Energy Networks Australia

20 January 2017

Mr John Pierce
Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

Distribution Market Model – response to Approach Paper

Dear Mr ~~Pierce~~ John,

Thank you for the opportunity to provide a submission in the consultation on the Approach Paper for the Distribution Market Model Project.

Energy Networks Australia welcomes the Commission's initiative in exploring the potential evolution of decentralised markets for the provision of electricity services at the distribution level.

Our members see the Commission's work as an important opportunity to:

» engage on the milestones and actions required to support energy transformation, working with the network industry and other stakeholders; and

» leverage the evidentiary base and substantial expert advice, both in Australia and globally.

Please don't hesitate to contact Brendon Crown, Executive Director, Economic Policy or myself on (02) 6272 1555, if you would like to discuss any aspect of the attached submission.

Yours sincerely,

John Bradley
Chief Executive Officer

Distribution Market Model

Response to Approach Paper – January 2017

Energy Networks Australia

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Executive Summary

Energy Networks Australia welcomes this opportunity to respond to the Australian Energy Market Commission's (AEMC's) Approach Paper on its Distribution Market Model.

Energy Networks Australia is the new name for the national industry body representing businesses operating Australia's electricity transmission and distribution and gas distribution networks. Member businesses of Energy Networks Australia provide energy to virtually every household and business in Australia.

Energy Networks Australia views the Commission's work as an exciting opportunity to explore opportunities for market models which deliver benefits to energy customers.

As the Commission is aware, relevant analysis has recently been released as part of the Electricity Network Transformation Roadmap program – a joint initiative between Australia's national science agency CSIRO and Energy Networks Australia. The AEMC has been a participant in many of the stakeholder workshops which shaped the roadmap and we appreciate the Commission's support for this process.

The Approach Paper focuses on many similar issues to the Roadmap and therefore the response to this paper draws on the analysis, evidence and expert material the Roadmap provides. In responding to the specific questions raised by the Commission, we would welcome opportunities to engage further on these issues. Energy Networks Australia sees the current Distribution Market Model study as an important process to:

- engage on the milestones and actions required to support energy transformation, working with the network industry and other stakeholders; and
- leverage the evidentiary basis and substantial expert advice, both in Australia and globally.

Energy Networks Australia recognises that the Approach paper represents the early stages of the Commission's review. Our response below draws on learnings from the Roadmap process and centres on a number of key points:

- ***Clarity on scope and objective is important.*** While the objective of the study is broad, the scope identified in the Approach Paper is currently narrowly constrained. For instance, the Approach Paper outlines a number of economic regulatory issues for distribution networks, but does not include substantial discussion of the future of distribution level energy services, the nature and scale of distribution markets, alternative market designs or the real potential for value creation for energy consumers by market participants.
- ***The Approach Paper appears to focus on which entity will perform certain functions and roles prior to substantial examination of the distribution market options.*** This focus appears premature in the absence of a clear understanding of the operational complexity, potential transaction costs or business case for any particular model.

- ***Energy Networks Australia suggests the need for a staged approach to establishing capability.*** In the case of distribution networks, for instance, this may require progressive establishment of advanced distribution network system operational capabilities and extensions of current network procurement of Distributed Energy Resources in a simple Network Optimisation Market. The Roadmap Key Concepts report identifies the practical potential to assess a digital Network Optimisation Market in a feasibility study and cost benefit design within a decade. By that time consideration may also have been given to the development of distribution-level energy markets. This would appear consistent with the statement in the Approach Paper that *"... the Commission expects that any ideal solution is likely to be an evolution of smaller amendments over time, not an immediate, wholesale change."*
- ***Market design should include a focus on realised customer outcomes.*** Good market design is important and necessarily starts with clarity about the scope and nature of the potential distribution market being referred to. Energy Networks Australia recommends the Commission include a strong focus on realised customer outcomes in its market design principles. In particular:
  - It is suggested that the wording of the proposed design objective *"Promote competition where feasible"* and *"Competition should be promoted to the extent possible"* could be better worded to align with the National Electricity Objective, such as *"Promote Competition wherever in the long-term interest of Consumers".*
  - This would reflect the long-standing focus of competition policy in Australia on the ends (customer outcomes) rather than the means (competition).
  - It is suggested the Commission may incorporate a principle that ensures *Efficient and Fair outcomes for Customers,* so that the realised customer outcomes (not only 'choice') are given primacy in the Commission's considerations.
  - Equal recognition of the potential for regulatory failure which, like market failure will lead to poor customer outcomes.

1. Objectives, scope and terms

Energy Networks Australia notes the Distribution Market Model Project is part of a broader work program, looking at the resilience and flexibility of market arrangements to respond to the availability and cost of energy technologies. This particular element of the broader work program, explores possible distribution market design options that may be available to harness opportunities presented by Distributed Energy Resources. The Commission wants to examine:

> "...how distributed energy resources might drive an evolution to a more decentralised provision of electricity services at the distribution level, the incentives or disincentives for business model evolution, whether changes to the regulatory framework, distribution operation and market design more broadly are needed to enable this evolution in a manner consistent with the National Electricity Objective"

Energy Networks Australia notes that while the objective of the project is quite broad, the actual scope of the Distribution Market Model project is relatively narrow. For instance, the Consultation Paper notes that:

> "...the focus of this project is on the technical and regulatory challenges of distributed energy resources on distribution networks. It does not comprehensively consider the design of transmission-based markets (including the wholesale electricity market) or retail markets."

As discussed further below, Energy Networks Australia considers it may be practically difficult for the AEMC to thoroughly evaluate distribution-level markets (which have the potential to bypass current wholesale or retail markets) or the proposed *"changes to market design more broadly",* without considering a broader range of issues.

Question 1
Do stakeholders agree with these definitions, or have any views on the project scope as a result of these definitions?

Energy Networks Australia provides the following feedback:

- In addition to the definitions provided in the Approach paper, Energy Networks Australia considers there would be benefit in defining other core terms such as *market* and *market model*.
- The definition of distributed energy resource appears incomplete in excluding the non-dispatchable rooftop solar PV systems. Such Solar PV resources currently provide the most significant source of distributed energy on the system. For instance, new and enhanced distribution system operational functions are likely to rely on enhanced monitoring and forecasting of Distributed Energy Resource output including Solar PV. Solar PV is presumably included in the distributed energy resources referred to on page 14 of the Consultation Paper, which would require appropriate methods of representation, aggregation and generation output forecasts. It is clearly included in the Approach Paper's discussion of technical impacts of 'distributed energy resources' at page 21.
- The use of words "smart" and "automatically" in the definitions may

unintentionally restrict consideration of technologies that already exist at a distributed or localised level (in particular load control devices).

Similarly, the definition of energy equipment (within distributed energy resources) should also include the most significant current fleet of controllable home devices - off-peak hot water systems. As the AEMC is aware, such systems are controlled (along with smart air-conditioners and pool pumps) under agreements between customers and their distribution network service provider in order to allow the distribution network to 'match supply and demand' while minimising the need for network augmentation.

Question 2
Do stakeholders support this project scope?
Is there anything that has not been flagged for consideration that should be?
Is there anything that should be excluded from the project scope?

The Project Scope indicates a focus on *"the **technical and regulatory challenges** of distributed energy resources on **distribution networks**."* (emphasis added). This seems somewhat skewed, given the objective of the 'Distribution Market Model' study includes exploring market platforms and the design of a new market.

While it highlights in some detail the perceived priority issues in network regulation, the Approach Paper does not include substantial discussion of the future of distribution level energy services, the nature and scale of distribution markets, alternative market designs or the real potential for value creation for energy consumers by market participants

While the Approach Paper has not yet addressed the market issues in detail, Energy Networks Australia notes - and supports - the intention that the final report will explore potential market design options, their advantages and disadvantages and their relative costs and benefits.

As noted above, the Approach Paper indicates the scope will exclude consideration of *"the design of transmission-based markets (including the wholesale electricity market) or retail markets."* It may be difficult to assess distribution-level energy markets without doing so, given their potential to bypass current wholesale or retail markets. The Approach paper notes this potential on page 9 in the context of Peer to Peer trading.

Network Optimisation

While it is not clear from the project scope what market design options are being considered, the AEMC may find value in some of the distribution model analysis included in the *Network Transformation Roadmap.*

The *Roadmap* discussed Network Optimisation markets at length, noting the potential for broader opportunities for distributed energy markets which would require changes to the National Electricity Market design. There is an intrinsic relationship between

the optimisation of energy flows through a network and the buying and selling of energy within that market. Both the Roadmap and other reviews have found that the DER value for network is location and time dependent and, in many cases, temporal. Distributed Energy Resources provide a range of services to the energy supply chain, of which network-facing services are but one significant part.

Within this context, the Roadmap identifies a staged approach to establishing capability for co-optimised distributed energy resources and network functions. Based on analysis of the technical, operational and economic issues, itidentifies a number of needs:

- **Advanced distribution network system operational capability to enable customer-led adoption of distributed energy resources (see Chapter 10 *Grid Transformation).*** Management of the electricity network will become increasingly complex with increasing dependence on intermittent renewable energy sources and millions of distributed energy resources. The Roadmap identifies the need for the development of advanced planning, distributed intelligence and operational tools.
- **The scope to progressively build on current network procurement of Distributed Energy Resources in a simple Network Optimisation Market.** This could occur through relative basic transaction processes, either directly from customers or through their agents;
- **The potential to assess a digital Network Optimisation Market in a feasibility study and cost benefit design by 2027.** As noted on page 82 of the Roadmap, by that time consideration may also have been given to the development of distribution-level energy markets.

Recent analysis for the *Electricity Network Transformation Roadmap suggests* the potential for 40% customers to have onsite resources within a decade and almost two-thirds by 2050. While significant opportunities for value creation exist outside the network sector, the *Roadmap* estimated the economic potential for incentives to customers with Distributed Energy Resources to reach $2.5 billion per year by 2050, for grid support services alone.

Details of the considerations of grid modernisation and market design can be found in chapters 10 and 11 of the Electricity Network Transformation Roadmap Concept Report.

2. AEMC Approach Paper Background and Context

Question 3
Are there any other elements of a DNSP's role or current responsibilities that should be considered?

Energy Networks Australia notes the Approach Paper's overview of the current role of the DNSP. Like the Assessment Framework in Section 3, this section should focus the Commission's Distribution Market Model review on outcomes for energy customers, rather than pre-emptive constraints on innovation in network service delivery.

For instance, the Approach Paper restates a position of the Commission's Integration of Storage report that *"…the economically regulated arm of a DNSP would be prevented from supplying battery storage devices at consumer premises…"* but it could procure such services. Energy Networks Australia supports regulatory reforms focussed on customer outcomes, which allow networks to deliver services efficiently. As the Commission notes in its recent Consultation Paper on Contestability of Services:

> "It is the services provided by an asset that are classified under the existing economic regulatory framework, not the assets themselves. An asset could provide multiple services, some of which are regulated and others that are competitive. As such, **introducing restrictions on the ownership of assets (or the ability of network businesses to earn a regulated return in relation to an asset) into the regulatory framework would need to be considered carefully in order not to create any unintended outcomes and may not be the best approach.**[1] **(emphasis added)**

Such a constraint on network innovation would be particularly concerning given the current context of network tariff reform in Australia. With a focus on network regulation, rather than customer outcomes, the Approach Paper appears to suggest that tariff reform is complete, despite minimal penetration of cost-reflective network tariffs. The Approach Paper states:

> "In November 2014, the AEMC made a rule that requires DNSPs to set network tariffs that reflect the efficient cost of providing network services to individual classes of consumers…all consumers will benefit through lower network costs and lower average network charges. To comply with the new rules, DNSPs have introduced peak demand and time-of-use tariffs that will take effect in 2017*."*[2]

A narrow focus on network regulation would suggest that these changes have been successful and benefits are accruing. The reality however is that, while many DNSPs already have some form of cost-reflective tariff on offer, the level of take-up by

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[1] AEMC (2016) National Electricity Amendment (Contestability of energy services) Rule 2016
[2] Approach paper, p13

customers which are supplied through their retailer (reliant on enabling meters and subject to jurisdictional regulation) has been virtually non-existent.

In fact, the evidence suggests that a reliance on current status quo, "Opt In" approaches will see the majority of customers remaining on unfair and inefficient network tariffs out to 2050[3].

This will have substantial effects on network costs and cross subsidies between customers who do not own distributed energy resources and those who do.

Importantly, the early transition of the majority of customers to cost-reflective tariffs is a necessary precondition to developing market based solutions for network optimisation and full use of innovative market opportunities such as 'peer to peer' trading.

Question 4

Are there any aspects of the regulatory framework that are not set out in sections 2.3 or 2.4 but which should be considered through this project?

The Commission outlines what it considers are challenges to existing regulatory instruments which are created by the increased penetration of DER. The biggest challenges identified by the Commission appear to relate to competition concerns in respect of the broad classification of network services and the threat of foreclosure of competition without appropriate ring-fencing arrangements.

The Commission also notes the role of AEMO in ensuring power system security and raises the question of future market design options and which institution should be responsible for active management of distribution system operations in the future.

However, there are a broader set of market regulatory challenges which should also be considered. The *Network Transformation Roadmap* identifies the need for the regulatory framework to facilitate other outcomes such as:

- The development of a universal authorisations and exemptions framework for the provision of new services (Chapter 4, Milestone 1);
- Reforms to customer protections frameworks (Chapter 3, Milestones 1-3);
- The implementation of new frameworks and services for achieving system security (refer to milestones in chapters 5 and 6);
- A faster transition to more efficient pricing signals through cost reflective tariffs (Chapter 7, Milestone 1);
- The trialling of alternative regulatory processes which are more adaptive to the transformation of the energy supply chain (Chapter 8, Milestones 1 and 3).

Such initiatives are "no regrets" actions – in other words they can be developed in a way that does not lock-in any single predetermined market design. They are therefore not predicated on changes to roles and responsibilities of existing market players,

[3] See *Network Transformation Roadmap: Key Concepts Report,* page 40.

market design and governance or institutional change - but are also flexible enough to allow such changes to be contemplated in the future.

However, the Roadmap highlights that key actions are time dependant – the evidence suggests that deferral or delay in foundation milestones are likely to result in worse outcomes for customers.

Question 5
Should the coordination of distribution systems with distributed energy resources be centralised under the direct control of one body?
Or should it be devolved and performed in a tiered manner?

Energy Networks Australia considers it is premature within the Approach Paper for the Commission to seek a conclusion on this issue. As noted above, the Approach Paper has not yet substantively defined or analysed the Distribution Markets which it is evaluating. It has not identified key design features, implementation arrangements or potential transaction costs of any particular model.

As the Approach Paper notes, while the potential for distribution-level energy markets could be analogous to transmission-level markets, in terms of the physics of electricity, security, reliability, quality and economics of power supply, there are fundamental practical differences also. The potential scale and complexity of distribution level markets requires careful evaluation of design questions such as:

- Is it a distribution level energy market – akin to the National Electricity Market - that is proposed or a digital network optimisation market?
- If a distribution level energy market is proposed, at what level of nodal decentralisation is the market proposed to trade and settle, with what frequency?
- If a distribution level energy market is proposed, will it be an exclusive market - and will it be mandatory in any way - or is there the potential for multiple overlapping markets?

There will be a range of advantages and disadvantages which should be evaluated with the transactional complexity of each option, with implications for the financial, service and risk outcomes for customers.

Energy Networks Australia supports the indicative comment by the Commission elsewhere in the Approach Paper that:

> "The Commission expects that any ideal solution is likely to be an evolution of smaller amendments over time, not an immediate, wholesale change. The Commission will progress its thinking on these issues over the coming months."

Similarly, the *Network Transformation Roadmap* concluded the need for a staged approach which includes the development of appropriate advanced distribution system operational capabilities as discussed under Question 2 above. This does not preclude the potential assessment of alternative institutional design issues at a later stage when such capabilities are more mature.

3. Assessment Framework

Question 6
Do stakeholders agree with the Commission's framework and these principles of good market design? Is there anything that the Commission has missed, or is unnecessary?

Energy Networks Australia generally supports the framework and principles of good market design, but would like the Commission to address several substantial issues, outlined below.

New competition objective

The Approach Paper states objectives for "any changes to energy market or regulatory design" which include a new objective that "Competition should be promoted to the extent possible".

In Box 3.2 it is restated as "Promote Competition where feasible". There are a number of concerns with this principle, including that:

- it is inconsistently expressed in two versions within the Approach Paper;
- it appears to conflate with the National Electricity Objective and its focus on the primacy of the long-term interest of consumers; and
- if the first version was taken literally, then promoting competition *"to the extent possible"* could be used to justify a regulatory design which, for instance, increased the scope of competition even where the costs outweighed the benefits.

Energy Networks Australia suggests this principle be reworded to align with the NEO such as

> "Promote Competition wherever in the long-term interest of Consumers"

This approach recognises the long-standing focus of competition policy in Australia on the *ends* (customer outcomes) rather than the *means* (competition) stating:

> "Competition policy is not about the pursuit of competition for its own sake. Rather, it seeks to facilitate effective competition in the interests of economic efficiency while accommodating situations where competition does not achieve economic efficiency…." [4]

[4] National Competition Policy (1993) , page 6.

Efficient and fair outcomes

The Commission infers that customer outcomes are maximised through its market design principles while acknowledging trade-offs are likely to occur between different principles. However, incorporating a principle that ensures efficient and fair outcomes for customers would ensure that the *realised* customer outcomes (not only choice) are given primacy in the Commission's considerations.

Potential for regulatory design and failure

Finally, there should be an equal recognition of the potential for regulatory failure which, like market failure will lead to poor customer outcomes.

Question 7
Are there any other issues the Commission should have regard to in considering possible market design options?

The Roadmap identifies a number of considerations regarding the design of future system architecture and markets that are relevant to this project.

The current transformation of the energy sector is by no means unique to Australia. There are a number of other jurisdictions that are faced with similar issues, and are advanced in their considerations of the options for the critical transformation that is required.

The Electricity Network Transformation Roadmap was informed by expert assistance from three international consulting firms who are highly experienced and respected in considering the transformation required to achieve the most effective future of the electricity system in a high DER future:

- Tabors, Caramanis and Rudkevich (TCR);
- Strategen Consulting;
- Newport Consulting Group.

Each of the expert consultants brought slightly different perspectives, allowing alternative options to be considered in light of the different operating environment in Australia. A number of common themes were brought out from the different expert views:

- Distributed Energy Resources can provide similar services, with individual types of DER more suited to certain services based on their technical characteristics
- Some limitations of individual DER can be supplemented or overcome through the use of more sophisticated controls, but it is important that DER is properly specified from the outset to achieve this
- Unified resources involving combinations of devices and products may provide significantly more benefits from the provision of a single type of DER at any one location.

- There is a need for networks to enhance capabilities to better integrate and connect growing numbers of DERs and provide more transparent information to DER participants
- New markets or incentives are needed to help customers understand where and how they can deploy different types of DER for broader market benefit
- There is a growing need for the coordination of energy flows across the electricity system, particularly so as customers and their agents or aggregators seek to aggregate loads from localised levels to provide wholesale or transmission market services.
- The experts noted that there are existing and future markets in which distributed energy resources can participate. However, there is a global recognition that the optimisation and orchestration of a decentralised and integrated electricity system involving millions of distributed energy resources will not just happen.

It is also widely recognised that transformation of the energy system will require a series of progressive stages. De Martini defines three broad phases as follows[5]:

- Grid modernisation
- DER integration
- Distributed Energy Markets

A sequenced approach is necessary to ensure benefits are realised in a coordinated manner. Care must be taken in trying to develop complex economic constructs to allow efficient operation of DER in a power system environment.

The future network will be potentially operationally more complex, and it is critical when designing market and platform approaches to ensure that secure and reliable network operation is achieved on a sustainable basis. There are many practical complexities associated with ensuring secure and reliable operation of the power system that may be compromised by a poor system architecture.

A holistic approach to the development of a new range of advanced planning, distributed intelligence and operational tools is therefore required.

The orchestration of distributed energy resources can provide valuable services that help optimise electricity network operation. A market for network optimisation could take a number of different forms, and may also be subject to a staged development process. At one extreme network optimisation can be achieved without a market (or at least without a complex market), while on the other hand there is also the potential for a sophisticated option for implementing a digital and automated market.

A key consideration is how to balance market signals with the required levels of system control to ensure that the system is operated efficiently while customers and market actors are able to trade and transact freely across the electricity system and across increasingly dynamic markets.

As previously noted the roadmap identifies a sequenced approach to market

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[5] Distribution Systems in a High DER future, Lawrence Berkeley National Laboratory (2015)

development. In the shorter term however simpler administrative and commercial approaches may be most effective to reduce the transactions costs, and therefore the hurdle for DER to participate in active markets to provide network services.

Networks can play a key role in guiding the development of localised markets through the provision of market signals and data.

More sophisticated forms of incentives and price signals are likely to evolve as the sophistication of grid architecture and markets increases.

This will necessarily require the development of transparent information for DER participants on the network requirements which may take the form of hosting analysis or heat maps which shows the location and amount of DER that can be accommodated or would add value at various locations.

The Roadmap contains a number of **basic architectural principles** which must be implemented to create a network optimisation market, including that the system must:

- aim to seamlessly enable orchestration and self optimisation at the customer level
- be able to integrate distributed energy resources in a way that supports both power system reliability and economic efficiency
- be designed to provide equivalent firmness of response to traditional network response
- be non-discriminatory
- ensure network optimisation opportunities are transparent and benefits reflect the actual distributed energy resource provided
- be observable and auditable
- be scalable, adaptable and extendable.

4. Technical Impacts of Distributed Energy Resources

The Commission identifies and describes a number of technical impacts from distributed energy resources. Importantly, the Commission recognises that these technical impacts are able to be managed by distribution networks without the need for centralised co-ordination.

These technical impacts can be addressed in a variety of ways and in fact are already managed in most networks effectively.

Nevertheless, with additional penetration of DER, the aggregate technical impact needs to be considered, with the impacts more severe if the uptake and operation of distributed energy resources is uncoordinated or in a non-orchestrated manner.

> Question 8
>
> Do stakeholders agree with the Commission's assessment of the technical impacts of distributed energy resources set out above in sections 4.1 to 4.8?

The Electricity Network Transformation Roadmap draws on work already undertaken in collaboration with AEMO as part of its Future Power System Security Program. EA Technologies supplemented this work with its own expert analysis of the possible features and characteristics of future grid side architecture including implications for power system security.

The Roadmap also identifies the need for technical and workforce enablers that will be required to transition the market. The Roadmap notes that the development of future standards on an open platform will provide key stakeholders more opportunity to develop and apply new technologies, enabling more product choice and encouraging greater innovation.

Globally, there is a recognition of a number of challenges when integrating distributed energy resources in to network operation. These include:

- Future system reliability, with an acknowledgement that system reliability may become an issue needing significant additional active management when VRE penetration levels exceed 30% depending on location;
- Management of the increasingly extreme evening ramp is already an emerging issue in some places. This results from the very rapid changes in demand that occurs in the late afternoon as people return home from work, and the relatively sharp drop off in supply from solar PV as its contribution reduces relatively rapidly during the early evening;
- Oversupply and curtailments of DER leading to fluctuation in supply;
- Ancillary services shortages;
- Localised voltage spikes, and overvoltages resulting from load rejection;
- Flicker; and
- Reverse flow and resulting safety issues.

While the penetration of distributed energy resources is likely to increase substantially, the customer driven transformation will still require management of the grid at granular, locational elements within the distribution network. The role of distribution network management will become increasingly important, irrespective of the market design and institutional framework developed.

There are numerous technical, operational, regulatory and market issues associated with both the impacts and opportunities for distributed energy resources. The Roadmap identifies in Chapters 10 through 12 a number of actions required to modernise the grid and develop market platforms so that networks can optimise the benefits (and address the challenges at minimal cost) from the increased penetration of distributed energy resources at the localised level.

The Roadmap outlines a number of actions to address future products and impacts for the distribution network.

> **Question 9**
>
> Do stakeholders agree with the Commission's preliminary assessment of these opportunities, and possible solutions to address the technical impacts of distributed energy resources?

In addition to the impacts identified in the Approach Paper, there are a number of benefits or products that distributed energy resources can provide. These include:

- Provision of energy to customers through the wholesale electricity market, including for day ahead markets;
- Capacity through reserves for a range of sources and locations, including overall system reserve, local reserves and flexible reserves;
- Provision of ancillary services including frequency control, spinning reserve (available on line), non-spinning reserve (available for rapid startup typically within 1-3 minutes) and supplemental reserves (available in 1 hour);
- Voltage support at all network levels, but particularly and uniquely suited for control at the distribution level where voltage control can be a challenge where there is high DER concentration;
- Improve quality of supply for distribution, for example flicker management; and
- Reliability by allowing fast reconnection during abnormal conditions, and resiliency by allowing formation of islands or managing outage conditions.

In summary, Energy Networks Australia sees the current study as an exciting opportunity to:

- engage on the roadmap milestones and actions and work with the network industry on the regulatory pathway to enable the agreed set of no regrets actions; and
- leverage the evidentiary basis and substantial expert advice, both in Australia and globally to chart a course for energy transformation across the entire energy market.

Energy Networks Australia

Question 10

Do stakeholders have any initial views on who should be responsible for managing these opportunities, or implementing possible solutions to the technical impacts?

Energy Networks Australia notes that distribution businesses are already adapting their businesses to meet customer driven changes to the energy landscape. Many of the impact of these changes arise in small locational parts of the network.

The technical issues relating to increased penetration of distributed energy resources, particularly Solar PV are being managed today by distribution network service providers. A range of network providers identify Quality of Service implications in areas of increased penetration of Solar PV, particularly as penetration rates exceed 25 to 30%.

For instance, the Energex Distribution Annual Planning Report (2015) noted that the current level of Solar PV penetration on Energex's network was causing power quality issues with increasing numbers of customer complaints. At that time, approximately 16% of all its transformers had high penetrations of solar PV.

The significance of this to the Distribution Market Model is to recognise that existing quality of service challenges caused by distributed energy resources are already being addressed today on the distribution network, by networks increasing their capacity for monitoring and control; and adopting simple, relatively inexpensive solutions wherever possible, such as 'tapping down' the distribution transformer voltage. In other cases, it may be necessary to augment customer service mains to reduce impedance or install bi-directional voltage regulators.

A number of networks have trialled battery storage to assess its ability to efficiently manage power quality issues. Energex has used 'direct load control' of customer hot water systems to soak up surplus solar energy as a "solar sponge".

While the penetration of distributed energy resources is likely to increase substantially, the customer driven transformation will still require management of the grid at granular, locational elements within the distribution network. The role of distribution network management will become increasingly important, irrespective of the market design and institutional framework developed.

There are numerous technical, operational, regulatory and market issues associated with both the impacts and opportunities for distributed energy resources. The Roadmap identifies in Chapters 10 through 12 a number of actions required to modernise the grid and develop market platforms so that networks can optimise the benefits (and address the challenges at minimal cost) from the increased penetration of distributed energy resources at the localised level.