SCER
Standing Council on Energy and Resources Senior Committee of Officials

Mr John Pierce
Chairman
Australian Energy Market Commission
PO Box A2449
SYDNEY SOUTH NSW 1235

Dear Mr Pierce John

The Standing Council on Energy and Resources (SCER) has agreed to submit a rule change request to the Australian Energy Market Commission on competition in metering services.

This rule change request has been developed based on recommendations contained in the AEMC Power of choice review and is in line with the broad energy reform package to support investment and market outcomes in the long term interests of consumers agreed by the Council of Australian Governments and SCER in December 2012.

The rule change proposal and associated description of the proposed rule are attached for your consideration.

Sincerely

Martin Hoffman

Acting Chair
Standing Council on Energy and Resources Senior Committee of Officials

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Enc

Secretariat
GPO Box 1564
Canberra ACT 2601
Telephone: (02) 6243 7788
scer@ret.gov.au

Introducing a new framework in the National Electricity Rules that provides for increased competition in metering and related services

Rule change request

October 2013

1. Name and address of rule change request proponent

Standing Council on Energy and Resources
SCER Senior Committee of Officials
Standing Council on Energy and Resources Secretariat
GPO Box 1564
Canberra ACT 2601

2. Description of the proposed rule change

This rule change request seeks to establish the arrangements for increased competition in metering and related services in the National Electricity Market (NEM). The objective of the new arrangements is to support the uptake of efficient demand side participation (DSP) by residential and small business customers, by making it easier to arrange for the metering needed to support choices of electricity products and services. The new arrangements will also make it easier for large customers to manage their own metering requirements.

The rule change request seeks to amend Chapter 7 of the National Electricity Rules (NER), and make other consequential changes as required, so that:

- no party has the exclusive right to provide a particular type of meter, unless a jurisdiction prescribes otherwise,
- responsibility for coordinating metering services is separated from the roles of the Financially Responsible Market Participant or the Local Network Service Provider, by creating a new Metering Coordinator role, and
- customers may engage a Metering Coordinator directly.

The rule change request also seeks to codify a smart meter minimum functionality specification through the NER. This would provide the option for Metering Coordinators to identify to market participants which of these capabilities are available at a particular connection point, allow for standardised procedures that take advantage of these capabilities, and if adopted by jurisdictional policy, may be referred to as a requirement for meters in defined situations such as new connections and replacements.

To support this framework, the Standing Council on Energy and Resources (SCER) has requested advice from the Australian Energy Market Commission (AEMC) on open access and common communication standards to support contestability in demand side participation end user services enabled by smart meters. The framework presented in this rule change proposal should be sufficiently flexible to accommodate any outcomes of the AEMC's advice.

The proposed changes are not intended to impact the intent of any existing metering related derogations specified in Chapter 9 of the NER.

3. Background to the rule change request

3.1 Energy market reform package

In December 2012, the Council of Australian Governments (COAG) and SCER agreed to a broad energy market reform package to support investment and market outcomes in the long term interests of consumers. This included consideration of demand side participation in the electricity market.

As part of this package, SCER agreed that officials should prepare rule change proposals for consideration by the AEMC addressing expansion of competition in metering and related services to all customers, consistent with a business-led, optional approach to adoption of more advanced metering in states where a widespread roll-out is not underway[1].

3.2 Power of Choice review

In November 2012, the Australian Energy Market Commission (AEMC) published its Final Report of the Power of Choice (PoC) review.[2] The purpose of the review was to investigate and identify the market and regulatory arrangements needed across the supply chain to facilitate efficient investment in, operation and use of DSP in the NEM.

The PoC review examined opportunities for consumers to make more informed choices about the way they use electricity. The review also addressed the market conditions and incentives required for network operators, retailers and other parties to maximise the potential of efficient DSP and respond to customers' choices. The overall objective of the review was to ensure that the community's demand for electricity services is met by the lowest cost combination of demand and supply options.

The AEMC made a number of recommendations intended to support the efficient uptake of DSP in the NEM. A key area of focus in the final report related to enabling technology. As part of the reforms in this area, the AEMC recommended that a new framework be introduced into the NER that provides for competition in the provision of meters and related services for residential and small business customers.

The PoC review final report contained a set of draft specifications that outlined the changes to the NER required to implement the AEMC's recommendations.

SCER officials have considered the AEMC's recommendations and draft specifications in preparing this rule change request.

[1] SCER Communique, 14 December 2012, https://scer.govspace.gov.au/files/2012/12/Final-SCER-Communique-14-December-2012.pdf

[2] Australian Energy Market Commission, *Power of choice review – giving consumers options in the way they use electricity*, Final Report, AEMC, 30 November 2012

4. Nature and scope of the issues the rule change request will address

In the electricity market, the fundamental purpose of metering is the measurement of electricity flows to allow financial settlement of the market and billing of customers.

Metering can also provide a platform for additional outcomes which allow customers and other participants to make decisions about how they engage in the market, for example by supporting:

- improved information about the timing and quantity of electricity consumption to support decisions about managing consumption and costs,
- innovative product offerings to customers, including an increased range of tariff options and products such as direct load control,
- new business practices that reduce costs, such as remote reading and remote connection and disconnection, and
- grid management technologies such as outage and supply quality detection.

SCER officials consider that the current arrangements for metering services in the NEM are a barrier to realising these additional opportunities from metering as an enabling technology.

4.1 Current arrangements for metering services

The original NEM principles for investment in metering were based on competition in metering responsibility, metering installation and data services[3].

Arrangements for large customers

Currently, competition in this area has been restricted in a practical sense to large and medium sized customers in the NEM, where remotely read interval metering is used (known as type 1-4 meters[4]). For these customers, the Financially Responsible Market Participant (FRMP) for a connection point (generally a retailer) can become the 'responsible person'[5], who must ensure that a meter and data services are provided at the connection point, unless it accepts an offer from the local distribution business, also known as the Local Network Service Provider (LNSP)[6], to act in this role and accept responsibility for the connection

[3] The original design principles for the NEM metering arrangements are summarised in Appendix A 'Original design principles used in developing the metering arrangements (chapter 7) of the National Electricity Rules' of the AEMC's Supplementary Paper 'Principles for metering arrangements in the NEM to promote installation of DSP metering technology', published with the draft report for the Power of Choice review.

[4] Type 1-4 meters are required for customers where energy flows across a connection point are above a threshold set by jurisdictions, generally 100 or 160 MWh.

[5] Under clause 7.2.2 the FRMP may elect to be the responsible person for a type 1-4 metering installation. Alternatively, the FRMP may accept an offer from the LNSP to be the responsible person.

[6] For consistency this rule change request uses the term Local Network Service Provider, including in contexts where the National Electricity Rules use the term Distribution Network Service Provider.

point. Where the FRMP is responsible for metering and data services, it must ensure that an accredited Metering Provider (for the physical metering equipment) and Metering Data Provider (to collect, manage and deliver the metering data) are engaged for the connection point. The FRMP can procure these services from competing providers.

SCER officials understand that these arrangements are not satisfactory where a 'large' customer (in terms of consumption, company size or number of sites) wants to arrange its own metering services. A large customer can contract directly with a Metering Provider at present[7], but may still face some barriers because, for example:

- the FRMP remains the legally liable responsible person, even though it is not a party to the contract between the customer and its metering service providers, and/or
- a customer with a number of 'small' sites (in terms of consumption) is restricted by the metering services provided by the LNSP at each site.

SCER officials intend that this rule change request will make it easier for large customers to manage their own metering requirements.

Arrangements for small customers

For residential and small business customers that have locally read interval meters (type 5) and accumulation meters (type 6), the LNSP has responsibility for managing meter provision and related services on the customer's behalf[8]. Other potential providers are not able to compete to provide type 5 and 6 meters to these customers. This was originally adopted as a transitional measure so that customers had effective metering services at the commencement of full retail competition. This transitional measure has remained in the NER to date.

The existing NER arrangements are inhibiting market participants, metering companies and customers from investing in more innovative metering technology which supports DSP products. Under the existing arrangements, a customer or FRMP (generally the retailer for the connection point) can seek to upgrade a metering installation from that provided by the LNSP, but may face several barriers in doing so.

In particular, an LNSP currently has certainty that it will be the provider of a type 5 or 6 meter and will receive regulated returns to recover the cost of providing metering assets and related services. If a customer or FRMP chose to upgrade to a remotely read meter, the LNSP's metering company would need to compete with other companies to provide the meter and related services. This represents a less certain outcome for the LNSP because:

- it cannot be sure that its offer to provide a meter would be successful, and

[7] Under rule 7.2.5(a)(2), a responsible person must allow another person to engage a Metering Provider for an installation.

[8] Under clause 7.2.3(a), the responsible person for type 5 and 6 metering installations is the LNSP. The situation is different in Victoria, where derogations from the NER (9.9B) mean that meters which meet Victoria's Advanced Metering Infrastructure specification are designated as type 5 or 6 meters (in spite of being remotely read) and are therefore are exclusively provided by LNSPs.

- if its offer was successful, the LNSP's meter company would need to agree to a commercial (rather than a regulated) arrangement with the FRMP.

As a result, an LNSP has a disincentive to assist in customer or FRMP decisions about upgrading a meter. SCER officials understand that this results in coordination problems where small customers or their FRMPs want to change the type of meter, between the FRMP procuring a meter on behalf of the customer (or the customer procuring a meter directly) and the incumbent LNSP meter provider.

Other aspects of the current arrangements for small customer metering are also affecting decisions about metering, including:

- bundling of LNSP metering costs with general network charges in some jurisdictions so that, if a FRMP replaces a metering installation, the customer would be paying both the charges passed on by the FRMP for the new meter, and the LNSP's metering charges bundled in the general network charge.

- uncertainty about the framework for negotiating exit fees between a FRMP and an LNSP if the FRMP seeks to replace an existing LNSP metering installation; a high exit fee would be a disincentive for retailers to invest in replacement metering technology, while a low fee may under-recover the LNSP's costs of providing metering services.
- uncertainty over who has rights to use the non-metering functions included in the meter.
    - SCER is addressing this issue through a parallel request to the AEMC for advice on open access to metering infrastructure by authorised parties.
- smart meter consumer protection arrangements are still being established and their implications are uncertain.
    - SCER is addressing some consumer protection issues through parallel amendments to the National Energy Retail Rules, and this rule change request asks the AEMC to make or advise of additional consumer protection arrangements needed in light of the new framework.
- investment uncertainty resulting from the power under the National Electricity Law (NEL) and NER for jurisdictions to mandate a roll out of smart meters by the LNSP(s) in their state or territory.
    - In the PoC review, the AEMC recommended that the possibility of a mandated roll-out of smart meters in the NEL be removed.[9] SCER has agreed to this recommendation[10].

[9] AEMC, *Power of choice review – giving consumers options in the way they use electricity*, Final Report, 30 November 2012, p 86.
[10] SCER response to the Power of Choice review, March 2013, http://www.scer.gov.au/workstreams/energy-market-reform/demand-side-participation/. The recommendation is being implemented through the Statutes

4.2 Proposed arrangements for metering services

Market arrangements for metering services should support choices based on the costs and benefits accruing to the various decision makers, including:

- customers' choices about their electricity tariffs and other products, which will help them manage their electricity consumption and costs,
- FRMPs, for example from the faster access to metering data provided by remotely read meters, from more accurate load profiles, or from options to remotely connect and disconnect loads,
- LNSPs, for example where a demand side program is a more efficient network management solution than building network infrastructure,
- jurisdictions, where policy can assist in overcoming barriers such as split benefits or coordination issues. For example, a cost benefit analysis might indicate that requiring use of certain types of meters in new and replacement situations would mean that economic benefits are realised more quickly, or would avoid sunk costs being incurred through the continued use of lower functionality meters.

To address the issues identified under the current arrangements, this rule change proposal seeks to introduce a new framework for the competitive provision of metering and data services that builds on the original principles for metering in the NEM.

A detailed specification of the proposed rule is provided in **Attachment A** to this rule change request.

4.2.1 Scope of the proposal

Roles and responsibilities

The proposed new arrangements include:

a. for clarity, replacing the term 'responsible person' with 'Metering Coordinator', a role that would have the same responsibilities and liabilities as are currently attached to the 'responsible person' role, and that would be performed by any person registered with and accredited by AEMO. The existing Metering Provider and Metering Data Provider roles would be unchanged. If registered with AEMO as a Metering Coordinator, a FRMP or LNSP could also perform this role.

b. No party would have the exclusive right to be or engage the Metering Coordinator for a particular type of meter, unless, in relation to residential or small business customers, a jurisdiction instrument prescribes that one or more specific Metering

Amendment (Smart Meters) Bill 2013, which was introduced to the South Australian Parliament in September 2013.

Coordinators, or a class of Metering Coordinators, are exclusively responsible for coordinating metering services relating to one or more meter types in a particular network area.

- As described in section 4.4, it is not intended that this would allow a jurisdiction to mandate that a particular Metering Coordinator can deploy smart meters. Jurisdiction decisions should be based on the efficient provision of basic metering services.

c. A FRMP would be responsible for ensuring that there is a Metering Coordinator at each of its customers' connection points.

d. A FRMP would be responsible for engaging a Metering Coordinator on a customer's behalf, unless:

- the FRMP chooses to act as Metering Coordinator (if registered with AEMO); or
- a Metering Coordinator is engaged directly by the customer; or
- a jurisdiction prescribes that one or more specific Metering Coordinators, or a class of Metering Coordinators, are exclusively responsible for coordinating metering services in a particular network area.

e. All customers would have the option to contract directly with any Metering Coordinator. In these circumstances, the FRMP would be required to respect the contract arrangements in place with the customer's chosen Metering Coordinator and could not charge the customer for metering services. The incumbent and new Metering Coordinator would manage the transition and inform the customer's retailer of any change.

f. To simplify arrangements for small customers, the standard retail contract would include a clause specifying that the retailer is to arrange metering services on behalf of the customer.

g. Small customers would still be able to engage a Metering Coordinator directly, but would need to enter a market retail contract with the retailer and a separate contract with a Metering Coordinator to do this.

h. Where a FRMP or a Metering Coordinator proposes to change a meter or its functions, a customer must at least be informed prior to the change. If the change affects the customer's contracts, the customer must consent to the change.

i. When changing a meter, the Metering Coordinator should only be required to inform the FRMP where the change in meter results in a material change to the services, costs, or contract terms. However, the Metering Coordinator would be required to inform the customer.

j. A Metering Coordinator would be able to assign its responsibility to another Metering Coordinator so long as there were no changes to the customer's retail contract where the FRMP has engaged the Metering Coordinator, or the metering contract where the customer has engaged the Metering Coordinator. The FRMP or the customer (as applicable) must be informed of the change in responsibility.

k. The new arrangements are intended to improve competition in metering services for end users of electricity. SCER officials expect that the proposed arrangements would be consistent with practices at other types of connection points, including generation-transmission and transmission-distribution connection points. However, SCER officials expect that the AEMC will make a final rule which ensures effective metering for connection points not involving an end user.

Metering coordinator contract arrangements

In the Power of Choice review, the AEMC recommended a framework for the competitive provision of metering services which it considered met the objectives of:

- reduced need for inefficient meter churn when a consumer switches retailer,
- metering arrangements that are as simple as possible for consumers,
- arrangements for engaging a Metering Coordinator that are simple and based on normal commercial agreements, and
- allowing parties to emerge alongside retailers and distributors that can independently accept financial liability for providing accurate metering installations to the consumer, including assessing the cost of that liability and the risk of the meter being replaced during its economic life.

Under the AEMC's proposal:

- the NER (or the National Energy Retail Rules) would regulate the standard contract between a FRMP (or customer) and a Metering Coordinator,
- if a customer exercised their choice to change retailers (e.g. from Retailer A to Retailer B), Retailer B would be required to honour the metering contract that was in place between Retailer A and the incumbent Metering Coordinator, and
- Retailer B could subsequently choose to replace the incumbent Metering Coordinator subject to the terms of that metering contract.

SCER officials consider that a standard contract between a FRMP (or customer) and a Metering Coordinator, if this approach is adopted by the AEMC, would be required to contain information on, but not limited to, contract length, termination fees and exclusivity restrictions.

SCER officials agree that having a framework that meets the objectives considered by the AEMC is important and it recognises that the AEMC's proposed approach is likely to achieve the desired outcomes.

However, in assessing this rule change request SCER officials expect that the AEMC will consider the implications of its recommended approach, including but not limited to whether:

- it introduces any potential barriers that may reduce competition in retail or metering services or innovation in retail or metering products,
- the Metering Coordinator is sufficiently incentivised to ensure its metering offer represents best value, and to provide a competitively priced offer to an incoming retailer,
- there are material commercial issues that may arise by deeming a contractual relationship between two competing retailers in circumstances where the incumbent Metering Coordinator is also the former retailer for the site,
- it is likely that an incoming retailer will continue the contractual relationship with the incumbent Metering Coordinator, noting that the incoming retailer will retain the right to choose another Metering Coordinator,
- a Metering Coordinator is likely to provide metering services that offer a good range of additional functions or can be easily upgraded so that its meters will not need to be replaced as new functions are taken up by retailers, distribution businesses or other service providers, and
- there are appropriate incentives for associated communications and data management systems to be interoperable with a range of parties.

Providing customers with information about the cost of metering services

Large customers currently have a range of options to investigate the cost of metering, for example calling for tenders for metering services as part of their regular energy procurement processes. These options are not readily available to small customers.

SCER officials consider that for the proposed arrangements to be fully effective, customers who are interested in entering into a direct relationship with a Metering Coordinator need to be able to access information so that they can compare the costs and benefits of different arrangements. This includes ensuring that small customers can compare retail offers where they have a direct contract with a Metering Coordinator for their metering services.

SCER officials propose that, where this information is available because an LNSP has unbundled its metering charges or the retailer has engaged a Metering Coordinator other than the LNSP, a retailer must inform the customer of the metering services charges for that customer, and the retail tariff that would be offered to the customer if charges for metering services were removed.

The AEMC is asked to consider the best approach for a retailer to discharge this obligation, which may include: consideration of requiring metering services information on a customer's bill; to be separately identified in the tariffs and charges to be payable by the customer; to be included in the required information that a retail marketer is to provide to a small customer; or to be provided to the small customer on request.

Transitional arrangements

At present, the LNSP is the responsible person for type 5, 6 and 7[11] metering installations. Where the AER classifies an LNSP's metering services as a direct control service, the LNSP's metering costs are regulated and the associated assets are included in its regulatory asset base.

This rule change request proposes that no party should have the exclusive right to be or engage a Metering Coordinator for a particular type of meter, including types 5, 6 and 7, unless a jurisdiction prescribes otherwise. The rule change proposes the following transitional arrangements where the LNSP is currently the responsible person:

- The LNSP will become the initial Metering Coordinator for the meters for which it is currently the responsible person. As long as the LNSP remains the Metering Coordinator, it has the full obligations of a Metering Coordinator, and in addition:
    - the AER would retain the ability to regulate fees where an LNSP is the Metering Coordinator because it was the incumbent responsible person for a meter, and in other situations, for example where the AER considers that there is not yet competition which would constrain the fees charged by the Metering Coordinator business unit of an LNSP.
    - its metering charges must be unbundled from Distribution Use of System (DUoS) network charges at the next regulatory determination, and
    - its metering company may compete with other Metering Coordinators to provide meters in the competitive market on a ring fenced basis.
- The FRMP will engage the LNSP as the initial Metering Coordinator for the meters for which the LNSP was the responsible person. In this situation:
    - the LNSP must not increase its charges to the FRMP for providing metering services, and
    - the LNSP must provide at least the same services to the FRMP as Metering Coordinator as it provided in its role as responsible person.

[11] A type 7 metering installation does not have a meter. A type 7 metering installation is, for example, a public lighting connection which has a stable, predictable consumption pattern. An algorithm which makes assumptions about electricity usage is used to estimate total consumption.

- Where another party becomes the Metering Coordinator for a connection point that has an existing type 5 or type 6 metering installation, there is provision for a reasonable exit fee determined by the AER:
    - based on the average depreciated value of the stock of the LNSP's existing Type 5 or 6 meters (this is for simplicity and administrative ease, as an alternative to attempting to determine the age of the actual meter at each individual customer's premises);
    - which may include efficient and reasonable costs of processing the customer transfer to another Metering Coordinator; and
    - the AER should determine whether a cap on exit fees is appropriate and, if so, the level of the cap.
- Where a FRMP or the customer has arranged for the replacement of an existing LNSP meter and the LNSP is no longer the Metering Coordinator for the site, the LNSP must not recover metering service charges from the customer.

Existing load management capabilities

There are existing load management DSP options that already operate in a number of the distribution networks in the NEM. A typical example is off peak hot water. This option allows the DNSP to limit supply to residential hot water heaters during certain times such as peak periods. This has been a feature of the market for some decades and helps to reduce:

- the size of the peak demand at a location in the network (or the network as a whole) and hence the capital and operating costs of maintaining a reliable supply, and
- the costs of energy at times of peak demand.

Such options have been justified under previous regulatory arrangements and generally still provide benefits through reduced energy generation and network costs. In some instances these schemes may be reducing the peak demand by hundreds of megawatts. Should the option cease to operate, there may be a need for additional capital expenditure to serve this load.

This rule change request proposes that the functionality of such existing load management options will be retained if a meter is replaced. That is, if the load management scheme operates through additional functionality in the existing metering installation, an upgraded or replacement metering installation should include equivalent functionality which is activated and operational at the time of the upgrade or replacement, in order to preserve the benefits of the scheme.

In the proposed arrangements, the Metering Coordinator must ensure that existing functionality remains operational.

Capturing network benefits

Nothing in this rule change request would prevent an LNSP from offering payment for metering services to support a DSP program, for example to achieve operating efficiencies or to access grid management functions of meters.

LNSP as Metering Coordinator

An LNSP's subsidiary Metering Coordinator (or Meter Provider or Meter Data Provider) would be able to offer to provide metering services.

Ring fencing and competitive procurement requirements may be established by the AER to ensure competitive neutrality between the LNSP's subsidiary and any other Metering Coordinator that may wish to provide these services.

Arrangements for the Victorian rollout of smart meters

In the PoC final report, the AEMC considered the current arrangements in Victoria, where a mandated rollout of smart meters has been undertaken. The AEMC recommended that there should be some arrangements put in place that have regard to that rollout. SCER officials consider it is appropriate that arrangements are put in place to accommodate the Victorian rollout to the extent possible, noting that the transitional requirements will depend heavily on the AEMC's review into the open access and communication standards to support demand side services.

Hence, it is proposed that the following arrangements are introduced:

- In Victoria, where a smart meter rollout has been mandated, an LNSP would be the Metering Coordinator for the smart meters it has deployed, and may continue in this role to the exclusion of other parties for a defined period. This defined period may be established by the Victorian Government through a jurisdictional instrument.
- Until the provisions of the national framework apply in that jurisdiction, the LNSP may also continue to deploy smart meters in accordance with the Victorian mandate rules and may continue as the Metering Coordinator for these meters to the exclusion of other parties for a defined period.
- Upon expiry of the LNSP's exclusivity period, the regulated exit fee would apply, to allow a retailer or customer to subsequently replace a meter installed under a mandate.

Consequential changes

SCER officials anticipate that consequential changes to other aspects of the national frameworks for electricity may be required to support the changes outlined in the rule change request.

At a minimum, a provision will need to be added to the National Energy Retail Rules (NERR) such that a standard retail contract states that the retailer is to arrange for metering services on behalf of the customer.

The AEMC should make any further necessary consequential changes, which may include:

- **Consumer protections:** The NERR establish protections for customers in their relationships with electricity distributors and retailers. The NERR do not address a situation where a customer may have another relationship with a Metering Coordinator. The AEMC should make consequential changes to ensure consumer protections continue to be appropriate where competitive metering is more widely available.

- **Retailer of last resort:** The AEMC is asked to make any consequential changes needed to ensure that Retailer of Last Resort arrangements are appropriate and ensure the continued provision of metering services when a retailer fails. The AEMC should advise if any changes need to be considered further by SCER.

- **Enforcement:** The new arrangements, including the new role of Metering Coordinator, may require enforcement provisions. The AEMC should make, or advise of, any provisions required including any changes to civil penalty provisions.

4.3 Including a minimum functionality specification in the NER

The AEMC's Power of Choice review considered the minimum functionality of meters to support the proposed new arrangements for contestable meter provision. In its final report, the AEMC recommended that the Smart Metering Infrastructure Minimum Functionality Specification (SMI MFS) developed by the National Smart Metering Program, and endorsed by SCER in December 2011, should be codified in the NER.

The SMI MFS was originally developed to define the functionality requirements and associated performance levels for smart meters in the context of jurisdictions being given a power to mandate a rollout of smart meters. SCER has agreed that this power should be removed from the NEL.

The SMI MFS remains useful as it identifies important smart meter functions such as energy measurement and recording, remote and local acquisition of data, visible displays, load management functions, quality of supply event recording, and loss of supply detection.

SCER officials consider that there are likely to be broad market benefits if participants have access to an agreed minimum functionality specification and related performance levels that a

smart meter should provide[12]. This would support standardisation of meter functionality and the development of business-to-business procedures to support the use of these functions.

This rule change request proposes that AEMO establish, maintain and publish a smart meter minimum functionality specification, including an explanation or specification of those functions and related performance levels, in the form of a procedure or guideline.

Making AEMO responsible for maintaining the smart meter minimum functionality specification, rather than including the smart meter functions and performance levels directly in the NER, would avoid the need for an AEMC rule change process each time changes to the functions and performance levels are contemplated. However, as for other procedures maintained by AEMO, AEMO would be required to apply the rules consultation procedures in the establishment of, and in order to change, the smart meter minimum functionality specification.

The rule change request does not propose that the smart meter minimum functionality specification would override the basic metrology requirements in the NER, such as accuracy, design standards, inspection and testing, and the need to meet Australian or international standards.

This rule change request does not propose that any meters must contain all the functions listed in the national smart meter minimum functionality specification, unless required by a jurisdiction in its new and replacement meter policy.

The current version of the SMI MFS is at **Attachment B** to this rule change request. This is provided for information and it is not proposed that the smart meter minimum functionality specification established by AEMO would necessarily replicate the SMI MFS. In the final rule, the AEMC may give guidance to AEMO on the factors that should be considered in establishing the specification.

SCER officials propose that some or all of the functions in the smart meter minimum functionality specification must be included in new and replacement meters when required by a jurisdiction.

If a jurisdiction has not applied a new and replacement policy, the smart meter minimum functionality specification would apply at the discretion of the party procuring or installing a meter. When installing meters that comply with the smart meter minimum functionality specification, Metering Coordinators would identify to market participants that these functions are available at a particular connection point, and market participants would be able to use standardised procedures that take advantage of these capabilities.

[12] In this context, 'functions' describes the things that a meter can do, such as supporting remote acquisition of data. 'Performance levels' describes the quality, quantity and timing of how the meter does those things, such as specifying that remote acquisition of data should be completed within a certain time limit.

Arrangements for the Victorian rollout of smart meters

SCER officials note that the Victorian Government rollout of smart meters commenced prior to the SCER decision on the SMI MFS, and therefore has its own minimum functionality. The functionality of the Victorian smart meters is broadly similar to that endorsed by SCER but is not identical. Victoria may apply the Victorian smart meter functionality specification as part of its new and replacement meter policy yet to be determined through a jurisdictional instrument.

4.4 Jurisdiction policies

New and replacement meters

The new arrangements must not require that all new and replacement meters installed in a jurisdiction be advanced meters.

SCER has agreed that each jurisdiction should be able to decide whether smart meters must be installed in defined situations[13]. Examples of these situations might include when a meter is installed at a new connection, when an old meter is replaced, or when there is the potential for export of electricity from a site. This is known as 'new and replacement' policy.

A new and replacement policy provides an option to accelerate deployments of particular types of meters beyond that expected under a voluntary deployment. SCER officials expect that the deployment of meters will be driven primarily by customer and business choices based on the costs and benefits available to each party. However, there may be situations when the scale of benefits from advanced meters for all parties could be increased, or realised more quickly, if supported by an appropriate new and replacement policy.

This rule change request seeks to codify that jurisdictions have the ability to define whether advanced meters must be installed in new and replacement situations and if such advanced meters must meet, or be capable of meeting, the smart meter minimum functionality as maintained by AEMO.

Appropriate amendments should be made to the national framework to provide for jurisdictions to define their requirements through the jurisdiction metrology material in the metrology procedure.

If a jurisdiction requires that smart meters be installed in new and replacement situations, an exemption to the minimum functionality may be applied to existing type 5 metering installations that can be upgraded to type 4 by adding remote communications capability. This would reduce the need for these meters to be replaced unnecessarily.

[13] SCER response to the *Power of Choice* review, March 2013, http://www.scer.gov.au/workstreams/energy-market-reform/demand-side-participation/

Reversion of meters

A jurisdiction's meter reversion policy clarifies whether an existing meter can be replaced with a lower-functionality meter. It is a means of ensuring that deployments are 'sticky'.

For example, if a new and replacement meter policy requires that interval meters must be installed, but a customer chooses to have a smart meter installed, a jurisdiction could require that the smart meter must not be replaced by a basic interval meter at a later date.

Jurisdiction reversion policies are currently defined through the jurisdiction metrology material in the metrology procedure, and this arrangement is proposed to remain unchanged.

Exclusive provision of meters by a Metering Coordinator

SCER officials note that in some situations a jurisdiction may wish to provide that one or more, or a class of, Metering Coordinator(s) would be exclusively responsible for coordinating metering services for some types of meters.

For example, if a jurisdiction is implementing a new and replacement policy for more advanced meters, there would be few occasions where basic type 6 metering is installed. A jurisdiction might consider that there is benefit in retaining the existing exclusive arrangements for basic type 6 metering as a transitional measure. For example, LNSPs currently are able to take advantage of significant economies of scale to provide basic type 6 metering at low cost to consumers, and it may be unlikely that competition would provide consumers with lower cost metering where there is a decreasing number of basic type 6 meters being installed.

A jurisdiction might also consider that there is little prospect of different business models to provide type 7 metering services (i.e. maintaining registers of unmetered connections and calculating their energy use), and little benefit in opening this sector to competition.

This rule change request seeks to establish a default national framework so that no party has the right to be or engage the Metering Coordinator for a particular type of meter.

However, the rule change request proposes to allow for a jurisdiction to prescribe, in relation to residential and small business customers, Metering Coordinator exclusivity for one or more meter types to support the efficient provision of basic metering services.

4.5. Communications infrastructure platform for remote access to a metering installation

The current version of the Rules contains minimal regulation of the provision of remote communications to a metering installation. Rule 7.11.3 provides the following high level requirements:

- "7.11.3(c): Metering Data Providers must maintain electronic data transfer facilities in order to deliver metering data from the metering data services database to the metering database in accordance with the relevant service level procedures.

- 7.11.3(h): Metering Data Providers must maintain electronic data transfer facilities in order to deliver metering data from the metering data services database to Market Participants and Network Service Providers who are entitled to receive metering data.

- 7.11.3(i): The Metering Data Provider's rules and protocols for the collection of metering data from a metering installation must be approved by AEMO and AEMO must not unreasonably withhold such approval.

- 7.11.3(j): The Metering Data Provider must arrange with the responsible person to obtain the relevant metering data if remote acquisition, if any, becomes unavailable."

The Glossary defines electronic data transfer in the following way:

- "The transfer of data by electronic means from one location to another."

Rule 7.3.1(a)(3) currently places a mandatory requirement for certain metering installations to contain the following functionality:

- "A metering installation, unless it is classified as an unmetered connection point in accordance with schedule 7.2, must [for] metering installations types 1, 2, 3, or 4, have electronic data transfer facilities from the metering installation to the metering data services database"

Rule 7.7(a) provided for specified people to obtain access to energy data (amongst other data). Rule 7.7(b) allows these people to gain electronic access to the energy data from the metering installation providing that certain conditions are met. These provisions together ensure that AEMO can collect data from a meter by remote acquisition should this be necessary if the market is under duress for any reason. They also allow other parties (including a customer) to access the energy data directly from the meter should this be requested for any reason.

The Glossary defines telecommunications network in the following way:

- "A telecommunications network that provides access for public use or an alternate telecommunications network that has been approved by AEMO for the remote acquisition of metering data"

In light of future deployments of meters with advanced functionality, SCER officials consider that the current rules on the provision of electronic data transfer facilities to metering installations is in need of revision.

The communication infrastructure to a metering installation must be provided in a way that:

- supports competition in metering data providers,

- provides open access at least for the collection of energy data,
- encourages open access for all functions included in the minimum functionality specification,
- ensures communications with a meter, including transfer of data, are secure,
- encourages competition in the provision of the infrastructure,
- does not unnecessarily limit the infrastructure to one local area,
- permits existing public telecommunication infrastructure providers to offer services if they so choose,
- permits any meter that complies with the NER to be connected to the infrastructure,
- encourages an international standard meter software 'language' to be adopted for meter and communications interoperability, and
- allows metering data services to be provided at an efficient cost.

The AEMC review of the framework for open access and communication standards is considering the related issue of how protocols and standards support use of the communication infrastructure to provide services to customers.

5. How the proposed rule will or is likely to contribute to the achievement of the National Electricity Objective.

The Rule making test contained in section 88 of the National Electricity Law requires that the AEMC may only make a Rule if it is satisfied that the Rule will or is likely to contribute to the achievement of the National Electricity Objective (NEO). The NEO is set out in section 7 of the NEL and is as follows:

> "The objective of this Law is to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to—
>
> (a) price, quality, safety, reliability and security of supply of electricity; and
>
> (b) the reliability, safety and security of the national electricity system."

The proposed Rule is intended to support the uptake of efficient demand side participation by residential and small business customers, by making it easier to arrange for the metering needed to support choices of electricity products and services. This is likely to advance the NEO in the following ways.

Improving overall market efficiency

Arrangements for metering in the NEM currently perform the basic function of measuring electricity flows to support settlement of the market. Larger customers may also have metering with additional functionality that provides additional benefits to those customers as well as their retailers and network businesses.

The proposals in this rule change request are intended to enhance the uptake of more advanced metering at the estimated 88 per cent of residential and small business sites where meters are being read on an accumulation basis[14]. SCER officials consider that the take up of more advanced meters for these customers will provide a platform which supports customers and other participants in the market to make more efficient decisions about how they use and invest in the electricity system. This outcome is expected to arise from effects including:

- allowing engaged customers to better manage the quantity, timing and cost of their electricity use. For example, a customer could accept a flexible pricing offer supported by an advanced meter, and choose to shift some of their consumption to a time when demand is lower and electricity is cheaper. The cumulative effect of similar customer decisions is likely to improve the allocative efficiency of the electricity market and reduce the costs to customers for an efficient level of consumption.

- more efficient network investment decisions where efficient price signals to customers lead to deferred or avoided network capital or operating costs by reducing peak demand.

- more efficient operation of generation, and participation in financial markets, where retailers have access to actual customer load profiles and where operation of peaking generation can be avoided.

Promoting efficient investments in metering and related services

SCER officials expect that the arrangements proposed in this rule change request would lead to efficient investment decisions about metering. In a competitive environment, customers, FRMPs, network businesses and Metering Coordinators are expected to make decisions about metering based on the costs and benefits accruing to the various decision makers. A decision to deploy advanced meters would only be expected to occur where the benefits throughout the supply chain (i.e. to retailers, third party energy service providers, network businesses and to customers) exceed the costs of the deployment. In the long term it would be expected that the benefits to retailers, third party energy service providers and network businesses would be captured by customers in the form of lower costs, through competition and the operation of the economic regulation undertaken by the AER.

[14] AEMC, *Power of Choice Review – giving consumers options in the way they use electricity*, 30 November 2013, p.76.

The proposed arrangements to allow any accredited person to be a Metering Coordinator would increase competition in the provision of metering and related services, which would be expected to reduce metering costs to customers. In addition, competition for the provision of metering and related services is likely to promote future innovations that would further reduce metering costs in the long term and increase the range of functions and associated services that can be offered to customers.

The proposed arrangements also allow the separation of the provision of metering and related services from the activities of retailers and other third party energy service providers. This is expected to reduce the need for the meter to be replaced when a customer changes retailer or moves premises where an advanced meter is installed. This reduces metering costs directly by reducing the likelihood of unnecessary meter replacement and indirectly by increasing investment certainty for Metering Coordinators. These cost reductions are likely to be passed on to customers through the competitive provision of metering and related services.

Reducing the costs of maintaining quality, reliability and security of the supply of electricity

The proposed arrangements are likely to increase the uptake of advanced metering in the NEM, since advanced meters will be deployed when they are needed to support customer choices and the business cases of networks businesses, retailers and other parties. The increased penetration of advanced metering with network functions is expected to assist the network businesses to monitor reliability and quality of supply, allowing these businesses to respond more promptly to power outages or poor quality. The increased penetration of advanced meters is expected to also enable functions like direct load control and remote connection and disconnection, which provide additional options for the network businesses to manage reliability and security of supply more effectively and at a lower cost.

The cost savings and increased ability to monitor the operation of the network will potentially improve the quality and reliability of supply to customers.

6. AEMO's declared network functions

The proposed rule will not affect the Australian Energy Market Operator's declared network functions.

7. Expected costs, benefits and impacts of the proposed rule

The proposed rule is likely to result in benefits across the electricity supply chain. Benefits are likely to include:

- better information on a customer's energy consumption that can help in managing costs.

- allowing retailers to settle in the wholesale market on their customers' actual consumption, as opposed to the average load profile of customers in a distribution area, improving the accuracy of the settlements arrangements.

- improving the speed of customer switching, and the possibility of more frequent billing which could help to reduce customer exposure to bill shock.

- a high degree of flexibility for retail tariff options that can be offered to customers, and the possibility of cost reflective flexible pricing to encourage efficient use of networks.

- opportunities for market development and business operational efficiencies.

End use customers

Electricity end use customers are expected to benefit from the proposed Rule in the following ways:

- greater choice of pricing offers and DSP products, with the potential to save on electricity costs.

- the ability to engage directly with a Metering Coordinator for the provision of metering and related services. This is expected to be relevant to large and medium sized customers in particular, allowing them to arrange metering services to minimise costs or maximise opportunities to monitor and manage energy use.

- increased competition in the short term and increased innovation in the longer term, potentially leading to reduced costs for the provision of metering and related services.

- more efficient allocation of network costs, and potentially reduced capital and operating network costs being passed through to all consumers, as more cost-reflective tariff structures are developed.

- an improved service in terms of quality, reliability and security of supply, through the ability for network businesses to use additional meter functionality.

End use customers may face additional metering service costs for an advanced meter compared to the charges for their existing accumulation meter. However, additional costs are expected to be minimised because:

- retailers have an incentive to minimise the costs of metering services procured for their customers, otherwise their price offers become uncompetitive, and/or

- in making a decision to switch to an advanced meter, the customer considers that additional benefits will outweigh additional costs.

The AER will also retain the ability to regulate the metering fees of an LNSP, for example where the AER considers that there is not yet competition which would constrain the fees charged by the Metering Coordinator business unit of an LNSP.

Retailers and third party energy service providers

Retailers and third party energy service providers are likely to benefit from the proposed Rule in the following ways:

- the opportunity to offer customers an increased range of pricing offers and DSP products,
- the opportunity to fill the new role of Metering Coordinator to organise metering and related services on behalf of customers.
- the availability of a range of competitive offers to provide metering services, leading to increased innovation and lower costs.
- certainty about exit fees when replacing an existing LNSP responsible person's meter.

LNSPs

Local network service providers would:

- no longer have the exclusive right to provider provide type 5, 6 or 7 metering services, unless other arrangements are specified by a jurisdiction.
- be required to compete with other accredited metering service providers to supply metering services to small customers.
- have minimal stranding risk on their existing metering assets given an appropriate exit fee that has been approved by the AER.
- have access to a range of grid management functions enabled by smart meters, which can reduce capital and operating expenditure.

Potential providers of metering and related services

Potential providers of metering and related services are likely to benefit from the proposed Rule by developing a business case based on:

- the ability to provide metering and related services to retailers, third party energy service providers and directly to customers, rather than only through the LNSPs or retailers, and
- the ability to develop a business case which includes offering to take on the legal responsibilities associated with metering services, rather than this being limited to LNSPs or retailers.

The AER

The AER would be required to:

- develop a process to assess the LNSPs' unbundling of metering charges from other network charges.
- develop criterion and processes for determining appropriate exit fees for existing LNSP meters.

AEMO

AEMO would be required to:

- amend its Metrology Procedure to reflect changes in the proposed Rule, and
- develop criterion and processes for accrediting Metering Coordinators, and
- develop guidelines and other material to assist Metering Coordinators and other market participants to understand their roles and meet their obligations.

While AEMO and the AER would have additional obligations, the costs are not likely to be significant. Any additional costs would occur initially when setting up the new processes, while there may be some additional on-going costs as the processes are undertaken.

8. Summary of consultation

Stakeholder consultation on the issues associated with the metering arrangements was undertaken throughout the various stages of the AEMC Power of Choice review. Submissions were received from stakeholders during each stage of the review. Generally, stakeholders supported the arrangements.

The detailed views of stakeholders are in Appendix G of the AEMC's final report on the Power of Choice review, which is available on the AEMC's website.

Attachment A

Description of the proposed rule

1. Introduction

1.1. This attachment is intended to provide a description of the form of the final rule that SCER officials expect would result from this rule change request. The description is presented in the following sections:

- the role of the Metering Coordinator and the relationship between the Metering Coordinator and other parties,
- arrangements for LNSPs,
- nature, governance and application of the minimum functionality specification,
- jurisdictional new and replacement policies, and
- responsibilities regarding the communications infrastructure platform for remote access to a metering installation.

Principles that apply to the competitive metering approach

1.2. The following principles should be reflected in the final rule:

1.2.1. These rules apply generally across the National Electricity Market (NEM).

1.2.2. The existing rules in Chapter 7 of the National Electricity Rules (NER) remain unless altered by the intent of this rule change request.

1.2.3. For clarity, the term 'responsible person' should be changed to Metering Coordinator, a role which as a minimum would have the same responsibilities and liabilities as are attached to the current 'responsible person' role.

1.2.4. Any person may perform the role of Metering Coordinator when registered with and accredited by the Australian Energy Market Operator (AEMO) for this role.

1.2.5. No party may have the exclusive right to be or engage the Metering Coordinator for a particular type of meter, unless in relation to residential or small business customers, a jurisdiction instrument prescribes that one or more specific Metering Coordinators, or a class of Metering Coordinators, are exclusively responsible for coordinating metering services relating to one or more meter types in a particular network area.

1.2.6. A customer may directly engage a Metering Coordinator.

1.2.7. A Financially Responsible Market Participant (FRMP) must ensure a Metering Coordinator is engaged at each of its customers' connection points.

1.2.8. A FRMP is responsible for engaging a Metering Coordinator on a customer's behalf, unless or until a Metering Coordinator is engaged directly by the customer.

1.2.9. To simplify arrangements for small customers, the standard retail contract will include a clause specifying that the retailer is to arrange metering services on behalf of the customer.

1.2.10. Small customers may still engage a Metering Coordinator directly, but would need to enter a market retail contract with the retailer and a separate contract with a Metering Coordinator to do this.

1.2.11. The arrangements should support retention of the existing meter, where a customer changes retailer, if the meter supports the chosen retail product and there is no metering cost reduction to the customer for changing meters.

1.2.12. The assignment of a Metering Coordinator to a metering installation is a commercial arrangement, and the terms of engagement are matters for commercial negotiations. However, a standard contract could be provided to assist parties, or the final rule could include any principles necessary to define the minimum content of contracts for metering services.

1.2.13. The AER will retain the ability to regulate fees where an LNSP is the Metering Coordinator.

1.2.14. This rule change request will not impact the intent of any existing metering related derogations in Chapter 9 of the NER.

2. The role of the Metering Coordinator and the relationship between the Metering Coordinator and other parties

The role of the Metering Coordinator

2.1 A party who is registered in the role of 'responsible person' for a metering installation before the final rule commences must be registered by AEMO in the role of Metering Coordinator at the commencement of these rules, and is to continue in that role for each assigned metering installation until either:

a. a new Metering Coordinator is engaged for that connection point, or

b. the party transfers its Metering Coordinator role for that connection point to another Metering Coordinator.

2.2 Any person may become a Metering Coordinator. Before becoming a Metering Coordinator, the person must register with and be accredited by AEMO for that role to ensure compliance with the NER.

2.3 For the removal of doubt:

a. a FRMP or an LNSP may also be a Metering Coordinator, and

b. a Metering Coordinator may also be a Metering Provider and/or a Metering Data Provider.

2.4 The Metering Coordinator may assign its responsibility under the Rules and its commercial agreement to another Metering Coordinator on the provision that no change is made to the commercial arrangements in place with the FRMP or the customer other than the change in Metering Coordinator. The FRMP or the customer (as applicable) must be informed of the change in responsibility.

Responsibilities of the Metering Coordinator

2.5 The Meter Coordinator has the same responsibilities as in the current clause 7.2.1(a) for ensuring:

a. provision, installation and maintenance of a metering installation, and

b. collection of metering data from each metering installation for which it is responsible, the processing of that data and the delivery of the processed data to the metering database and to parties entitled to that data.

2.6 For the removal of doubt, the Metering Coordinator is legally liable for the accuracy of the metering installation, the integrity of the metering data, and its delivery to NEM stakeholders.

2.7 The Metering Coordinator will also be responsible for the other functions and obligations of a responsible person contained in Chapter 7, where they are retained, as well as the new provisions contained in this specification, including the following key requirements:

a. When engaged for this purpose, ensuring that a connection point has and maintains a NER compliant metering installation and a National Metering Identifier (NMI).

b. Identifying the features of the equipment to be included in the metering installation in accordance with the requirements of the party engaging the Metering Coordinator.

c. Engaging and coordinating the availability, dispatch and performance of the Metering Provider and the Metering Data Provider (whose roles will not change)

to ensure that metering data is provided to parties entitled to receive the data in accordance with requirements such as quality and timeliness.

d. Paying the Metering Provider and the Metering Data Provider for the services performed.

e. Ensuring the maintenance and testing of metering installations.

2.8 The Metering Coordinator must ensure any existing load control functionality at the connection point remains operational when a metering installation is changed.

Loss of accreditation for Metering Coordinator, Metering Provider or Metering Data Provider

2.9 A Metering Coordinator, Metering Provider or Metering Data Provider will automatically loose its accreditation if it is placed in receivership.

2.10 Any metering installation components owned by the Metering Coordinator, Metering Provider or Metering Data Provider at the time of declaring receivership must remain available for operational use by other Metering Coordinators, Metering Providers and/or Metering Data Providers (as the case may be) and AEMO until alternative arrangements for a handover of those components are made by the Receiver.

2.11 The FRMP at a connection point that is the subject of a declaration of receivership for a Metering Coordinator must arrange for another Metering Coordinator to be appointed in place of the former party, or must ensure that a Metering Coordinator will be appointed by a customer without undue delay, depending on the commercial arrangements in place prior to the declaration of receivership.

2.12 The Metering Coordinator at the metering installation that is the subject of a declaration of receivership of a Metering Provider or a Metering Data Provider must arrange for another Metering Provider or a Metering Data Provider to be appointed without undue delay.

Relationship between a Metering Coordinator and a FRMP

2.13 A FRMP must ensure that there is a Metering Coordinator at each of its customers' connection points.

2.14 A FRMP is responsible for engaging a Metering Coordinator on a customer's behalf, unless:

a. the FRMP chooses to act as Metering Coordinator (if registered with AEMO); or

b. a Metering Coordinator is engaged directly by the customer; or

c. a jurisdiction prescribes that a Metering Coordinator, or a class of Metering Coordinators, are exclusively responsible for coordinating metering services in a particular network area.

2.15 When changing a meter, the Metering Coordinator should only be required to inform the FRMP where the change in meter results in a material change to the services, costs, or contract terms. However, the Metering Coordinator would be required to inform the customer.

2.16 Where the FRMP has engaged the Metering Coordinator, the FRMP may request its Metering Coordinator for a metering installation to change the features of that metering installation. A Metering Coordinator must not unreasonably block a request so long as functions being used by other parties remain available.

2.17 Where a FRMP has engaged the Metering Coordinator, the Metering Coordinator must inform the FRMP of the functions required in a meter in that jurisdiction, and the circumstances in which the metering installation must be upgraded to provide those functions.

Relationship between the FRMP and a customer in regard to metering services

2.18 Where a FRMP has requested a change to a metering installation as at 2.16, and the change has not been requested on behalf of the FRMP's customer, the FRMP must:

a. where there is no change to the costs charged to the customer or the services available to the customer, adequately inform the customer of the change, in writing prior to the change, or

b. where the change results in changes to the costs charged to the customer or the services available to the customer, obtain the prior consent of the customer to the change.

2.19 A FRMP must action a request by its customer to change the features of a metering installation for which the FRMP has engaged the Metering Coordinator. In this case the FRMP:

a. must request that the Metering Coordinator change the features of the metering installation,

b. must inform its customer of any additional cost resulting from the customer's request, and obtain the customer's consent to the additional costs prior to instructing the Metering Coordinator to proceed with the change, and

c. may recover any additional cost from its customer in a transparent manner.

2.20 Where the FRMP is also the Metering Coordinator, a FRMP must action a request by its customer to change the features of a metering installation. In this case the FRMP:

a. must inform its customer of any additional cost resulting from the customer's request, and obtain the customer's consent to the additional costs prior to proceeding with the change, and

b. may recover any additional cost from its customer in a transparent manner.

2.21 A retailer's standard retail contract for small customers must include a clause specifying that the retailer is to arrange metering services on behalf of the customer.

2.22 Where this information is available because an LNSP has unbundled its metering charges or the retailer has engaged a Metering Coordinator other than the LNSP, a retailer must inform the customer of the cost of metering services for that customer, and the retail tariff that would be offered to the customer if charges for metering services were removed.

2.23 A FRMP must not prevent its customer from engaging a Metering Coordinator directly, and must inform the customer of any changes required to the customer's retail contract.

2.24 A FRMP must respect any metering services agreement entered into between its customer and a Metering Coordinator, and must not recover costs for metering services from that customer.

Relationship between a customer and a Metering Coordinator

2.25 Where a Metering Coordinator changes a metering installation, or the functions available in the metering installation, and the change has not been requested by the customer or the FRMP, the Metering Coordinator must:

a. where there is no change to the costs charged to the customer directly or via the FRMP, or to the services available to the customer, adequately inform the customer in writing of the change, either directly or via the FRMP, prior to the change.

b. where the change results in changes to the costs charged to the customer or the services available to the customer, obtain the prior consent of the customer to the change, either directly or via the FRMP.

2.26 A customer may enter into an agreement directly with a Metering Coordinator for the provision of metering services, which must include the requirement that the Metering Coordinator ensures that a metering installation is installed and maintained, metering data is collected, processed and delivered to NEM stakeholders, and the FRMP is advised of the agreement.

2.27 Where a customer has engaged a Metering Coordinator, the customer may request its Metering Coordinator for a metering installation to change the features of that metering installation. A Metering Coordinator must not unreasonably block a request that does not affect the functions being used by other parties.

2.28 Where a customer has engaged the Metering Coordinator, the Metering Coordinator must inform the customer of the functions required in a meter in that jurisdiction, and the circumstances in which the metering installation must be upgraded to provide those functions.

3 Arrangements for LNSPs

Distribution Use of System (DUOS) tariffs

3.1 From the date the final rule commences, an LNSP must unbundle the metering charges for any meters included in its regulatory asset base from its DUOS tariff at the next regulatory review.

Exit fees

3.2 Where the LNSP is the Metering Coordinator because it was the responsible person for a type 5 or 6 meter, and the FRMP or customer (as the case may be) changes to a new Metering Coordinator, the LNSP may recover an exit fee as determined by the AER for that LNSP. In this situation:

a. the AER must consider the following criteria when making an exit fee determination:

(i) the fee must be reasonable,

(ii) the fee should be based on the average depreciated value of the existing *meter* and operating costs,

(iii) the fee may include reasonable costs of processing the customer transfer to another Metering Coordinator,

(iv) the exit fee for the type 5 metering installation may differ from the exit fee for the type 6 metering installation,

(v) where a jurisdiction requires that new and replacement meters be of a higher functionality than the existing meter, exit fees must not be determined by the AER and must not be recovered by the LNSP for meters not compliant with the specified functionality installed after the commencement of that policy.

b. The AER may consider whether a cap on exit fees is appropriate and, if so, the level of the cap.

Capturing network benefits

3.3 Nothing in this rule change request would preclude an LNSP from offering payment for metering services or purchasing services enabled by a smart meter to support a DSP program, achieve operating efficiencies or access grid management functions of meters.

LNSP as Metering Co-ordinator

3.4 An LNSP's subsidiary Metering Coordinator (or Meter Provider or Meter Data Provider) would be able to offer to provide metering services.

3.5 Ring fencing and competitive procurement requirements may be established by the AER to ensure competitive neutrality between the LNSP's subsidiary and any other Metering Coordinator that may wish to provide these services.

Arrangements when a metering installation is changed

3.6 In the case where:

a. a customer or FRMP requests a change to a metering installation, and

b. the Metering Coordinator is an LNSP, and

c. the LNSP had commenced recovering the cost of the metering installation (or parts of that installation) from the regulated tariff approved by the AER prior to the upgrade, then

i. the LNSP must establish a new commercial agreement with the requesting party for the metering services provided at the connection point, and

ii. a new metering service fee may be recovered by the LNSP from the requesting party based on commercial considerations, along with an exit fee for the meter as separately determined by a submission to the AER.

3.7 Where a FRMP or the customer has arranged for the replacement of an existing LNSP meter and the LNSP is no longer the Metering Coordinator for the site, the LNSP must not recover metering service charges from the customer.

4 Nature, governance and application of the minimum functionality specification

4.1 The term 'smart meter minimum functionality specification' will be included in Chapter 10 of the NER and is to refer to a guideline or procedure established, published and maintained by the Australian Energy Market Operator (AEMO).

4.2 The final rule should reflect that the smart meter minimum functionality specification defines, at least:

a. the functions that must be supported by a smart meter, and

b. the performance levels associated with each function.

4.3 AEMO must apply the rules consultation procedures when establishing and changing the smart meter minimum functionality specification.

4.4 When specified by a participating jurisdiction, some or all of the smart meter minimum functionality specification must apply:

a. to all or a class of new or replacement meters, and/or

b. where an appliance has the potential to, or does, inject electricity into a connection point.

4.5 Jurisdiction policy on application of the smart meter minimum functionality specification will be specified through the jurisdiction metrology material in the metrology procedure.

4.6 The smart meter minimum functionality specification will not, however, be a binding minimum standard unless prescribed by a jurisdiction. The specification would also not override basic metrology requirements in the NER.

5. Jurisdiction new and replacement policy

5.1. The final rule will provide that jurisdictions may define the functions of meters that must be installed in new and replacement situations.

5.2. Jurisdictions may require that new and replacement meters must meet or be capable of meeting the smart meter minimum functionality specification.

5.3. A jurisdiction may require that new and replacement meters provide some of the functions in the smart meter minimum functionality specification, or different functions.

5.4. Jurisdiction policy on new and replacement meters will be specified through the jurisdiction metrology material in the metrology procedure. Appropriate amendments should be made to the national framework to provide for this outcome.

5.5. Jurisdictional new and replacement policy would also not override basic metrology requirements in the NER.

6. Victorian transitional arrangements

6.1. In Victoria the LNSP would be the Metering Coordinator for the smart meters it has deployed, and may continue in this role to the exclusion of other parties for a defined period. This defined period may be established by the Victorian Government through a jurisdictional instrument.

6.2. Until the provisions of the national framework apply in that jurisdiction, the LNSP may also continue to deploy smart meters in accordance with the Victorian mandate rules and may continue as the Metering Coordinator for these meters to the exclusion of other parties for a defined period.

6.3. Upon expiry of the LNSP's exclusivity period, the regulated exit fee would apply, to allow a retailer or customer to subsequently replace a meter installed under a mandate.

6.4. Victoria may determine that the Victorian smart meter functionality specification is to continue to apply in Victoria through jurisdictional instrument.

7. Responsibility for changes to meter settings

7.1 AEMO is responsible for authorising alterations to any changes to parameters or settings in a meter but only to the extent that the parameters or settings are associated with the measurement and recording (including associated log entries) of energy data. Note that rule 7.8.3(a) will be modified to restrict AEMO to the role originally intended by the existing rules.

7.2 The Metering Provider is responsible for implementing parameter or setting changes in the meter in accordance with rule 7.8.3(b), subject to AEMO's authorisation where required, providing those parameter or setting changes:

a. have been authorised to the extent that they affect the measurement or recording (including associated log entries) function of the meter;

b. which are designated as 'FRMP settings' in an AEMO procedure, have been requested by the FRMP who is registered against the connection point to which the metering installation is assigned; and

c. which are designated as 'LNSP settings' in an AEMO procedure, have been requested by the LNSP who is registered against the connection point to which the metering installation is assigned.

7.3 AEMO must establish and maintain a procedure (which may be the metrology procedure) on the arrangements by which changes to all parameters and settings in a meter may be requested by a FRMP or other authorised party, and the method of receiving and actioning those requests by an appropriate Metering Provider.

8 Responsibilities regarding the communications infrastructure platform for remote access to a metering installation.

Open access to the meter measurement function

8.1 The measurement and recording function and, where available, the remote acquisition function in a meter must, be configured to enable open access to the energy data held in the meter by parties authorised to access the data, in addition to any requirements in the NER associated with these functions.

8.2 For the removal of doubt, the remote acquisition function may be configured to support individual open access to a meter as well as operator facilitated access to that meter, providing that open access is always available to a person who is entitled to access the energy data in that meter.

Electronic data transfer infrastructure

8.3 Any person may provide a telecommunications network between a metering installation and a metering data services database and/or the metering database.

8.4 A person who performs the connection between a metering installation and a telecommunications network must be registered and accredited by AEMO for that role as provided by rule S7.4.2(a) and Table S7.4.3.

8.5 A telecommunications network that does not provide public access (an alternate telecommunications network) must ensure that:

a. its interface to the metering installation does not prevent open access to the energy data in the metering installation being available to any party who has this right under rules 7.7(a);

b. its interface to the metering installation does not prevent another party from providing an alternate telecommunications network to that metering installation should that be desirable for any reason.

8.6 The change of a meter or its communication interface by a Metering Provider to increase the number of communication ports at the meter must not interfere with the connection and operation of an existing telecommunications network at that metering installation.

8.7 In providing its approval to the alternate telecommunications network AEMO must confirm, at least, that:

a. open access to energy data and the relevant meter logs is preserved for the collection of energy data;

b. either operator facilitated access, or open access, is available for all meter functions that don't relate to the collection of energy data.

c. the provision for multiple communication ports at the metering installation is not inhibited by any one alternate telecommunications network;

d. where an operator facilitated access is to be provided, a User Manual is publically available that explains how the facilitated access would operate, the rights and obligations of all parties who seek or provide access to that telecommunications network, and in AEMO's opinion the User Manual is reasonable (in that it provides the necessary guidance to parties seeking to use the telecommunications network);

e. communications with the meter, including transfer of data, are secure.

8.8 The Metering Provider assigned to a metering installation must manage electronic data transfer congestion at that metering installation in accordance with rule 7.7(c1), should there be a potential for this to occur.

8.9 Charges for the use of a telecommunications network (whether public or alternate) are to be based on commercial considerations.

9 Consequential changes

9.1 The AEMC should make consequential changes necessary to support the new arrangements proposed in this rule change request, which may include ensuring that:

- consumer protections continue to be appropriate where competitive metering is more widely available,
- Retailer of Last Resort arrangements are appropriate and ensure continued provision of metering services when a retailer fails, and
- enforcement provisions ensure parties fulfil their obligations.

NSMP
National Smart Metering Program

NSMP Business Requirements Work Stream

Smart Metering Infrastructure Minimum Functionality Specification

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Table of Contents

1 Document Control

1.1 Version Control

Version	Date	Description	Amended by
0.01	16th May 2009	First Draft	Dr Martin Gill
0.02	18th May 2009	Review by H. Koller	Dr Martin Gill
0.03	22nd May 2009	Meter configurations and synchronized load switching on the HAN	Dr Martin Gill
0.04	27th May 2009	Editorial agreed with Martin Gill	H. Koller
0.05	28th May 2009	First draft of Performance Levels	Dr Martin Gill
0.06	28th May 2009	First draft of Glossary	H. Koller
0.07	9th June 2009	BRWG amendments	H. Koller
0.08	25th June 2009	Updates after PTWG meeting	Dr Martin Gill
0.09	29th June 2009	Added description for 8&14 Reworded Performance Levels	Dr Martin Gill
0.10	30th July 2009	Update after BRWG #5 including SMCN data estimates (for scaling)	Dr Martin Gill
0.11	14th Aug 2009	Updates after BRWG #6	H. Koller and M. Gill
0.12	17th Aug 2009	Updates after BRWG #6 Issue as clean version at request of BRWG	H. Koller and M. Gill
0.13	7th September 2009	Issued to BRWG for Workshop #7 held on 16/17 Sept09	Dr Martin Gill and H. Koller
0.13A	26th September 2009	Marked updates after MRG and BRWG Workshop #7 held on 16/17 Sept09 Delete Appendix C – no longer required	Dr Martin Gill and H. Koller
0.14	28th September 2009	New version with new document structure and new Appendices. Please refer to version 0.13A for audit trial of prior responses to action items from 10 Aug to 17 Sept 2009 from the Metrology Reference Group, Regulation Working Group and the Business Requirements Working Group. The Glossary in this document is for the SMI F.S. and not the NSMP.	Dr Martin Gill and H. Koller

Version	Date	Description	Amended by
0.14A	2nd October 2009	Minor modifications in Version 0.14 issued to the BRWG on 28 Sept09. Replace references to AMI meter with SMI meter Delete typo in section 6.9. 1 "single phase small meter" remove "small" Add to Applicable Standards section *For the Dedicated Load Control Relay - AS62054 parts 11 and 21 will apply.* *For the Supply Contactor - IEC 62055-31 will apply.* Add Appendix D – List of Related Technical Papers	Dr Martin Gill and H. Koller
0.14A_RWG	12th October 2009	Insert RWG Actions from the RWG workshop held on 8/9 October under Outstanding Actions for each function.	Dianne Shields
0.15	19th October 2009	Update after BRWG #8 Review of tense Change to Smart Meter Management System Collection changed to Acquisition Inserted Appendix D to describe Supply Contactor States (List of Technical Papers now Appendix E) Additional edits and comments by H. Koller	Dr Martin Gill H. Koller
0.20	9th November 2009	Technical drafting review to make the document comprehensible from a technical viewpoint, Address terminology, linkages, cross-referencing, consistency, flow, structure and formatting. This review did not seek to change any substantive technical content. Outstanding issues/actions have been consolidated in an issues register.	Peter Van Loon Dr Martin Gill
0.21	9th November 2009	Clean Release of Version 0.20	Dr Martin Gill
0.22	17th November 2009	Update after BRWG #9	Dr Martin Gill
0.23	11th January 2010	Update after BRWG #10. Reformat of Load Control	Dr Martin Gill
0.24	12th February 2010	Updated following BRWG workshops of 10/11 Feb 2010	Dr Martin Gill
0.25	7th April 2010	*Note: NSSC endorsed the functionally requirements in version 0.24 and base lined them. This excludes the Smart Metering Infrastructure Performance Levels, Participant Service Levels (Indicative), and Glossary.* Changed Function 7.6 Load Management via a controlled load contactor or relay to allow up to three	Dr Martin Gill Rohan Madders

Version	Date	Description	Amended by
		2A voltage relays to be included. This reduces the number of applicable metering configurations in Table 6.1 from ten to eight. This change to the meter would increase the flexibility by using the relay to control a load that had an external load contactor. The meter could then control load via the internal dedicated load contactor and other loads via a relay that had an external load contactor. Reinstated Customer Supply Monitoring as requested by NSSC on 23 Feb 2010 Added additional Retailer requirements for Supply Capacity Control (section 7.8) for purposes of Vendors RFI Review by Regulation Work Stream Leader of glossary has resulted in a number of new terms – explanation is provided in the supporting paper Interval Data Channels (Version 0.3)	
0.26	8th May 2010	*Updates after BRWG meeting of 12/13 April 2010.* Reduced number of meter configurations Added setting for load control contactor position during under frequency and demand limit event Clarification of supply contactor states, meter measurements, Emergency Supply Capacity and calculations of Supply Capacity limits Formatting of glossary terms throughout document Monitor load renamed monitor supply Performance Levels deleted instead referencing Vendors' RFI *Note:* *On 21 April 2010, the NSSC approved that the NSMP Working Groups could work off version 0.26. The NSSC accepted the recommendation of the Secretariat that the changes from version 0.24 to version 0.26 were minor and should not delay the work of the Regulation Working Group in rules drafting. The NSSC will be presented with a change control report on 26 May 2010.*	Dr Martin Gill

Version	Date	Description	Amended by
0.27A	10th August 2010	Incorporate changes in response to the vendors' RFI Incorporate changes to Boost functionality from the July BRWG meeting and Supply Capacity Limiting in the August meeting	Dr Martin Gill
0.90	30th August 2010	Deleted Participant Service Levels Clarified effect of meter loss of supply on the supply contactor	Dr Martin Gill
1.0	20th October 2010	Updated Glossary Definitions including use of CLC/R Updated references in Appendix B Added Urban Performance Levels Final NSSC endorsement and baseline for validation testing in the pilots and trials – 20 October 2010	Dr Martin Gill
1.1	15thDecember 2010	Inclusion of Section 7.9 HAN Clarify randomisation on Termination of Priority Override Document setting allowing selection of the events to be stored Consistent use of Australian Eastern Standard Time	Dr Martin Gill
1.2	5th May 2011	Inclusion of recommended HAN Addition of option to initiate the Demand Limit with the Emergency Supply Capacity Limit Specified the reaction time for the Supply Contactor when Monitor Supply limit is exceeded Introduction of the term *ESI Implementation* to capture specific HAN requirements Addition of a separate HAN event log Clarification of future settings reconfiguration Functionality renamed Customer Supply (Safety) Monitoring Updated List of Meter Parameter Settings New glossary definition for authorised party	Dr Martin Gill
1.3	30th Nov 2011	Clarification of meter options in Table 6-3 where functionality is not fully described Standardisation of headings for sections 7.19, 7.20 and 7.21	

1.2 Approval

Authorised by	Signature	Date
NSSC Program Director		

1.3 References

The following documents are referred to in this document.

Document Name	Version
National Electricity Rules Chapter 7 Metering	Version 26
National Electricity Rules Chapter 10 Glossary	Version 35
NMI M6 Pattern Approval and Verification of Electricity Meters: Definitions, Metrological and Technical Requirements	Second edition, draft for comment — February 2009
Metrology Procedure: Part A National Electricity Market *Document No: MT_OP1985v002*	Version No: 2.01 Effective date: 1 July 2009
AS 4755.3.1 Demand response capabilities and supporting technologies for electrical products Part 3.1: Interaction of demand response enabling devices and electrical products—Operational instructions and connections for air-conditioners	9 December 2008
UCAIug: AMI-SEC-ASAP AMI System Security Requirements	V1.01 12/17/2008

2 Introduction

This specification details the functionality requirements for *Smart Metering Infrastructure (SMI)* and associated *SMI performance levels* that will apply to metered electricity customer installations where a smart metering infrastructure roll out is mandated by a jurisdictional Minister[1].

All functionality requirements and *SMI performance levels* are minimum requirements only and do not limit the implementation of *SMI* that has functionality or performance levels that exceed this specification.

The functional specification is for information purposes. That information may be used:

- To inform the MCE as to how the minimum smart metering services will support the Ministerial Council on Energy (MCE) Decisions 13 Dec 2007 and 13 June 2008
- To provide a business definition for translation into regulatory instruments

SMI capability requirements[2] will be governed under the National Electricity Rules in accordance with the *National Electricity (South Australia)(Smart Meters) Amendment Bill 2009.*

3 Ministerial Council on Energy Policy Objectives

The MCE decisions of the 13 Dec 2007 and 13 June 2008 set out the expected outcomes of smart metering:

- Reducing demand for peak power, with consequential infrastructure savings (e.g. network augmentation and generation)
- Driving efficiency and innovation in electricity business operations, including improving price signals for efficient investment and contracting
- Promoting the long term interests of electricity consumers with regard to the price, quality, security and reliability of electricity
- Promoting competition in electricity retail markets
- Enabling consumers (including residential, business, low- and high-volume users) to make informed choices and better manage their energy use and greenhouse gas emissions
- Manage distributional price impacts for vulnerable consumers
- Promoting energy efficiency and greenhouse benefits
- Providing a potential platform for other demand side response measures and avoiding discrimination against technologies, including alternative energy technologies

This specification recognises these objectives and takes account of Council of Australian Governments (COAG) commitments, MCE policy direction, the market objectives and consultation with stakeholders.

The following table maps the MCE list of smart meter functions to those covered in this Functionality Specification.

[1] Please note the National Electricity Amendment (Ministerial Smart Meter Roll Out Determinations) Transitional Rule 2009 specifies which customer installations are subject to a mandate. The policy objective is to mandate smart meter for small customers.
[2] MCE has not yet made a policy decision as to whether the infrastructure performance levels will be regulated. This policy matter has been referred to SCO and MCE by the NSSC.

Table 3-1: MCE list of Functions and corresponding Functionality

MCE Function Number	MCE Reference	Section	National Functionality Specification
1	Half-Hourly Consumption Measurement and Recording	7.1	Measurement and Recording
2	Remote Reading (Weekly)	7.2	Remote Acquisition
3	Local Reading – Hand-Held Device	7.3	Local Acquisition
4	Local Reading – Visual Display on Meter	7.4	Visible Display and Indicators on Meter
5	Communications and Data Security	7.16	Communications and Data Security
6	Tamper Detection	7.17	Tamper Detection
7	Remote Time Clock Synchronisation	7.5	Meter Clock Synchronisation
8 & 14	Load Management at Meters through a Dedicated Controlled Circuit	7.6	Load Management through a controlled load contactor or relay
9	Remote Reading (Daily)	7.2	Remote Acquisition
10	Power Factor Measurement	7.1	Measurement and Recording
11	Import/Export Metering	7.1	Measurement and Recording
12	Remote Connect/Disconnect	7.7	Supply Contactor Operation
13	Supply Capacity Control	7.8	Supply Capacity Control
15	Interface for other Load Control Devices		Not Included
16	Interface to Home Area Network (HAN) using Open Standard	7.9	Home Area Network using Open Standard
17	Provision of an In-Home Display		Not Included
18	Interface for Communications from Gas and Water Meters		Not Included
19	Quality of Supply & Other Event Recording	7.10	Quality of Supply and Other Event Recording
20	Meter Loss of Supply Detection and Outage Detection	7.11	Meter Loss of Supply Detection
21	Customer Supply Monitoring	7.21	Customer Supply (Safety) Monitoring
22	Real-Time Service Checking	7.12	Remote Meter Service Checking
23	Interoperability for Meters / Devices at Application Layer	7.18	Interoperability for meters/devices at Application Layer
24	Hardware Component Interoperability	7.19	Hardware Component Interoperability
25	Remote Reconfiguration	7.13	Meter Settings Reconfiguration
26	Remote Software Upgrades	7.14	Software Upgrades
27	Separate Standard Base Plate		Not Included
28	Non Meter Board Installation		Not Included
29	Plug and Play Device Commissioning	7.15	Plug and Play Device Commissioning

4 Overview of Smart Metering Infrastructure

Figure 4-1 details the components of SMI as defined in this specification.

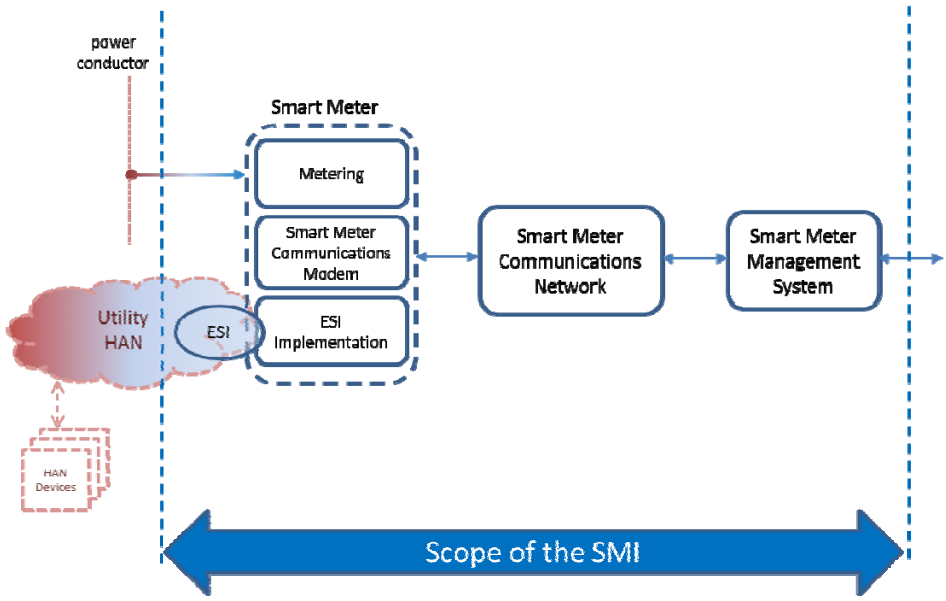


Figure 4-1: Overview of SMI

SMI consists of the following components, all of which must conform to the relevant minimum functional requirements set out in this document:

a) ***Smart Meter*** means a device complying with Australian Standards which measures and records the production and/or consumption of electrical energy and also conforms to the minimum functional requirements set out in this document. Where the term *meter* is used through this document it means a *smart meter*.

b) ***Smart Meter Management System (SMMS)*** means the component of an *SMI* system that allows commands and messages to be exchanged with the *smart meter* via the *Smart Meter Communications Network (SMCN)*.

c) ***Smart Meter Communications Network (SMCN)*** means all communications equipment, processes and arrangements that enable *remote* communications between the *smart meter* and the *SMMS*.

d) ***Home Area Network (HAN)*** means a Local Area Network (LAN) established within the customer premise. The *smart meter* shall provide an interface to the *HAN*.

5 This Specification

5.1 Limit of This Specification

This specification is limited to specifying the *SMI* functionality and associated *SMI performance levels*. *SMI performance levels* are defined[3] as follows:

- ***SMI Performance Level*** – describes the minimum performance in terms of quantity, quality and time required for a function to be performed by the *SMI*[4].

This specification contains the target urban *SMI performance levels* which will be confirmed by companies in pilots and trials. In light of that experience there may be a need to revise the urban *SMI performance levels*.

The NSSC has made the following recommendations to the Standing Council of Officials (SCO) regarding rural and remote *SMI performance levels* with particular reference to Country Energy and Ergon Energy.

1. Redefine the definition of urban to include a significant number of country town centres that are currently classified as rural. This will extend the population base for which urban *SMI performance levels* can be measured
2. Define rural *SMI performance levels* to delay the definition of performance levels for the newly defined rural and remote locations over the next 2 years. This time period is required to fully understand the impacts and performance characteristics of proposed Telecommunications technologies that will cater for these regional areas. There have also not been sufficient pilots or trials of smart meters in rural and remote locations to sufficiently understand performance levels at this time.

5.2 Use of Italicised expressions

Italicised expressions in this specification are defined in the glossary in Appendix A.

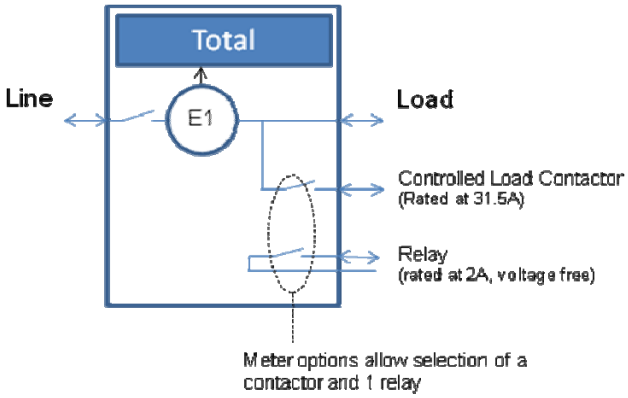
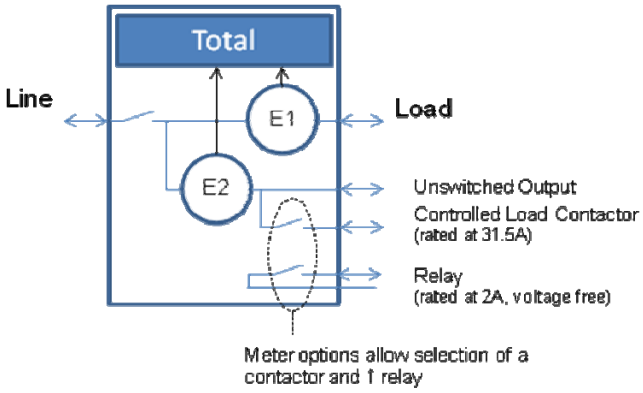
[3] Refer to the SM Regulatory Architecture Paper (approved by the NSSC on 15 July 2009)
[4] An Infrastructure Performance Level can pertain to an individual smart metering installation or to the performance of the *smart metering infrastructure* for a population of *smart meters*. The time is *measured* from the *smart meter management system* to the *smart meter*.

6 Applicable Meter Configurations and Standards

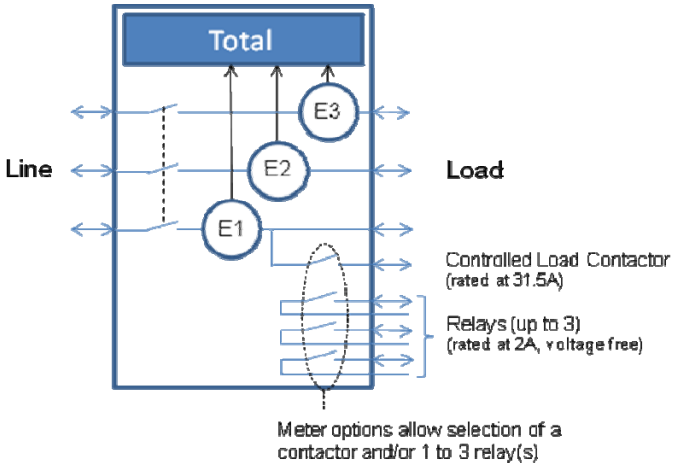
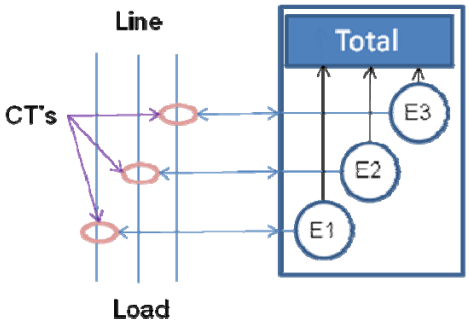
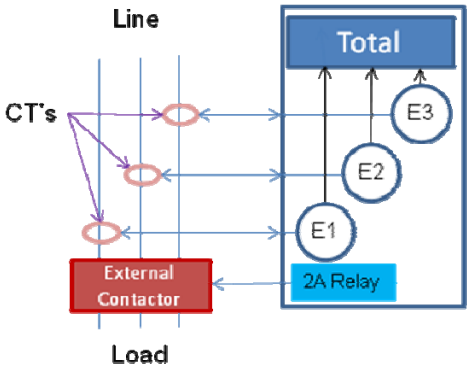
6.1 Common Applicable Meter Configurations

Table 6-1 shown below provides a description of the common applicable meter configurations with physical variants[5].

Table 6-1: Applicable Meter Configurations with Physical Variants

Meter Configuration	Description of Physical variant
Single Phase Single Element Meter	 31.5 A *controlled load contactor* is rated to 230 Vac 2 A *relay* is rated to 230 Vac supplied *voltage* free
Single Phase Two Element Meter	Suitable for sites with separate *measurement* of the Controlled Load (for example off-peak hot water tariffs) For meters with a 31.5 A *controlled load contactor* both a switched and unswitched output[6] is available from the second element  31.5 A *controlled load contactor* is rated to 230 Vac 2 A *relay* is rated to 230 Vac but supplied *voltage* free

[5] The physical depiction of internal connections is provided to show functional capability. Internal wiring of actual meters may differ from the diagrams.
[6] The 31.5A rating only applies to the switched output. The unswitched output from the second element may support a higher rating.

Meter Configuration	Description of Physical variant
Three Phase Whole Current Meter	 Note: The integrated 31.5 A *controlled load contactor* is only Single phase 2 A *relays* are rated to 230 Vac but are supplied *voltage* free
Three Phase CT Connected Meter	For large *customers* where the load is too large for a *whole current meter*  No *controlled load contactor or relay* No *supply contactor*
Three Phase CT Connected Meter Supporting External Supply Contactor	The 2 A relay is *voltage* free and rated to 230 Vac, capable of controlling an external *supply contactor*  No *controlled load contactor* or (load control) *relay* Note: External *supply contactor* falls outside scope of *SMI*

Each of the metering configurations shown in Table 6-1 shall record *accumulated energy values* corresponding to *energy* flows through the *meter*. The list of *accumulated energy* values supported by each *meter* configuration is shown in Table 6-2. The requirements for storing corresponding *interval energy data* are detailed in Section 7.1.

Table 6-2: Accumulated Energy Values Recorded by Metering Configurations

Meter Configuration	***Accumulated Energy* Values Recorded in the *Meter***
Single Phase Single Element *meter* Three Phase *whole current meter* Three Phase *CT connected meter* Three Phase *CT connected meter* supporting external *supply contactor*	*Total Imported Active Energy* (kWh) *Total Exported Active Energy* (kWh) *Total Imported Reactive Energy* (kvarh) *Total Exported Reactive Energy* (kvarh)
Single Phase Two Element *meter*	*Total Imported Active Energy* (kWh) *Total Exported Active Energy* (kWh) *Total Imported Reactive Energy* (kvarh) *Total Exported Reactive Energy* (kvarh) Element 1 *Imported Active Energy* (kWh) Element 1 *Exported Active Energy* (kWh) Element 2 *Imported Active Energy* (kWh) Element 2 *Exported Active Energy* (kWh)

6.2 Mapping of Meter Configurations to Minimum Functionality

Table 6-3 defines the minimum functionality for the applicable *meter* configurations shown in Table 6-1.

In Table 6-3 :

- √ indicates that the *meter* configuration is required to support this functionality.
- X indicates that the function is not required, but this does not preclude the responsible participant deploying *meters* supporting this functionality.
- ⇨ Indicates that clarification of the exact functionality and performance is still required.
- O indicates that the function is supported for *meters* fitted with a *controlled load contactor* and/or *relays*

Table 6-3: Minimum functionality for Applicable meter configurations.

Function	Section	Single Phase Single Element	Single Phase Two Element	Three Phase Whole Current	Three Phase CT connected	Three Phase CT connected supporting external *supply contactor*
Measurement And Recording	7.1	√	√	√	√	√
Remote Acquisition	7.2	√	√	√	√	√
Local Acquisition	7.3	√	√	√	√	√
Visible Display On Meter	7.4	√	√	√	√	√
Meter Clock Synchronization	7.5	√	√	√	√	√
Load Management Through a *controlled load contactor* or *relay*	7.6	O	O	O	X	X
Via the HAN	7.9	√	√	√	√	√
Supply Contactor Operation	7.7	√	√	√	X	√
Supply Capacity Control	7.8	√	√	√	X	√
Home Area Network Using Open Standard	7.9	√	√	√	√	√
Quality Of Supply & Other Event Recording	7.10	√	√	√	√	√
Meter Loss Of Supply Detection	7.11	√	√	√	√	√
Remote Meter Service Checking	7.12	√	√	√	√	√
Meter Settings Reconfiguration	7.13	√	√	√	√	√
Software Upgrades	7.14	√	√	√	√	√
Plug and Play Device Commissioning	7.15	√	√	√	√	√
Communications and Data Security	7.16	√	√	√	√	√
Tamper Detection	7.17	√	√	√	√	√
Interoperability for Meters/Devices at Application Layer	7.18	⇨	⇨	⇨	⇨	⇨
Hardware Component Interoperability	7.19	⇨	⇨	⇨	⇨	⇨
Meter Communications: Issuing Messages and Commands	7.20	√	√	√	√	√
Customer Supply (Safety) Monitoring	7.21	⇨	⇨	⇨	⇨	⇨

6.3 Applicable Standards

a) *Meters* shall meet the relevant requirements of

(i) AS62052.11 - Electricity metering equipment (a.c.) – General requirements, tests and test conditions – Part 11: Metering equipment

(ii) AS62053.21- Electricity metering equipment (a.c.) – Particular requirements – Part 21: Static meters for active energy (classes 1 and 2)

(iii) AS1284.11 - Single-phase multifunction watt hour meters and

(iv) Any pattern approval requirements of the National Measurement Institute, National Electricity Rules (NER) and metrology procedure.

b) *Reactive energy measurement* shall meet the requirements of AS 62053.23 - Electricity metering equipment (ac)— Particular requirements Part 23: Static meters for reactive energy (classes 2 and 3)

c) *Meters* shall *measure* over and under *voltage* in accordance with the requirements of Class S devices as specified in Section 5.4 of Edition 2.0 of IEC61000-4-30 Electromagnetic compatibility (EMC) Part 4-30: Testing and measurement techniques – Power quality measurement methods

d) For those *meters* with a *controlled load contactor* - AS62052.21-2006 Electricity metering equipment (ac) — General requirements, tests and test conditions Part 21: Tariff and load control equipment. In particular Section 7.4 Output elements shall apply.

e) For those *meters* fitted with a *voltage* free *relay* - AS62052.21-2006 Electricity metering equipment (ac) — General requirements, tests and test conditions Part 21: Tariff and load control equipment. In particular Section 7.4 Output elements shall apply. The *relay* shall also be compatible with AS4755 Part 3.1

f) For those *meters* with a *supply contactor* - IEC 62055-31-2005 Electricity metering – Payment systems – Part 31: Particular requirements – Static payment meters for active energy (classes 1 and 2). In particular Sections 7.9.2 Specified ratings and 7.9.3 Performance requirements for load switching utilisation category UC1 shall apply.

7 Minimum Functionality

7.1 Measurement and Recording

7.1.1 Requirements

a) The accuracy of *energy measurement* shall be:

   (i) For all *meters*: a*ctive energy* to accuracy Class 1

   (ii) For *whole current meters*: *reactive energy* to accuracy Class 3

   (iii) For *CT connected meters*: *reactive energy* to accuracy Class 2

b) The resolution of *energy measurement* shall be

   (i) For *active energy*: 1 Wh

   (ii) For *reactive energy*: 1 varh

c) Throughout this functionality specification the terms *record* and *store* have different meanings. The glossary definition of each term is repeated here:

   (i) *record* means to capture the value. For values which are *recorded* it is only possible to obtain a single value (see *stored* when multiple values must be retained)

   (ii) *store* means retain the value with the ability to determine the date and *time* associated with the value (for example *interval energy values* are *stored*)

d) For each *Accumulated energy value* described in Table 6-2 a *meter* shall:

   (i) Separately *record* the *accumulated energy value* and this value shall be captured in the *event* of *meter loss of supply*.

   (ii) *Store interval energy values* in 30 minute *trading intervals*

   (iii) Include the facilities on site to *store interval energy values* for 35 days per *interval energy channel*

   (iv) *Stored interval energy data* shall have a resolution of 0.1 kWh for *active energy* and 0.1 kvarh for *reactive energy*.

   (v) It shall be possible to enable or disable the *storing* of an *interval energy channel* both *locally* and *remotely*.

   (vi) The *meter* shall support a *secure* means of resetting the *accumulated energy values* (to zero).

e) For each *interval energy channel* the summated *interval energy values* over any number of consecutive *trading intervals* shall equal the change in the *accumulated energy value* over the same number of *trading intervals*, plus or minus 0.1 kWh for *active energy* or 0.1 kvarh for *reactive energy*.

f) The *meter* shall be capable of *measuring active power*

   (i) For all *meters*; the *meter* shall be able to *measure total net active power* with an indication if the value is *imported* or *exported*.

      (a) For two element *meters*: the *meter* shall also be able to *measure active power* per *measurement element* with an indication if each value is *imported* or *exported*.

   (ii) The resolution of *active power* shall be 10 W; (once the load is above the *meter* starting current)

(iii) The *meter* shall calculate *active power* every 5 seconds

g) The *meter* shall be capable of *measuring voltage*

(i) The accuracy of *voltage measurement* shall be as defined in IEC61000-4-30 for under and over *voltage measurement* for Class S devices (1%)

(ii) The resolution of *voltage measurement* shall be 0.1 volts.

7.1.2 Smart Metering Infrastructure Performance Levels

There are no *SMI performance levels* for *measurement* and recording.

7.2 Remote Acquisition

7.2.1 Requirements

a) *SMI* shall support *remote acquisition* of *interval energy data*, *accumulated energy data* and *meter event* logs.

b) *SMI* shall support routine acquisition of *energy data* and *meter event* logs. The enabling and disabling of routine acquisition of any *interval energy channel* shall be possible *locally* and *remotely*

c) The *SMI* shall support a *special meter read* command to acquire *energy data* and *event* logs

d) The *SMI* shall support *remote acquisition* of multi utility meter data from the *ESI Implementation* (refer to Section 7.9.1.8)

7.2.2 Smart Metering Infrastructure Performance Levels

7.2.2.1 Urban Performance Level

7.2.2.1.1 Routine Daily Acquisition

a) All *energy data* and *event* logs shall be acquired from

(i) 99% of *meters* within 4 hours after midnight

(ii) 99.9% of *meters* within 24 hours after midnight.

7.2.2.1.2 Individual Meters

a) For the s*pecial meter read energy data* successfully received from

(i) 95% of *meters* within 5 minutes

(ii) 99% of *meters* within 10 minutes

b) The *SMI performance level* shall be tested by performing s*pecial meter reads* at 0.5% (5,000 meters per million (mpM)) of the number of operational *SMI meters* in a *distribution network area*. This will be tested over an 8 hour period, with the sending of s*pecial meter read* commands uniformly distributed across both time and the deployed *SMCN* collection points. The test can be conducted once in any 24 hour period

c) The applicable amount of data shall be the acquisition of seven days of a single channel of *interval energy data* and *accumulated energy data*

7.3 Local Acquisition

7.3.1 Requirements

a) The *meter* shall include a *local* communications port allowing information transfers between the *meter* and devices connected to the port.

b) The *local* communications port shall support the local acquisition of *interval energy data, accumulated energy data* and *meter event* logs

c) The *local* communications port shall provide *secure* access to *energy data*, *meter event* logs and all settings within the *meter*

7.3.2 Smart Metering Infrastructure Performance Levels

a) The *local* communications port shall support the acquisition of 35 days of a single *interval energy channel* of 30 minute *trading intervals* and all *energy data* within 14 seconds

b) The stated *SMI performance level* shall be maintained under all test conditions outlined in relevant *Australian Standards* for *meters*.

7.4 Visible display and indicators on meter

7.4.1 Requirements

a) The *meter* shall include a *visible display* and indicators.

b) The *visible display* shall be capable of displaying all *accumulated energy values* listed in Table 6-2

c) The list of *accumulated energy values* enabled or disabled for *visible display* shall be *locally* and *remotely* configurable

d) The *visible display* resolution for all *accumulated energy values* shall be:

   (i) *active Energy*: 0.1 kWh

   (ii) *reactive Energy*: 0.1 kvarh

e) The *visible display* shall be capable of displaying *total net active power* clearly indicating if it is *imported* or *exported*.

   (i) For two element *meters*, the *visible display* shall also be capable of displaying a*ctive power* per *measurement element* clearly indicating if each value is *imported* or *exported*. The list of a*ctive power* values available for display shall be *locally* and *remotely* configurable.

   (ii) The *visible display* resolution for a*ctive power* shall be 10 W (once the load is above the *meter* starting current)

   (iii) When displaying a*ctive power* the *visible display* shall have an update frequency of 5 seconds

f) For *meters* fitted with *CLC/R* the *meter* shall provide a clear visible indication of the status of each *controlled load contactor* and/or *relay* as On or Off.

g) For *meters* fitted with a *supply contactor*:

   (i) *The meter* shall have a clear visible indication of the status of the *supply contactor* as On, Off, exceeded supply capacity or armed

   (ii) When the *supply contactor* is in the exceeded supply capacity state (in circumstances where a supply capacity limit has been exceeded), the *visible display* shall display the remaining time (in minutes and seconds) before the *supply contactor* automatically switches to the On state (*supply contactor* in the closed position).

7.4.2 Smart Metering Infrastructure Performance Levels

There are no *SMI performance levels* for Visible display and indicators on *meter*.

7.5 Meter Clock Synchronisation

7.5.1 Requirements

a) The *meter* shall include a *meter clock* which must be maintained within ±20 seconds of *Australian Eastern Standard Time (AEST).*

b) An *event* shall be *stored* in the access and security *event* log when the *meter clock* is adjusted by more than 20 seconds. The access and security *event* shall include the size of the *time* adjustment.

7.5.2 Smart Metering Infrastructure Performance Levels

There are no *SMI performance levels* for *Meter Clock* Synchronisation.

7.6 Load Management through a Controlled Load Contactor or Relay

7.6.1 Requirements

a) For a *meter* with a *controlled load contactor* or *relay (CLC/R)* the *controlled load contactor* or *relay* shall be integrated into the *meter*.

   (i) The rating of a single phase *controlled load contactor* that is integrated into the *meter* shall be 31.5 A resistive (AC1 rating) and a nominal *voltage* rating of 230 Vac.

   (ii) The rating of a single phase *voltage* free *relay* integrated into the *meter* shall be 2 A with a *voltage* rating of 230 Vac.

   (iii) It shall be possible to separately specify the functionality described in Section 7.6 to the *controlled load contactor* and all *relays* integrated into the *meter*

   (iv) In Section 7.6 references to *CLC/R* should be interpreted as the *controlled load contactor* and/or *relay(s)* fitted to the *meter*

b) For *meters* with *CLC/R* the *meter* shall support the following basic load control functions:

   (i) Load switch actions

   (ii) Switch time randomisation

   (iii) Load cycling

c) The *meter* will use the basic load control functions to separately support the following modes of operation for each *CLC/R* in the *meter*.

   (i) Normal operation

      (a) Default load control schedule

   (ii) Alternative load control operation

      (a) Special day load control schedule

      (b) Priority override

   (iii) Event driven operation

      (a) Meter loss of supply event

      (b) Under frequency event

      (c) Demand limit event

   (iv) Customer driven operation

      (a) Boost mode

d) Settings for the *CLC/R* shall be configurable both *locally* and *remotely*

e) The hierarchy for the modes of operation of the *CLC/R* is governed by the following order:

   (i) Priority 1[7] Where enabled Meter Loss of Supply Load Switching

   (ii) Priority 2 Where enabled: Under Frequency Load Switching

   (iii) Priority 3 Where Boost and Boost Primacy enabled: Boost

   (iv) Priority 4 When commanded: *Priority Override* (described in Section 7.6.1.3)

[7] Priority 1 is the highest priority

(v) Priority 5 Where enabled: Direct Load Control Demand Limit

(vi) Priority 6 Where Boost enabled and Boost Primacy disabled: Boost

(vii) Priority 7 When *meter* date is a special date: Special Day Load Control Schedule

(viii) Priority 8 Default Daily Load Control Schedule

7.6.1.1 Basic Load Control Functions

7.6.1.1.1 Load Switch Actions

a) The *CLC/R* shall have functionality supporting:

(i) Turn On Immediately

(ii) Turn Off Immediately

(iii) Delayed Turn On (using Switch Time Randomisation, refer to Section 7.6.1.1.2)

(iv) Delayed Turn Off (using Switch Time Randomisation)

(v) Start *load cycling* (refer to Section 7.6.1.1.3)

(vi) Stop *load cycling*

7.6.1.1.2 Switch Time Randomisation

a) In order to avoid synchronised switching of loads throughout the *distribution network area* the *meter* shall support the generation of a random delay

(i) The *meter* shall have programmable settings allowing:

(a) The minimum time delay to be specified from 0 to 720 minutes (12 hours) in 1 minute increments;

(b) The maximum time delay to be specified from 0 to 720 minutes (12 hours) in 1 minute increments;

(ii) The delay calculated by the *meter* shall be a time in seconds from the minimum time delay to the maximum time delay. The algorithm shall use a uniform probability.

(a) To ensure that the *CLC/R* is turned on or off for a defined time when using delayed switching the *meter* shall:

1. When the *meter* is powered on or *meter* settings affecting Switch Time Randomisation are changed, the *meter* shall calculate and *record* a new random time delay. All Delayed Turn On and Delayed Turn Off *load switch actions* will use this *recorded* time delay.

7.6.1.1.3 Load Cycling of the CLC/R

a) *Load cycling* of the *CLC/R* shall support the following functionality:

(i) The *meter* shall *record* a programmable setting allowing a random delay to be specified before *load cycling* commences. The setting shall allow:

(a) The time delay before commencing *load cycling* to be specified from 0 to 120 minutes in 1 minute increments.

(b) The time delay before commencing *load cycling* calculated by the *meter* shall be a time in seconds from zero to the time delay specified above. The random delay algorithm shall use a uniform probability distribution.

(ii) The *meter* shall have programmable settings allowing the cycle times to be specified. The settings shall allow:

(a) The cycle on time to be specified in minutes from 1 to 120 minutes in 1 minute increments.

(b) The cycle off time to be specified in minutes from 1 to 120 minutes in 1 minute increments.

b) When the Load control cycling program starts;

(i) If the initial position of the *CLC/R* is in the off position, then after the random delay the *CLC/R* will switch to the on position and will commence cycling (off and on) in accordance with the cycle on time and cycle off time.

(ii) If the initial position of the *CLC/R* is in the on position then after the random delay the *CLC/R* will switch to the off position and will commence cycling (on and off) in accordance with the cycle on time and cycle off time

7.6.1.2 Normal Operation Mode

a) The *CLC/R* shall have functionality supporting a programmable sequence of *load switch actions*.

b) The *meter* shall *record* two Default Day Load Control Schedules referred to as '*Day Type* 1 Default Load Control Schedule' and '*Day Type* 2 Default Load Control Schedule'. Each Default Day Load Control Schedule shall *record* ten (10) programmable entries, where each of the ten entries shall specify:

(i) The *meter time* at which the *load switch action* will occur (in hours and minutes)

(ii) The required *load switch action* (from 7.6.1.1.1)

c) For each day of week it shall be possible to *record* a programmable setting specifying which (of the two) Default Load Control Schedules will operate on that day

7.6.1.3 Alternative Load Control Operation Mode

7.6.1.3.1 Special Day Load Control Schedule

a) The *meter* shall support a special day load control schedule.

(i) To support the special day load control schedule the *meter* shall *record* a programmable list of up to twelve dates on which the 'Special Day Load Control Schedule' is to be used

(ii) The *meter* shall *record* a programmable 'Special Day Load Control Schedule'. The 'Special Day Load Control Schedule' shall *record* ten (10) programmable entries, where each of the ten entries shall specify:

(a) The *meter time* at which the *load switch action* will occur (in hours and minutes)

(b) The required *load switch action* (from 7.6.1.1.1)

7.6.1.3.2 Priority Override

a) The *meter* shall support a *priority override* command

(i) The *priority override* command shall specify either

(a) Start *priority override*. The command shall support settings for:

1. The *CLC/R* that is being controlled
2. Start date and *time* (in hours and minutes) for the override. The start *time* shall also allow: commence immediately.
3. Duration of the override from 1 to 1440 minutes (24 hours) in 1 minute increments
4. The required *load switch action* (from 7.6.1.1.1)

(b) Terminate *priority override*

1. The terminate *priority override* command shall support settings for:
    a. The *CLC/R* that is being controlled
    b. Either end after a random delay or end immediately
2. Operation of the terminate *priority override* command. For the specified *CLC/R*
    a. If the terminate *priority override* command is received before the specified start *time* and date: the *priority override* shall be cancelled and the *CLC/R* shall not commence *priority override*
    b. If the terminate *priority override* command is received during the *priority override*: the *CLC/R* shall return to the highest operational load control mode either after a random delay or end immediately as specified in the terminate *priority override* command
    c. If the terminate *priority override* command is received when no *priority override* is programmed: the *CLC/R* shall continue to use the current mode.

(ii) After the duration of the *priority override* or when a command to terminate *priority override* is received, the *meter* shall return to the highest operational load control mode

(iii) If during the *priority override* another *priority override* command is received, it shall overwrite the previous settings.

7.6.1.4 Event Driven Operation Mode

7.6.1.4.1 Meter Loss of Supply Load Switching

a) The *meter* shall support *meter loss of supply* load switching of the *CLC/R*.

(i) The *meter* shall *record* programmable settings allowing

(a) *Meter loss of supply* load switching to be enabled or disabled.

(b) The position of the *CLC/R* during *meter loss of supply* as either turned on or turned off

(ii) If *meter loss of supply* load switching is enabled:

(a) On detection of *meter loss of supply*, the load contactor shall be switched to the specified position

(b) On power restore the *recorded* random delay (specified in 7.6.1.1.2) shall be applied before returning to the highest operational load control mode

7.6.1.4.2 Under Frequency Load Switching

a) If the *meter* supports under frequency load switching of the *CLC/R*.

(i) The *meter* shall *record* programmable settings for under frequency load switching. The settings shall allow:

(a) Under frequency load switching to be enabled or disabled

(b) The trigger frequency for under frequency load switching from 48 Hz to 50 Hz in increments of 0.1 Hz

(c) The *measurement period* for triggering under frequency load switching from 5 seconds to 60 seconds in increments of 5 seconds

(d) The *measurement period* for triggering the end of under frequency load switching from 1 minute to 60 minutes in increments of 1 minute

(e) The under frequency load contactor position for the *CLC/R* during the under frequency event, as either turned on or turned off.

(ii) If under frequency load switching is enabled

(a) When the *measured* mains frequency drops below the trigger frequency for more than the trigger *measurement period* the *meter* shall ensure the *CLC/R* is in the under frequency load contactor position. An *event* shall be *stored* in the *meter's* quality of supply *event* log to indicate that under frequency mains switching has occurred.

(b) When the *measured* mains frequency increases above the trigger frequency for more than the end of under frequency *measurement period* the *meter* shall store an *event* in the *meter's* quality of supply *event* log indicating that the mains frequency has returned to normal. The *meter* shall use the *recorded* random time delay (as specified in 7.6.1.1.2) before returning to the highest operational load control mode.

7.6.1.4.3 Demand Limit Load Control Switching

a) The *meter* shall support demand limit load control switching of the *CLC/R*.

(i) The *meter* shall *record* programmable settings allowing

(a) Demand limit load control switching to be enabled or disabled.

(b) The start *time* for the demand limit load control switching to be set in hours and minutes

(c) The duration for the demand limit load control switching to be set in minutes from 5 to 1440 minutes (24 hours) in increments of 5 minutes

(d) The demand limit supply capacity limit to be set from 0.1 kWh to 99 kWh in 0.1 kWh increments

(e) The *measurement period* to be set from 1 to 60 minutes in 1 minute intervals

(f) The position of the *CLC/R* during demand limit load control switching as either turned on or turned off

(g) The *meter* to automatically initiate demand limit load control switching while the Emergency Supply Capacity Limit is initiated as enabled or disabled

b) Operation of demand limit load control switching

(i) If demand limit load control switching is enabled and the *meter time* indicates that demand limit load control switching should be initiated:

(a) Starting at the programmed start *time* the *meter* shall measure the *total exported active energy* in the *measurement period*.

1. If the *measurement* exceeds the demand limit supply capacity limit the *meter* shall switch the *CLC/R* to the programmed position for the remainder of the *measurement period*. At the end of the *measurement period* control of the *CLC/R* returns to the highest operational load control mode. An *event* shall be written to the *meter's* quality of supply *event* log indicating that the *CLC/R* has switched due to demand limit load control.

2. If the *measurement* does not exceed the programmed demand limit supply capacity limit the *meter* shall not switch the *CLC/R* and will repeat the *energy measurement* for each subsequent *measurement period*

3. At the conclusion of the programmed duration, control of the *CLC/R* returns to the highest operational load control mode,

(ii) If automatic initiation of the demand limit load control switching when the Emergency Supply Capacity Limit is initiated is enabled

(a) When the *meter* receives the initiate emergency supply capacity limit command the *meter* shall measure the *total exported active energy* in the *measurement period*. If the *measurement* exceeds the demand limit supply capacity limit the *meter* shall switch the *CLC/R* to the programmed position for the remainder of the *measurement period*. At the end of the *measurement period* control of the *CLC/R* returns to the highest operational load control mode. An *event* shall be written to the *meter's* quality of supply *event* log indicating that the *CLC/R* has switched due to demand limit load control.

(b) When the *meter* receives the terminate energy supply capacity limit command control of the *CLC/R* returns to the highest operational load control mode.

7.6.1.5 Customer Driven Operation Mode

a) A *meter* shall have a configurable boost option to operate the *CLC/R*.

b) The *meter* shall *record* programmable settings for the boost option. The settings shall allow:

(i) Boost operation to be enabled or disabled.

(ii) The time for which boost shall remain in operation when activated, from 1 to 6 hours in half hour increments

(iii) The position of the *CLC/R* during boost operation as either turned on or turned off

(iv) An option to allow the customer to terminate boost by pressing the boost button, which can be enabled or disabled

c) If Boost is enabled[8]:

(i) A *customer* can activate boost functionality by pressing a button (boost button) on the front of the *meter*.

(ii) When the *meter's* boost function is activated,

(a) The *meter* shall switch the *CLC/R* to the specified position for the specified time

(b) An *event* will be *stored* in the *meter's* quality of supply *event* log indicating that boost has been activated.

(c) At the end of the boost preset time control of the *CLC/R* will return to the highest operational load control mode.

(d) If the option to allow customer termination of boost is enabled:

1. When the *customer* presses the boost button on the front of the *meter*, control of the *CLC/R* will return to the highest operational load control mode and an *event* will be *stored* in the *meter's* quality of supply *event* log indicating that the customer has terminated boost.

d) When the boost button is disabled, pressing the boost button will not activate the boost function or switch the *CLC/R*.

e) It shall be possible to change the priority of the boost functionality using a boost primacy setting. Enabling the boost primacy setting shall raise the priority of the boost above that of *priority override* and direct load control demand limit.

[8] Clarification: Boost can be individually configured for the *controlled load contactor* and each *relay* in the *meter*

f) The *meter* shall support a programmable setting to automatically disable boost functionality when the emergency supply capacity limit is enabled.

7.6.2 Smart Metering Infrastructure Performance Levels

7.6.2.1 Urban Performance Level

7.6.2.1.1 Pre-defined Meter Groups

a) Requested *priority override* load control action performed by

   (i) 90% of *meters* within 5 minutes

b) The *SMMS* may not get an immediate acknowledgement, however on retrieval of *event* logs it will be possible to determine the success rate

c) Each *priority override* command may specify a total of 6 different *meter* groups.

d) Up to 12 *priority override* commands can be sent in any 24 hour period to pre-defined meter groups consisting of up to 12.5% of the operational *SMI meter* population in a *distribution network area*. The *meters* shall be uniformly distributed among the *SMCN* collection points used across the *distribution network area*.

7.6.2.1.2 Individual Meters

a) For *priority override* commands sent to individual meters the requested load control action shall be acknowledged by

   (i) 95% of *meters* within 5 minutes

   (ii) 99% of *meters* within 10 minutes

b) The *SMI performance level* shall be tested by sending *priority override* commands from the *SMMS* to a total of 0.5% (5,000 mpM) of the number of operational *SMI meters* in a *distribution network area*. This will be tested over an 8 hour period, with the sending of commands uniformly distributed across both time and the deployed *SMCN* collection points. The test can be conducted once in any 24 hour period.

7.7 Supply Contactor operation

7.7.1 Requirements

a) A *meter* other than a three phase *CT connected meter* without an external *supply contactor*, shall support functionality to control a *supply contactor* to enable the interruption and restoration of supply to *customer* premises;

(i) For all *whole current meters* the *supply contactor* shall be integrated into the *meter*;

(ii) For *CT connected meters* supporting an external *supply contactor*, a *voltage* free 2 A relay with a rating of 230 Vac shall be integrated into the *meter*.

b) In section 7.7 references to the *supply contactor* shall also apply to the control relay integrated into the three phase *CT connected meter* supporting external *supply contactor*

c) For *whole current meters* when the *supply contactor* in the *meter* is in the open position all outgoing (*customer* side) active circuits for the *meter* shall remain de-energised;

d) *Supply contactor* operation shall be possible both *locally* and *remotely*;

e) For *meters* with a *supply contactor* it shall be possible to display the status of the *supply contactor* on the *visible display* and indicators on *meter* (refer 7.4.1). The possible *supply contactor* status is:

(i) On (*supply contactor* in the closed position)[9]

(ii) Armed (*supply contactor* in the open position)

(iii) Off (*supply contactor* in the open position)

(iv) Supply capacity exceeded (*supply contactor* in the open position, *visible display* shows the remaining time before the *supply contactor* is automatically switched to the on state)

f) The *SMI* shall support separate commands for switching the *supply contactor*[10]. The commands shall always be actioned by the *meter* regardless of the initial state of the *supply contactor*. The four *supply contactor* switch commands are:

(i) Close command

(ii) Monitor supply command (refer 7.7.1.1)

(iii) Arm command (refer 7.7.1.2)

(iv) Open command

7.7.1.1 Monitor Supply

a) The *meter* shall support a monitor supply (auto-off) function such that if the *measured exported active power* is above a programmable level after receiving the monitor supply command, the *supply contactor* will automatically switch to the off state (open position).

b) When the monitor supply command is used:

(i) The *meter* shall automatically switch the *supply contactor* to the off state (open position) if more than “X” Watts of *exported active power* is *measured* by the *meter* for more than “Y” seconds during the *measurement period* of “Z” seconds after the *meter* receives the command, where:

(a) “X” range: 20 W – 25 kW programmable in 20 W increments

[9] When the *supply contactor* is in the Monitor Supply State the display status can be shown as On
[10] Refer Appendix C for switching matrixes and configurations

(b) "Y" range: 1- Z seconds programmable in 1 second increments

(c) "Z" range: 1- 3,600 seconds programmable in 1 second increments

(d) For *CT connected meters* (with 2A relay) the *measurement* of "X" shall be the value *measured* by the *meter*, the *meter* does not need to know the *CT* ratio and is not required to calculate the *customer* load

(ii) The *supply contactor* shall be switched to the off state (open position) in less than 1 second of the *exported active energy* exceeding the set limits.

(iii) The *meter* shall *store* a quality of supply *event* when the *supply contactor* has been automatically switched to the off state (open position) due to exceeding the monitor supply settings.

7.7.1.2 Arm

a) When the *meter* receives an arm command, the *meter* shall ensure that the *supply contactor* is in the open position. The *meter* shall have a clear visible indication that the *supply contactor* is now in the Armed state.

b) When the *meter* is in the armed state it shall be possible for a *customer* to change the *meter* from the armed state to the on state (*supply contactor* in the closed position). A *meter event* will be *stored* in the quality of supply *event* log to indicate that the *customer* has moved the *supply contactor* to the on state.

c) The *meter* shall support a configurable arming time out period. If during the arming time out period the *customer* does not turn the *supply contactor* to the on state the *meter* shall automatically return to the off state. A *meter event* will be *stored* in the quality of supply *event* log to indicate that a time out has occurred. The arming time out period shall be programmable from 1 hour to 48 hours in 1 hour increments.

7.7.1.3 Supply Contactor Functionality for Meter Loss of Supply

a) The *meter* shall support an option to switch the *supply contactor* to the open position when *meter loss of supply* is detected. If this option is enabled the *meter* shall ensure the *supply contactor* is in the open position during *meter loss of supply.* Upon *supply* restoration the *meter* shall restore the *supply contactor* to the state before *meter loss of supply.* It shall be possible to *locally* and *remotely* enable and disable this option.

b) If the *supply contactor* was in the on state before *meter loss of supply*. On power restore if the *meter* detects a power outage beyond the programmable minimum duration the *meter* shall wait a random delay period before switching the *supply contactor* to the closed position. If the outage is less than the minimum duration the *supply contactor* shall be switched to the closed position without the delay.

(i) The *meter* shall have programmable settings allowing:

(a) The minimum duration of the power outage to be specified from 5 seconds to 300 seconds in 5 second increments

(b) The minimum time delay to be specified from 0 seconds to 300 seconds (5 minutes) in 5 second increments

(c) The maximum time delay to be specified from 0 seconds to 300 seconds (5 minutes) in 5 second increments

(ii) The delay calculated by the *meter* shall be a time in seconds from the minimum time delay to the maximum time delay. The algorithm shall use a uniform probability.

(iii) Any *supply contactor* switch command received by the *meter* during the delay period will immediately terminate the delay period.

c) If the *supply contactor* was in the armed state before *meter loss of supply*. On power restore the *meter* shall treat the *event* as if an Arm command has been received.

d) If the *supply contactor* was in the monitor supply state before *meter loss of supply.* on power restore the *meter* shall treat the *event* as if a monitor supply command has been received.

e) If the *supply contactor* was in the exceeded supply capacity state before *meter loss of supply*. on power restore the *meter* shall treat the *event* as if the *supply contactor* was in the on state (as described in 7.7.1.3 b)).

7.7.2 Smart Metering Infrastructure Performance Levels

7.7.2.1 Urban Performance Level

7.7.2.1.1 Individual Meters

a) The *supply contactor* switch command shall be acknowledged by:

(i) 95% of *meters* within 5 minutes

(ii) 99% of *meters* within 10 minutes

b) The *SMI performance level* shall be tested by sending *supply contactor* switch commands from the *SMMS* to a total of 0.5% (5,000 mpM) of the number of operational *SMI meters* in a *distribution network area*. This will be tested over an 8 hour period, with the sending of commands uniformly distributed across both time and the deployed *SMCN* collection points. The test can be conducted once in any 24 hour period.

7.8 Supply Capacity Control

7.8.1 Requirements

a) A *meter*, other than a three phase *CT connected meter* not supporting external *supply contactor*, shall support functionality to implement supply capacity control;

b) A *meter* with supply capacity control shall support five supply capacity control limits:

(i) Time of day export supply capacity limit

(ii) Distribution network export supply capacity limit

(iii) Time of day import supply capacity limit

(iv) Distribution network import supply capacity limit

(v) Emergency supply capacity limit

c) A *meter* shall support *local* and *remote* enabling and disabling of each supply capacity limit.

7.8.1.1 Time of Day Export Supply Capacity Limit

a) The *meter* shall support time of day export supply capacity limiting

(i) The *meter* shall record programmable settings allowing

(a) *Time* of day export supply capacity limiting to be enabled or disabled

(b) The start *time* for the time of day export supply capacity limit to be set in hours and minutes

(c) The duration for the *time* of day export supply capacity limit to be set in minutes from 5 to 1440 minutes (24 hours) in increments of 5 minutes

(d) The supply capacity limit to be set from 0.1 kWh to 99 kWh in 0.1 kWh increments

(e) The *measurement period* to be set from 1 to 60 minutes in 1 minute intervals

b) If time of day export supply capacity Limiting is enabled and the *meter time* indicates that time of day export supply capacity limiting should be initiated:

(i) Starting at the programmed start time and extending for the specified duration, the *meter* shall ensure that *total exported active energy* consumption is below the supply capacity limit in each *measurement period*. The *supply contactor* shall switch to the supply capacity exceeded state (open position) immediately the accumulated kWh *energy* consumption exceeds the supply capacity limit and remain in the open position for the remainder of the *measurement period* after which time the *supply contactor* shall be automatically switched to the on state (closed position). An *event* shall be written to the *meter's* quality of supply *event* log indicating that the *supply contactor* has switched due to time of day export supply capacity limiting.

(ii) The first *measurement period* used in time of day export supply capacity limiting shall require the *meter* to generate a random time period in seconds from 0 to the *measurement period* (expressed in seconds). This time period shall be used as the first *measurement period*. All subsequent *measurement periods* shall use the specified *measurement period*.

7.8.1.2 Distribution Network Export Supply Capacity Limit

a) The meter shall support distribution network export supply capacity limiting

(i) The *meter* shall record programmable settings allowing

(a) Distribution network export supply capacity limiting to be enabled or disabled

(b) The supply capacity limit to be set from 0.1 kWh to 99 kWh in 0.1 kWh increments

(c) The *measurement period* to be set from 1 to 60 minutes in 1 minute intervals

b) If distribution network export supply capacity limiting is enabled:

(i) The *meter* shall ensure that *total exported active energy* consumption is below the supply capacity limit in each *measurement period*. The *supply contactor* shall switch to the supply capacity exceeded state (open position) immediately the *total exported active energy* consumption exceeds the supply capacity limit and remain in the open position for the remainder of the *measurement period* after which time the *supply contactor* shall be automatically switched to the on state (closed position). An *event* shall be written to the *meter's* quality of supply *event log* indicating that the *supply contactor* has switched due to distribution network export supply capacity limiting.

7.8.1.3 Time of Day Import Supply Capacity Limit

a) The *meter* shall support time of day import supply capacity limiting

(i) The *meter* shall record programmable settings allowing

(a) Time of day import supply capacity limiting to be enabled or disabled

(b) The start *time* for the time of day import supply capacity Limit to be set in hours and minutes

(c) The duration for the time of day import supply capacity limit to be set in minutes from 5 to 1440 minutes (24 hours) in increments of 5 minutes

(d) The supply capacity limit to be set from 0.1 kWh to 99 kWh in 0.1 kWh increments

(e) The *measurement period* to be set from 1 to 60 minutes in 1 minute intervals

b) If time of day import supply capacity limiting is enabled and the *meter time* indicates that time of day import supply capacity limiting should be initiated:

(i) Starting at the programmed start *time* and extending for the specified duration, the *meter* shall ensure that *total imported active energy* generation is below the supply capacity limit in each *measurement period*. The *supply contactor* shall switch to the supply capacity exceeded state (open position) immediately the *total imported active energy* generation exceeds the supply capacity limit and remain in the open position for the remainder of the *measurement period* after which time the *supply contactor* shall be automatically switched to the on state (closed position). An *event* shall be written to the *meter's* quality of supply *event* log indicating that the *supply contactor* has switched due to time of day import supply capacity limiting.

(ii) The first *measurement period* used in time of day import supply capacity limiting shall require the *meter* to generate a random time period in seconds from 0 to the *measurement period* (expressed in seconds). This time period shall be used as the first *measurement period*. All subsequent *measurement periods* shall use the specified *measurement period*.

7.8.1.4 Distribution Network Import Supply Capacity Limit

a) The *meter* shall support distribution network import supply capacity limiting

(i) The *meter* shall record programmable settings allowing

(a) Distribution network import supply capacity limiting to be enabled or disabled

(b) The supply capacity limit to be set from 0.1 kWh to 99 kWh in 0.1 kWh increments

(c) The *measurement period* to be set from 1 to 60 minutes in 1 minute intervals

b) If distribution network import supply capacity limiting is enabled:

(i) The *meter* shall ensure that *total imported active energy* generation is below the supply capacity limit in each *measurement period*. The *supply contactor* shall switch to the supply capacity exceeded state (open position) immediately the *total imported active energy* generation exceeds the supply capacity limit and remain in the open position for the remainder of the *measurement period* after which time the *supply contactor* shall be automatically switched to the on state (closed position). An *event* shall be written to the *meter's* quality of supply *event* log indicating that the *supply contactor* has switched due to distribution network import supply capacity limiting.

7.8.1.5 Emergency Supply Capacity Limit

a) The emergency supply capacity limit command initiates or terminates emergency supply capacity limiting in the *meter*.

b) The *meter* shall *record* a programmable setting to disable emergency supply capacity limiting. If this setting is disabled the *meter* shall not initiate emergency supply capacity limiting after receiving the emergency supply capacity command.

c) When the emergency supply capacity limit is initiated it shall take priority over the distributor export supply capacity limit and time of day export supply capacity limit.

d) When the emergency supply capacity limit is initiated *supply* shall be uninterrupted if the *total exported active energy* consumption is below "L" kWh over the *measurement period* of "M" minutes. The *supply contactor* shall switch to the supply capacity exceeded state (open position) immediately the *total exported active energy* consumption exceeds "L" kWh and remain in the open position for the remainder of the *measurement period* after which time the *supply contactor* shall be automatically switched to the on state (closed position). An *event* shall be written to the *meter's* quality of supply *event* log indicating that the *supply contactor* has switched due to emergency supply capacity limiting. The range for the programmable settings are:

(i) L is from 0.1 kWh to 99 kWh in 0.1 kWh increments

(ii) M is from 1 to 60 minutes in 1 minute intervals

e) When the emergency supply capacity limit is first initiated the *meter* shall generate a random time period in seconds from 0 seconds to the *measurement period* (60xM seconds). This time period shall be used as the first *measurement period*. Subsequent *measurement periods* shall use the specified *measurement period*.

7.8.1.6 General Requirements

a) When the s*upply contactor* is switched as a result of supply capacity limiting the *meter* shall *store an event* in the *meter's* quality of supply *event* log indicating the time the *supply contactor* switched to the open position and subsequently switched to the closed position.

b) When the *supply contactor* is in the supply capacity exceeded state (open position) due to exceeding the supply capacity Limit the *meter* shall provide a *visible display* of the time remaining before the *supply contactor* will automatically switch to the on state.

c) For *CT connected meters* with 2 A relay: the supply capacity limits shall be the value *measured* by the *meter*. The *meter* does not need to know the *CT* ratio and is not required to calculate the *supply* to the *customer*.

d) The *meter* is only required to record one start time for time of day import supply capacity limiting and one start time for time of day export supply capacity limiting.

7.8.2 Smart Metering Infrastructure Performance Levels

7.8.2.1 Urban Performance Level

7.8.2.1.1 Pre-defined Meter Groups

a) The requested emergency supply capacity limiting command shall be performed by

   (i) 90% of *meters* within 10 minutes

b) The *SMMS* may not get an immediate acknowledgement, however on retrieval of *event* logs it will be possible to determine the success rate

c) Up to two emergency supply capacity limiting commands can be sent in any 24 hour period to pre-defined groups consisting of up to 100% of the operational *SMI meter* population in a *distribution network area*.

7.8.2.1.2 Individual Meters

a) Clarification: The use case for this function indicates that *meters* will be concentrated in a geographic area and cannot be assumed to be uniformly distributed across the *distribution network area*. It is assumed that 2000 *meters* will be involved in the testing.

b) The requested emergency supply capacity limit command shall be acknowledged by

   (i) 95% of *meters* within 30 minutes

   (ii) 99% of *meters* within 1 hour

c) The *SMI performance level* shall be tested by sending emergency supply capacity control commands from the *SMMS* to a total of 2,000 *meters*. The sending of commands shall be uniformly distributed across a 30 minute test period. The meters shall be clustered around collocated *SMCN* collection points. The test can be conducted twice in any 24 hour period.

7.9 Home Area Network using Open Standard

7.9.1 Requirements

a) The application layer shall support ZigBee Smart Energy Profile 2.0.

b) The physical layer is IEEE 802.15.4 operating in the 2.4 GHz RF band with Internet Engineering Task Force (IETF) standard Media Access Control (MAC) layers providing IPv6 transport.

c) The *ESI Implementation* shall provide:

(i) Transmit power: 20 dBm (100 mW)

(ii) Receive signal strength: -98 dBm (for a packet error rate not exceeding 1%)

7.9.1.1 HAN Device Management

a) The *meter* shall be capable of performing as the *ESI* for the *utility HAN*.

b) The *SMI* shall support a means of securely *registering HAN devices* to the *ESI*. Only *registered HAN devices* shall be allowed to share information with the *ESI* and other *HAN devices* on the *utility HAN*.

c) The *SMI* shall support the *registration* of 16 individual *HAN devices* on the *utility HAN*.

d) The *ESI* shall be able to *register* more than one *meter* on the *utility HAN*

e) The *ESI* shall be able to *register* other utility meter types on the *utility HAN*.

f) The *SMI* shall be able to individually communicate with each *registered HAN device* on the *utility HAN*.

g) The *SMI* shall be able to upgrade the *software* in a *registered HAN device*[11] on the *utility HAN* including the *ESI Implementation*

h) The *ESI* shall be able to obtain measures of link quality at a *registered HAN device* on the *utility HAN* providing at least five levels of granularity (for diagnostic purposes).

i) The *SMI* shall support the setting of a *commencement date*. This shall be used by:

(i) *meters* to ensure that *HAN devices* cannot access data stored before the specified *commencement date* (this ensures *HAN Devices* cannot access historical data stored in *meters* before the specified date)

(ii) The *ESI Implementation* to ensure that *HAN devices* cannot access from the *meter* or *ESI Implementation* information received before the specified *commencement date*. (this ensures *HAN devices* cannot access messages or retail tariffs, sent before the specified date)

(iii) The *SMI* shall support sending a *clear command* to *registered HAN Devices*

j) The *SMI* shall support a means of removing *HAN devices* from the *utility HAN* to ensure that they can no longer share information with the *ESI Implementation* or other *HAN devices* on the *utility HAN*

k) The *SMI* shall support turning off *HAN transmissions* from the *ESI Implementation*.

l) The *ESI Implementation* shall be able to identify the *HAN device* type, services, functionality and capability supported by each *HAN device* on the *utility HAN*. The *SMI* can read this information from the *ESI Implementation*.

[11] This assumes that the *registered HAN device* has been certified under the standard to accept software upgrades

m) The *ESI Implementation* shall retain the last date and *time* that a *registered HAN device* was seen on the *utility HAN*. The *SMI* can read this information from the *ESI Implementation* using remote service check.

7.9.1.2 HAN Local Time

a) Provision of *time* to the *ESI*

(i) The *meter* shall make the current meter *time* and date available to the *ESI*.

(ii) The *SMI* shall use *AEST* for all transactions with the *ESI*, including load schedules, retail tariffs and effective dates

b) Provision of *time* to *HAN devices*

(i) The *ESI* shall use a common time base (for example *UTC*) when communicating to *HAN devices*.

(ii) The *SMI* shall support setting a *local time* offset in the *ESI* including setting a future setting with an effective date and *time*. The *local time* offset is included to support different time zones from *AEST* and any adjustments for daylight savings time.

(iii) The *ESI* shall make available a *local time* offset to enable *HAN devices* to convert any *time* received from the *ESI* from the common *time* base to *local time*.

7.9.1.3 Load Control

a) The *SMI* shall support load control of *registered HAN devices*. This shall include:

(i) Management of *HAN* load control schedules in the *ESI Implementation*

(ii) Ability to communicate supply capacity control limits to *HAN devices* via the *ESI*

(iii) Ability to send *priority override* commands to *HAN devices*

(iv) Ability for customers to override load control schedules associated with *HAN devices*

(v) Ability to determine the status of *HAN devices*

7.9.1.3.1 Management of Load Control Schedules in the ESI Implementation

a) The *ESI Implementation* shall store 16 *HAN* load control schedules. The *ESI Implementation* shall communicate to each *registered HAN device* the appropriate load schedule information supporting:

(i) Storing for each day of the week a programmable setting specifying which of two default load schedules referred to as '*Day Type* 1 Default Load Control Schedule' and '*Day Type* 2 Default Load Control Schedule' applies

(ii) Storing a programmable list of up to twelve dates on which a special day load control schedule is to be used in place of a default day load control schedule

(iii) The two default day load control schedules (*Day Type* 1 or *Day Type* 2) and the special day load control schedule shall store ten programmable entries which specify the *HAN device* instruction and *meter* time at which the *HAN device* instruction will occur. The *HAN device* instruction can specify:

(a) turn on, turn off, demand adjustment, set temperature set point, set maximum demand, load control modes specified in AS4755, etc.

(b) a flag to specify if the Load Control Schedule can be overridden by customer override (see section 7.9.1.3.4)

(iv) The device or devices that the schedule applies to as either

(a) A single uniquely defined *HAN device*

(b) A *HAN device* type (all *registered HAN devices* of this type shall use this schedule)

(v) In order to avoid synchronised switching of loads in a distribution network, the Load Control Schedule shall support the generation of a random delay before a *HAN device* instruction is acted on by *HAN device*s associated with that load control schedule.

(vi) *Registered HAN devices* on the *utility HAN* can request load control schedules from the *ESI Implementation* at any time.

(vii) The *ESI Implementation* shall be able to notify *registered HAN devices* when a new schedule is available for *HAN* load control devices.

(viii) The *ESI Implementation* shall support storage for 16 future load control schedules with each specifying an effective date and *time*.

7.9.1.3.2 Communication of Supply Capacity Control Limits

a) To support predicting if the customer is going to exceed applicable limits, the *ESI* shall support notification of supply capacity control limits stored in *meters*.

(i) The *meter* shall make available to the *ESI* those supply capacity limits which are currently active in the *meter*.

(ii) The *meter* shall make available to the *ESI* the imported/exported kWh and time elapsed in the *measurement period*.

(iii) The *ESI* shall make available the current supply capacity control limits and *measurement period* to all *registered HAN device*s

7.9.1.3.3 Priority Override Commands to HAN Devices

a) The *SMI* shall be able to send *priority override* commands to *HAN devices* via the *ESI Implementation*. The *priority override* command shall specify either:

(i) Start *priority override* of a load control schedule

(a) The start *time* and date of the override (including start after a random delay and start immediately)

(b) The duration of the override

(c) The state of the *HAN device* during the override

(d) The load control schedule that is being overridden.

(e) A flag to specify if the *priority override* can be overridden by customer override

(ii) End *priority override* of a load control schedule

(a) The end *priority override* command shall specify:

1. The load control schedule that is no longer being overridden
2. Either end after a random delay or end immediately

(b) Operation of the end *priority override* command. For the specified load control schedule

1. If the end *priority override* command is received before the specified start *time* and date: the *Priority Override* shall be cancelled and the *HAN device* will not commence *priority override*
2. If the end *priority override* command is received during the *priority override*: the *HAN device* shall return to the programmed load control schedule after a random delay or end immediately

3. If the end *priority override* command is received when no *priority override* is programmed: the *HAN device* shall continue to use the load control schedule.

b) When the *ESI Implementation* receives a *priority override* for a *HAN device*, for which *priority override* has been enabled, the *ESI Implementation* shall create an entry in the *HAN event* log when the addressed *HAN device* acknowledges receipt of the command. The entry shall store the unique *HAN* identifier and sufficient information to identify which *priority override* command has been acknowledged.

7.9.1.3.4 Customer Override of Load Control Schedules

a) For *HAN devices* supporting Customer Override, the *ESI* shall support:

(i) Initiation of customer override of a load control schedule associated with a *HAN device* (how this is achieved is out of scope of this specification)

(ii) *Customer* cancellation of the customer override (how this is achieved is out of scope of this specification)

b) When a load control schedule is overridden by customer override the *ESI Implementation* shall write an entry into the *HAN event* log at the start of the override and another at the end of the override. The entry shall store the unique *HAN device* identifier.

c) The *SMI* shall be able to set a duration for which customer override remains in operation. The *ESI Implementation* shall communicate this duration to *registered HAN devices*

7.9.1.4 Consumption/Generation Information

a) The *ESI* shall support the *transmission* of information from all *meters* connected to the *utility HAN* to *registered HAN devices*. As a minimum the *ESI* shall support:

(i) All *measurements* made by the *meter* as detailed in section 7.1.1 including the 5 second update rate

(ii) All items listed in section 7.4.1 Visible Display and Indicators

(iii) All items described in section 7.12.1 Remote Service Checking

(iv) All energy data available for *remote* acquisition, (including gas and water data) acquired daily as detailed in section 7.2.1, but excluding access to *meter event* logs

7.9.1.5 Customer Messaging

a) The *SMI* shall provide the capability of sending messages to *HAN devices* via the *ESI Implementation*.

(i) Shall be capable of handling messages of 256 bytes of plain text

(ii) Each message shall contain a unique message identifier

(iii) Each message shall identify the *authorised party* sending the message

(iv) Messages will be sent to all *registered HAN devices* on the *utility HAN* that are capable of receiving messages.

(v) The message shall support a customer acknowledgement request flag. When enabled it indicates to the *ESI Implementation* that an event should be stored in the *HAN event* log when the customer (first) indicates receipt of the message.

(vi) The message shall support a *HAN device* acknowledgement request flag. When enabled it indicates to the *ESI Implementation* that an event should be stored in the *HAN event* log when the *HAN device* (first) indicates receipt of the message.

(vii) The message shall support the message priority specified in section 7.20.1. The *ESI Implementation* shall send messages to *HAN devices* in priority order

(viii) Shall support an effective date/*time* (the message will not be sent from the *ESI Implementation* to the *HAN device* until this date/*time*)

(ix) Shall support an expiry date/*time* (the message will not be sent from the *ESI Implementation* to the *HAN device* after this date/*time*)

b) The *SMI* shall support communicating an estimate of the greenhouse gases being generated by the customer's consumption/generation activity.

c) The *ESI Implementation* shall store messages sent from the *SMI.* It shall support eight separate mailboxes for use by different *authorised parties*. Once the *ESI Implementation* cannot store a new message in the *authorised party's* mailbox, the new message will overwrite :

(i) the oldest message in the *authorised party's* mailbox which has been acknowledged by the addressed *HAN device* or *customer*

(ii) any message in the *authorised party's* mailbox for which the expiry date has past

(iii) the oldest entry in the *authorised party's* mailbox

7.9.1.6 Retail Tariffs

a) The *ESI Implementation* shall store sufficient retail tariff information to enable a *HAN device* to convert kW and kWh readings into an estimated current cost of consumption. The estimated current cost of consumption will assist customer understanding of the consequences of changes to their behaviour[12].

b) The *SMI* shall support the capability of communicating retail tariff information to *HAN devices* via the *ESI.*

c) The *ESI Implementation* should support different retail tariff structures (for example rates throughout the day and different days of the week including weekdays, weekends and special days).

d) The *ESI Implementation* shall support retail tariffs with half hour pricing components in accordance with the following table:

Table 7-1: Retail tariff pricing support for each *meter* configuration

Meter Configuration	**Half hourly pricing supported for**
Single Phase Single Element *meter* Three Phase *whole current meter* Three Phase *CT connected meter* Three Phase *CT connected meter* supporting external *supply contactor*	*Total Imported Active Energy* (kWh) *Total Exported Active Energy* (kWh)
Single Phase Two Element *meter*	*Total Imported Active Energy* (kWh) *Total Exported Active Energy* (kWh) Element 1 *Imported Active Energy* (kWh) Element 1 *Exported Active Energy* (kWh) Element 2 *Imported Active Energy* (kWh) Element 2 *Exported Active Energy* (kWh)

[12] *HAN Devices* are not capable of performing as a billing engine

e) The *ESI Implementation* shall support the storage of future retail tariffs. Each future retail tariff shall support an effective date and *time*.

f) *Registered HAN device*s shall be able to request a copy of the retail tariff information stored in the *ESI Implementation*.

g) The *SMI* shall support Critical Peak Pricing (CPP). The CPP message shall specify the start *time* and duration of the CPP period. *HAN devices* shall support randomisation of automated response to the CPP. When the *ESI Implementation* receives a CPP message it shall store an *event* in the *HAN event* log for each *registered HAN device* acknowledging receipt of the CPP message.

7.9.1.7 Other Requirements

a) The *SMI* shall support the secure two-way transmission of alternative protocols over the *HAN* (for example future protocols to support electric vehicles and meter protocols including the ANSI C12 family and DLMS/COSEM).

b) The *SMI* shall be able to store the current state of the *ESI Implementation* and shall be able to reinstate the stored state when required without *customer* action (including *registered HAN devices*, load control schedules, retail tariffs, etc.).

7.9.1.8 Multi-utility metering (including Gas/Water)

a) The *ESI Implementation* shall support *data mirroring* for multi-utility meters (for example gas and water meters)

b) The *ESI Implementation* shall support:

(i) *Data mirroring* for a total of three multi-utility meters

(ii) *Storing* one week of half hourly *measurement* data for each multi-utility meter

(iii) *Storing* an accumulated total *measurement* for each multi-utility meter.

c) The *SMI* shall be able to *remotely* acquire the multi-utility meter data from the *ESI Implementation* (refer to Section 7.2.1).

7.9.2 Smart Metering Infrastructure Performance Levels

7.9.2.1 Urban Performance Level

7.9.2.1.1 Pre-defined Meter Groups

a) Requested *priority override* command to *ESI Implementation* action performed by

(i) 90% of *ESI Implementations* within 5 minutes

b) The *SMMS* may not get an immediate acknowledgement, however on retrieval of *event* logs it will be possible to determine the success rate

c) Each *priority override* command to the *ESI Implementation* may specify a total of 6 different *meter* groups.

d) Up to 24 *priority override* commands to *ESI* can be sent in any 24 hour period to pre-defined groups consisting of up to 5% of the operational *SMI meter* population in a *distribution network area*. The *meters* shall be uniformly distributed among the *SMCN* collection points used across the *distribution network area*.

7.9.2.1.2 Individual Meters

a) For *priority override* load control commands sent to an individual *ESI*

(i) The requested load control action shall be acknowledged by

(a) 95% of *ESI Implementations* within 5 minutes

(b) 99% of *ESI Implementations* within 10 minutes

(ii) The *SMI performance level* shall be tested by sending *priority override* commands from the *SMMS* to a total of 0.5% (5,000 mpM) of the number of operational *SMI meters* in a *distribution network area*. This will be tested over an 8 hour period, with the sending of commands uniformly distributed across both time and the deployed *SMCN* collection points. The test can be conducted once in any 24 hour period.

b) For *HAN* instructions sent to an individual *ESI Implementation*

(i) The *HAN* instruction shall be acknowledged by

(a) 95% of *ESI Implementations* within 30 minutes

(b) 99% of *ESI Implementations* within 1 hour

(ii) The *SMI performance level* shall be tested by sending *HAN* instructions from the *SMMS* to a total of 5% (50,000 mpM) of the number of operational *SMI meters* in a *distribution network area*. This will be tested over a 16 hour period, with the sending of instructions uniformly distributed across both time and the deployed *SMCN* collection points. The test can be conducted once in any 24 hour period.

7.10 Quality of Supply & other Event Recording

7.10.1 Requirements

a) The *meter* shall *store meter events* in two separate *event* logs*:*

(i) Quality of supply *event* log; and

(ii) Access and security *event* log

b) The *ESI Implementation* shall store *HAN events* in a separate *HAN event* log

c) The access and security *event* log shall be *stored* separately in the *meter* and cannot be overwritten by quality of supply *events* or *HAN events*

d) For each type of *meter event* it shall be possible to *record* settings specifying:

(i) If the *meter* should *store* the *event*

(ii) If the *meter* should immediately *report* the *event* to the *SMMS*

e) For each type of *HAN event* it shall be possible to record settings specifying:

(i) If the *ESI Implementation* should *store* the *event*

(ii) If the *ESI Implementation* should immediately report the *event* to the *SMMS*

f) Each of the *event* logs shall *store* the 100 most recent *events*

g) The *event* logs shall *store* the nature and time and date of all *events*

h) *Meter events stored* in the quality of supply *event* log are:

(i) *Meter loss of supply*

(ii) Power restoration

(iii) For three phase *meters*, *loss of supply to a phase* and the affected phase

(iv) For three phase *meters*, restoration of supply to a phase and the restored phase

(v) Under/over-*voltage event* start, and for three phase *meters*, the affected phases

(vi) Under/over-*voltage event* end and for three phase *meters* the phases that have returned to normal *voltage* levels. For an under *voltage event* the minimum *voltage measured* and for an over *voltage event* the maximum *voltage measured* during the *event*

(vii) The *supply contactor* status has changed state and the reason

(viii) The *CLC/R* have been changed by *priority override* command, under frequency event, demand limit event or that boost was activated or terminated

(ix) Customer supply (safety) monitoring has detected a possible fault at the *customer* premises

i) For *meter loss of supply* and under/over-*voltage events* the *meter* shall *store* one *meter event* at the start of the *event* and *store* another *meter event* at the end of the *event*.

j) *Meter events stored* in the access and security *event* log are:

(i) *Software* manipulation detected

(ii) *Meter* terminal cover or *meter* main cover opening detected

(iii) *Import energy* detected (If the *meter* is not configured to *store* the *imported active interval energy channel*);

(iv) *Accumulated energy values* have been reset to zero;

(v) *Meter* settings have been changed (indicating if changed *locally* or *remotely*);

(vi) *Meter clock* is adjusted by more than 20 seconds (with the amount of the adjustment);

(vii) Status of *software* upgrade (with completed or failed);

(viii) All *meter* error and *meter* warning flags

k) *HAN events stored* in the *HAN event* log are:

(i) *HAN device* has joined the *utility HAN*

(ii) *HAN device* has failed to join the *utility HAN*.

(iii) Message sent from the *SMMS* to a *registered HAN device* is (first) acknowledged by the *HAN device*

(iv) A message sent from the *SMMS* with the *customer* acknowledgement request flag enabled is (first) acknowledged by a *customer* (Refer Section 7.9.1.5 a) (iv))

(v) A message sent from the *SMMS* with the *HAN device* acknowledgement request flag enabled is (first) acknowledged by the *HAN device* (Refer Section 7.9.1.5 a) (v))

(vi) Start of customer override of load control schedule, including the specific *HAN device* identifier

(vii) End of customer override of load control schedule, including the specific *HAN device* identifier

(viii) Retail tariff information has been updated or changed in the *ESI Implementation*

(ix) *Priority override* acknowledged by a *HAN device* including the specific *HAN device* identifier

(x) Critical Peak Pricing message acknowledged by a *HAN device* including the specific *HAN device* identifier

(xi) Status of *ESI Implementation* software upgrade (with success or fail)

l) The *meter* and *ESI Implementation* shall provide sufficient information to allow the *SMI* to be able to detect when *meter events* or *HAN events stored* in an *event* log have been over written before being acquired by the *SMMS*

m) The *meter* and *ESI Implementation* shall *record* settings to *report* to the *SMMS* that each *event* log has reached a programmable number of *events* since the *event* log was last acquired by the *SMMS* (setting the value to zero will disable *reporting*).

7.10.1.1 Under voltage and over voltage events

a) The *meter* shall provide programmable settings to support under and over-*voltage events*. The settings shall allow:

(i) A reference *voltage* to be used for over and under *voltage event* triggering specified from 100 volts to 240 volts in 1 volt increments

(ii) The trigger value for an under-*voltage event* to be specified from: -5% to -20% in 1% steps from the reference *voltage*;

(iii) The trigger value for an over-*voltage event* to be specified from: +5% to +20% in 1% steps from the reference *voltage*;

(iv) The *voltage* must remain under/over the trigger value for the trigger time, M, before the *meter stores* the under/over-*voltage event* start. The setting of M shall be in the range of 1 second to 300 seconds in 1 second increments;

(v) The *hysteresis* setting associated with under and over *voltage event measurement* shall be programmable from 0% to 2% of the reference *voltage* in 0.5% increments;

b) For each under-*voltage meter event* the minimum *voltage* that occurred during the period of the *meter event* shall be *stored* within the operating *voltage* range of the *meter*;

c) For each over-*voltage meter event* the maximum *voltage* that occurred during the period of the *meter event* shall be *stored* within the operating *voltage* range of the *meter*

7.10.2 Smart Metering Infrastructure Performance Levels

7.10.2.1 Urban Performance Level

7.10.2.1.1 Reporting of Events

a) *Events* programmed to *report* shall be detected by the *SMMS* for:

   (i) 95% of *meters* within 10 minutes

b) The *SMI performance level* shall be tested by generating *reported events* at a total of 0.5% (5,000 mpM) of the number of operational *SMI meters* in a *distribution network area*. *Reportable events* shall be uniformly distributed across both time and the deployed *SMCN* collection points.

c) Notes:

   (i) *Meters* are only required to *report events* for which *meter event* log settings specify *reporting*.

   (ii) The *SMI performance levels* for *meter loss of supply* and Power Restore *event reporting* are presented separately in Section 7.11.2.

7.11 Meter Loss of Supply detection

7.11.1 Requirements

a) *Meter loss of supply* shall be detected and *stored* in the *meter*.

b) When a *meter loss of supply event* is *stored* and *meter* quality of supply settings indicate that the *event* should be *reported* to the *SMI* it shall be *reported* as soon as possible. This *SMI* capability is intended for the *reporting* of small scale outages. In a large scale outage it does not require all *meters* to successfully *report meter loss of supply.*

c) During *meter loss of supply*, all programmable settings (listed in Appendix B), the *meter clock*, *energy data*, and *meter event* logs will be preserved, such that upon subsequent power restoration, the *meter* and *SMI* resume proper operation.

7.11.2 Smart Metering Infrastructure Performance Levels

7.11.2.1 Urban Performance Level

7.11.2.1.1 Reporting

a) Power restoration shall be detected by the *SMMS* for

   (i) 90% of *meters* within 1 hour

b) The number of *meters* reporting a power restoration *event* can be up to 2% (20,000 mpM) of the operational *SMI meter* population in *a distribution network area* in a 24 hour period

c) Note: No *SMI performance level* is prescribed for *reporting meter loss of supply*

7.12 Remote Meter Service Checking

7.12.1 Requirements

a) The *smart metering infrastructure* shall support remote meter service checking of the presence of *supply* to a *meter*

b) The *SMI* shall be able to *remotely* determine

(i) For the *supply contactor* (where fitted)

(a) The status of the *supply contactor* as on, off, monitor supply, exceeded supply capacity or armed

(b) When in the exceeded supply capacity state, the *SMI* shall be able to determine the remaining time before the *supply contactor* will automatically switch to the on state (closed position)

(ii) The status of all *CLC/R* (where fitted) as on or off

(iii) Instantaneous *voltage* at the *meter* (For three phase *meters*: the per phase *voltage measurement*)

(iv) The *total net active power* with an indication if *imported* or *exported*

(a) For single phase two element *meters*: the per element *active power* indicating if *imported* or *exported*

(v) *HAN* status from the *ESI Implementation*, including measures of link quality at *HAN devices* and the last date and *time* that *HAN devices* where seen on the *utility HAN*

7.12.2 Smart Metering Infrastructure Performance Levels

7.12.2.1 Urban Performance Level

7.12.2.1.1 Individual Meters

a) Remote meter service checking shall obtain service data from

(i) 95% of *meters* within 5 minutes

(ii) 99% of *meters* within 10 minutes

b) The *SMI performance level* shall be tested by performing remote meter service checks at 2% (20,000 mpM) of the number of operational *SMI meters* in a *distribution network area*. This will be tested over an 8 hour period, with the service check commands uniformly distributed across both time and the deployed *SMCN* collection points. The test can be conducted once in any 24 hour period.

7.13 Meter Settings Reconfiguration

7.13.1 Requirements

a) A *meter* shall support all *meter* settings as defined in Appendix B of this specification.

b) The *meter* shall support *local* and *remote meter* settings reconfiguration.

c) The *meter* shall *store* an event in the access and security *event* log when *meter* settings are configured or reconfigured.

d) The configuration or reconfiguration of a *meter* setting shall not diminish the integrity of the *energy data stored* and *recorded* within the *SMI*.

e) The *SMI* shall support an effective date and *time* for all *meter* settings reconfiguration. The effective date and *time* shall allow *meter* settings to be reconfigured in advance, only taking effect when the *meter time* exceeds the specified date and *time*. It shall also be possible to specify that the *meter* settings take effect immediately.

   (i) The effective *time* shall allow the *time* to be set in whole hours.

   (ii) A separate effective date and *time* shall be supported for settings associated with each function detailed in this functionality specification.

   (iii) If a new effective date and *time* is specified for a setting it will overwrite the previous setting (note: if the *meter time* has not exceeded the specified date and *time* the previous setting will not take effect).

   (iv) When *meter* settings are changed using an effective date, an entry shall be *stored* in the *meter's* access and security *event* log.

7.13.2 Smart Metering Infrastructure Performance Levels

7.13.2.1 Urban Performance Level

7.13.2.1.1 Individual Meters

a) Requested configuration or reconfiguration of a *meter* setting at an individual *meter* shall be acknowledged by

   (i) 95% of *meters* within 30 minutes

   (ii) 99% of *meters* within 1 hour

b) The *SMI performance level* shall be tested by performing meter settings reconfiguration at 15% (150,000 mpM) of the number of operational *SMI meters* in a *distribution network area*. This will be tested over a 16 hour period, with the meter settings reconfigurations being uniformly distributed across both time and the deployed *SMCN* collection points. The test can be conducted once in any 24 hour period.

7.14 Software upgrades

7.14.1 Requirements

a) The *smart metering infrastructure* and *meter* shall support *local* and *remote software* upgrades.

b) It shall be possible to upgrade *meter software* without impacting metrology functionality of the *meter* (e.g. the *storing* of *interval energy data*). The *meter* may have a short interruption when the *software* is loaded but this outage shall be no longer than initial start-up of the *meter as* specified in AS62053.21-2005 Section 8.3.1

c) A *software* upgrade must not diminish the integrity of *energy data* held within the *SMI*

d) During and after a *software* upgrade the *meter*, *SMCN* and *HAN* will continue to operate normally.

e) The *SMCN* and *meter's ESI* shall support *local* and *remote software* upgrades.

f) It must be possible to *locally* and *remotely* determine the version of *software* running in the *meter*, *SMCN* and *ESI Implementation*.

g) The authenticity and validity of all *software* upgrades must be ensured before being loaded.

h) All devices used in the *smart metering infrastructure* shall validate the authenticity of all *software* before running the *software*.

i) All attempts to upgrade *meter software* shall be *stored* in the *meter's* access and security *event* log with a success or fail status.

7.14.2 Smart Metering Infrastructure Performance Levels

7.14.2.1 Urban Performance Level

7.14.2.1.1 Pre-defined Meter Groups

a) A *software* upgrade will be successfully completed by 99.9% of *SMI* components within 7 days.

b) The *SMI* shall support one *software* upgrade in any 7 *day* period.

c) The *SMMS* may not get an immediate acknowledgement, however on retrieval of *event* logs it will be possible to determine the success rate for *software* upgrade at *meters*

7.14.2.1.2 Individual Meters

a) *Software* upgrade shall be successfully completed and acknowledged by 99.9% of *SMI* components within 2 *days*

b) The *SMI performance level* shall be tested by performing a *software* upgrade at 2% (20,000mpM) of the *SMI* components as a percentage of the number of operational *SMI meters* in a *distribution network area*. This will be tested over a 48 hour period, with the sending of *software* upgrades being uniformly distributed across both *time* and the deployed *SMCN* collection points.

7.15 Plug and Play Device commissioning

7.15.1 Requirements

a) When *installed* the *meter* shall *report* to the *SMMS*

b) The *SMI* shall support a means of adding the *meter* details to the *SMMS* so that once the *meter reports* it has been *installed* the *meter* will commence proper operation without further *local* intervention

7.15.2 Smart Metering Infrastructure Performance Levels

There are no *SMI performance levels* for plug and play device commissioning.

7.16 Communications and Data Security

7.16.1 Requirements

a) The SMI shall ensure that all communications performed both *locally* and *remotely* with the *meter,* occurs in a *secure* manner

b) *SMI* communications and data security shall be addressed using a risk based approach.

c) During the planning process for the procurement, deployment and maintenance of *smart metering infrastructure* a comprehensive risk assessment shall be completed. The assessment shall be conducted in accordance with AS31000, AS27001 and AS27002. It is recommended that the risk assessment should address the vulnerabilities listed in the current version of the United States document Advanced Metering Infrastructure System Security Requirements (AMI-SEC) and/or other Advanced Metering Infrastructure risk assessment frameworks;

d) The communications and data security risk assessment shall include considerations of possible vulnerabilities of the *meter*;

e) The risk assessment shall set target levels. Reasonable steps shall be taken to materially address identified risks to the specified target levels.

f) The risk assessment shall be reviewed appropriately, considering the time since the last assessment and any significant changes in the environment. The review shall include an assessment of any gaps between the desired target level and the current implementation

g) The risk assessment shall be conducted in addition to any jurisdictional legislation covering protection of critical infrastructure and personal privacy

7.16.2 Smart Metering Infrastructure Performance Levels

There are no *SMI performance levels* for communications and data security.

7.17 Tamper Detection

7.17.1 Requirements

a) A *meter* and the *smart metering infrastructure* shall be capable of detecting and *storing tamper* of the *smart meter infrastructure*;

b) The *meter* shall detect the following possible violations:

(i) Any opening of the *meter* terminal cover or *meter* main cover

(ii) Any *software* manipulation

c) When a *tamper* is detected by the *meter* an *event* shall be *stored* in the access and security *event* log*;*

d) Where *tamper* is detected by the *SMI* it shall be *reported* to the *SMMS.*

7.17.2 Smart Metering Infrastructure Performance Levels

Performance levels for tamper detection are described under quality of supply & other event recording (section 7.10.2).

7.18 Interoperability for Meters/Devices at Application Layer

7.18.1 Requirements

This is a placeholder allowing the specification of a single standard providing interoperability for *meters* and devices at the application layer when a standard meeting the functionality outlined in this specification becomes available.

7.18.2 Smart Metering Infrastructure Performance Levels

There are no *SMI performance levels* for interoperability for *meters*/devices at application layer.

7.19 Hardware Component Interoperability

7.19.1 Requirements

This is a placeholder allowing the specification of a single standard providing interoperability for hardware components when a standard providing the functionality outlined in this specification becomes available.

7.19.2 Smart Metering Infrastructure Performance Levels

There are no *SMI performance levels* for hardware component interoperability.

7.20 Meter Communications: Issuing Messages and Commands

7.20.1 Requirements

a) The *SMI* shall have the capability to send *instructions* to an individual *meter,* groups of *meters* or *HAN devices*

b) The *SMI* shall support the ability to assign three priority levels to *instructions* sent to *meters* and *HAN devices*

c) The *SMI* shall have the ability to queue *instructions* received by the *SMMS*. The queue shall process high priority *instructions* before *instructions* with lower priority. For *instructions* with the same priority the *instructions* will be processed in the order that they were received (that is first in, first out).

7.20.2 Smart Metering Infrastructure Performance Levels

SMI performance levels for commands are defined in the following sections of this document:

The functions supporting Group commands are:

- *Priority override* command (section 7.6.2)
- Emergency supply capacity limit command (section 7.7.2)
- *Priority override* command to *HAN devices* (section 7.9.2)

7.21 Customer Supply (Safety) Monitoring

7.21.1 Requirements

This is a placeholder allowing the Pilots and Trials to validate the costs and benefits of this functionality.

a) The *meter* shall support an option to enable the detection of:

   (i) Reverse polarity from the *distribution network* to the *customer's* premises

   (ii) Degradation of the neutral connection from the *distribution network* to the *customer's* premises and

   (iii) Degradation of the earth connection at the *customer's* premises

b) When one of these conditions is detected an *event* shall be *stored* in the quality of supply *event* log*;*

7.21.2 Smart Metering Infrastructure Performance Levels

SMI performance levels for customer supply (safety) monitoring are described under quality of supply & other event recording (section 7.10.2)

Appendix A. Glossary

Accumulated energy data

Accumulated energy data means one or more *accumulated energy values.*

Accumulated energy value

Accumulated energy value means the value resulting from the *measurement* representing a flow of *energy* at a *metering point*.

Active Energy

Active Energy means a *measure* of electrical *energy* flow, being the time integral of the product of *voltage* and the in-phase component of current flow across a *connection point*[13], expressed in watt hour (Wh).

Active Power

Active Power means the rate at which *active energy* is transferred expressed in watts (W).

Australian Eastern Standard Time (AEST)

AEST means the *time* at the 150th meridian of longitude east of Greenwich in England.

Australian Standard (AS)

Australian Standard means the most recent edition of a standard publication by Standards Australia (Standards Association of Australia).

authorised party

authorised party means as per the relevant National Electricity Market (NEM) Procedure or applicable regulatory instruments, the authorised party is the role within the NEM identified as having the right to request and/or receive transactions relating to the *SMI*.

clear command

clear command means a command sent to *registered HAN devices* requesting them to delete stored messages, tariffs and historical consumption data.

commencement date

commencement date means a date set to ensure that *HAN Devices* cannot access historical data stored in *meters* or the *ESI* before the specified date.

connection point[14]

connection point means the agreed point of *supply* established between *Distribution Network Service Provider* and a *customer*.

controlled load contactor (CLC)

controlled load contactor means an electrically controlled switch used to control power to a device or devices in the *customer's* premises. Throughout this specification functionality associated with the *controlled load contactor* is also supported on the load control relays.

[13] In the context of this specification *connection point* should be interpreted as *metering point.* (see footnote 14)
[14] The SMI F.S. is using the NER Chapter 10 definition of *connection point*. It is noted that a *connection point* may consist of multiple meters, as such in the context of this specification *connection point* should be read as *metering point*

controlled load contactor and/or relay (CLC/R)

CLC/R refers to the *controlled load contactor* and/or *relay(s)*. Throughout this specification functionality associated with the *controlled load contactor* is also supported by (load control) *relays*.

Current Transformer (CT)

Current transformer means a transformer for use with meters in which the current in the secondary winding is, within prescribed error limits, proportional to and in phase with the current in the primary winding.

CT connected meter

CT connected meter means a *meter* for which the *customer* load is *measured* using a *current transformer*

customer

customer means an end-use retail *energy customer* at a *metering point* that may consume and/or generate electricity

data mirroring

data mirroring means retaining information in the *ESI* from battery powered devices. This functionality is provided to enable battery powered devices to increase the battery life.

day

day means the 24 hour period beginning and ending at midnight *Australian Eastern Standard Time* (*AEST*).

Day Type

Day Type means a classification enabling a *day* to be treated differently, for example *Day Type* 1 might be used to identify a work day while *Day Type* 2 identifies weekends (used in load control schedules section 7.6.1 and 7.9.1.3).

distribution network area

distribution network area means d*istribution network service provider's distribution system* under the rules

Distribution Network Service Provider

Distribution Network Service Provider means a person who engages in the activity of owning, controlling or operating a *distribution system.*

distribution system

distribution system means a distribution network, together with the connection assets associated with the distribution network, which is connected to another transmission or distribution system.

download

download means to extract data from a *meter* to the *SMMS*.

energy

energy means a *supply* or source of electrical power *measured* over time leading to *active* and/or *reactive energy.*

energy data

energy data means *interval energy data* and *accumulated energy data*.

Energy Services Interface (ESI)

Energy Services Interface means a secure interface to a premises communications network which facilitates relevant *energy* applications (e.g. *remote* load control, demand response, monitoring and control of Distributed Generation, in-premises display of *customer* usage, reading of *energy* and non-*energy* meters, Plug-in Electric Vehicle charging and roaming coordination, and integration with energy management systems, etc.), provides auditing / logging functions that record transactions to and from *HAN devices*, and, often, coordination functions that enable secure transactions between the *HAN devices* commissioned and *registered* on its network and enrolled in a program offered by an *authorised party*. Note: There may be more than one *ESI* in a premises or more than one *ESI* in a *HAN device*

ESI Implementation

ESI Implementation means the physical implementation of the *ESI* in accordance with the specification in this document. It includes all the functionality of the *ESI* (as described in the ZigBee Smart Energy Profile Application Layer) and additional functionality requirements, including transmit power, receive sensitivity and storage requirements for some items.

event

event means something of significance has occurred

export

export means the delivery of *energy* from the National Electricity Market Pool to a *customer*.

Home Area Network (HAN)

Home Area Network means a Local Area Network (LAN) established within the *customer* premises.

HAN device

HAN device means equipment fitted with a communications modem capable of communicating with the *HAN*.

HAN event

HAN event means an *event* which can be selected to be *stored* in the *HAN event* log (refer to Section 7.10.1)

HAN interface

HAN interface means an interface supporting communications between the *meter* and *HAN Devices*.

hysteresis

hysteresis is used in this specification to mean a *voltage* offset from the trigger value that reduces retriggering of the quality of supply *event* when the mains *voltage* is close to the set *voltage* trigger.

import

import means the delivery of *energy* from a *customer* into the National Electricity Market Pool.

installed

installed means the *meter* will be mounted at the *metering point*, tested and certified in accordance with the National Electricity Rules, any jurisdictional and technical requirements.

instruction

instruction means either a message or a command sent to a *meter* or *HAN devices*

interface standard

interface standard means a non-proprietary standard that describes one or more functional and/or physical characteristics necessary to allow the exchange of information between two or more (usually different) systems or pieces of equipment.

interval energy channel

interval energy channel means a series of *interval energy values measured* and *stored* over consecutive *trading intervals* or sub-multiples of a *trading interval.*

interval energy data

interval energy data means the *interval energy channels stored* by a *meter.*

interval energy value

interval energy value means the value resulting from the *measurement* representing a flow of *energy* at a *metering point* over a *trading interval* or are sub-multiples of a *trading interval.*

load control scheme

load control scheme means a sequence of load control switch *instructions* capable of switching the *controlled load contactor* or relay(s) at specified times during the day.

load cycling

load cycling means a repetitive sequence of turn off and turn on durations (as specified in Section 7.6.1.1.3)

load switch action

load switch action means an instruction to be performed by the *controlled load contactor* integrated into the *meter* (as specified in Section 7.6.1.1.1).

local

local means operations performed locally at the *meter* and not performed using the *SMCN*.

local time

local time means the time and date that a *customer* would refer to. Local time and date is obtained when the *ESI* applies a programmable offset from the *meter time* and date.

loss of supply to a phase

loss of supply to a phase means the *voltage* on a phase falls below that specified at the lower end of the extended operating range as detailed in AS62056.11.

measure

measure means the process of obtaining the magnitude of a quantity

measurement element

measurement element means the basic device used to *measure* electrical *energy* in a *meter*

measurement period

measurement period means the time period over which the *measurement* will be undertaken.

meter

meter means a device complying with *Australian Standards* which *measures* and *records* the flow of electrical *energy*.

meter clock

meter clock means a device that keeps track of the current *time* and date. In the *meter* it refers to a device that will maintain the *time* and date in the absence of mains power.

meter event

meter event means an *event* which can be selected to be *stored* in the *meter event* logs (refer to Section 7.10.1)

meter loss of supply

meter loss of supply means

- For single phase meters: the *voltage* falls below that specified at the lower end of extended operating range as detailed in AS62056.11.
- For three phase meters: the *voltage* on all phases falls below that specified at the lower end of the extended operating range as detailed in AS62056.11.

metering data

metering data means the data obtained from a *metering installation*, the processed data or substituted data.

metering installation

metering installation means the assembly of components and/or processes that are controlled for the purpose of metrology and which lie between the *metering point(s)* or non-*metered connection point* and the point of connection to the tele*communications network*. The assembly of components may include the combination of several *metering points* to derive the *metering data* for a *connection point*. The *metering installation* must be classified as a revenue *metering installation* and/or a check *metering installation*.

metering point

metering point means the point of physical connection of the device *measuring* the electrical power in the power conductor.

Priority Override

Priority Override describes a separate command sent to *CLC/Rs* contained in the *meter* (refer to section 7.6.1.3.2) and to *HAN devices* (refer to section 7.9.1.3.3)***.***

reactive energy

reactive energy means a *measure* in var hours (varh) of the alternating exchange of stored *energy* in inductors and capacitors, which is the *time*-integral of the product of *voltage* and the out-of-phase component of current flow across a *connection point*[15].

record

record means to capture the value. For values which are *recorded* it is only possible to obtain a single value (see *stored* when multiple values must be retained)

registered

registered refers to a *HAN device* which has successfully performed *registration*

[15] In the context of this specification *connection point* should be interpreted as *metering point.* (see footnote 14 for more details)

registration

registration means the process by which a *HAN Device* is authorized to communicate on a logical network. This involves the exchange of security credentials with an *ESI*. The *registration* process is required for the exchange of secure information between a *registered* device and the *ESI* and among other *HAN devices registered* to that *ESI*.

relay

relay means an electrically controlled switch within a *meter*, that is used to break or restore continuity in a circuit allowing the control of a device.

report

report means to send a message that informs the receiving party of an *event*.

remote

Remote means operations performed using the *SMCN* to access the *meter* or data held in the *meter*.

request

request means the process by which commands are sent to the *meter* by the *SMMS*.

secure

secure means in a manner that prevents an unauthorised access to or interference with the operation of the *SMI*.

smart meter

smart meter means a device complying with *Australian Standards* which *measures* and *records* the production and/or consumption of electrical *energy* and also conforms to the minimum functionality requirements set out in this document.

Smart Meter Communications Network (SMCN)

SMCN means all communications equipment, processes and arrangements that enable *remote* communications between the *meter* and the *SMMS.*

SMI (Smart Metering Infrastructure)

SMI means the infrastructure consisting of *smart meters, SMCN, SMMS* and *HAN* that conforms to the relevant minimum functionality set out in this document.

Smart Meter Infrastructure performance level

Smart Meter Infrastructure performance level means the minimum performance in terms of quantity, quality and *time* required for a function to be performed by the *SMI*. (Note: the *SMI performance level* shall be measured over the *time* period specified in the *SMI performance level*[16].

Smart Meter Management System (SMMS)

Smart Meter Management System means the component of an *SMI system* that allows commands and messages to be exchanged with the *smart meter* via the *SMCN*.

[16] A *SMI performance level* can pertain to an individual *smart metering* installation or to the performance of the *smart metering infrastructure* for a population of *smart meters*. The time is *measured* from the *smart meter management system* to the *smart meter*.

special meter read

special meter read means an actual *meter* reading performed outside of the usual reading cycle for the *meter*.

software

software means both *software* and firmware (*software* embedded in the device) contained in components of the *SMI*.

store

store means retain the value with the ability to determine the date and *time* associated with the value (for example *interval energy values* are *stored*).

supply

supply means the delivery of electricity.

supply contactor

supply contactor means an electrically controlled switch that enables the *supply* to be turned off or turned on.

tamper

tamper means an unauthorised attempt to interfere with, or a successful interference with components of the *SMI.*

time

time means *AEST* or *UTC*, as required by the National Measurement Act (1960) of the Commonwealth.

total exported active energy

total exported active energy means the sum across all *measurement elements* of electrical *energy* delivered from the National Electricity Market Pool to a *customer*, expressed in watt hour (Wh).

Example:

For a single phase two element *meter* with a constant load of 3.5 kW exported on element 1 and 1.5 kW imported on element 2, the value of *total exported active energy* over a 60 minute *measurement period* would be 2 kWh exported.

total imported active energy

total imported active energy means the sum across all *measurement elements* of electrical *energy* delivered from a *customer* into the National Electricity Market Pool, expressed in watt hour (Wh).

total net active power

total net active power means the rate at which *active energy* summed across all *measurement elements* in the *meter* is transferred.

trading interval

trading interval means a 30 minute period ending on the hour (*AEST*) or on the half hour as defined by the *meter clock* and means the 30 minute period ending at that *time*.

transmission

transmission means to send a signal. In the context of the *HAN* transmissions are sent by radio or power-line.

UTC

UTC refers to co-ordinated universal time.

utility HAN

utility HAN refers to to the *HAN* containing the utility *ESI* and the *HAN devices registered* on that *ESI.*

visible display

visible display means to provide a visual representation of the information available from the *meter* (including *accumulated energy values* and *active power* values)

voltage

voltage means the electronic force or electric potential between two points that gives rise to the flow of electricity.

whole current meter

whole current meter means a meter for which the *customer* load passes directly through the *meter* (also referred to in other documents as a direct connect *meter*).

Appendix B. List of Meter Parameter Settings

Setting	Available Values	Section
Store Total Exported Active Energy	Enabled or Disabled	7.1.1 d) (v)
Store Total Imported Active Energy	Enabled or Disabled	7.1.1 d) (v)
Store Total Exported Reactive Energy	Enabled or Disabled	7.1.1 d) (v)
Store Total Imported Reactive Energy	Enabled or Disabled	7.1.1 d) (v)
Store Element 1 Exported Active Energy	Enabled or Disabled (Single Phase Two Element meters only)	7.1.1 d) (v)
Store Element 1 Imported Active Energy	Enabled or Disabled (Single Phase Two Element meters only)	7.1.1 d) (v)
Store Element 2 Exported Active Energy	Enabled or Disabled (Single Phase Two Element meters only)	7.1.1 d) (v)
Store Element 2 Imported Active Energy	Enabled or Disabled (Single Phase Two Element meters only)	7.1.1 d) (v)
Controlled Load Contactor Day Type 1 Default Load Control Schedule	10 times (in hours and minutes) with corresponding meter switch action	7.6.1.2 b)
Controlled Load Contactor Day Type 2 Default Load Control Schedule	10 times (in hours and minutes) with corresponding meter switch action	7.6.1.2 b)
Controlled Load Contactor Day of Week Day Type	For each of the 7 Day of Week values specifies either the Day Type 1 or Day Type 2 Default Load Control Schedule	7.6.1.2 c)
Controlled Load Contractor Dates to run Special Day Load Control Schedule	Twelve Dates to run Special Day Load Control Schedule	7.6.1.3.1 a) (i)
Controlled Load Contactor Special Day Load Control Schedule	10 times (in hours and minutes) with corresponding meter switch action	7.6.1.3.1 a) (ii)
Controlled Load Contactor Switch Time Randomisation – Minimum Delay Time	0 to 720 minutes in 1 minute increments	7.6.1.1.2 a) (i) (a)
Controlled Load Contactor Switch Time Randomisation – Maximum Delay Time	0 to 720 minutes in 1 minute increments	7.6.1.1.2 a) (i) (b)
Controlled Load Contactor Load Control Cycling Program – Time Delay before starting cycling	0 to 120 minutes in 1 minute increments	7.6.1.1.3 a) (i) (a)
Controlled Load Contactor Load Control Cycling Program - Cycle On Time	0 to 120 minutes in 1 minute increments	7.6.1.1.3 a) (ii) (a)

Setting	Available Values	Section
Controlled Load Contactor Load Control Cycling Program – Cycle Off Time	0 to 120 minutes in 1 minute increments	7.6.1.1.3 a) (ii) (b)
Controlled Load Contactor Load Contactor – Meter Loss of Supply switching	Enabled or Disabled	7.6.1.4.1 a) (i) (a)
Controlled Load Contactor Load Contactor – Meter Loss of Supply position during power outage	Turned on or Turned off	7.6.1.4.1 a) (i) (b)
Controlled Load Contactor Load Control Demand Limit	Enabled or Disabled	7.6.1.4.3 a) (i) (a)
Controlled Load Contactor Load Control Demand Limit Monitoring Start Time	Time of Day	7.6.1.4.3 a) (i) (b)
Controlled Load Contactor Load Control Demand Limit Duration	5 to 1440 minutes (24 hours) in increments of 5 minutes	7.6.1.4.3 a) (i) (c)
Controlled Load Contactor Load Control Demand Limit Measurement Interval	1 to 60 minutes in 1 minute increments	7.6.1.4.3 a) (i) (e)
Controlled Load Contactor Load Control Demand Limit Exported Average Active Demand Trigger value	0.1 to 99 kWh in 0.1 kWh increments	7.6.1.4.3 a) (i) (d)
Controlled Load Contactor Load Control Demand Limit Load contactor position during event	Turned on or turned off	7.6.1.4.3 a) (i) (f)
Controlled Load Contactor Load Control Demand Limit Enable Demand Limit when Emergency Supply Capacity Limit enabled	Enabled or Disabled When Enabled the Demand Limit will be automatically initiated when the Emergency Supply Capacity Limit is initiated	7.6.1.4.3 a) (i) (g)
Controlled Load Contactor Load Control Under Frequency	Enabled or Disabled	7.6.1.4.2 a) (i) (a)
Controlled Load Contactor Load Control Under Frequency Measurement Period	5 seconds to 60 seconds in 5 second increments	7.6.1.4.2 a) (i) (c)
Controlled Load Contactor Load Control Under Frequency Frequency Threshold	48 Hz to 50 Hz in 0.1 Hz increments	7.6.1.4.2 a) (i) (b)
Controlled Load Contactor Load Control Under Frequency Restore Measurement Period	1 to 60 minutes in 1 minute increments	7.6.1.4.2 a) (i) (d)

Setting	Available Values	Section
Controlled Load Contactor Load Control Under Frequency Load contactor position during under frequency event	Turned on or turned off	7.6.1.4.2 a) (i) (e)
Controlled Load Contactor Boost Button	Enabled or Disabled	7.6.1.5 b) (i)
Controlled Load Contactor Boost Operation Time	From 1 to 6 hours in ½ hour increments	7.6.1.5 b) (ii)
Controlled Load Contactor Position during Boost	Turned on or Turned off	7.6.1.5 b) (iii)
Controlled Load Contactor Customer termination of boost	Enabled or Disabled	7.6.1.5 b) (iv)
Controlled Load Contactor Boost Primacy	Enabled or Disabled	7.6.1.5 e)
Controlled Load Contactor Boost Disabled when Emergency Supply Capacity Control is enabled	Enabled or Disabled	7.6.1.5 f)
Relay 1 Day Type 1 Default Load Control Schedule	10 times (in hours and minutes) with corresponding meter switch action	7.6.1.2 b)
Relay 1 Day Type 2 Default Load Control Schedule	10 times (in hours and minutes) with corresponding meter switch action	7.6.1.2 b)
Relay 1 Day of Week Day Type	For each of the 7 Day of Week values specifies either the Day Type 1 or Day Type 2 Default Load Control Schedule	7.6.1.2 c)
Relay 1 Dates to run Special Day Load Control Schedule	Twelve Dates to run Special Day Load Control Schedule	7.6.1.3.1 a) (i)
Relay 1 Special Day Load Control Schedule	10 times (in hours and minutes) with corresponding meter switch action	7.6.1.3.1 a) (ii)
Relay 1 Switch Time Randomisation – Minimum Delay Time	0 to 720 minutes in 1 minute increments	7.6.1.1.2 a) (i) (a)
Relay 1 Switch Time Randomisation – Maximum Delay Time	0 to 720 minutes in 1 minute increments	7.6.1.1.2 a) (i) (b)
Relay 1 Load Contactor – Meter Loss of Supply switching	Enabled or Disabled	7.6.1.1.3 a) (i) (a)
Relay 1 Load Contactor – Meter Loss of Supply position during power outage	Turned on or Turned off	7.6.1.1.3 a) (ii) (a)

Setting	Available Values	Section
Relay 1 Load Control Cycling Program – Time Delay before starting cycling	0 to 120 minutes in 1 minute increments	7.6.1.1.3 a) (ii) (b)
Relay 1 Load Control Cycling Program - Cycle On Time	0 to 120 minutes in 1 minute increments	7.6.1.4.1 a) (i) (a)
Relay 1 Load Control Cycling Program – Cycle Off Time	0 to 120 minutes in 1 minute increments	7.6.1.4.1 a) (i) (b)
Relay 1 Load Control Demand Limit	Enabled or Disabled	7.6.1.4.3 a) (i) (a)
Relay 1 Load Control Demand Limit Monitoring Start Time	Time of Day	7.6.1.4.3 a) (i) (b)
Relay 1 Load Control Demand Limit Monitoring End Time	Time of Day	7.6.1.4.3 a) (i) (c)
Relay 1 Load Control Demand Limit Measurement Interval	1 to 30 minutes in 1 minute increments	7.6.1.4.3 a) (i) (e)
Relay 1 Load Control Demand Limit Exported Average Active Demand Trigger value	0.1 to 99 kWh in 0.1 kWh increments	7.6.1.4.3 a) (i) (d)
Relay 1 Load Control Demand Limit Load contactor position during event	Turned on or turned off	7.6.1.4.3 a) (i) (f)
Relay 1 Load Control Demand Limit Enable Demand Limit when Emergency Supply Capacity Limit enabled	Enabled or Disabled When Enabled the Demand Limit will be automatically initiated when the Emergency Supply Capacity Limit is initiated	7.6.1.4.3 a) (i) (g)
Relay 1 Load Control Under Frequency	Enabled or Disabled	7.6.1.4.2 a) (i) (a)
Relay 1 Load Control Under Frequency Measurement Period	5 seconds to 60 seconds in 5 second increments	7.6.1.4.2 a) (i) (c)
Relay 1 Load Control Under Frequency Frequency Threshold	48 Hz to 50 Hz in 0.1 Hz increments	7.6.1.4.2 a) (i) (b)
Relay 1 Load Control Under Frequency Restore Measurement Period	1 to 60 minutes in 1 minute increments	7.6.1.4.2 a) (i) (d)

Setting	Available Values	Section
Relay 1 Load Control Under Frequency Load contactor position during under frequency event	Turned on or turned off	7.6.1.4.2 a) (i) (e)
Relay 1 Boost Button	Enabled or Disabled	7.6.1.5 b) (i)
Relay 1 Boost Operation Time	From 1 to 6 hours in ½ hour increments	7.6.1.5 b) (ii)
Relay 1 Position during Boost	Turned on or Turned off	7.6.1.5 b) (iii)
Relay 1 Customer termination of boost	Enabled or Disabled	7.6.1.5 b) (iv)
Relay 1 Boost Primacy	Enabled or Disabled	7.6.1.5 e)
Relay 1 Boost Disabled when Emergency Supply Capacity Control is enabled	Enabled or Disabled	7.6.1.5 f)
Relay 2 (3 phase only) Day Type 1 Default Load Control Schedule	10 times (in hours and minutes) with corresponding meter switch action	7.6.1.2 b)
Relay 2 (3 phase only) Day Type 2 Default Load Control Schedule	10 times (in hours and minutes) with corresponding meter switch action	7.6.1.2 b)
Relay 2 (3 phase only) Day of Week Day Type	For each of the 7 Day of Week values specifies either the Day Type 1 or Day Type 2 Default Load Control Schedule	7.6.1.2 c)
Relay 2 (3 phase only) Dates to run Special Day Load Control Schedule	Twelve Dates to run Special Day Load Control Schedule	7.6.1.3.1 a) (i)
Relay 2 (3 phase only) Special Day Load Control Schedule	10 times (in hours and minutes) with corresponding meter switch action	7.6.1.3.1 a) (ii)
Relay 2 (3 phase only) Switch Time Randomisation – Minimum Delay Time	0 to 720 minutes in 1 minute increments	7.6.1.1.2 a) (i) (a)
Relay 2 (3 phase only) Switch Time Randomisation – Maximum Delay Time	0 to 720 minutes in 1 minute increments	7.6.1.1.2 a) (i) (b)
Relay 2 (3 phase only) Load Contactor – Meter Loss of Supply switching	Enabled or Disabled	7.6.1.1.3 a) (i) (a)
Relay 2 (3 phase only) Load Contactor – Meter Loss of Supply position during power outage	Turned on or Turned off	7.6.1.1.3 a) (ii) (a)

Setting	Available Values	Section
Relay 2 (3 phase only) Load Control Cycling Program – Time Delay before starting cycling	0 to 120 minutes in 1 minute increments	7.6.1.1.3 a) (ii) (b)
Relay 2 (3 phase only) Load Control Cycling Program - Cycle On Time	0 to 120 minutes in 1 minute increments	7.6.1.4.1 a) (i) (a)
Relay 2 (3 phase only) Load Control Cycling Program – Cycle Off Time	0 to 120 minutes in 1 minute increments	7.6.1.4.1 a) (i) (b)
Relay 2 (3 phase only) Load Control Demand Limit	Enabled or Disabled	7.6.1.4.3 a) (i) (a)
Relay 2 (3 phase only) Load Control Demand Limit Monitoring Start Time	Time of Day	7.6.1.4.3 a) (i) (b)
Relay 2 (3 phase only) Load Control Demand Limit Monitoring End Time	Time of Day	7.6.1.4.3 a) (i) (c)
Relay 2 (3 phase only) Load Control Demand Limit Measurement Interval	1 to 30 minutes in 1 minute increments	7.6.1.4.3 a) (i) (e)
Relay 2 (3 phase only) Load Control Demand Limit Exported Average Active Demand Trigger value	0.1 to 99 kWh in 0.1 kWh increments	7.6.1.4.3 a) (i) (d)
Relay 2 (3 phase only) Load Control Demand Limit Load contactor position during event	Turned on or turned off	7.6.1.4.3 a) (i) (f)
Relay 2 (3 phase only) Load Control Demand Limit Enable Demand Limit when Emergency Supply Capacity Limit enabled	Enabled or Disabled When Enabled the Demand Limit will be automatically initiated when the Emergency Supply Capacity Limit is initiated	7.6.1.4.3 a) (i) (g)
Relay 2 (3 phase only) Load Control Under Frequency	Enabled or Disabled	7.6.1.4.2 a) (i) (a)
Relay 2 (3 phase only) Load Control Under Frequency Measurement Period	5 seconds to 60 seconds in 5 second increments	7.6.1.4.2 a) (i) (c)
Relay 2 (3 phase only) Load Control Under Frequency Frequency Threshold	48 Hz to 50 Hz in 0.1 Hz increments	7.6.1.4.2 a) (i) (b)
Relay 2 (3 phase only) Load Control Under Frequency Restore Measurement Period	1 to 60 minutes in 1 minute increments	7.6.1.4.2 a) (i) (d)

Setting	Available Values	Section
Relay 2 (3 phase only) Load Control Under Frequency Load contactor position during under frequency event	Turned on or turned off	7.6.1.4.2 a) (i) (e)
Relay 2 (3 phase only) Boost Button	Enabled or Disabled	7.6.1.5 b) (i)
Relay 2 (3 phase only) Boost Operation Time	From 1 to 6 hours in ½ hour increments	7.6.1.5 b) (ii)
Relay 2 (3 phase only) Position during Boost	Turned on or Turned off	7.6.1.5 b) (iii)
Relay 2 (3 phase only) Customer termination of boost	Enabled or Disabled	7.6.1.5 b) (iv)
Relay 2 (3 phase only) Boost Primacy	Enabled or Disabled	7.6.1.5 e)
Relay 2 (3 phase only) Boost Disabled when Emergency Supply Capacity Control is enabled	Enabled or Disabled	7.6.1.5 f)
Relay 3 (3 phase only) Day Type 1 Default Load Control Schedule	10 times (in hours and minutes) with corresponding meter switch actions	7.6.1.2 b)
Relay 3 (3 phase only) Day Type 2 Default Load Control Schedule	10 times (in hours and minutes) with corresponding meter switch actions	7.6.1.2 b)
Relay 3 (3 phase only) Day of Week Day Type	For each of the 7 Day of Week values specifies either the Day Type 1 or Day Type 2 Default Load Control Schedule	7.6.1.2 c)
Relay 3 (3 phase only) Dates to run Special Day Load Control Schedule	Twelve Dates to run Special Day Load Control Schedule	7.6.1.3.1 a) (i)
Relay 3 (3 phase only) Special Day Load Control Schedule	10 times (in hours and minutes) with corresponding meter switch actions	7.6.1.3.1 a) (ii)
Relay 3 (3 phase only) Switch Time Randomisation – Minimum Delay Time	0 to 720 minutes in 1 minute increments	7.6.1.1.2 a) (i) (a)
Relay 3 (3 phase only) Switch Time Randomisation – Maximum Delay Time	0 to 720 minutes in 1 minute increments	7.6.1.1.2 a) (i) (b)
Relay 3 (3 phase only) Load Contactor – Meter Loss of Supply switching	Enabled or Disabled	7.6.1.1.3 a) (i) (a)
Relay 3 (3 phase only) Load Contactor – Meter Loss of Supply position during power outage	Turned on or Turned off	7.6.1.1.3 a) (ii) (a)

Setting	Available Values	Section
Relay 3 (3 phase only) Load Control Cycling Program – Time Delay before starting cycling	0 to 120 minutes in 1 minute increments	7.6.1.1.3 a) (ii) (b)
Relay 3 (3 phase only) Load Control Cycling Program - Cycle On Time	0 to 120 minutes in 1 minute increments	7.6.1.4.1 a) (i) (a)
Relay 3 (3 phase only) Load Control Cycling Program – Cycle Off Time	0 to 120 minutes in 1 minute increments	7.6.1.4.1 a) (i) (b)
Relay 3 (3 phase only) Load Control Demand Limit	Enabled or Disabled	7.6.1.4.3 a) (i) (a)
Relay 3 (3 phase only) Load Control Demand Limit Monitoring Start Time	Time of Day	7.6.1.4.3 a) (i) (b)
Relay 3 (3 phase only) Load Control Demand Limit Monitoring End Time	Time of Day	7.6.1.4.3 a) (i) (c)
Relay 3 (3 phase only) Load Control Demand Limit Measurement Interval	1 to 30 minutes in 1 minute increments	7.6.1.4.3 a) (i) (e)
Relay 3 (3 phase only) Load Control Demand Limit Exported Average Active Demand Trigger value	0.1 to 99 kWh in 0.1 kWh increments	7.6.1.4.3 a) (i) (d)
Relay 3 (3 phase only) Load Control Demand Limit Load contactor position during event	Turned on or turned off	7.6.1.4.3 a) (i) (f)
Relay 3 (3 phase only) Load Control Demand Limit Enable Demand Limit when Emergency Supply Capacity Limit enabled	Enabled or Disabled When Enabled the Demand Limit will be automatically initiated when the Emergency Supply Capacity Limit is initiated	7.6.1.4.3 a) (i) (g)
Relay 3 (3 phase only) Load Control Under Frequency	Enabled or Disabled	7.6.1.4.2 a) (i) (a)
Relay 3 (3 phase only) Load Control Under Frequency Measurement Period	5 seconds to 60 seconds in 5 second increments	7.6.1.4.2 a) (i) (c)
Relay 3 (3 phase only) Load Control Under Frequency Frequency Threshold	48 Hz to 50 Hz in 0.1 Hz increments	7.6.1.4.2 a) (i) (b)
Relay 3 (3 phase only) Load Control Under Frequency Restore Measurement Period	1 to 60 minutes in 1 minute increments	7.6.1.4.2 a) (i) (d)

Setting	Available Values	Section
Relay 3 (3 phase only) Load Control Under Frequency Load contactor position during under frequency event	Turned on or turned off	7.6.1.4.2 a) (i) (e)
Relay 3 (3 phase only) Boost Button	Enabled or Disabled	7.6.1.5 b) (i)
Relay 3 (3 phase only) Boost Operation Time	From 1 to 6 hours in ½ hour increments	7.6.1.5 b) (ii)
Relay 3 (3 phase only) Position during Boost	Turned on or Turned off	7.6.1.5 b) (iii)
Relay 3 (3 phase only) Customer termination of boost	Enabled or Disabled	7.6.1.5 b) (iv)
Relay 3 (3 phase only) Boost Primacy	Enabled or Disabled	7.6.1.5 e)
Relay 3 (3 phase only) Boost Disabled when Emergency Supply Capacity Control is enabled	Enabled or Disabled	7.6.1.5 f)
Supply Contactor – Meter Loss of Supply switching	Enabled or Disabled	7.7.1.3 a)
Supply Contactor – Meter Minimum Duration of Power Outage	5 seconds to 300 seconds in 5 second increments	7.7.1.3 b) (i) (a)
Supply Contactor – Minimum Time Delay before Close	0 seconds to 300 seconds (5 minutes) in 1 second increments	7.7.1.3 b) (i) (b)
Supply Contactor – Maximum Time Delay before Close	0 seconds to 300 seconds (5 minutes) in 1 second increments	7.7.1.3 b) (i) (c)
Monitor Supply Average *active power* threshold (X)	20 W to 25 kW per element per phase 20 W increments	7.7.1.1 b) (i) (a)
Monitor Supply Measurement period (Y)	1 – Z seconds in 1 second increments	7.7.1.1 b) (i) (b)
Monitor Supply Total monitoring time	1 second to 3600 seconds in 1 second increments	7.7.1.1 b) (i) (c)
Arm – Support Timeout	Enabled or Disabled	7.7.1.2 c)
Arm – Timeout if not pressed	1 hour to 48 hours in 1 hour increments	7.7.1.2 c)
Distribution network Export Supply Capacity Limit - Enable	Enabled or Disabled	7.8.1.2 a) (i) (a)
Distribution network Export Supply Capacity Limit – Average Exported Active energy	0.1 to 99 kWh in increments of 0.1 kWh	7.8.1.2 a) (i) (b)
Distribution network Export Supply Capacity Limit – Measurement Period	1 to 60 minutes in increments of 1 minute	7.8.1.2 a) (i) (c)

Setting	Available Values	Section
Time of Day Export Supply Capacity Limit – Enable	Enabled or Disabled	7.8.1.1 a) (i) (a)
Time of Day Export Supply Capacity Limit – Start time	Meter time in Hours and minutes	7.8.1.1 a) (i) (b)
Time of Day Export Supply Capacity Limit – Duration	5 minutes to 1440 minutes (24 hours) in increments of 5 minutes	7.8.1.1 a) (i) (c)
Time of Day Export Supply Capacity Limit – Average Exported Active energy	0.1 to 99 kWh, in 0.1 kWh increments	7.8.1.1 a) (i) (d)
Time of Day Export Supply Capacity Limit – Measurement Period	1 minute to 60 minutes in increments of 1 minute	7.8.1.1 a) (i) (e)
Distribution network Import Supply Capacity Limit - Enable	Enabled or Disabled	7.8.1.4 a) (i) (a)
Distribution network Import Supply Capacity Limit – Average Imported Active energy	0.1 to 99 kWh, in increments of 0.1 kWh	7.8.1.4 a) (i) (b)
Distribution network Import Supply Capacity Limit – Measurement Period	1 minute to 60 minutes in increments of 1 minute	7.8.1.4 a) (i) (c)
Time of Day Import Supply Capacity Limit - Enable	Enabled or Disabled	7.8.1.3 a) (i) (a)
Time of Day Import Supply Capacity Limit – Start Time	Meter time in Hours and Minutes	7.8.1.3 a) (i) (b)
Time of Day Import Supply Capacity Limit - Duration	5 to 1440 minutes (24 hours) in increments of 5 minutes	7.8.1.3 a) (i) (c)
Time of Day Import Supply Capacity Limit – Average Imported Active energy	0.1 to 99 kWh, in increments of 0.1 kWh	7.8.1.3 a) (i) (d)
Time of Day Import Supply Capacity Limit – Measurement Period	1 minute to 60 minutes in increments of 1 minute	7.8.1.3 a) (i) (e)
Allow Emergency supply capacity limit	Enabled or Disabled (if disabled the *meter* ignores the Emergency Supply Capacity Limit command)	7.8.1.5 b)
Emergency Supply Capacity Limit	0.1 kWh to 99 kWh in 0.1 kWh increments	7.8.1.5 d) (i)
Emergency Supply Capacity – Measurement Period	1 to 60 minutes, in 1 minute increments	7.8.1.5 d) (ii)
Reference voltage for under/over voltage events	Specified from 100 volts to 240 volts in 1 volt increments	7.10.1.1 a) (i)
Under/Over Voltage trigger time	1 second to 300 seconds in 1 second increments	7.10.1.1 a) (iv)
Under-voltage event recording variance threshold	-5% to -20%, in 1% increments of Reference Voltage	7.10.1.1 a) (ii)

Setting	Available Values	Section
Over-voltage event recording variance threshold	+5% to +20%, in 1% increments of the Reference Voltage	7.10.1.1 a) (iii)
Under and Over-voltage event – hysteresis setting	0% to 2% in 0.5% increments of the Reference Voltage	7.10.1.1 a) (v)
List of meter events programmed to be recorded in the event log	For each event: Enabled or Disabled (possible events are listed in Section 7.10.1 h) and j))	7.10.1 d)
List of meter events programmed to report immediately to the *SMMS*	For each event: Enabled or Disabled (possible events are listed in Section 7.10.1 h) and j))	7.10.1 d)
List of HAN events programmed to be recorded in the HAN event log	For each event: Enabled or Disabled (possible events are listed in Section 7.10.1 k))	7.10.1 e)
List of HAN events programmed to report immediately to the *SMMS*	For each event: Enabled or Disabled (possible events are listed in Section 7.10.1 k))	7.10.1 e)
Number of events added to access and security event log before reporting to *SMMS*	The *meter* shall *record* settings to *report* to the *SMMS* that the access and security *event* log has reached a programmable number of *events* since the *event log* was last acquired by the *SMMS*. (setting the value to zero will disable *reporting)*	7.10.1 m)
Number of events added to quality of supply event log before reporting to *SMMS*	The *meter* shall *record* settings to *report* to the *SMMS* that quality of supply *event log* has reached a programmable number of *events* since the *event* log was last acquired by the *SMMS*. (setting the value to zero will disable *reporting)*	7.10.1 m)
Number of events added to the HAN event log before reporting to *SMMS*	The *ESI Implementation* shall *record* settings to *report* to the *SMMS* that the HAN *event* log has reached a programmable number of *events* since the *event* log was last acquired by the *SMMS* (setting the value to zero will disable *reporting).*	7.10.1 m)
List of *accumulated energy values* selected for display on the Visual Display	Select from Table 6-2.	7.4.1 c)
List of *active power* values selected for display on the Visual Display (Two element meters only)	*Total net active power*: enabled or disabled Two element meters: Element 1 Active Power: enabled or disabled Element 2 Active Power: enabled or disabled	7.4.1 e) (i)
List of devices registered on the HAN	ESI shall support up to 16 *HAN devices* (including *HAN device* type, services, functionality and capability supported by each *HAN device* on the *utility HAN*)	7.9.1.1 c) and 7.9.1.1 l)
Commencement Date	Used to limit HAN device access to information before this date	7.9.1.1 i)
HAN Load Control Schedules	16 HAN load control schedules each with: 10 times (in hours and minutes) with corresponding meter switch action	7.9.1.3.1 a)
Duration of Customer Override	To Be Detailed	7.9.1.3.4 c)

Setting	Available Values	Section
Retail tariff information (current)	Sufficient retail tariff information to enable a *HAN device* to convert kW and kWh readings into an estimated current cost of consumption	7.9.1.6 a)
Retail tariff information (future)	Same as Retail tariff information (current) with additional date and time that the future retail tariff becomes the current retail tariff	7.9.1.6 e)

Summary of Status Indicators

From Section 7.4 Visible display and indicators on meter

a) For *meters* fitted with *CLC/R*:

(i) The *meter* shall have a clear visible indication of the status of each *CLC* and *relay* as On or Off.

b) For *meters* fitted with a *supply contactor*

(i) The *meter* shall have a clear visible indication of the status of the *supply contactor* as on, off, exceeded supply capacity or armed

(ii) When the *supply contactor* is in the exceeded supply capacity state (in circumstances where a supply capacity limit has been exceeded), the *meter* shall display the remaining time (in minutes and seconds) before the *supply contactor* automatically switches to the On state (closed position).

Appendix C. Description of Removing Power to Premises

Premises that are fitted with a *smart meter* with a *supply contactor* (refer section 7.7) will support several methods for the de-energisation and re-energisation of the premises. These options are shown in the following table:

Table C-1: Table Describing Options for De-energisation and Re-energisation of Premises

Descriptor	Supply Fuse	Meter Supply Contactor	Description/state of premises
Remove Fuse	Fuse removed	Meter is not energised	Supply to premises (including meter) is "off" and isolated. *Remote* connection by Supply Contactor is not possible.
Remove Fuse and tag	Fuse isolated (removed and tagged and restricted use invoked)	Meter is not energised	Supply to premises (including meter) is "isolated". *Remote* connection by Supply Contactor is not possible
Supply Contactor Turned Off	Fuse installed	Supply Contactor is in the open position	Power is available at the premises (subject to their being no upstream outages) *Remote* (or *local*) re-energisation is possible using the Supply Contactor.
Supply Contactor Turned On	Fuse installed	Supply Contactor is in the closed position	Power is available at the premises (subject to their being no upstream outages) Remote (or local) de-energisation is possible using the Supply Contactor.

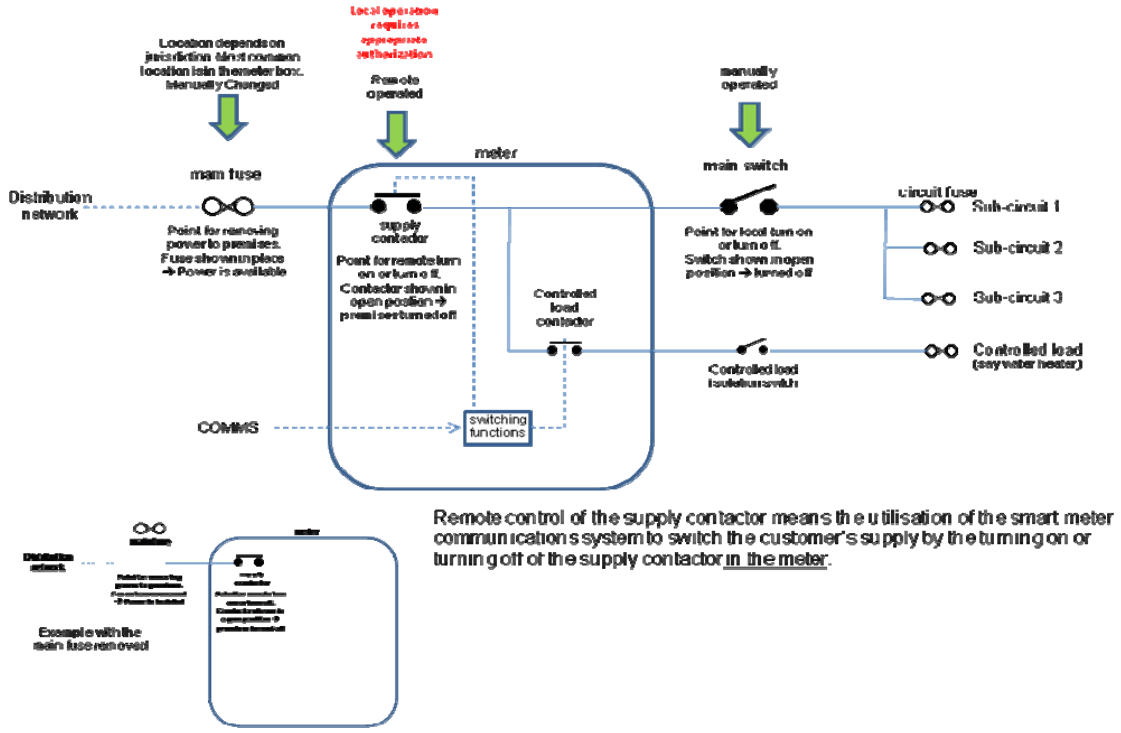


Figure C-1: Schematic Diagram Showing Points of Removal of Power Premises

The *supply contactor* supports four commands intended to be used for switching between the off and on states (*supply contactor* in the open and closed positions respectively). The result of receiving the four commands when the *supply contactor* is initially in the off state are shown in the following figure:

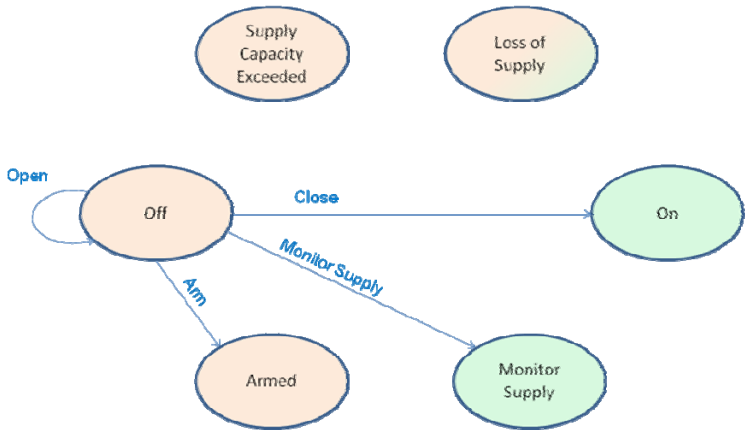


Figure C-2: Allowable Commands for Operating the S*upply Contactor* from the Off State

When the *smart meter* receives the monitor supply command the *supply contactor* shall move to the monitor supply state. From this state it will either move to the on or off state (assuming that no further *supply contactor* switch commands are received from the *SMMS*). This is shown in the following figure:

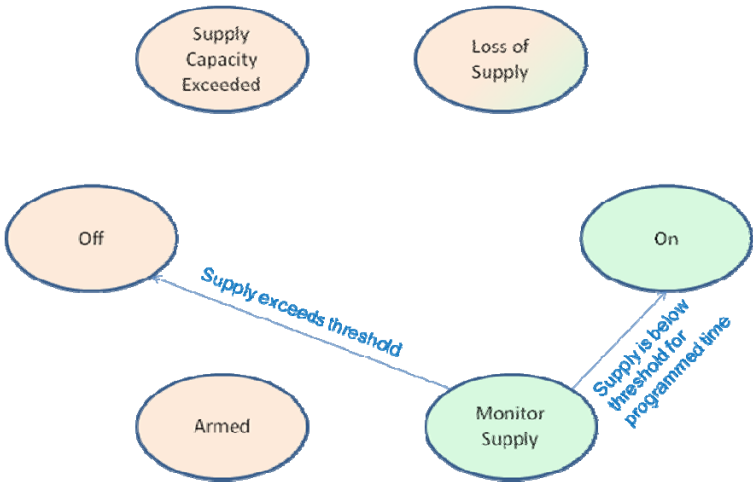


Figure C-3: Allowable Transitions from the Monitor Supply State

When the *smart meter* receives an arm command the *supply contactor* will move to the armed state. From this state it will either move to the on or off state (assuming that no further *supply contactor* switch commands are received from the *SMMS*). This is shown in the following figure:

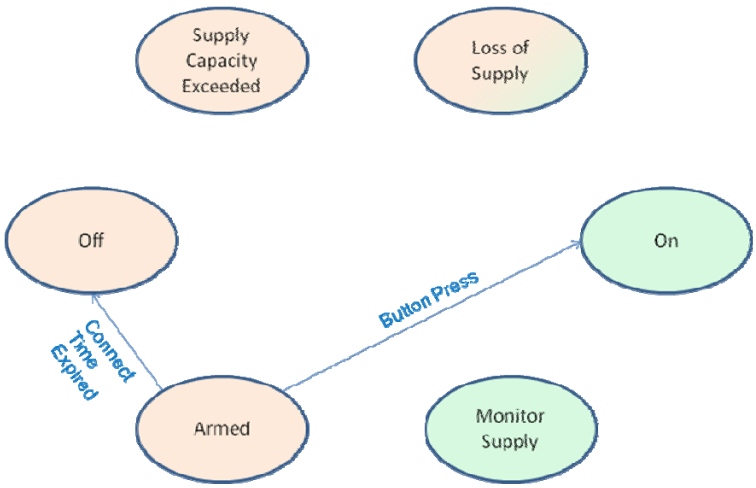


Figure C-4: Allowable Transitions from the Armed State

Appendix D. Background Papers

The following table details discussion papers prepared during the development of the Functionality Specification. In all cases the Functionality Specification. is the master document and the discussion papers simply provide additional background information. It should be noted that these documents have been produced by Dr Martin Gill of KEMA Consulting and have not been vetted or endorsed by the BRWG.

Document Name	Baseline Version	Section Numbers
NSMP Measurement Resolution	Version 1.0	7.1
NSMP Current Transformers and Meter Resolution	Version 1.0	7.1
NSMP Power Factor Measurement	Version 1.2	7.1
NSMP Function 11 Import Export	Version 1.0	7.1
NSMP Voltage Measurement	Version 1.0	6.3 and 7.10
NSMP Interval Energy Data Channels	Version 1.0	6.1 and 7.1
NSMP Home Area Network Research Study	Version 1.0	7.9
UK Retailers HAN Research Study Gap Analysis	Version 1.0	7.9
NSMP Communications and Data Security	Version 1.0	7.16
NSMP Function 23 Interoperability for Meters/Devices at the Application Layer and Function 24 Hardware Component Interoperability	Version 1.0	7.18 and 7.19
NSMP Interoperability - Review of Meter Protocols	Version 1.2	7.18
NSMP Use of the HAN to support Function 24	Version 1.0	7.19
NSMP Customer Supply Monitoring	Version 1.0	7.21
NSMP Supply Contactor	Version 1.0	7.7
NSMP Supply Capacity Control	Version 1.0	7.8
NSMP Function 8/14 Dedicated Load Control	Version 1.0	7.6
NSMP Smart Meter Physical Load Control Options	Version 1.0	6.1 and 7.6
NSMP Outage Reporting	Version 1.2	7.11
NSMP Evaluation of Performance Levels	Version 1.0	Performance Levels