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Submission to the Australian Energy Market Commission (AEMC)

Title: Expanding competition in metering and related services
Stage: Consultation on request for Rule change
AEMC reference: ERC0169/RRC0002

Dear AEMC, 29 May 2014

Please find attached Standard Australia's submission to the AEMC's rule change consultation to expand competition in metering and related services.

This submission addresses 'Question 22' found in the Consultation Paper regarding the appropriate body to develop a new minimum smart meter functionality specification.

Question 22
Is AEMO the appropriate body to develop and maintain the proposed minimum functionality specification to support competition in metering and related services, or are there alternative options that could be considered?

Thank you for considering this submission and we welcome the opportunity to discuss the role Standards Australia can play to support smart meter competition.

Yours sincerely,

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Standards Australia is an appropriate body to develop Australian Standards referenced within the Minimum Functionality Specification in order to support competitive metering and related services.

WHO IS STANDARDS AUSTRALIA?

Standards Australia is the nation's peak non-government Standards organisation. It is charged by the Commonwealth Government to meet Australia's need for contemporary, internationally aligned Standards and related services.

WHY STANDARDS AUSTRALIA?

Australian Standards enhance the nation's economic efficiency and international competitiveness. They also contribute to community demand for a safe and sustainable environment.

Standard Australia leads and promotes a respected and unbiased Standards development process ensuring all competing interests are heard, their points of view considered and consensus reached.

AUSTRALIAN STANDARDS AND REGULATION

Whilst Australian Standards are voluntary consensus documents that are developed by agreement, their application can be mandated by government or called up in a contract. Australian Standards can be drawn up in regulation for the energy industry, to strengthen and grow energy infrastructure.

This means that regulators can capitalise on existing technical knowledge without having to use their own resources.

When looking at how technical specifications can be developed and implemented, Australian Standards are a cost effective mechanism to deliver consensus based outcomes.

INTERNATIONALLY ALIGNED AUSTRALIAN STANDARDS

Standards Australia is an active participating member at the International Electrotechnical Commission (IEC), the leading organisation of International Standards for all electrical, electronic and related technologies. IEC Standards promote world trade and economic growth and encourage the development of products, systems and services that are safe, efficient and environmentally friendly.

The IEC has identified the importance of standards for smart metering to support a more effective and sustainable energy network. International standards on smart metering are available for adoption in Australia.

INTERNATIONAL STANDARDS - REDUCING TECHNICAL BARRIERS TO TRADE

Standards Australia has a policy of adopting International Standards wherever possible. This policy is in line with Australia's obligations under the World Trade Organization's Code of Practice, which requires the elimination of technical Standards as barriers to international trade.

Adopting International Standards in Australia will reduce technical barriers to international trade, increase the size of potential markets and position Australian firms to compete in the world economy. This will strengthen the market and also enable a platform to reflect the latest technologies and innovations.

HARMONISED STANDARD ACROSS ALL AUSTRALIAN STATES

Australian Standards are consensus documents, which include contributions from relevant stakeholders across Australia. This wide consultation enables harmonised standards across all Australian states.

For example, in 2013 the Australian Government worked together with Standards Australia to publish AS 5577 - Electricity network safety management system. The standard covers the maintenance of network asset integrity, vegetation management and bush fire risk mitigation.

Standards Australia is unique in that it provides the infrastructure and processes to bring together all relevant stakeholders from numerous Australian states. As a result AS 5577 provides a national framework for the harminosation of energy safety systems - an important step forward for workplace and community safety.

The intention of this standard is that each of the jurisdictions adopts AS 5577, such that Network Service Providers must comply with it.

Engagement with Standards Australia by government policy decision makers, go a long way to ensure alignment and to leverage existing technical infrastructure.

SMART GRID AND SMART METERS

Technical standards promote interoperability and drive productivity.

Smart Grid is one example. Smart Grid plays an important role in providing more efficient and resilient power grids.

In 2012, the Federal Government commissioned Standards Australia to develop a Smart Grid Standards Roadmap. This strategic framework outlined the development of Australian Standards to support the near term commercialisation of Smart Grids in Australia.

It is important to note that smart meter standards are important infrastructure standards outlined in this roadmap. They will further support the commercialisation of Smart Grids.

The strategic framework for advancing Australian Standards for Smart Grids comprises of three discrete elements, namely:

CONCLUSION

Australian Standards on Smart Meter Design will support smart meter competition. Standards Australia welcomes the opportunity to develop Australian Standards for reference in the Smart Meter Minimum Functionality Specification. These Standards will be developed and maintained in line with Standard Australia's consensus process and will be aligned with international standards where possible.

Australian Standards for Smart Grids – Standards Roadmap

Jason Lazar of Standards Australia, and Mark McKenzie of Rare Consulting

June 2012

Australian Government
Department of Resources, Energy and Tourism

STANDARDS Australia

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Appendices

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1 About this paper

The optimal deployment of smart grids holds significant potential for the management of many of the challenges confronting the electricity supply chain in Australia. Coupled with the introduction of variable electricity tariffs (i.e. time-of-use charging), Smart Grids provide a mechanism for the management of electricity demand with consequent benefits in terms of:

- reducing peak load across the network and thereby deferring the need for investment in network augmentation;
- supporting the early detection and rectification of network issues, thereby improving continuity of electricity supply;
- improving the efficiency, and therefore lowering the costs, of electricity delivery through better operational management of grid assets;
- delivering information to support reductions in discretionary consumer demand by actively engaging end-consumers in the management of their electricity demand;
- accommodating future growth in electric vehicles, small-scale generation and storage, and generation from renewable energy sources.

In June 2011, the Australian Department of Resources, Energy and Tourism commissioned Standards Australia (and Rare Consulting) to identify the need for Australian standards to support the near-term commercialisation of smart grids in Australia.

This request arose as a result of the Department's facilitation of the Smart Grid, Smart City project being undertaken in New South Wales, and ongoing international discussions about the need for standards to support the development of smart grids around the world.

The approach to the development of Australian Standards for Smart Grids detailed in this document differs significantly from past approaches advanced by both the International Electro technical Commission (EIC), and US based National Institute for Standards and Technology (NIST). Both of these standards 'roadmaps' provide a comprehensive listing of possible standards for every potential element of a Smart Grid, but do not provide specific guidance on the priority areas required for near term market commercialisation (i.e. largely because such an approach will vary for individual economies).

This paper – the Australian Roadmap for Smart Grids Standard Development – sought to develop a logic based framework for the identification of those standards deemed to be essential for near term market commercialisation, noting that work on other standards could be deferred until the Smart Grids market matured. This approach involved three principal steps, namely:

- identification of the current barriers to the near term commercialisation of Smart Grids in Australia in consultation with key stakeholders
- Examination of the role of Australian Standards as a means of redressing these barriers and the specific priority areas for development of Australian Standards
- Scoping of the work required for development of standards in each priority area via utilisation of the work already completed by IEC and NIST (and therefore ensuring harmonisation with international standards as far as practical).

Essentially, this paper concludes with the presentation of a strategic plan (or *roadmap*) for the development of Australian Standards to support the near term commercialisation of Smart Grids in Australia.

2 Study methodology

The approach adopted for the development of this document - an *Australian Smart Grids Standards Roadmap* - differed markedly from past international approaches to Standards Development for Smart Grids adopted by NIST and IEC.

Both the NIST documents (*NIST Framework and Roadmap for Smart Grid Interoperability Standards – Release 1.0 and Release 2.0*) and the IEC (*IEC Smart Grid Standardisation Roadmap June 2010*) provide a comprehensive listing of standards requirements that have been developed by:

a) Examining the future architecture (and likely variants) of Smart Grids in the future

b) Identifying the new equipment and technology that would need to be deployed

c) Considering the processes that will need to be followed for the integration of this new equipment with legacy electricity networks without compromising safety or operability.

The NIST and IEC documents do not establish a sequence for advancing standards development in individual economies owing to the fact that the different infrastructure. policy and social settings of individual economies dictates that the commercialisation of Smart Grids will vary across countries. Some economies (most notably Germany, China and Japan) have already started to develop individual approaches that are tailored to the needs of their individual economy.

Accordingly, the approach adopted for this study first sought to identify the key barriers to the market commercialisation of Smart Grids in Australia. Once these barriers were agreed between stakeholders, the study team sought to identify the specific role of standards in addressing these barriers – noting that market rules and policy settings can also be used to address market barriers - and then develop a strategic framework for advancing specific Australian Standards for Smart Grids.

Following completion of the framework, the NIST and IEC work was utilised to identify the specific actions that could be progressed and the degree to which:

a) this work was already being advanced by international work, or;

b) there were gaps between specific Australian requirements and the international work completed to date.

The study methodology is presented in Figure 2.1 and a discussion of each element of the study is presented in the following sub-sections.

2.1 Desktop research

The first task involved a review of available literature of Smart Grids development around the world by the study team and derivation of key insights about the current state of the Smart Grids market both in Australia, and around the world. This work was undertaken by the study team between 1 June 2011 and 31 August 2011 and was formally presented to the inaugural meeting of the Standards Working Group (see below) on 13 September 2012.

The key findings of this first element of work gave rise to the identification of the following strategic observations about the Smart Grid market:

- Australia's electricity network is ageing and subject to ever increasing energy demand – albeit that this demand will be supported by conventional and non-conventional supply (e.g. small scale renewables) in the future
- Together with appropriate market price signals, the application of smart grids has the potential to defer investment in grid infrastructure by influencing consumer use patterns.

- Smart grids involve the application of communications infrastructure across the electricity network to facilitate dynamic electricity transactions at the point of end use (and provide a mechanism for maximising returns for feed-in)

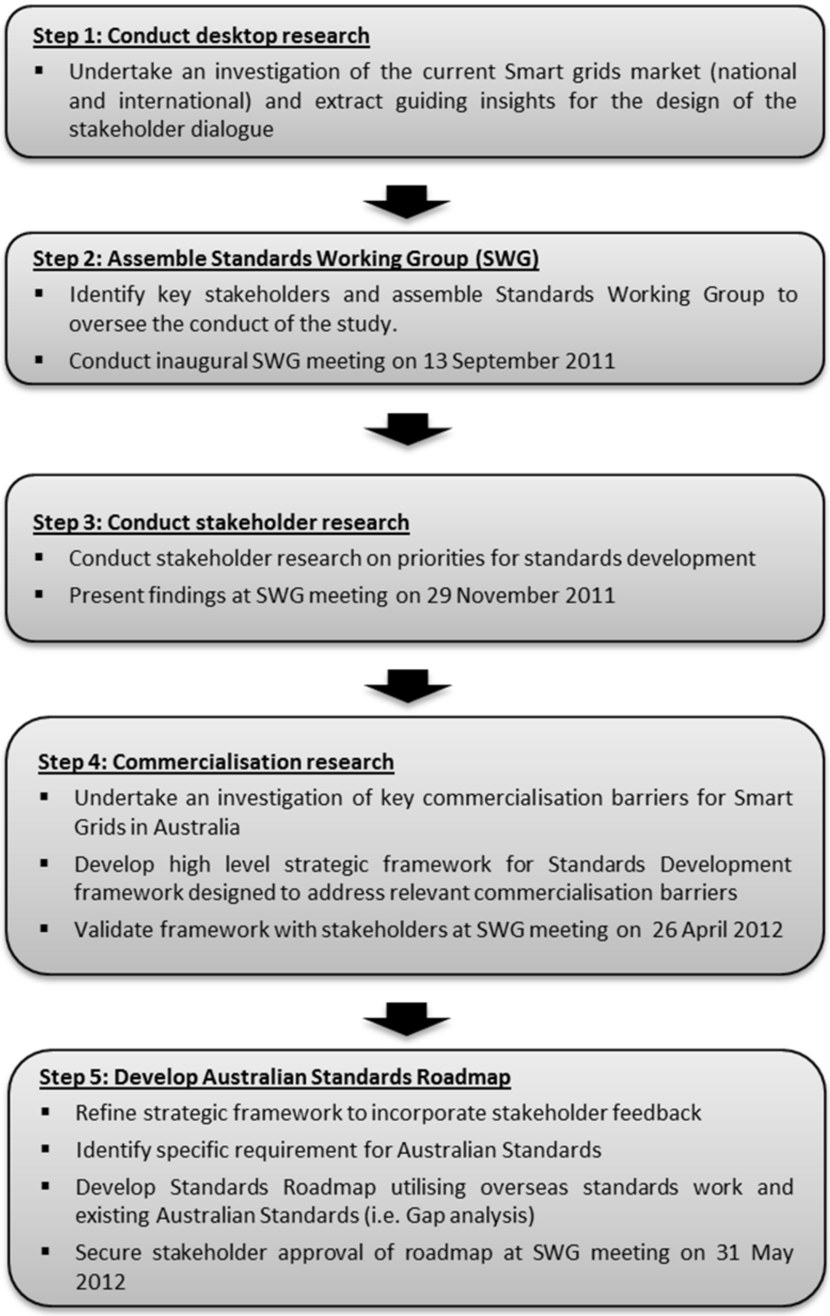

Figure 2.1: Summary of study methodology for development of Australian Standards roadmap

- There is no such thing as a generic smart grid – different technologies and different levels of integration will result in different levels of 'smartness'.
- The effective operation of a Smart grid requires integration of generator, distributor, and electricity retailer to facilitate a seamless customer transaction.
- International experience suggests that Smart Grids hold potential for peak load reduction and supply continuity, but results of smaller number of trials reveal performance variability.
- Australian experience with Smart Grids is relatively limited at this early stage and the Australian community's early experience is likely to have been somewhat coloured by adverse public perceptions arising from the Victorian Smart meters rollout.

The outcomes of this work were used to design the format of key stakeholder discussions, with a view to securing agreement on the nature of the current barriers to market commercialisation and assessing the potential role of Australian Standards in addressing these barriers.

2.2 Stakeholder consultation (and working group discussions)

Stakeholder consultation comprised two mechanisms. The first was the formation of a Standards Working Group (SWG) comprising key stakeholders in the development of the Smart Grids market in Australia. The second involved the conduct of a stakeholder survey to assess the priorities for Australian Standards Development.

2.2.1 Standards Working Group (SWG)

Standards Australia established a national working group to assist with the identification of the requirements for Australian standards (i.e. near-term, medium-term and long-term) based on the development of a consensus about the most likely pathway for the commercialisation of smart grids in Australia. The SWG comprised representatives from a wide variety of interests and market sub-segments as shown in Figure 2.2.

The SWG discussions involved a cross section of stakeholders (see Appendix 1) were robust throughout the process, indicating that there were diverse views amongst different stakeholders in respect of:

- the quantum of economic, social and environment benefit to be delivered in practice by the application of smart grids to date on the national electricity grid;
- the roles of traditional and non-traditional market players in the development of smart grids;
- the degree to which the development of smart grids should be wholly consistent with current National Electricity Market (NEM) rules and underlying competition principles.

The above observation gave rise to a recognition by the Standards Australia study team that there was a lack of stakeholder consensus on the likely commercialisation path for smart grids in Australia at the commencement of the process which, in turn, is a possible explanation for the apparent uncertainty about the nature of the most likely commercialisation pathway for smart grids in Australia.

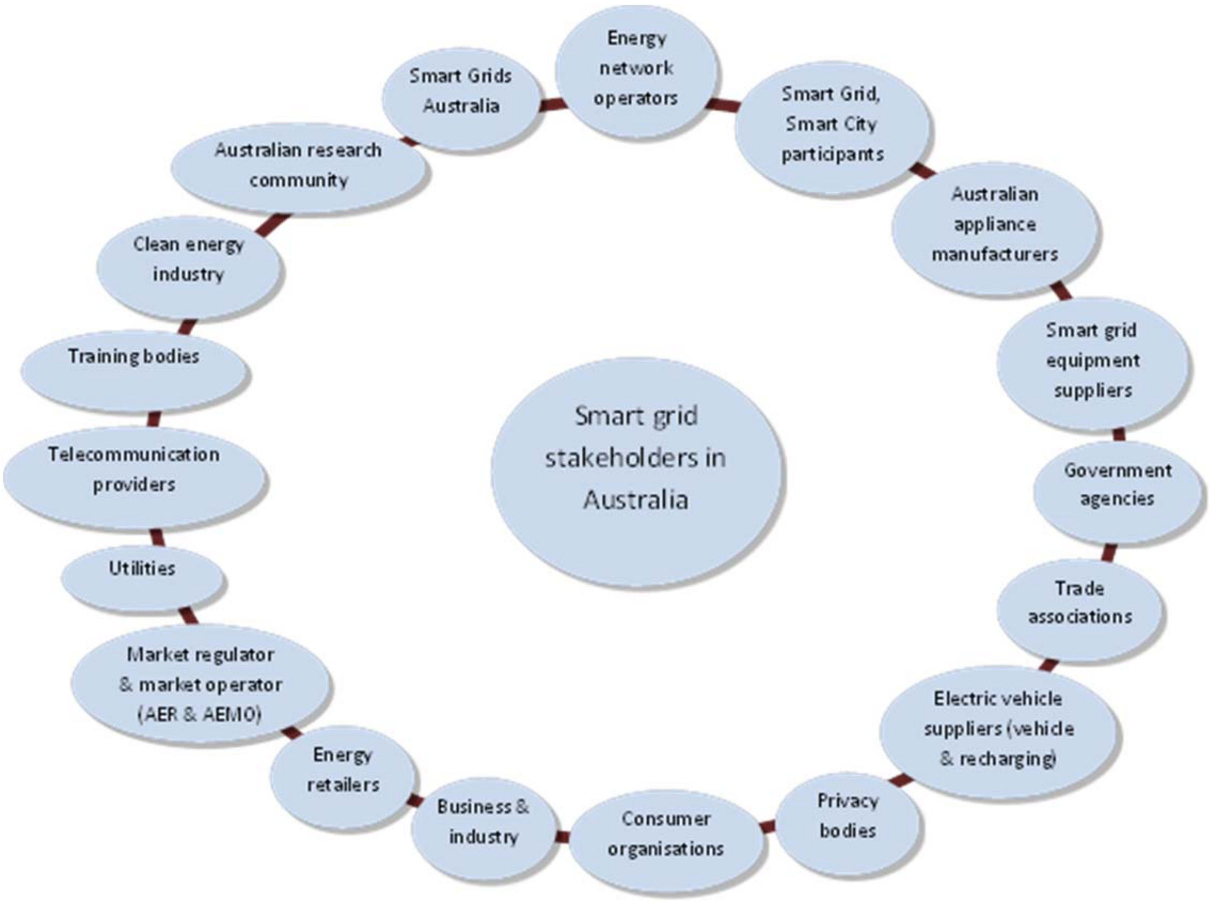

Figure 2.2: Summary of stakeholder groups that comprised the SWG.

2.2.2 Stakeholder survey

In the period following the first SWG meeting on 13 September 2011, the study team conducted a survey to gauge the opinion of a cross-section of stakeholders about the priorities for the development of Australia Standards to support the near term commercialisation of Smart Grids in Australia.

The survey was conducted between 2nd and 22nd November 2011. The objective of the survey was to canvass the opinions of key stakeholder groups in relation to:

- the issues that need to be addressed to support the early commercialisation of Smart Grid solutions in Australia, and;
- the relative priority of these issues

The survey contained two groups of questions. The first comprised a set of open-ended questions that sought to validate the draft list of issues developed during the first SWG meeting (i.e. unprompted canvassing of issues). The second set comprised *score-based* questions that asked respondents to rank the 11 priority areas identified by the SWG in Workshop 1 (i.e. prompted canvassing of issues).

The survey was conducted using *Survey Monkey* (an online survey tool) and responses were received from 25 of the 43 stakeholder groups that were approached to participate in the survey, which equates to a response rate of 58%.

The findings of the survey revealed that apart from agreeing on the importance of interoperability, stakeholder views on the priority of individual standards were varied. Discussion of the inconclusive nature of the survey findings at the SWG meeting on 29 November 2011 gave rise to the following principal observations:

- Many of the standards and guidelines currently being progressed in overseas jurisdictions provide the platforms for development of standards for Smart Grids
- There are draft standards in place for the management of operability, but little is known about the quantum of the investment burden for the owners and operators of the networks
- There are also an increasing number of international guidelines for the management of the security of data over a smart grid (e.g. US Department of Homeland Security) and organisational responsibilities for data management
- The timing of market development (i.e. commercialisation) will be a key to assessing the need for Standards and the roles of the actors in a Smart Grid
- Accordingly there is a need to develop a perspective on the likely timing/sequencing of market commercialisation in Australia - and the need for specific standards relative to these issues.

2.3 Development of strategic framework

Having completed a review of current market developments and realised that there appeared to be a lack of stakeholder consensus on the priority of individual standards for Smart Grids in Australia, the study team sought to develop a new strategic framework that could potentially be used to identify the requirements for specific standards in Australia.

In order to develop this framework, the study team moved away from the methodology adopted by IEC and NIST – a methodology that involved scoping out all of the prospective elements of the smart grid and then identifying a requirement for standards to support the design and operation of this equipment.

Rather, the study team sought to develop a strategic framework that took due account of the current market barriers to standards development and then considered the degree to which Australian Standards could reasonably assist with redressing these market barriers – and thereby smooth the way for early commercialisation of Smart Grids in Australia

This framework was developed by the study team between January 2012 and April 2012, culminating in the presentation of the framework to the SWG on 26 April 2012. The framework was subsequently validated by the SWG with some modification.

2.4 Development of the Standards Roadmap (Gap analysis)

The final task involved the development of an implementation plan (or roadmap) for the development of Australian Standards in the areas that were deemed to be important for the near term commercialisation of smart grids in Australia.

This work essentially involved comparison of the requirements of the strategic framework with the current international work being advanced by IEC, NIST, and other international agendas. In addition, the study team examined synergy with existing Australian Standards pertaining to the operation of the existing network.

Essentially, this work involved the application of a gap analysis technique to identify the most appropriate method of developing Australian Standards in the priority area. Specific options for standards development that were considered by this work, included:

- wholesale adoption of an existing international standard for Smart Grids;
- adaption of an existing or foreshadowed international standard for Smart Grids;
- adaption of a relevant and existing Australian Standard for conventional grid operation; and,

- creation of a new standard.

The outcomes of this work were then tabulated in a work plan for future consideration by the Australian Department of Resources, Energy and Tourism (DRET), Standards Australia, and key industry stakeholders.

3 Navigating the challenges to smart grid deployment in Australia

An examination of national and international case study literature and the consideration of the feedback from structured stakeholder research were used to identify the likely challenges to near term commercialisation of Smart Grids in Australia.

This work identified eight commercialisation challenges that could be used to construct a strategic framework for the commercialisation of Smart Grids in Australia - and the Australian Standards that will be required to support this effort.

A brief discussion of these challenges is presented in the following subsections.

3.1 Effective management of any related public safety risks

Any technology that involves interaction with the national electricity grid carries inherent public safety risks. Failure to effectively manage these risks may result in a public backlash that could jeopardise the pace and very future of the technology.

Accordingly, there will be a need to have sufficient safeguards in place to ensure that the future commercialisation of smart grids does not create new public safety risks in terms of shock risk, fire risk and exposure to electromagnetic radiation (essentially by ensuring consistency with existing standards).

3.2 Maximise the positive financial outcomes for electricity consumers

An analysis of current literature on smart grid implementation around the world reveals that past smart grid trials have delivered mixed financial outcomes for electricity consumers, with these outcomes ranging from positive, to neutral, to negative.

Accordingly, there appears to be a need to adopt a national deployment strategy that (a) maximises the positive financial outcomes for consumers, and (b) minimises the risk of negative financial outcomes for consumers.

3.3 Effective management of consumer information risks

A common theme in many of the smart grid trials conducted to date has been the failure to adequately engage consumers in smart grid deployment. This failure appears to have resulted in consumer confusion leading to consumer pushback and/or negative financial outcomes for consumers. In addition, there are emerging concerns about the security of consumer data broadcast over a smart grid.

Consequently, any future deployment should ensure comprehensive engagement with electricity consumers to minimise consumer information and data security risks.

3.4 Minimise departure from existing NEM rules and competition principles

There is currently some debate between electricity market participants about the degree to which smart grid deployment should be wholly consistent with current National Electricity Market rules and competition principles. Given that these rules and principles have been developed over a long period with the involvement of market participants, any substantial departure from these principles should be carefully considered in respect of the potential adverse market and consumer consequences.

3.5 Accommodate uncertainty surrounding the quantum of Smart Grid benefits

As an emerging technology with various deployment configurations, there is considerable uncertainty surrounding the quantum of real-world benefits of smart grids in Australia.

Accordingly, and given that the performance of smart grids is likely to vary between different economies and national grid regimes, there is a need to better understand the configuration that will deliver the greatest public and commercial dividends for the Australian economy (via the conduct of large-scale trials such as the Smart Grid, Smart City project).

3.6 Minimise the quantum of early investment risk

A key risk in the early commercialisation of any new technology relates to potential differences in the technology architecture of specific products, potentially leading to early product obsolescence and destruction of value. Accordingly, there is a need to ensure consistency in the high-level architecture of smart grid technology (i.e. interconnectivity, grid compatibility and communication protocols).

3.7 Accommodate emerging low carbon technologies

A key benefit of smart grids is the potential of this technology to manage the integration of photovoltaics and electric vehicles with the national grid (i.e. maximise energy yield and minimise grid disturbance), which in turn improves the market attraction of these low carbon technologies. Accordingly, any future smart grid deployment should seek to accommodate the interaction of these technologies with the national electricity grid.

3.8 Support national reduction of GHG emissions from electricity generation

Through interaction with consumer behaviours (and aided by variable electricity tariffs), smart grids provide an opportunity to reduce consumer demand for electricity from large numbers of low consumption customers (i.e. households). Consequently, any future deployment of smart grids should seek to advance a regime that optimises the potential energy efficiency improvements and thereby reduce GHG emissions from electricity generation (versus business as usual forecasts).

4 A strategic framework for Standards Development

As mentioned earlier in this paper, the key challenge to the development of a strategic framework for advancing development of Australian Standards for Smart Grids was the absence of industry consensus on the likely commercialisation of smart grids in Australia. Having identified the near term commercialisation challenges listed in the preceding section of this paper, the study team:

a) assessed the role of Australia Standards in helping to address these challenges, with a view to identifying requirements for development of specific Australian Standards; and,

b) developed a strategic framework for progressing work on the development of specific Australian Standards considered relevant for the near term commercialisation of Smart Grids in Australia.

The following sub-sections provide a discussion of how the study approached the above tasks and outlines the resultant strategic framework.

4.1 The role of standards in addressing key commercialisation challenges

The development of Australian Standards can assist in addressing the commercialisation challenges of an emerging technology market. The key advantage of using Australian Standards for this process is that the strategy for addressing specific issues can be developed by producing a voluntary industry framework that establishes market norms without the need for regulatory or legislative intervention by government.

In the case of co-regulated markets (i.e. markets the shape and operation of the market is affected both by government policy and free market dynamics), such as the national electricity market, the key to addressing the commercialisation challenges will lie in the adoption of a multi-faceted approach outlined in figure 4.1 that embraces:

(a) consideration of market operation rules and principles

(b) policy and legislative actions by government; and,

(c) Australian Standards and voluntary industry codes of practice

Consideration of the specific role of standards in accommodating the above commercialisation challenges of smart grids led the study team to conclude that Australian standards could be developed to assist with the management of three of the commercialisation challenges cited in Section 4 of this paper, namely:

- effective management of any substantial public safety risks;
- effective management of consumer information risks (i.e. predominantly data security and consumer privacy pertaining to the management of sensitive consumer data); and,
- minimise the quantum of risk associated with early investment in Smart Grid technologies and market commercialisation.

Accommodation of the remaining five challenges presented in Section 4 would require parallel actions in the areas of market operation and/or policy and legislative considerations. While the development of Australian Standards could potentially provide some assistance with these five risks, nature of the interplay between Australian Standards development and these parallel actions was deemed to be outside the scope of this study.

Accordingly, the study team sought to develop a strategic framework that focussed primarily on the accommodation of the three market challenges cited above.

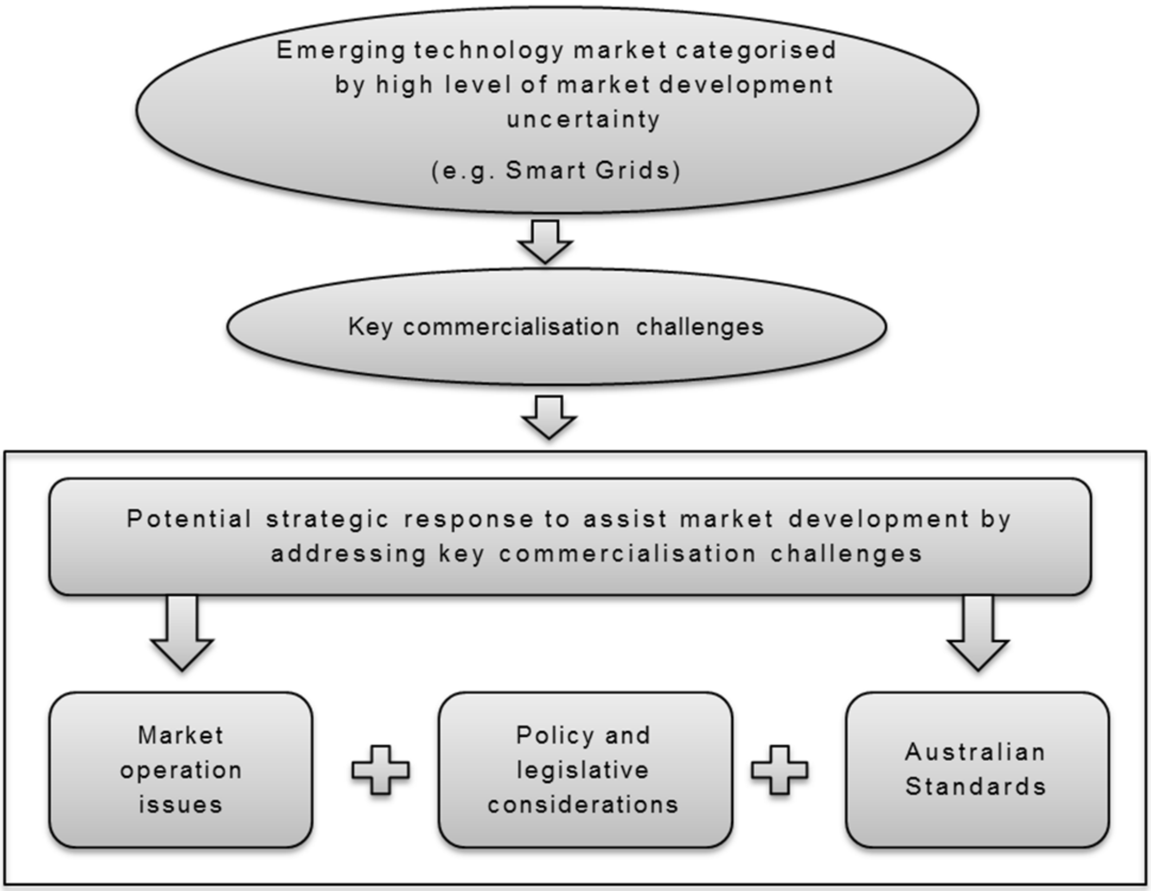

Figure 4.1: The role of Australian Standards in supporting commercialisation of emerging technologies.

4.2 A logic based framework for Smart Grid standards development

Consideration of the discussion presented above gave rise to the design of a strategic framework for advancing Australian Standards for Smart Grids. This framework is presented in Figure 4.2 and comprises three elements, namely:

- **FOUNDATION STANDARDS.** These standards have been assessed as being the building blocks on which successive standards should be developed in the future. They essentially address the core architectural considerations of the smart grid concept, including public safety, grid compatibility, communication protocols and data security.
- **SUPPORTING FOUNDATION ACTIONS.** These are actions that do not specifically relate to the development of Australian Standards, but are considered necessary to maximise the commercial and community dividend from development of the Australian Standards that have been identified
- **INFRASTRUCTURE STANDARDS.** These standards utilise the protocols stipulated in the foundation standards to construct specific standards for the design, operation and installation of smart grid infrastructure. The standards in this group can be further classified in terms of 'customer-side' standards and 'grid-side' standards.

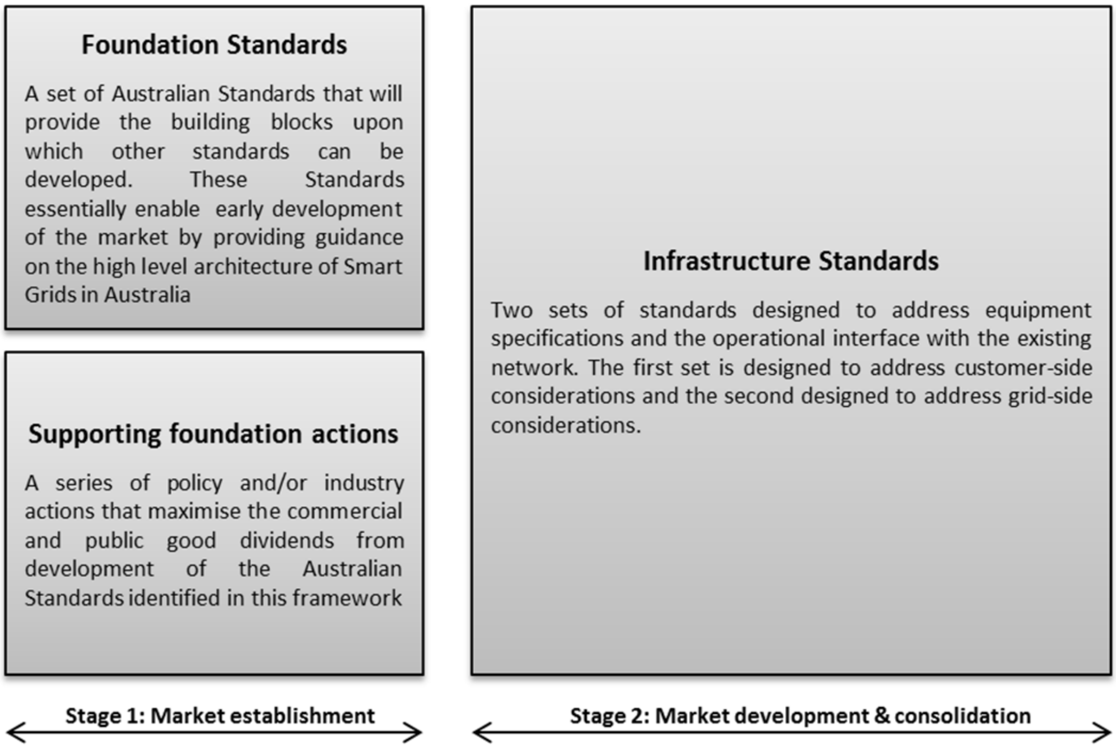

Figure 4.2: A strategic framework for developing Australian Standards for Smart Grids.

4.3 Foundation standards

It is suggested that the development of Australian Standards for smart grids would be predicated on the development of overarching or foundation standards that outline the core architecture of smart grids in Australia. A total of five areas for the development of *Foundation Standards* were identified, namely:

- Data security protocols
- Communication protocols
- Electromagnetic compatibility
- Interconnection protocols
- Smart Grid Vocabulary

4.4 Supporting foundation actions

An analysis of the issues surrounding the development of the Foundation Standards – and the degree to which the development of these standards addresses the three key commercialisation challenges – reveals that there will be a need to progress three supporting policy and/or legislative actions: These actions can be summarised as follows:

- **PROMOTE BEST PRACTICE IMPLEMENTATION.** Current literature reveals mixed economic, environmental and consumer outcomes from the various Smart Grid projects that have been implemented around the world. Consequently, there is a need to develop greater guidance in respect of best practice implementations. This work will likely require the continued conduct of large-scale trials in partnership with industry and the wider community.

- **CLARIFICATION OF REGULATORY FRAMEWORK**. There is a need to clarify the regulatory framework within which Smart Grids will be required to operate, with particular reference to the degree to which current NEM rules and competition principles will continue to apply for Smart Grids.
- **INDUSTRY CODE OF PRACTICE FOR STAKEHOLDER ENGAGEMENT**. Examination of the modes of failures from past Smart Grid implementations reveals that poor stakeholder engagement has been a key failure mechanism in the majority of smart grid trials implemented to date – and a similar observation was made by stakeholders in respect of the Victorian Smart Meter roll-out. Accordingly, there is a need for industry to develop a code of practice for future engagement of all stakeholders in future Smart Grid implementations.

4.5 Infrastructure standards

Once developed, the foundation standards described above provide a platform for the development of a suite of standards governing the design, installation and operation of smart grid infrastructure and systems. These standards can be classified into two groups, namely:

- **CONSUMER-SIDE.** Areas for standards development under this classification would include smart meter design, smart meter installation, smart meter installer skills and training, electric vehicle connectivity, electrical storage (for both non–electric and electric vehicles), smart home automation and smart office automation.
- **GRID-SIDE** . Areas for standards development would include transmission of information protocols, systems safeguards, distribution automation, distribution management systems, substation automation, operation of micro-grids (stand-alone), and connection of micro-grids (to the national grid).

5 Foundation standards

The following sub-sections provide a discussion of how development each of the *Foundation Standards* identified in Section 5 of this paper might be progressed. This discussion has been derived from an analysis of the status of current national and international standards for Smart Grids.

It should be noted that the discussion in this section is advanced within the confines of existing Standards Australian protocols which dictate that only IEC standards can be considered for adoption or adaptation for Australian Standards development. Nonetheless, any future work targeting the development of Australian Standards for Smart Grids could be informed by the approaches adopted by other Standards agenda such as NIST.

5.1 Data Security protocols

Requirement for standard (and scope of consideration).	A key consideration in the satisfactory operation of smart grids is the integrity of all data (especially customer data) transmitted across the network. Apart from the net pricing benefits to consumers, public acceptance of smart grids is likely to be directly dependent on the degree to which potential threats to data theft and data integrity are managed. Given growing societal concern in respect of data security over the internet, this issue is a core consideration in the early development of the smart grid concept in Australia. It is envisaged that the standard would extend to the management of data security and data integrity relating to: ▪ IT infrastructure used by market participants ▪ all telecommunications infrastructure that makes up the smart grid.
Relevant national & international standards	IEC/TS 62351 (Parts 1 to 7 inclusive) IEC/TS 62351 – 8 (work in progress) ISO/IEC 27001 ANSI/ISA-99 ITU-T (possibly via ACMA)
Suggested approach to Australian Standard development.	Adaption of existing international standards for Australian market application with a view to developing a single Australian Standard for the management of data security across the Smart Grid. Work would ideally take account by the recent work completed by the US Department of Homeland Security and should also take account of the minimum requirements of Australian Privacy legislation.

5.2 Communication protocols

Requirement for standard (and scope of consideration).	The concept of smart grids relies on the establishment of a dynamic communication system across the grid – from point generation to end-use. Given the elemental nature of the national electricity grid and the use of different equipment and varying levels of communication sophistication, there is a need for the industry to reach agreement on the core communication protocols to be applied across the smart grid in Australia. Ideally this work will comprise several discrete areas of investigation along similar lines to those being pursued by the IEC, including: ▪ design and operation of control system services (i.e. data services, functional logic services and business logic services); ▪ development and documentation of a common data architecture, recognising that the current data system operates with autonomous systems; ▪ the nature of the communication architecture to be applied across the smart grid (e.g. TCP/IP Protocol); ▪ design and operation of tele-control equipment and systems, such that these systems combine to form a homogenous communication system.
Relevant national & international standards	IEC/TR62357, IEC 61970-1, and IEC 61968.
Suggested approach to Australian Standard development.	Adaption of existing international standards for Australian market application

5.3 Electromagnetic compatibility

Requirement for standard (and scope of consideration).	While not necessarily a new standard *per se*, there will be a need to ensure that all future elements of the smart grid are designed and operated in such a manner as to ensure electromagnetic compatibility with the existing electricity grid. Essentially, there is likely to be a need to publish a standard that stipulates that all smart grid infrastructure must conform to current electromagnetic compatibility standards, and outlines the testing regimes to be used for demonstrating such compliance. Consideration may also need to be given to the warrants for immunity provisions for the increasing number of voltage components in the frequency range below 150 kilohertz.
Relevant national & international standards	IEC 61000 series (and all Australian equivalents). CISPR (i.e. Special International Committee on Radio Interference)
Suggested approach to Australian Standard development.	Adaption of existing international and national standards for Australian market application.

5.4 Interconnection protocols

Requirement for standard (and scope of consideration).	The satisfactory development of this standard is dependent on the completion of the proposed standards relating to communication protocols, data security and electromagnetic compatibility. Future application of the smart grid will require that any equipment connected to the grid is consistent with the core communication, data security and electromagnetic compatibility requirements of the smart grid. Accordingly, there will be a need to develop specific interconnection protocols to support connection of the following elements to a future smart grid: ▪ distributed storage ▪ distributed generation networks (i.e. micro-grids) ▪ electric vehicles ▪ small-scale generation (i.e. residential photovoltaic).
Relevant national & international standards	IEC 60904, IEC 62446, IEC/TS 62257.
Suggested approach to Australian Standard development.	Adaption of international standards for Australian market application.

5.5 Smart Grid vocabulary

Requirement for standard (and scope of consideration).	The development of all Smart Grid Standards will require the adoption of a common vocabulary and terminology for all elements of a Smart grid. Accordingly, there will be a need for all stakeholders to agree specific terminologies for smart grid equipment and operating processes. Ideally, this standard should be the first standard to be progressed as it will ensure that all future standards (i.e. Foundation and Infrastructure Standards) share consistent terminology.
Relevant national & international standards	Nil. Definitions are included in the definitions to a variety of IEC standards for Smart grids. Opportunity to use the IEC dictionary and the international Smart Grid network (IEC 60050).
Suggested approach to Australian Standard development.	Development of ‘clean skin’ standard utilising current national and international terminologies as far as possible. Feedback any new terminologies to IEC via SG3 to ensure continued high level harmonisation.

6 Consumer side considerations

The following sub-sections provide a discussion of how development each of the Customer-side Infrastructure Standards identified in Section 5 of this paper might be progressed. This discussion is based on an analysis of the status of current national and international standards for Smart Grids.

It should be noted that the discussion in this section is advanced within the confines of existing Standards Australian protocols which dictate that only IEC standards can be considered for adoption or adaptation for Australian Standards development. Nonetheless, any future work targeting the development of Australian Standards for Smart Grids could be informed by the approaches adopted by other Standards agenda such as NIST.

6.1 Smart meter design

Requirement for standard (and scope of consideration).	Standards will be required to stipulate the performance characteristics of smart meters with a primary focus on the safe operation and electrical integrity of these devices. The scope of these standards will need to address factors such as hardware design, software functionality, communications effectiveness, base functionality, expandability, and measurement accuracy.
Relevant national & international standards	IEC 62052 (parts 11, 21, and 31), IEC 62053 (parts 11, 21, 22, 23, 24, 31, 52 and 61), IEC 62054 (parts 11 and 21), IEC 62058 (parts 11, 21 and 31), IEC 62059, and IEC 62056 series.
Suggested approach to Australian Standard development.	Adoption of international standards for Australian market application

6.2 Smart meter installation

Requirement for standard (and scope of consideration).	In addition to the design of the meter, the effectiveness of the smart meter in supporting to safe and effective operation of smart grids will be heavily dependent on the quality of installation (noting that the installation of Smart Meters must support safe and effective electrical and communications functionality). Poor installation of this infrastructure has the potential to create substantial public risk (in terms of shock risk and fire risk) or reduce the economic utility of upstream investments in areas such as dynamic load control and system monitoring.
Relevant national & international standards	Adapt elements from AS/NZS 3000 for electrical procedures and develop procedures for management of communications procedures.
Suggested approach to Australian Standard development.	Development of a ‘guiding standard’ for installers derived from AS/NZS 3000.

6.3 Smart meter installation skills and training

Requirement for standard (and scope of consideration).	This standard could be expressly developed as a basis for the implementation of a voluntary accreditation scheme for installers of smart meter infrastructure. Ideally, the standard would stipulate the minimum skills and training requirements of personnel charged with the installation of smart meters in Australia with a view to minimising public safety risk and consumer protection risks.
Relevant national & international standards	No existing standards
Suggested approach to Australian Standard development.	Development of new 'cleanskin' standard for Australian market application

6.4 Electric vehicle connectivity

Requirement for standard (and scope of consideration).	One of the central opportunities afforded by the smart grid is the capacity to manage some of the inherent loading challenges associated with the recharging of electric vehicles. It is envisaged that this standard would stipulate the performance requirements of recharging equipment (i.e. hardware configuration, communications systems, failsafe mechanisms, base functionality) that is connected to the grid. It is important to note that this standard would not specify the actual design of the equipment, but rather would stipulate the minimum requirements for ensuring compatibility with the communications and electronic architecture of the smart grid (i.e. standards for the design of recharging infrastructure are currently being developed under EVO-001-04 which is being managed by Standards Australia).
Relevant national & international standards	IEC 62196 (parts 1 and 2), IEC 62196 –part 3 (under development) IEC 61851 AS/NZS 4755.3.4 (under development) AS/ISO 8713 series ISO/IEC 15118 IEC 60364-5 (parts 53 and 55) AS/ISO 8713 series (under development)
Suggested approach to Australian Standard development.	Adaption of international standards and close cooperation with the deliberations of EVO-001-04.

6.5 Electric storage

Requirement for standard (and scope of consideration).	The smart grid affords an opportunity for the grid to utilise small-scale electricity storage – located downstream of HV Transformers – during peak periods of localised network demand. The net utility of this storage, however, will be a function of the quality of the stored energy and the level of access afforded to network operators. Accordingly, there will be a need to develop electrical and communication standards that apply specifically to non-conventional (and localised) storage and the communication systems used to deploy this energy.
Relevant national & international standards	No existing standards
Suggested approach to Australian Standard development.	Development of new 'cleanskin' standard for Australian market application, taking into account current national/international research in electrical storage.

6.6 Electric storage (EV's)

Requirement for standard (and scope of consideration).	The longer term prospect of utilising energy stored in EV's connected to the grid during peak periods of demand (i.e. Vehicle-to-Grid or VtoG functionality) brings requirements that will differ in nature to that required of non EV storage systems. Accordingly, there will likely be a need to develop a standard that stipulates the performance characteristics of EV batteries and power systems to be used for VtoG so as to ensure this infrastructure meets minimum thresholds for safety, battery durability, and cyclic stability of electricity.
Relevant national & international standards	ISO 6469-1, IEC 61982, and IEC 62619.
Suggested approach to Australian Standard development.	Adaption of existing international standards for Australian market application.

6.7 Smart home automation

Requirement for standard (and scope of consideration).	The automation of end-use of electricity in the home is a key function of a mature smart-grid, providing the opportunity for networks to either turn down or turn off power to a home based on an agreement that has been developed with a customer (either directly, or via the electricity retailer). Achievement of this functionality requires the installation of infrastructure beyond the meter, including the use of Wi-Fi enabled Home Area Networks (HAN's) and linked home appliances. It is therefore envisaged that once Smart Grids achieve a level of market sophistication, there will be a need to specify performance standards for the design, installation and safe operation of this type of infrastructure.
Relevant national & international standards	ISO 16484 series, IEC 14543-3, EN13321 series, EN 13757 AS/NZS 4755 (Current and under development)
Suggested approach to Australian Standard development.	Adaption of current international standards for Australian market application.

6.8 Smart building automation

Requirement for standard (and scope of consideration).	Similar to the requirement for standards supporting smart home automation, there will be a need to develop standards for the installation of next generation energy infrastructure supporting automated control of electricity supplied to non-residential buildings
Relevant national & international standards	ISO 16484, EN50090 series,
Suggested approach to Australian Standard development.	Adapt existing international standards for Australian market application.

6.9 Demand response interface

Requirement for standard (and scope of consideration).	The principal community benefits of a Smart Grid are derived from empowering end-users with the functionality needed to manage their demand in a transaction environment. As a consequence, there is a need to specify the high level requirements for the operation of this interface given core public safety and consumer protection objectives.
Relevant national & international standards	ISO 16484 series, EN 50090, EN50428, EN 13321 and EN50491. AS/NZS 4755 (current and under development)
Suggested approach to Australian Standard development.	Adaption of current international standards for Australian market application

6.10 Distributed generation

Requirement for standard (and scope of consideration).	A growing tendency towards the decentralized generation of electricity via cogeneration and trigeneration systems creates a need for the development of high level protocols for Smart Grid technologies designed to manage the interaction of these systems with the national grid. The standard is likely to articulate high level performance objectives relating to communication and interoperability.
Relevant national & international standards	IEC 60904, IEC/TS 62257, and IEC 62446
Suggested approach to Australian Standard development.	Adaption of existing international standards for Australian market application.

7 Grid side considerations

The following sub-sections provide a discussion of how development each of the Grid-side Infrastructure Standards identified in Section 5 of this paper might be progressed. This discussion has been derived from an analysis of the status of current national and international standards for Smart Grids.

It should be noted that the discussion in this section is advanced within the confines of existing Standards Australian protocols which dictate that only IEC standards can be considered for adoption or adaptation for Australian Standards development. Nonetheless, any future work targeting the development of Australian Standards for Smart Grids could be informed by the approaches adopted by other Standards agenda such as NIST.

7.1 Transmission of information

Requirement for standard (and scope of consideration).	It is envisaged that this standard would be developed under the auspices of the Foundation Standards relating to communications protocols and data security and would extend to the design and operation of the tele-control equipment and systems used across the supply chain. That is, development of specific standards for the transmission of information by: ▪ The market operator/monitor ▪ Power generators ▪ Transmission companies ▪ Electricity retailers Given the likely substantive differences in the data systems used by participants (both within and between) each element of the supply chain, it is envisaged that this standard would specify minimum performance criteria in respect of communications interfacing and data security.
Relevant national & international standards	IEC/TR62357, IEC 61970-1, and IEC 61968.
Suggested approach to Australian Standard development.	Adaption of existing international standards for Australian market application. Likely to be almost entirely consistent with the Foundation Protocol (Communication protocols) but with specific reference to grid equipment.

7.2 System safeguards

Requirement for standard (and scope of consideration).	If developed to its full potential, Smart Grids will increase the inter-dependencies of the discrete elements of the national electricity grid, potentially increasing the risk of power interruptions. Successful management of this issue will likely require network wide application of Wide Area Measurement Systems (WAMS) and System Integrity Protection Schemes (SIPS) enabled by new monitoring hardware such as grid sensors. It is envisaged that this element would also extend to the testing (i.e. design and operation) of condition monitoring equipment used for transformer monitoring, GIS monitoring, overhead line monitoring, and circuit breaker monitoring. Accordingly, there will likely be a need to develop a standard for the design (and testing), installation, and maintenance of new sensing equipment. These standards would ideally be used to ensure compliance with minimum safety, operational, and data security thresholds.
Relevant national & international standards	IEC 61869 series (Some of this series is still under development)
Suggested approach to Australian Standard development.	Adaption of international standards for Australian market application.

7.3 Distribution automation

Requirement for standard (and scope of consideration).	The automation of distribution systems will require efficient and effective communications between transformer infrastructure and substation infrastructure. Accordingly, there will be a need to develop a standard setting out common communication and cyber security protocols for the operation of these communications. Given likely key differences in existing infrastructure, the protocols will need to be developed on a performance basis to accommodate likely varying levels of technical sophistication of existing distribution systems.
Relevant national & international standards	IEC 62351 series and IEC 61968 series.
Suggested approach to Australian Standard development.	Adaption of international standards for Australian market application.

7.4 Substation automation

Requirement for standard (and scope of consideration).	The automation of electricity substations will require development of new substation functionality enabled by hardware and software additions. Accordingly, there will be a need for the development of a standard describing the performance requirements for automated substation systems and the communication interface of these systems with other elements of the distribution network.
Relevant national & international standards	IEC 61869 series and IEC 61850 series
Suggested approach to Australian Standard development.	Adaption of international standards for Australian market application.

7.5 Distribution management systems

Requirement for standard (and scope of consideration).	The progressive development of distribution management systems will be required to build the functionality of the smart grid to such a point that distributors have the capacity for dynamic load control via direct communication with end-use appliances and equipment. The development of this capability requires the progressive deepening of information exchange with consequent enhancements in the data security and community interface with other elements of the grid. Dynamic and automated load control, for example, will require the establishment of an effective communication link with HAN's, requiring increased emphasis on communication protocols, public safety, and data security. Accordingly, there will be a need to develop standards that stipulate the minimum acceptable characteristics of the interface between distribution networks (i.e. control centres) and other relevant elements of the grid. These standards will need to be sufficiently dynamic to support the evolution of smart grid functionality over time.
Relevant national & international standards	IEC 61968 IEC-TC 57 (work in progress) AS/NZS 4755
Suggested approach to Australian Standard development.	Adaption of international standards where possible, but a significant element of these standards will need to be drawn from the work of IEC-TC 57 which is still in progress. This work should be progressed in tandem with the development of standards for the Demand Response Interface.

7.6 GIS protocols for Smart Grids

Requirement for standard (and scope of consideration).	This work is relatively recent and relates to agendas being pursued by the international geospatial community. Essentially this work will allow the geospatial mapping of energy information for buildings within urban settlements.
Relevant national & international standards	No existing standards
Suggested approach to Australian Standard development.	Work is being advanced by the Australian Department of Innovation, Science, Research and Tertiary Education promoting the accelerated adoption of Building Information Modelling within the built environment sector. Accordingly, there will be a need to establish a collaboration for the coordination of Smart Grid standard development with this work.

7.7 Operation of micro-grids

Requirement for standard (and scope of consideration).	Smart Grid functionality provides an opportunity to utilise the surplus energy generated by *micro grids* (networked small scale distributed generation) during peak periods of load demand. In order for this potential to be realised, however, it is essential that the electrical and communications architecture of these micro grids is compatible with that of the national electricity grid. Accordingly, there is likely to be a requirement for developing standards for the independent operation of smart grids such that their operation is compatible with the national electricity grid.
Relevant national & international standards	AS 4777 (parts 1 to 3 inclusive), AS6100.3.100
Suggested approach to Australian Standard development.	Conduct a review of existing Australian standards in respect of specific Smart Grid requirements.

7.8 Connection of micro-grids to the national grid

Requirement for standard (and scope of consideration).	At a concept level, the operation of smart grids affords an opportunity to tap into the power generated by micro-grids and/or renewable energy generation. Accordingly, there will be a need to develop standards stipulating the characteristics of the optimal interface (i.e. communications, electrical quality, cyber security) between these electricity sources and the national electricity grid.
Relevant national & international standards	AS 4777 (parts 1 to 3 inclusive), AS6100.3.100
Suggested approach to Australian Standard development.	Conduct a review of existing Australian standards in respect of specific Smart Grid requirements.

Summary and suggested next steps

The discussion presented in this paper presents a strategic framework (or roadmap) for the development of Australian Standards to support the near term commercialisation of Smart Grids in Australia with a view to realising the following potential benefits for the Australian community:

- reducing the quantum of peak load across the network and thereby deferring the need for industry investment in network augmentation;
- supporting the early detection and rectification of network issues, thereby improving continuity of electricity supply;
- improving the efficiency, and therefore lowering the costs, of electricity delivery through better operational management of grid assets;
- delivering information to support reductions in discretionary consumer demand by actively engaging end-consumers in the management of their electricity demand;
- accommodating future growth in electric vehicles, small-scale generation and storage, and generation from renewable energy sources.

A key consideration in achievement of the above goals was to ensure that the development of any Australian Standards for Smart Grids does not constrain future innovation, given the infant state of the market and the likely dynamic nature of technologies for Smart Grid application.

Consultation with stakeholders in the Smart grid market revealed that there is currently a lack of stakeholder consensus on the likely commercialisation path for smart grids in Australia which, in turn, appears to be slowing smart grid deployment and creating uncertainty about the nature of the most likely commercialisation pathway.

Given the apparent absence of industry consensus on the likely commercialisation of smart grids in Australia, Standards Australia developed a strategic framework for Standards Development that has been designed to assist with the management of three current challenges for the near term commercialisation of the Smart Grid market in Australia, namely:

- effective management of any substantial public safety risks;
- effective management of consumer information risks (i.e. predominantly data security); and,
- minimise the quantum of risk associated with early investment in Smart Grid technologies and market commercialisation.

Consideration of the key elements of the above discussion gave rise to the design of a strategic framework for advancing Australian Standards for Smart Grids that comprises three discrete elements, namely:

- **FOUNDATION STANDARDS.** These standards have been assessed as being the building blocks on which successive standards should be developed in the future. They essentially address the core architectural considerations of the smart grid concept, including public safety, grid compatibility, communication protocols and data security.
- **SUPPORTING FOUNDATION ACTIONS.** These are actions that do not specifically relate to the development of Australian Standards, but are considered necessary to maximise the commercial and community dividend from development of the Australian Standards that have been identified
- **INFRASTRUCTURE STANDARDS.** These standards utilise the protocols stipulated in the foundation standards to construct specific standards for the design, operation and installation of smart grid infrastructure. The standards in this group can be further classified in terms of ‘customer-side’ standards and ‘grid-side’ standards.

Examination of the interdependencies between specific standards suggested that the development of the foundation standards should precede the development of both sets of infrastructure standards – due principally to the fact that the foundation standards could be used to set the communications and data security architecture for the operation of the smart grid. The resulting framework is summarised in Figure 9.1.

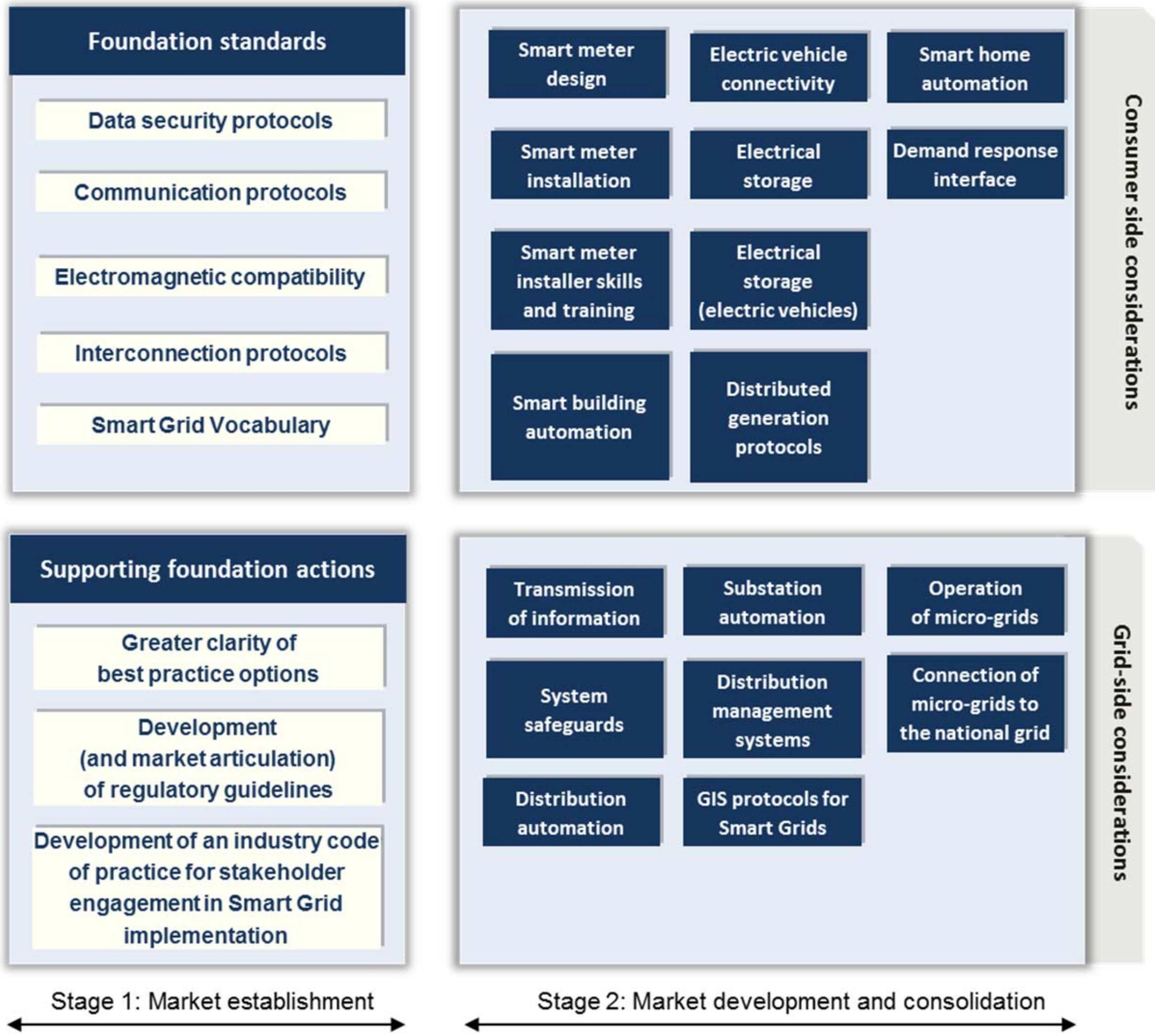

Figure 9.1: Summary of the Roadmap for development of Australian Standards for Smart Grids.

Subject to final endorsement of the directions outlined in this paper by the Australian Government, it is suggested that resources be allocated to the development of the Australian Standards identified in this paper and that the Standards Working Group be formally constituted as a Standards Committee to progress this work.

Study recommendations

The analysis and supporting discussion presented in this paper give rise to the following specific conclusions in relation to the requirements for Australian Standards to support the near term commercialisation of Smart Grids in Australia"

1. The development of Australian Standards should be progressed with a view to addressing the following explicit challenges to the near term commercialisation of Smart Grids in the Australian marketplace:
   a. effective management of any substantial public safety risks;
   b. effective management of consumer information risks (i.e. predominantly data security); and,
   c. minimising the quantum of risk associated with early investment in Smart Grid technologies and market commercialisation

2. Subject to the availability of sufficient funding, a formal Australian Standards Committee should be constituted and charged with the responsibility to advance work on the development of a series of overarching (or *Foundation Standards)* addressing five specific areas of Smart Grid market development, namely:
   a. Data security protocols
   b. Communication protocols
   c. Electromagnetic compatibility
   d. Interconnection protocols
   e. Smart Grid Vocabulary

3. Following development of these Australian Standards, work should commence on a number of Australian Standards relating to specific elements of a Smart Grid (both customer side and grid side applications). The priority of this work should ideally be assessed by the newly constituted Standards Committee following completion of work on the five *Foundation Standards* described above.

4. In addition to commencing work on Australian Standards for Smart Grids, the Australian Government and industry should work cooperatively to advance parallel work in three areas to support the near term commercialisation of Smart Grids, namely:
   a. **PROMOTING BEST PRACTICE IMPLEMENTATION.** Current literature reveals mixed economic, environmental and consumer outcomes from the various Smart Grid projects that have been implemented around the world. Consequently, there is a need to develop greater guidance in respect of best practice implementations. This work will likely require the continued conduct of large-scale trials in partnership with industry and the wider community.
   b. **CLARIFYING THE REGULATORY FRAMEWORK TO BE APPLIED TO SMART GRIDS**. There is a need to clarify the regulatory framework within which Smart Grids will be required to operate, with particular reference to the degree to which current NEM rules and competition principles will continue to apply for Smart Grids.
   c. **DEVELOPMENT OF AN INDUSTRY CODE OF PRACTICE FOR STAKEHOLDER ENGAGEMENT**. Examination of the modes of failures from past Smart Grid implementations reveals that poor stakeholder engagement has been a key failure mechanism in the majority of smart grid trials implemented to date – and a similar observation was made by stakeholders in respect of the Victorian Smart Meter roll-out. Accordingly, there is a need for industry to develop a code of practice for future engagement of all stakeholders in future Smart Grid implementations.

Appendix 1

List of participants in Standards Working Group deliberations

Workshop 1 - 13 SEP 2011

Name	Organisation
Mr Mark Amos	Energy Networks Association (ENA)
Mr Keith Torpy	Smart Grid Australia
Dr Ilya Budovsky	National Measurement Institute (NMI)
Mr David Crossley	Australian Industry Group (AiG)
Ms Janine Rayner	Consumer Federation Australia (CFA)
Mr Phil Alan	Federal Chamber of Automotive Industries (FCAI)
Mr Ashley Sanders	Mitsubishi Australia
Mr Tom Barry	Department Resources Energy and Tourism (DRET)
Mr Stacey McIntosh	Department Resources Energy and Tourism (DRET)
Mr Steve Robinson	Simens Australia
Mr Paul Robinson	IBM Australia
Mr Scott Douglas	GE Energy
Mr Ted Spooner	University of NSW
Mr Jon Real	Department of Infrastructure and Transport
Mr Quentin Pinner	Attorney Generals Department
Mr Kristian Handberg	Department of Transport Victoria

Workshop 2 - 29 NOV 2011

Name	Organisation
Dr Ilya Budovsky	National Measurement Institute
Jon Onley	Australian Industry Group
Shane Thein	Siemens
Mal Coble	IBM Australia Limited
Chris Body	Department of Resources, Energy and Tourism
Mark Amos	Energy Networks Association
James Colbert	Origin Energy
Ramy Soussou	Energy Retailers Association of Australia (ERAA)
Kristian Handberg	Department of Transport
Phil Allan	FCAI
Tom Barry	Department of Resources Energy Tourism.
Stacey McIntosh	Department of Resources Energy Tourism.
Peter Riggs	National Measurement Institute
Stephanie Bashir	AGL Energy
Mike Wyckmans	ABB Australia
Ian Watt	Ausgrid
Jeff Fry	Ausgrid
Janine Rayner	Consumer Action Law Centre

Workshop 3 - 26 APRIL 2012

Name	Organisation
Chris Body	Department of Resources, Energy and Tourism
Jeff Fry	Ausgrid
Ramy Soussou	Energy Retailers Association of Australia
Mark Paterson	CSIRO
Phillip King	Ausgrid
Mark Amos	ENA
Colin Payne	ACMA
Shane Thein	Siemens
Lelde Vitols	Department of Climate Change and Energy Efficiency
Ashley Sanders	Mitsubishi Motors Australia
James Hurnall	Federal Chamber of Automotive Industries
Stephanie Bashir	AGL Energy
Tom Barry	Department of Resources, Energy Tourism
David Williamson	Department of Resources, Energy Tourism
Lauren Anderson	Department of Resources, Energy Tourism
Ximena Elliott	Department of Resources, Energy Tourism
Dr Dimitrios Georgakopoulos	National Measurement Institute
Tracey Colley	Consumer Federation of Australia
Paul Fahey	CERT Australia
Ted Spooner	The University of NSW
Mark McKenzie	Rare Consulting
Lucy Stevens	Clean Energy Council

Workshop 4 - 31 MAY 2012

Name	Organisation
Ramy Soussou	Energy Retailers Association of Australia
Mark McKenzie	Rare Consulting
Jon Onley	Australian Industry Group
Mark Amos	Energy Networks Australia
Colin Payne	Australian Communications and Media Authority
Dr Ilya Budovsky	National Measurement Institute
Mark Paterson	CSIRO
David Williamson	Department of Resources, Energy and Tourism
Stephanie Bashir	AGL Energy
Lelde Vitols	Department Of Climate Change and Energy Efficiency

Appendix 2

List of related national and international standards

AS 4755.3.1-2008 Demand response capabilities and supporting technologies for electrical products - Interaction of demand response enabling devices and electrical products—Operational instructions and connections for airconditioners
AS 4755-2007 Framework for demand response capabilities and supporting technologies for electrical products
AS 4777.1-2005 Grid connection of energy systems via inverters - Installation requirements
AS 4777.2-2005 Grid connection of energy systems via inverters - Inverter requirements
AS 4777.3-2005 Grid connection of energy systems via inverters - Grid protection requirements
AS 61000.3.100-2011 Electromagnetic compatibility (EMC) - Limits—Steady state voltage limits in public electricity system
AS 62052.11-2005 - Electricity metering equipment (AC) - General requirements, tests and test conditions - Metering equipment (IEC 62052-11, Ed.1.0 (2003) MOD)
AS 62052.21-2006 - Electricity metering equipment (ac) - General requirements, tests and test conditions - Tariff and load control equipment (IEC 62052-21, Ed. 1.0 (2004) MOD)
AS 62053.21-2005 Electricity metering equipment (AC) - Particular requirements - Static meters for active energy (classes 1 and 2) (IEC 62053-21 Ed.1.0 (2003) MOD)
AS 62053.22-2005 Electricity metering equipment (AC) - Particular requirements - Static meters for active energy (classes 0.2 S and 0.5 S)
AS 62053.23-2006 Electricity metering equipment (ac) - Particular requirements - Static meters for reactive energy (classes 2 and 3)
AS 62054.11-2006 Electricity metering (ac) - Tariff and load control - Particular requirements for electronic ripple control receivers
AS 62054.21-2006 Electricity metering (ac) - Tariff and load control - Particular requirements for time switches
AS 62056.21-2006 Electricity metering - Data exchange for meter reading, tariff and load control - Direct local data exchange
AS ISO 8713-2012 Electric road vehicles—Terminology
AS NZS 4755.3.1-2012 Demand response capabilities and supporting technologies for electrical products - Interaction of demand response enabling devices and electrical products—Operational instructions and connections for air conditioners
AS NZS 4755.3.2-2012 Demand response capabilities and supporting technologies for electrical products - Interaction of demand response enabling devices and electrical products—Operational instructions and connections for devices controlling swimming pool pump-units
AS NZS ISO IEC 27001-2006 - Information technology - Security techniques - Information security management systems – Requirements
AS/NZS 3000-2007 Electrical installations (known as the Australian/New Zealand Wiring Rules)
I EC 62058-11 ED. 1.0 Electricity metering equipment (AC) - Acceptance inspection - Part 11: General acceptance inspection methods
IEC 14543-3 series - Information technology -- Home Electronic Systems (HES)
IEC 60050 series - International Electrotechnical Vocabulary
IEC 60364-5-53 ED. 3.1 - Electrical installations of buildings - Part 5-53: Selection and erection of electrical equipment - Isolation, switching and control

IEC 60364-5-55 - Electrical installations of buildings - Part 5-55: Selection and erection of electrical equipment - Other equipment
IEC 60904-1 ED. 2.0 :2006 Photovoltaic devices - Part 1: Measurement of photovoltaic current-voltage characteristics
IEC 60904-10 Ed. 2.0:2009 -Photovoltaic devices - Part 10: Methods of linearity measurement
IEC 60904-2 ED. 2.0:2007 - Photovoltaic devices - Part 2: Requirements for reference solar devices
IEC 60904-3 ED. 2.0:2008 - Photovoltaic devices - Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data
IEC 60904-4 Ed. 1.0:2009 - Photovoltaic devices - Part 4: Reference solar devices - Procedures for establishing calibration traceability
IEC 60904-5:2011 - Photovoltaic devices - Part 5: Determination of the equivalent cell temperature (ECT) of photovoltaic (PV) devices by the open-circuit voltage method
IEC 60904-7 ED. 3.0:2008 - Photovoltaic devices - Part 7: Computation of the spectral mismatch correction for measurements of photovoltaic devices
IEC 60904-8 ED. 2.0:1998 - Photovoltaic devices - Part 8: Measurement of spectral response of a photovoltaic (PV) device
IEC 60904-9 ED. 2.0:2007 - Photovoltaic devices - Part 9: Solar simulator performance requirements
IEC 61000 series - Electromagnetic compatibility (EMC)
IEC 61851-1 ED. 1.0 Electric vehicle conductive charging system - Part 1: General requirements
IEC 61851-21 ED. 1.0 Electric vehicle conductive charging system - Part 21: Electric vehicle requirements for conductive connection to an a.c./d.c. supply
IEC 61851-22 ED. 1.0 Electric vehicle conductive charging system - Part 22: AC electric vehicle charging station
IEC 61968-1 ED. 1.0 Application integration at electric utilities - System interfaces for distribution management - Part 1: Interface architecture and general requirements
IEC 61968-13 ED. 1.0:2008 - Application integration at electric utilities - System interfaces for distribution management - Part 13: CIM RDF Model exchange format for distribution
IEC 61968-3 ED. 1.0:2004 - Application integration at electric utilities - System interfaces for distribution management - Part 3: Interface for network operations
IEC 61968-4 ED. 1.0:2007 - Application integration at electric utilities - System interfaces for distribution management - Part 4: Interfaces for records and asset management
IEC 61968-9 Ed. 1.0 Application integration at electric utilities - System interfaces for distribution management - Part 9: Interfaces for meter reading and control
IEC 61970-1 ED. 1.0:2005 - Energy management system application program interface (EMS-API) - Part 1: Guidelines and general requirements
IEC 61982 ed1.0 Secondary batteries (except lithium) for the propulsion of electric road vehicles - Performance and endurance tests
IEC 61982-1 ED. 1.0 Secondary batteries for the propulsion of electric road vehicles - Part 1: Test parameters
IEC 61982-2 ED. 1.0 Secondary batteries for the propulsion of electric road vehicles - Part 2: Dynamic discharge performance test and dynamic endurance test
IEC 61982-3 ED. 1.0 Secondary batteries for the propulsion of electric road vehicles - Part 3: Performance and life testing (traffic compatible, urban use vehicles)
IEC 62053-11 ED. 1.0 Electricity metering equipment (a.c.) - Particular requirements - Part 11: Electromechanical meters for active energy (classes 0,5, 1 and 2)
IEC 62053-31 ED. 1.0 Electricity metering equipment (a.c.) - Particular requirements - Part 31: Pulse output devices for electromechanical and electronic meters (two wires only)

IEC 62053-52 ED. 1.0 Electricity metering equipment (AC) - Particular requirements - Part 52: Symbols
IEC 62053-61 ED. 1.0 Electricity metering equipment (a.c.) - Particular requirements - Part 61: Power consumption and voltage requirements
IEC 62056-21 ED. 1.0 Electricity metering - Data exchange for meter reading, tariff and load control - Part 21: Direct local data exchange
IEC 62056-31 ED. 1.0 Electricity metering - Data exchange for meter reading, tariff and load control - Part 31: Use of local area networks on twisted pair with carrier signalling
IEC 62056-42 ED. 1.0 Electricity metering - Data exchange for meter reading, tariff and load control - Part 42: Physical layer services and procedures for connection-oriented asynchronous data exchange
IEC 62056-46 ED. 1.0 Electricity metering - Data exchange for meter reading, tariff and load control - Part 46: Data link layer using HDLC protocol
IEC 62056-47 ED. 1.0 Electricity metering - Data exchange for meter reading, tariff and load control - Part 47: COSEM transport layers for IPv4 networks
IEC 62056-53 ED. 2.0 Electricity metering - Data exchange for meter reading, tariff and load control - Part 53: COSEM application layer
IEC 62056-61 ED. 2.0 Electricity metering - Data exchange for meter reading, tariff and load control - Part 61: Object identification system (OBIS)
IEC 62056-62 ED. 2.0 Electricity metering - Data exchange for meter reading, tariff and load control - Part 62: Interface classes
IEC 62058-21 ED. 1.0 Electricity metering equipment (AC) - Acceptance inspection - Part 21: Particular requirements for electromechanical meters for active energy (classes 0,5, 1 and 2)
IEC 62058-31 ED. 1.0 Electricity metering equipment (AC) - Acceptance inspection - Part 31: Particular requirements for static meters for active energy (classes 0,2 S, 0,5 S, 1 and 2)
IEC 62059-31-1 ED. 1.0 Electricity metering equipment - Dependability - Part 31-1: Accelerated reliability testing - Elevated temperature and humidity
IEC 62059-32-1 Electricity metering equipment - Dependability - Part 32-1: Durability - Testing of the stability of metrological characteristics by applying elevated temperature
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Appendix 3

Glossary

ANSI	American National Standards Institute
AS	Australian Standard
EV	Electric vehicle
GHG	Greenhouse gas
IEC	International Electro technical commission
ISO	International Standards Organisation
NEM	National Electricity Market
NIST	National Institute of Standards and Technology
SWG	Standards Working Group