in terms of prices among all users of advanced metering infrastructure features..

29. However, advanced metering system owners and operators can recover costs for additional requirements that users may request or impose on the advanced metering system infrastructure and equipment.

30. This policy arises due to the potential for advanced metering system owners to charge a different price to users of their system that are using the same functionality. The same price for the same service or use should be charged to all users.

31. This policy does not prevent advanced metering system infrastructure owners or operators from recovering the cost of additional or unique requirements that require development of the advanced metering system infrastructure to achieve.

## Open operation of AMI systems

32. **Policy:** Advanced metering should not be deployed in such a way as to create a barrier to competition. All services that can be provided by the advanced metering system should be available to be accessible by all system users (service providers) on equal terms provided they meet reasonable minimum access criteria.

33. This policy arises due to the nature of advanced metering systems. In general, these systems require mass deployment in a concentrated area, relying on economies of scale for their deployment viability. This means that first-movers establishing an AMI system in a given area will most likely preclude the deployment of any subsequent competing systems in that same area, as they would be unlikely to also reach the volumes or densities required for commercial viability.

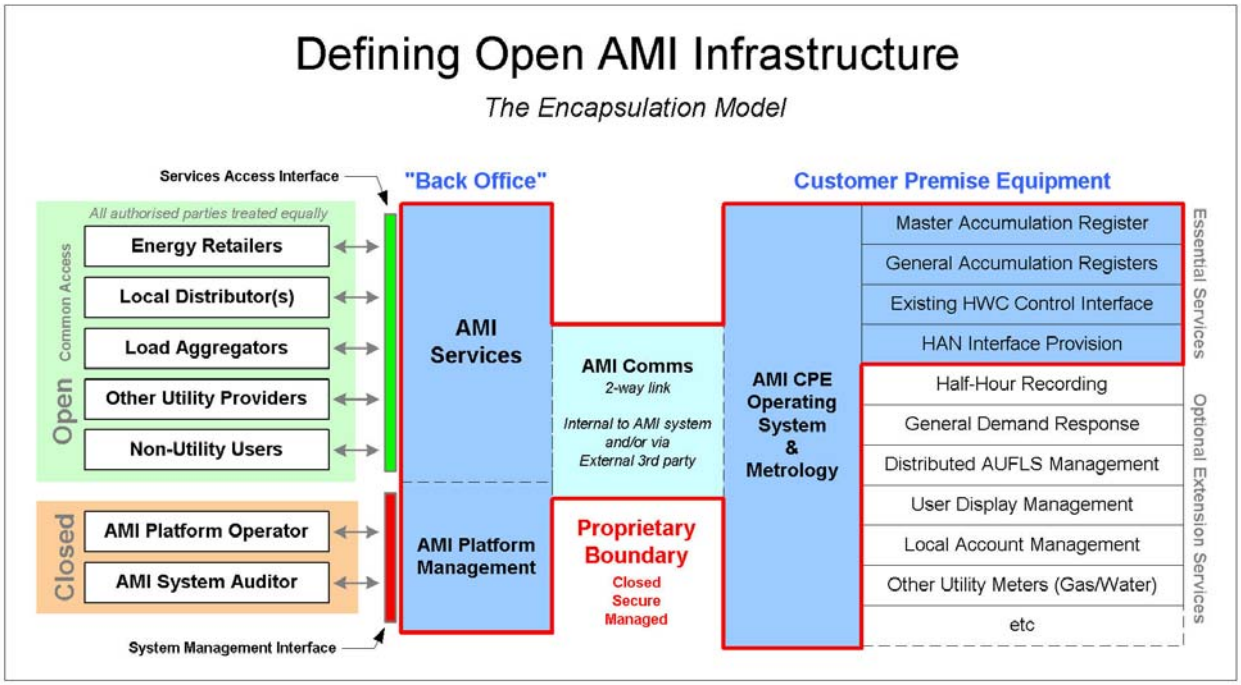
34. Virtually all commercially available advanced metering systems are proprietary in nature. The Authority does not consider this to be a problem; in fact it can be advantageous. Proprietary systems can easily be operated in an open manner, and have an inherent advantage in that they can generally be managed to high operational security requirements. This allows open yet controlled access to well-defined services at the boundary, at the same time taking advantage of the closed nature of the system to assist data security and robust system management.

35. Selection of a suitable proprietary system depends on the requirements of consumers. Suppliers will select and install systems on commercial considerations. The Authority's concern is that the systems meet basic criteria, which will protect consumers and the integrity of the market.

36. Proprietary AMI systems, through suitable design trade-offs, can also locate the necessary functionality anywhere within the closed system to optimise for best performance for their chosen combination of platform technologies and communications links.

37. The main downside with proprietary AMI systems is the potential for customer lock-in, which could be a barrier to trade. However, this could be addressed through openness at the AMI system borders.

38. The following diagram helps to illustrate this approach and may assist in developing this openness requirement into a practical working arrangement. In principle, the various parties wishing to use the system should be provided access through a common interface. The details of how this would occur could be left up to the party wanting access and the AMI platform operator. It is even possible different service users may require different interchange protocols, and these could be offered by the platform operator. The guiding principle, however, should be that no mechanism should be used to frustrate the process of accessing platform features or services, so that the net outcome will be that all service users will experience materially equal treatment.




39. This diagram illustrates how open proprietary AMI systems could be deployed without creating a barrier to competition. Parties interested in offering services to end users across the system would contract for access via the “Services Access Interface” (shown in green). Distributors may be given preferred access to load control under special circumstances, such as if network security is threatened, but otherwise all parties using the platform services should be treated equally.

40. A second access point (the System Management Interface, shown in red) may also be appropriate. This allows the metering platform operator access to more secure features of the system required for its setup and on-going operation. The compliance of the system with both the minimum policy guidelines and good operational practices could be the subject of periodic audit by a specialised independent party.

41. The red line bordering the majority of the AMI system in the diagram represents the notional boundary of a generic proprietary AMI system. 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 communications links.

## Interface protocols

42. **Policy:** The Authority does not believe that it should be necessary to mandate interface protocols for the exchange of data across either the Services Access Interface or the System Management Interface of an AMI system. The guiding principle should be that whatever protocols may be agreed between the parties for use across these interfaces, they should not be used as a barrier to competition.

43. Wherever possible, the protocols employed should either be widely used computer industry protocols or well-established electricity industry protocols.

44. Requiring standards compliance early in the life cycle of new technologies is never ideal, and should be avoided unless:

    (a) the immediate and ongoing benefits are obvious and compelling for the majority of users, or

    (b) industry players cannot make headway without so doing.

45. Neither of these appears to be the case with advanced metering in NZ at this time.

46. The same principle applies to the provision of a home area network (HAN). This is seen as a potentially realistic and cost effective way of expanding the electrical loads available for future system or consumer cost control. With end-user permission, these additional loads could be turned either down or off by service providers with the user suitably compensated for the value of this. The Authority believes the possibilities, for the far more efficient management of the NZ electricity system, that this approach potentially would enable more than justify any requirement that the ability to add a HAN be an essential feature of an AMI system.

## Communications

47. **Policy**: The Authority considers that to qualify as an “advanced metering system”, two way communications between the Services Access Interface and the metering point should be provided. Ideally, this should be as near to “real time” communications as is feasible.

48. All communication links, whether internal to the AMI system technology or provided by an external third party (via contract to the AMI platform provider) should be 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 premise equipment (CPE), rather than via a back office server, but this does not change the principle of providing appropriate access to the set of services offered by the AMI system.

## Metrology

49. **Policy:** No change to the metrology section of a meter should be made remotely via the communications system.

50. The metrology section is the portion of an electricity meter which measures the flow of electrical energy. It is governed by well established IEC and ANSI standards and AMI providers will be expected to comply with these relevant standards as set out in the Code.

51. AMI systems are likely to be able to have their programming altered via the communications system. While this is a potentially useful ability, it allows the possibility of system and/or data corruption. This ability should therefore not be permitted to impact the metrology of the AMI device. The Guidelines outline the situation where this could be permitted on the non-metrology portion of the AMI CPE and processes to be followed.

52. Any changes to the metrology section of an AMI meter will require the recertification of each meter that has been changed.

## Meter reading

53. **Policy**: AMI systems should provide a minimum of six (6) general accumulating (GA) registers to allow the service user to accumulate energy usage data during previously defined time periods.

54. AMI systems can be viewed as a platform hosting a number of services, with meter reading considered as one of many services. This view helps simplify some issues, such as where the “demarcation point” is. It is defined as the point where the meter register is recognised at the boundary of the proprietary system. Using an open AMI system, the data administrator would access the data they require as a service user via the Service Access Interface, just like any other service user. If necessary, this data

could be aggregated and sorted as a prior service by another service provider as appropriate.

55. There is no upper limit to the number of the GA registers and they may be reset if desired once the data has been securely retrieved and is available via the services access interface. The GA registers service may be provided either in the CPE or via a summation service in a back office server.

56. Recording consumption every 30 minutes (“half-hour logging”) may be desirable in certain circumstances, but this is a commercial decision and not a minimum requirement. The reason is that using a few well positioned registers, combined with profiling based settlement, can deliver many of the benefits of half hour (HH) recording at potentially lower data handling volumes.

57. The AMI platform must be able to provide the ability to meter both import and export power on sites if this is formally contracted between the energy retailer and their customer.

## Management of load control

58. **Policy:** AMI devices should have direct load control switching capability which conforms to the Authority's load control policy.

59. This may be achieved through a feature in the AMI CPE itself (such as an internal load control switch) or it may be achieved by leaving an existing ripple control relay (or other existing load control device) in place.

## Data security: access, storage, and transportation

60. **Policy:** The AMI platform operator should be responsible for maintaining processes to ensure the robustness and integrity of all data being moved and stored within their system.

61. It is envisaged that the platform operator should be a market participant and its processes should be subject to periodic audit to ensure they comply with all applicable provisions of the Code.

62. Access to all services (including the data available from a service) would be provided by the platform operator via the services access interface. This is system specific, and the platform operator will provide any protocol conversion required.

63. Data storage for other critical aspects of the AMI system (such as event log, audit logs, etc) could be left to the AMI system to determine. The consequences of lost or damaged data should be agreed between the service user and the platform operator as part of their normal commercial terms.

64. As a matter of principle, AMI systems should maintain a record of key events in accordance with the Code and meet other requirements including receipt of load control signals. There should be a permanent record of any changes to the system

which has the potential to affect the accuracy or resolution of any service. This record should be available for audit and retained for the life of the AMI system.

## Provision for HAN Interface

65. **Policy:** AMI systems should have provision for a suitable HAN interface.

66. There is considerable interest in the potential for additional load management via access to appliances in addition to hot water cylinders in a manner that does not require expensive rewiring of the premises or the appliance. Control of such loads, either directly by electricity users or indirectly by their chosen agents, in response to pricing signals could significantly change the need for new generation and improve the utilisation of the existing transmission and distribution networks.

67. The Authority believes it would be too restrictive to suggest a preferred standard. It is anticipated that the rate of change in this area will see such standards evolve naturally over the next few years.

## Provision for customer displays

68. **Policy:** In-house customer displays are desirable, but are not seen as essential.

69. Register displays should be available to consumers in order to validate consumption and invoices, without the requirement of specialised screens or existing terminals. 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.

## Premise disconnections and reconnections

70. **Policy:** AMI equipment could disconnect a premise remotely provided it is done in accordance with the Guideline on arrangements to assist low income and vulnerable consumers. That Guideline, which deals with procedures for disconnection of supplies for non-payment reasons, was introduced in July 2007. However, for safety reasons, automatic remote reconnection, following a disconnection must not be performed.

71. The service provider issuing the authorisation for the operation of a remote premise disconnection switch to change state via the AMI system (presumably the retailer) must ensure that appropriate procedures are in place end-to-end to comply with all relevant aspects of the Guideline on arrangements to assist low income and vulnerable consumers.

72. The accompanying “Guidelines for advanced meter infrastructure” is consistent with arrangements to assist low income and vulnerable consumers, and also consistent with the model domestic contract with regard to disconnection and reconnection.

73. 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.

## Prepayment

74. **Policy:** 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 platform operator.

75. Traditionally, prepay systems have always differed markedly in their design from post-pay billing systems in the electricity industry.

76. The key difference is that in the case of prepay, the master copy of the customer account resides within the metering installation with the central system serving as a backup record. Post-pay metering installations generally hold the master copy in the centralised billing system.

77. It is expected that applications will evolve which converge pre- and post-payment into a single service continuum.

## Remote areas

78. **Policy:** AMI platform operators should strive to extend their systems to give the maximum possible coverage consistent with commercially sensible deployment.

79. Remote areas are a challenge to the economic deployment of many services. Where an AMI system does not have an internal communication capability suited either technically or economically to very wide area deployment, it is expected that AMI systems and services will be extended to remote areas in parallel with communications networks (such as the Internet) also supporting a range of services.

80. Where the platform operator feels that they are unwilling to extend their systems for whatever reason, they should be open to approaches from energy retailers and the remote community concerned to explore other possibilities to provide coverage.

# Implementation

81. To create an environment in which the policies outlined in this document can be more easily implemented, it is necessary to distinguish whether they can be achieved by specifying them as part of the feature set of an advanced metering system, or whether a change to the current Code governing the market would be needed.

## Guidelines

82. The “Guidelines for advanced meter infrastructure” is a separate document further detailing the policies outlined in this document and identifying minimum features the Authority wishes to see incorporated into advanced metering systems established in NZ.

83. 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 , the Authority recommends that the guidelines be followed.

## Amendments to the Code

84. The current metering employed in the vast majority of installations in NZ uses stand-alone single or three phase meters which are interrogated manually on site. The metering installations are categorised according to load and required accuracy. These categories are set out in Code of Practice 10.1 of Schedule 10.1 of the Code.

85. AMI is in the process of being added as a meter type within the registry. The selection of the advanced meter type in conjunction with any other meter type will indicate to participants that a meter with remote communications is installed at an installation control point (ICP), and the retailer will need to ensure that it has the appropriate certification for handling this information. The selection of HH or NHH in conjunction with AMI will indicate the method of settlement used for the ICP rather than the extent of information recorded. Switching provisions need to be reviewed to ensure they are consistent with the introduction of AMI meters.

86. Retailers' ICP switch files have been modified within the revised registry that became effective on 14 April 2008. In addition some of the electricity information exchange protocols (EIEP) formats may need to be modified to convey the additional metering and register information.

87. Any proposed amendments to the Code will be referred to the Code of Practice D5 review panel for further refinement before becoming a specific amendment, subject to consultation as per the provisions of the Electricity Industry Act.

88. An information guide on metering installations can be found at the following website address: http://www.ea.govt.nz/act-code-regs/rules-regs/rulebook-regs/guidelines/market

# Appendix A High Level AMI requirements following consultation

A.1 Based on the submissions received on the discussion paper (June 2007) and an analysis of the requirements for advanced metering system, the Authority has concluded that open access to AMI systems would prevent these becoming barriers to competition.

A.2 The Authority has also concluded that prescribing how systems will be designed is not appropriate and that the guidelines should set out the ideals for AMI systems but not the interface protocols that should be used.

A.3 The Authority's policy is that the following should be considered minimum requirements for AMI systems established in NZ:

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

(b) 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;

(c) a minimum of six (6) general accumulation (GA) registers which may start and stop their accumulation at programmable times to at least 30 minute resolution and coincident with the HHM data logging boundaries. This functionality may be provided within the meter’s CPE or at another location (such as the back office server) within the AMI system;

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

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

(f) provide a services access interface using commonly used protocols (such as XML, or already existing data swapping file formats) via the AMI system on equal terms;

(g) provision for a home area network;

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

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

# Appendix B Benefits of advanced metering

B.1 Advanced metering systems by themselves will be of little value unless they give rise to material beneficial changes in the way electricity is generated, delivered, and consumed. Provided that they are correctly configured and information that can be made available is used, these new systems should assist to:

(a) impact on distribution, transmission and generation of the ability to support financial incentives to alter consumer behaviour via suitable pricing signals;

(b) provide regular and accurate meter readings;

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

(d) reduce costs to generate and deliver electricity;

(e) improve the reliability of the overall electricity network;

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

(g) 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;

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

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

B.2 Specifically, distributors should also benefit from the use of AMI by using the systems to:

(a) check on distribution asset loadings (transformers, cables) and shuffle assets into best locations;

(b) reduce network technical losses by providing the ability to reduce peak loads on portions of their networks;

(c) track temperatures of distribution transformers and be warned of life-shortening temperatures;

(d) identify points of failure on a network;

(e) check voltage limits (high and low) on a low voltage feeder to ensure it is within compliance limits;

(f) ensure that remote load control signals have been received;

(g) manage and identify issues relating to network losses.

(h) offer capacity limited rates to encourage improvement of load factor on their networks; and

(i) manage capacity limiting of demand, which could also be used in dry years to share electricity consumption within a region.