



STANDARDS  
Australia

# ROADMAP FOR STANDARDS AND THE FUTURE OF DISTRIBUTED ELECTRICITY

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Final Report – May 2017



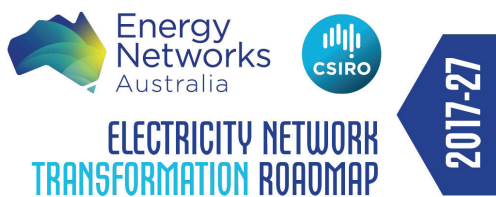
## About this Report

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This report – *Roadmap for Standards and the Future of Distributed Electricity* – May 2017, was prepared by Standards Australia.

The Roadmap was identified by Energy Networks Australia (formerly Energy Networks Association) as a fundamental enabler in redesigning the electricity network, and is crucially linked to the ENA/CSIRO Electricity Network Transformation Roadmap. Thus Standards Australia gratefully acknowledges the financial support from ENA for this Roadmap as Standards Australia's co-resourcing partner.

**Co-resourcing partner:**



## Foreword

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### Dr Bronwyn Evans, Chief Executive Officer Standards Australia



Electricity grids are undergoing rapid change driven by the unprecedented demand for new use cases and flexibility. Today, it is no longer about simply delivering energy. While, energy remains central, now it is about information, communication and data, all of which are shifting the focus to a customer-oriented supply chain. As new products and technologies appear on the Australian energy market, network operators are coming under increasing pressure to adjust their business models to suit.

The Roadmap for Standards and the Future of Distributed Electricity was a structured program of consultations aimed at strategically identifying needed standardisation efforts over the short, medium and long term. It brought together all those who had an interest in transforming the grid, enabling conversations between the key groups, and finally, setting out a list of prioritised actions to guide future directions in grid development. The Roadmap and report would not have been possible without the appreciated support of Energy Networks Australia, as well as the views received from a number of Australian interest groups that hold a stake in the future of the grid. Standards Australia is honoured to have facilitated this Roadmap with government and regulators, network operators, market facilitators, manufacturers, consumer groups and other experts.

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## Executive Summary

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In recent years there have been significant technological developments relating to electricity distribution and consumption, to which the International Electrotechnical Commission (IEC) has been responding through the development of standards that incorporate these technological advancements. Despite these advancements, a strategic approach to standardisation for electricity networks had not been devised in Australia.

Standards Australia facilitated the Roadmap for Standards and the Future of Distributed Electricity between July 2016 and September 2016 and prepared this report in November 2016. The work was designed to support the strategic roll-out of standards in Australia as electricity networks transition to a true ecosystem of prosumers.

The report was produced as a result of a discussion paper and an industry workshop held in August 2016 which enabled industry, consumer and government stakeholders to express priorities and identify relevant international standards for use in Australia.

### Summary of Insights:

- **The standards framework for the future of distributed electricity should support innovation in product, system and network renewal whilst maintaining appropriate levels of safety, system security and reliability.**
- **Inter-operability and harmonisation of solutions were key themes. This should be managed not through vertical development groups but by way of an overarching plan.**
- **Emerging themes like energy and data security must also be managed at both a technical and policy level to ensure the viability of the grid as it transforms.**
- **International standards participation will ensure that Australia's perspectives are incorporated at this level, thus facilitating the national uptake of international standards, which were identified by stakeholders as key resources supporting the transformation of the grid.**

## Context and Assumptions

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This roadmap represents an important component of the larger framework of the joint [Electricity Network Transformation Roadmap](#) between Energy Networks Australia and CSIRO. The Roadmap's stated objectives are worth repeating:

*"In this time of unprecedented change for global energy services, the Roadmap is designed to identify the preferred transition which the electricity network industry must make in the next decade, to be ready to support better customer outcomes under a diverse range of long-term energy scenarios.*

*By setting out a pathway for the transition of electricity networks by 2025, the Roadmap seeks to position network businesses and the whole energy supply chain for the future, to support the evolving needs of customers, innovate and develop new services that customers value and foster the long-term resilience and efficiency of Australia's energy system."*

Stage 1 of the ENA/CSIRO Roadmap identified standards as one important enabler to realise the various and potential "futures" of the grid. Standards play a key role in enabling more transactive power systems by supporting interoperability between technologies, providing consistent frameworks for design and implementation and ensuring safety and security of supply. In fact, the integration of new technologies and distributed energy resources (DER) and interoperability will be fundamental to the performance of the power system of the future.

Some of the key requirements identified through the Roadmap process have been:

- Evolving customer requirements including active customer participation
- The system will become more dynamic and agile
- Active network management
- Continuing integration of new technologies
- Ability to optimise the management of DER
- Increased range and complexity of data/information requirements
- Increased data/information transparency
- Enhanced communications and data systems
- Enhanced cyber security
- Development of decentralised control systems
- To enhance system security

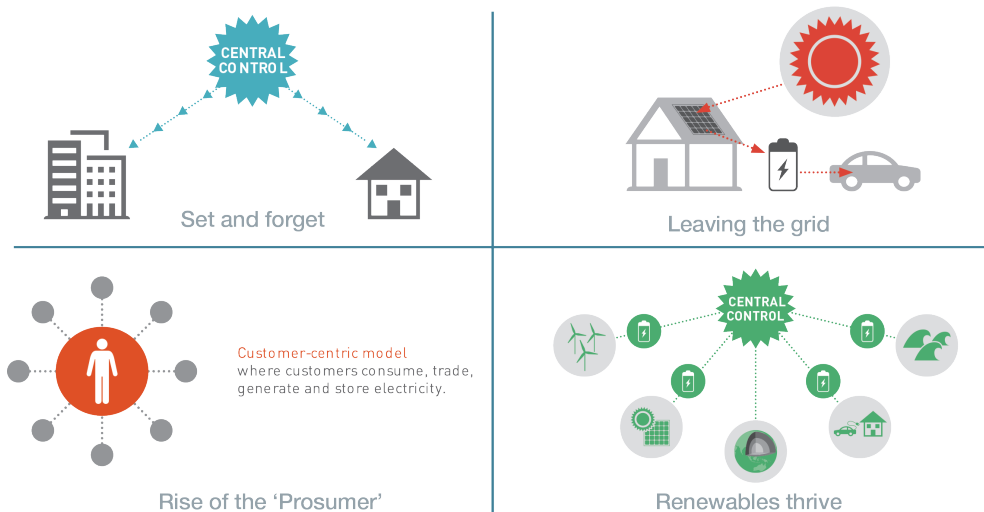
The Roadmap program has also highlighted that the scale and complexity of the electrical grid and its transformation necessitate that those involved in developing and managing it share a common understanding of its operational details. It is in this context that this Standards Australia roadmap has been developed.

Thus, the initial discussion paper of the Standards Roadmap set out various and potential futures of the grid, through which government, industry, consumer groups and other interested parties were asked to consider as they provided their feedback. The futures were framed as the starting assumptions and are illustrated below.



## Four 2050 Scenarios from the Future Grid Forum

Provided by CSIRO's Future Grid Forum



### Standards Process

Although not directly part of the roadmapping exercise during consultation, feedback was received regarding the time it takes for a standard to reach publication. Speed to market and issues associated with this are an ongoing challenge for Standards Australia which is fundamentally driven by external stakeholders and consensus on the content of a standard. Notwithstanding these challenges, Standards Australia remains in ongoing dialogue with contributors on issues such as speed-to-market, as was highlighted during the consultation period. On a regular basis, Standards Australia opens a number of feedback channels such as nominating organisation forums, seminars and surveys. The feedback indeed aligns with this roadmap and has highlighted other issues such as consistency of process and content delivery. As Standards Australia develops standards for the net benefit of Australia, it is critical that the process be streamlined, consistent and the products fit for purpose. As such Standards Australia has put in place a number of initiatives which seek to address these issues:

#### Speed-to-market

- Implementation of a cut-down proposal form to undertake identical international adoption projects
- Submission of proposals for identical adoptions can now occur at any time
- Implementation of a dedicated resource to deliver identical adoptions, with combined and cut-down public commenting and balloting period of six weeks
- Online tools introduced to facilitate remote meetings
- Updated XML template, drawing contributors' focus to content rather than style/presentation, and streamlining the styling and editing process
- Piloting of collaboration tools that facilitate drafting activities

**Process consistency**

- Ongoing and regular staff training of drafting rules and staff development through introduction of a capability framework and the Standards Academy
- Ongoing and regular committee member drafting training available in-person in major capital cities and online
- Revision and update for clarification of Standardisation Guide 006 *Rules for the structure and drafting of Australian Standards*

**Content delivery**

Investment in and roll-out of digital content repository, providing capability to deliver standards in various formats, accessed through a variety of devices

These measures, in addition to a range of other initiatives, are to make developing standards simpler, faster and better for stakeholders and the economy more generally.



## Overview of Topic/Functional Areas

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A reference group was set up to steer the roadmap consultations and considered the larger picture of standards in electricity distribution and also the new technologies appearing on the Australian market, before identifying, a key set of topic/functional areas. The reference group was tasked with categorising areas of standardisation, given their complexity and interconnectedness. The topic areas were selected so that each could be evaluated and linked to past, current or new areas of standardisation. The topic/functional areas, in many cases overlap, however, they form an overall picture of potential areas of standardisation between the point of generation and the point of consumption. The topic/functional areas are listed below:

### **Market Systems and Operations**

- Market Systems
- Electrical System Operation

### **Governance and Services**

- Asset management
- Security
- Cyber Security
- Critical Infrastructure Resilience
- Terminology

### **Generation: Distributed and Centralised**

- General Generation
- Solar
- Marine
- Wind
- Hydro
- Thermal Power Plants

### **Transmission and Distribution**

- Substations
- Switchgear
- Transformers
- Protection Relays
- Cable and Overhead Lines
- Grid Size Energy Storage
- Distributed Energy Coordination

### **Prosumers**

- Building Management System
- Customer Energy Management
- Process Automation Systems
- Demand Response Management Equipment
- Advanced Metering
- Local Energy Storage
- Electric Vehicles
- Inverters
- Microgrids

### **Supporting Technologies**

- Communications
- Electromagnetic Compatibility
- Power Quality

### **Data**

- Frameworks
- Privacy

## Consultation Approach

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The Roadmapping exercise included the development of a consultation discussion paper which was published on 11 July 2016. In addition, an industry workshop was held on 30 August 2016. Both phases of consultation sought to elicit from government, industry, consumer groups and other interested parties, their perspectives on the standardisation needs outlined by the topic areas. The content and responses to the discussion paper and workshop are appended to this document (see Appendix A).

NOTE: Standards Australia participated in two workshops as part of the ENA/CSIRO Roadmap seeking feedback from stakeholders regarding the areas in need of standardisation. The two workshops were specifically targeting standardisation needs relating to grid architecture and introducing the concept of interoperability to new and existing standards

## Summary of Outcomes

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In considering the responses received during the discussion paper consultation and the industry workshop, the responses have been assembled into a list of actions, summarised below, with each action being presented beneath the originally posed statements. See also “Action Plan” on page 15.

### ***1. Current state of standards and committees in each of the topic areas;***

The current snapshot of standards activities is presented overleaf, with each topic area colour-coded. The colours represent an assessment of the status of work in the topic area (refer to key):

## OVERVIEW OF TOPIC AREAS

### MARKET SYSTEMS AND OPERATIONS

Market Systems	Electrical System Operation
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### GOVERNANCE AND SERVICES

Asset management	Security	Cyber Security	Critical Infrastructure Resilience	Terminology
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### GENERATION: DISTRIBUTED AND CENTRALISED

General Generation	Solar	Marine	Wind	Hydro	Thermal Power Plants
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### TRANSMISSION AND DISTRIBUTION

Substations	Switchgear	Transformer	Protection Relays	Cable and Lines/Overhead	Grid Size Energy Storage	Distributed Energy Coordination
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### PROSUMERS

Building Management System	Customer Energy Management	Process Automation Systems	Demand Response Management Equipment	Advanced Metering	Local Energy Storage
Electric Vehicles	Inverters	Microgrids			

### SUPPORTING TECHNOLOGIES

Communications	Electromagnetic Compatibility	Power Quality
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### DATA

Frameworks	Privacy
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- Identified as in need of urgent work or broader participation
- Identified as in need of work
- Identified as lack of Australian activity, but consensus for work not clear
- Current Work Underway or Active Committee with broad representation
- No clear status identified or discussed

## **2. Areas where consensus was established for urgent work to be undertaken;**

### **Distributed Energy Coordination**

- i. In order to address the needs of open standards and interoperability a set of principles needs to be urgently introduced by way of questions that are asked of standards development projects, critically during proposal development and kick-off, and finalisation of the standard. The questions will help guide technical committees into addressing the real need of keeping standards open, technology neutral, encourage interoperability and consider privacy.

Specifically the proposed questions to be asked during proposal development and kick-off to guide standards development include:

- Is this performance based, allowing for innovation?
- Is this technology neutral?
- Does this allow for and/or encourage interoperability?
- Do we need to consider any data or privacy issues?
- Are there committees which will be impacted, or could impact us?
- Do we need to consider the National Electricity Rules?

At finalisation the following set of questions could then be asked:

- Do other standards need to be revised due to this project?
- Are there other impacts which need to be raised?
- Should we review the topic area overview?

- ii. Under the topic of distributed energy co-ordination, two additional international engagement actions were identified: setting up an Australian mirror group to the IEC Systems Committee (SyC) Smart energy, and the IEC Systems Committee (SyC) Low voltage direct current and low voltage direct current for electricity access, to be driven by industry and government stakeholders. A separate roadmapping exercise for these actions may be required.

### **Cyber security**

- iii. To address standards gaps in Cyber Security there is a need to re-engage and invigorate the largely inactive EL-050, Power system control and communication, as mirror committee to IEC TC 57, Power systems management and associated information exchange, with a particular focus on the IEC 62351 series on *Power systems and management and associated information exchange – Data and communications security*. Noting IEC TR 62351-12:2016 Part 12: *Resilience and security recommendations for power systems with distributed energy resources (DER) cyber-physical systems*. Future road mapping could be undertaken in this area.

**3. Co-ordinate development of a roadmap for future standards development and associated actions over the coming years, and time frames for those activities.**

**Electrical System Operation**

- iv. Consensus was established, for the critical interface between renewable and variable power sources, including electrical energy storage and electric vehicles and their interaction with the grid system operation.

IEC SC 8A, Grid integration of renewable energy generation, was identified as one key conduit through which standards solutions to issues on system operation could be provided. It is thus proposed that the mirror committee, EL-034-05, Grid connection of renewable energy generation, be invigorated and indeed the constitution of the governing committee, EL-034, Power quality, be amended to reflect this shift toward renewables feeding into the grid. As appropriate, standards published by IEC SC 8A should be considered for adoption in Australia

**Microgrids**

- v. Consensus on standards for microgrids was positive and thus it was identified that Australia should engage with and contribute to the IEC Systems Evaluation Group (SEG) 6 (Non-conventional distribution networks/microgrids), to be driven by industry and government stakeholders. A separate roadmapping exercise for this action may be required.

**Terminology**

- vi. In response to the need for closer alignment with global terminology, a proposal to be submitted by industry and government stakeholders for the establishment of an Australian mirror committee to IEC TC 1 Terminology. Future road mapping could be undertaken in this area.

**Frameworks and privacy**

- vii. In view of the need to co-ordinate the overlap between IEC and JTC 1 matters, a data reference group to be convened as a joint subcommittee under the Australian committees JTC 1 Strategic Advisor Committee (JTC 1 SAC) and IEC National Committee (AU IEC NC) to co-ordinate standardisation related to data frameworks and privacy as regards electricity networks.

# Action Plan

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Topic/subtopic area	Actions	By Whom	Milestones	Expected Implementation period
<b>URGENT WORK</b>				
Distributed Energy Co-ordination	Guiding questions to be implemented in energy projects at proposal development, kick-off and finalisation	Standards Australia	<ul style="list-style-type: none"> <li>• Discussion with SD team (April 2017)</li> <li>• Incorporation into KO presentation (June 2017)</li> </ul>	April 2017– June 2017
	Submit proposals for mirroring: <ul style="list-style-type: none"> <li>• IEC SyC Smart Energy</li> <li>• IEC SyC LVDC Low voltage direct current and low voltage direct current for electricity access</li> </ul>	Stakeholders – potentially network operators or government [Note: a more structured roadmap exercise may be required]	<ul style="list-style-type: none"> <li>• Identify champion and email stakeholders (May 2017)</li> <li>• Assess proposal for mirroring activities (June 2017)</li> <li>• Constitute mirror committees (September 2017)</li> <li>• Convene first meeting and assess work program (October 2017)</li> </ul>	April 2017– October 2017
Cyber Security	Re-engage and invigorate largely inactive EL-050 Power system control and communication as mirror committee to IEC TC 57 Power systems management and associated information exchange, with a particular focus on the IEC 62351 series	Standards Australia/ Stakeholders – potentially network operators and service providers	<ul style="list-style-type: none"> <li>• Identify champion and email stakeholders (May 2017)</li> <li>• Assess proposal for mirroring activities (July 2017)</li> <li>• Reconstitute mirror committee (September 2017)</li> <li>• Convene first meeting and assess work program (November 2017)</li> </ul>	April 2017– November 2017



# Action Plan

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Topic/subtopic area	Actions	By Whom	Milestones	Expected Implementation period
<b>FUTURE WORK</b>				
Electrical systems operation	Amend constitution of EL-034 Power Quality (mirror to IEC TC 8). Populate EL-034-05 mirroring IEC SC 8A Grid integration of renewable energy generation.	Standards Australia	<ul style="list-style-type: none"> <li>• Discuss approach with SD team (May 2017)</li> <li>• Send callout to experts to participate on EL-034-05 (June 2017)</li> <li>• Approve changes (July 2017)</li> </ul>	May 2017– July 2017
Microgrids	Submit proposal for mirroring IEC SEG 6 Non-conventional distribution networks/ microgrids.	Stakeholders – potentially network operators, government or industry participants [Note: a more structured roadmap exercise may be required]	<ul style="list-style-type: none"> <li>• Identify champion and email stakeholders (June 2017)</li> <li>• Assess proposal for mirroring activities (August 2017)</li> <li>• Constitute mirror committee (October 2017)</li> <li>• Convene first meeting and assess work program (November 2017)</li> </ul>	June 2017– December 2017
Terminology	Submit proposal for new Australian mirror committee to IEC TC 1 Terminology.	Stakeholders – potentially network operators, retailers, or regulators/ government [Note: a more structured roadmap exercise may be required]	<ul style="list-style-type: none"> <li>• Identify champion and email stakeholders (June 2017)</li> <li>• Assess proposal for mirroring activities (August 2017)</li> <li>• Reconstitute mirror committee (October 2017)</li> <li>• Convene first meeting and assess work program (November 2017)</li> </ul>	June 2017– December 2017
Frameworks and Privacy	Convene data meeting under JTC 1 SAC and IEC NC to co-ordinate standardisation efforts related to data frameworks and data privacy.	Standards Australia	<ul style="list-style-type: none"> <li>• Raise at next IEC NC meeting and JTC 1 SAC meeting</li> </ul>	June 2017– December 2017

## Conclusion

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The development of the Roadmap for Standards and the Future of Distributed Electricity was a structured process of consultation with the electrical energy industry on the future standards and directions needed to support the transformation of the grid. Responses and contributions were received from a variety of industry, government and consumer interest groups.

Respondents provided feedback on: the current state of standardisation; items which required urgent activity; and efforts reserved for co-ordination at the horizon. The functional areas of greatest importance, as identified by the consultation participants were: distributed energy co-ordination, cyber security, electrical systems operation, microgrids, terminology, and data frameworks and privacy.

The roadmapping exercise has produced a plan of action, which underlines those areas for which consensus exists and are in urgent need of engagement.

The Roadmap has identified items of particular importance (urgent items in bold):

- **Guiding questions to be implemented in energy projects at proposal development, kick-off and finalisation stages.**
- **Participation on IEC SyC, Smart Energy**
- **Participation on IEC SyC LVDC, Low voltage direct current and low voltage direct current for electricity access**
- **Participation on IEC TC 57, Power systems management and associated information exchange, with a particular focus on the IEC 62351 series**
- International alignment remains a critical enabler to realising the benefits of a distributed electricity network, and thus an increased level of international participation, resulting in greater harmonisation and facilitation of trade is needed.
- Participation on IEC SC 8A, Grid integration of renewable energy generation
- Participation on IEC SEG 6, Non-conventional distribution networks/microgrids.
- Participation on IEC TC 1, Terminology
- Convene data reference meeting as joint subcommittee under JTC 1 SAC and IEC NC to co-ordinate standardisation efforts related to data frameworks and data privacy.

Safety, system security and reliability of supply were constant underlying themes of the consultation process, and remain the key drivers to develop standards in the “empty spaces”. The greatest driver however is ensuring personal safety so that people who interact with the grid can do so without getting hurt or worse.

The report summarises the actions undertaken in the Roadmap, and is an informative tool for stakeholders that recognises the importance of allowing market forces to run their course and provide support through future standards development. The agenda of Standards Australia and the programs of work it undertakes is driven by stakeholders, including industry organisations, network operators and other market participants and indeed regulatory agencies and policy setting government departments. It is thus critical that the recommendations of the report be driven by key industry and government stakeholders so that standardisation gaps can be closed.

The report has identified the need to engage internationally, specifically with a number of Systems Committees, System Evaluation Groups and Technical Committees at the International Electrotechnical Commission (IEC). Policies that drive international standards participation will ensure that Australia's perspectives are incorporated at this level, thus facilitating the national uptake of standards produced by these groups. These groups have been identified by stakeholders as key resources supporting the transformation of the grid. Standardisation is an important lever of change in the energy market, it builds capacity and is one catalyst of achieving an efficient, reliable and cost effective electricity supply system in Australia. Participating at the cutting edge of international standardisation system currently being led by the IEC has been identified by stakeholders as critical to support grid transformation. In many areas of standardisation, Australia punches above its weight at the international level. Through thoughtful policy setting and with industry collaboration, Australia can continue this trend by taking advantage of the opportunities identified in this report.

The report was written with input from stakeholders and supports the Network Transformation Roadmap being undertaken by Energy Networks Australia (ENA) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

# Appendix A – Discussion Paper, Discussion Paper Response and Workshop

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## Discussion Paper

The discussion paper was designed to serve three key purposes:

- 1. Seek feedback on the current state of standards and committees in each of the topic areas;**
- 2. Understand if there is consensus for any urgent work to be undertaken; and**
- 3. Co-ordinate development of a roadmap for future standards development and associated actions over the coming years, and time frames for those activities.**

Stakeholders were requested to provide their input and perspectives on energy standardisation and classify the status of standards development in their respective topic areas.

This classification could assist with understanding where standards activities are functioning well, where consensus seems to be lacking, which topic areas require urgent work, and future areas of standardisation.

The Discussion Paper ([download PDF here](#)) encouraged responses to a series of questions by presenting each topic area with its associated sub-topics.

The discussion paper included a table of supplementary information for each topic area suggesting the relevant Australian committees (and their activity level) and standards in those topic/functional areas, and also highlights the relevant IEC/ISO committees (and whether Australia participated/observed), and related standards.

Additionally, stakeholders were then asked to consider the following questions:

- What could be the unintended consequences of changes to the standards in each topic area?
- How might changes to the standards in each topic area impact privacy or security?
- How should privacy and security be considered when creating/revising these documents?

## Discussion Paper Response

More than 25 responses to the discussion paper were received. A number of them identified the need to further develop the standards footprint in Australia, while others identified areas where better co-ordination between national and international work could assist.

Gaps in standards activities in Australia were identified, reflecting in part a lack of a current knowledge base in Australia, and therefore highlighting where the existing needs lie.

### Strengths

Areas where Australia is strong in standardisation were confirmed, such as photovoltaic installations, inverters, electro-magnetic compatibility (EMC), power quality, asset management, advanced metering and demand response. In some of these industries, Australia not only participates but is part of a leading group of technologists at the forefront of international efforts.

For example the AS/NZS 4755 series on demand response operating instructions for appliances connected to a demand response enabling device (DRED), is a key suite of standards leading the way in peak demand management issues. Most recently, the world-first Part 3.5 of this series was published which provides the operating instructions for battery storage systems connected to the grid.

Australia is also technically strong in photovoltaic installations connected to the grid. In this domain, a key Australian delegate heads an IEC working group responsible for developing international standards on photovoltaic systems, their construction, operation and maintenance (IEC TC 82 WG 3 Systems).

In these examples, standardisation efforts in Australia are strong, and thus when coupled with powerful policy directives, and other key institutional drivers, the demand response and photovoltaic industries can and are flourishing in Australia.

While the penetration of photovoltaic installations in the market and the high level of local expertise are in some way a function of Australia's climate, it does suggest that Australia has the potential to lead given an alignment of such key variables.

In the case of the AS/NZS 4755 series, and building on the success of local Australian expertise, an IEC technical specification, entitled IEC TS 62950, *Household and similar electrical appliances – Specifying smart capabilities of appliances and devices – General aspects*, is at the time of writing being finalised. This technical specification will lay the foundation for a series of "smart" appliance standards focusing on the interaction between the appliance and the grid. In this example, Commonwealth policy directives were the initial support mechanisms for demand response technologies. Through collaboration, knowledge bases were able to grow, eventually leading to Australia developing a world-first in this domain. An Australian expert is now part of the leadership group of an IEC working group on smart appliances, with stakeholders agreeing that a well-placed policy can catalyse expertise, ultimately leading to successful implementation of innovative technologies.

## Opportunities

Opportunities were highlighted by participants on a number of themes which are listed below. Of particular note was the concern expressed by stakeholders regarding system safety and reliability, in addition to the safety of those who interact with the system:

### *Innovation enablers*

Standardisation efforts ought to encourage innovation and openness, taking a technology neutral approach, as far as practicable. While currently the future of the grid remains uncertain, standards developed at this time should not be limited to discreet areas. Innovators of applications and new technologies want to ensure that cutting-edge developments are able to work within a standards framework rather than being constrained by it. Equally, network distributors and supply chain participants must have confidence in the performance of these new innovations. In non-safety related aspects of technologies, respondents considered that market forces would determine product features and technology innovation, and thus standards should be written to allow for such growth. A poignant example is battery storage in which one respondent identified the diverse chemical compositions of battery systems, suggesting that standards be written to facilitate efficiency, innovation and competition, rather than inhibit these developments. Standards should not attempt to predict a dominant technology, but should focus on performance, with the various technologies appended to the main standard. Thus, an open approach to standardisation was the common message.

### *Interoperability*

The notion of interoperability appeared in a number of submissions with stakeholders seeking to ensure that standards did not inadvertently hamper functionality and operation between devices/applications and the grid which are unknown to each other. Standards should support strong interconnections between the devices and the grid so that safe and reliable system operation is maintained. Communications frameworks and protocols, control systems and data, privacy and cyber security all came through as common themes. While each of these aspects is discreet, the common thread is data, ensuring its secure use, and mitigating potential abuse.

### *International engagement*

International engagement and alignment was another prominent theme of the submissions. While some areas as noted above shine brightly for Australia, a vast majority of technical expertise can be found internationally, and specifically, at the IEC. One submission compared the Australian and Chinese experiences: *“Participation by the Australian electricity industry (as opposed to a handful of “committed experts”) is reasonably non-existent. This contrasts significantly with the participation of the Chinese electrical industry in the activities of IEC TC 8 (Systems aspects for electrical energy supply) in particular where the Chinese industry has clearly sought to have a dominant world position with respect to distributed generation.”*

Participation at the international level is critical. Australia is a small market in global terms, and hence there is an imperative to engage internationally so that the products which arrive in Australia are compatible with Australian systems, encouraging local market growth and competition.

### *Horizons*

Varied perspectives remain on technologies on the horizon, including wind technologies, grid-side energy storage and electric vehicles. What was clear, however, among the submissions, was the need for standards to comprehend the shift toward a customer-centric grid, in which control over energy use, reliability of supply and data remained squarely in focus.

### *Security*

A clear consensus was identified across submissions, regarding the importance of standards and establishing a coordinated set of criteria and methodologies that the networks and other key actors in the electricity supply industry use in the planning and safe and secure operation of the Electricity System. This will become even more critical as the system transforms.



## Workshop

The industry workshop held on 30 August 2016 was an opportunity for industry, government consumer groups and others to come together, to express their views and perspectives, as well as to develop a collective view where possible by assessing the submissions, responses and by establishing consensus. The workshop considered a proposed representation of standardisation gaps based on the responses to the discussion paper. Each of the speakers sought to broadly cover the gaps, and highlighted drivers for change. The workshop was structured as follows:

- Context and approach to the Standards Roadmap
- Larger context of the CSIRO/ENA Roadmap
- Perspectives from
  - Australian Energy Council
  - Energy Networks Australia
  - AEMO/AEMC
  - Energy Consumers Australia
- High priorities
- Committee structures
- International work
- Next steps

More than 50 participants registered for the day with stakeholders representing market and network operators, consumers, researchers and academics, device manufacturers and suppliers, retailers, regulators and other specific industry associations. The workshop represented perhaps the first time so many stakeholders from within the electrical energy sector had come together to discuss the future of the grid as it relates to standards.

“Appendix B – Industry Workshop” provides a list of organisations which registered to attend the workshop.



## Workshop Response

During the workshop proceedings, the key themes raised in response to the discussion paper re-appeared. Safety remained an important concern for stakeholders during the discussion. The network needs to be safe for every level of exposure to it. Coupled with this concern was ensuring the security of the network, that is, its ability to continue supplying power. And also, the system's reliability, or the quality and stability of the supply. As such, the workshop was able confirm the areas of priority, and sharpen the collective thinking around those themes. The workshop also identified new areas of activity which were not expressly conveyed during the first round of consultation.

The following items were discussed:

### *Distributed energy coordination*

Distributed energy coordination and the encouragement of open standards and interoperability were raised at various points during the workshop. Participants expressed that in the current climate of grid transformation, standards should not inadvertently inhibit the development of new technologies, but rather be written as performance based requirements, focusing on outcomes, rather than step-by-step "deemed to comply" solutions. The issue of interoperability permeated the discussion paper responses and also the industry workshop.

### *Cyber security/security*

Energy networks are a key piece of infrastructure in the Australian economy, and the impacts associated with down-time and blackouts have recently been keenly felt by those in South Australia. Malicious intent and greater access through a distributed network is a very real and potentially disastrous combination, with network assets and key infrastructure components becoming increasingly vulnerable. Thus cyber security measures to ensure the ongoing reliability of supply was identified as a key gap in standardisation requiring urgent attention by the assembled stakeholders.

### *Electrical system operation*

Another important concern that was raised is the current void of rules and guidance on how renewable energy sources, including but not limited to behind-the-meter storage systems, interact and impact on the larger network. As new products enter the market and as customers seek to sell energy back to the grid, the impacts of these transactions are yet to be fully understood. However, as more of the population implement these technologies, it is critical that the impacts on the grid including, power quality, are effectively and efficiently managed.

### *Microgrids*

With a rise in recent microgrid success stories, stakeholders shared the view that clear guidance through standards are required so that the successful operation of other schemes could be enjoyed. The issues of security remained front of mind for most stakeholders, also as it related to microgrids.

### *Terminology*

An unexpected discussion point which drew agreement from stakeholders was for the setting and adoption of common terminology. Australia has been adhering informally to a common terminology in energy and electrotechnology standards, however, there were no formal linkages to IEC. Industry, government and other parties agreed that following international leads with regard to terminology would be a beneficial pursuit.

### *International harmonisation*

A key agreement amongst stakeholders which indeed overlays the entire process of consultation, was the need for harmonising internationally. It was agreed that while “Australia punches above its weight” in a number of technical fields, there still remains many sub topics for which the benefits of international harmonisation are yet to be realised. Australia as a relatively small market needs to capitalise on opportunities to contribute internationally to ensure smooth uptake of new products in Australia, thus encouraging competition and market growth. Stakeholders unanimously agreed that one of the key actions to facilitate the grid transformation is international engagement and harmonisation. Participants agreed that Australian mirror committees to the IEC was the appropriate mechanism for engagement, and to mirror their structure for all relevant committees as closely as possible.

### *Data frameworks and privacy*

Participants agreed that as information (generated through a more transactive network) is shared, stored and controlled, there is a need for robust data frameworks so that individual profiles can be safely protected and privacy of information on energy use, production and consumption more generally, is secure.

## Appendix B – Industry Workshop

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This appendix provides a list of the organisations which registered to attend the industry workshop\* on 30 August 2016.

Australian Energy Market Operator	Energy Networks Association
AES Alliance	Energy Safe Victoria
AGL Energy	Engineers Australia
Alternative Technology Association Ampcontrol	Enphase Energy
ANZ Bank	Ergon Energy
Australian and New Zealand Recycling Platform	Ethnic Communities' Council of NSW
Ausgrid	FMA Australia
Australian Energy Council	Goodwe Australia
Australian Energy Market Commission	GT Power Electronic Consulting
B&R Enclosures	KPMG
Caldwell & Associates	Lighting Council Australia
Clean Energy Finance Corporation	Master Electricians Australia
ClimateWorks Australia	Mitsubishi Motors Australia Ltd
Consumers Federation of Australia	NECA NSW
CSIRO	Rheem Australia Pty Ltd
DNV GL	Seed Advisory Pty Ltd
Eclectic Engineering	Solar Australia
Ecoult Energy Storage Solutions	Tegart Consulting
	Tridonic Australia

\*Stakeholders who made submissions to the discussion paper but did not register for the workshop were:

BES (Aust) Consulting Electrical Engineers	Noja Power Switchgear Pty Ltd
Department of Defence (Air Warfare Centre)	Nova Systems
Electricity Engineers' Association of New Zealand	Prysmian Group
EMR Australia	Standards Australia Technical Committee TE-003 Electromagnetic compatibility
George Wilkenfeld and Associates	Stop Smart Meters Australia
International Copper Association of Australia	Western Power

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## More Information

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Jonathan has extensive operational experience in standardisation, having spent 4 years in the standards development team, both leading a team of project managers and managing the delivery of his own projects, including AS/NZS 3000 Wiring Rules. Jonathan has represented Australian interests at IEC and ISO governance meetings in Europe and South-East Asia respectively.

Jonathan previously served in multiple project manager/engineering roles in Australia, Europe and sub-Saharan Africa delivering civil infrastructure projects in telecommunications, mining and public works.

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## About Standards Australia

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Founded in 1922, Standards Australia is an independent, not-for-profit organisation, recognised by the Commonwealth Government as the peak non-government Standards development body in Australia. It is charged by the Commonwealth Government to meet Australia's need for contemporary, internationally-aligned Standards and related services. The work of Standards Australia enhances the nation's economic efficiency, international competitiveness and contributes to community demand for a safe and sustainable environment.